REMARKS ON ARABESQUE DECORATIONS, AND PARTICULARLY THOSE OF THE VATICAN.
(With an Engraving, Plate I.)
Read at the Institute of British Architects, February 3, 1840.

At a moment when the public attention is so greatly occupied with the revival of decorations in fresco painting, we have much pleasure in being enabled to lay before our readers, on the commencement of a new volume, the following paper, originally produced at the Institute of British Architects. We regret that we cannot devote a larger number of engravings to the illustration of this essay, which must consequently appear somewhat defective in form.

It is an observation which has been very frequently repeated and very variously expressed, that the proper use to be made of the study of the ancients in their works of art, is not to copy, but to endeavour to think like them. It is admitted to be of little utility to the artist, to imitate the forms of those beautiful models of decoration, which the Greeks and Romans have bequeathed to us, unless at the same time he qualifies himself to apply them judiciously, and modify them successfully, by investigating the principles from which they originate. Among these principles, none is more important, or has exercised a greater influence in bringing ancient art to perfection, than that which has been so well condensed into one line, that

"True art is Nature to advantage dressed."

and if we wish to rival the ancients in the production of what is at once excellent and original, we must, like them, seek the original types in the works of Nature. This was the source from which they drew the various objects which they have modified and combined, not only in their capitals, their friezes, their vases and their furniture, but also in the apparently capricious and fanciful mixtures of different species of animals, and even of foliage and animals, into harmonious compositions, which delight the eye by their graceful and elegant forms, however repugnant to truth, or incompatible with reason. The motives are to be inquired into which influenced the choice of these objects, and the process investigated, by which they fell into the conventional forms in which alone many, perhaps most of them, are now to be found.

That such a course of study would be analogous to the practice by which the ancients themselves attained so high a reach of perfection, we have sufficient proof. Nothing in art can be imagined more conventional than the orders of architecture; and yet Vitruvius endeavours to derive them all from simple principles, and in the Doric order, we can easily trace the original elements of a primitive mode of construction. We shall not so readily perceive the analogy with the female form, given as the origin of the Ionic. It requires a very great stretch of imagination to refer the volutes to the curls of the hair, or the flutes to the folds of the garment. Whatever be the origin of the Corinthian order, the fable which attributes its invention to Callimachus, is as graceful as the order itself; and its repetition by Vitruvius sufficiently indicates it to have been a received principle, that the most conventional forms (and a more conventional form than the Corinthian capital it would be difficult to point out), were supposed to have been originally suggested by the forms and accidents of nature. The least we are authorized to infer from all these instances is, that in the opinion of the only ancient author on architecture to whom we are able to refer, a motive was to be found in every thing the ancients invented, and that in studying the arts it was indispensable to seek and to understand it.

To follow up the subject of these remarks, would open an extensive field of inquiry. They are offered in the present instance merely as preface to a few observations on the arabesque style of decoration, illustrated by a short review of the arabesques in the Loggie of the Vatican. It is proposed to inquire how far the artists who designed and executed these arabesques have been indebted to the antique, and how far they have modified the hints derived from that source, so as to adopt their compositions to the purposes they are destined to fulfil. There will also be occasion to notice the derivation of many conventional forms, and the happy adaptation of natural objects by which these arabesques are enriched in a very extraordinary degree.

In speaking of these sort of compositions as arabesques, the term is of course adopted as it is commonly understood, and it is needless to explain that we disregard both its etymology and meaning in applying it to the paintings and stuccoes of antiquity, which represent not only foliage and fruits, but also beasts of every species, and imaginary creatures combined and interlaced together. These decorations have also acquired the name of grotesques, from the grotoes.
or underground buildings in which they have been found—a term we have perverted still more from the sense in which it was invented.

It is remarkable that the only mention Vitruvius makes of this style of decoration, is in reproval of it—but he describes it so accurately, that the passage is worth repeating, if for no other reason. After pointing out and classifying, what he considers legitimate objects for painting walls, such as architectural compositions, landscapes, gardens, and sea-pieces—the figures of the gods, and subjects drawn from mythology, and the poems of Homer, he proceeds thus—"I know not by what caprice it is, that the rules of the ancients, (observe, that Vitruvius looks up to the ancients in his day, that is to say to the Greeks,) who took truth for the model of their paintings, are no longer followed. Nothing is now painted upon walls but monsters, instead of true and natural objects. Instead of columns we have slender reeds, which support a complication of flimsy stems and leaves twisted into volutes. Temples are supported on candelabra, whence rises, as from a root, foliage on which figures are seated. In another place, we have demi-figures issuing from flowers, some with human faces, others with the heads of beasts, all things which are not, never have been, nor ever can. Such is the influence of fashion, that either through indolence or caprice, it renders the world blind to the true principles of art. How can it ever be supposed that reeds can uphold a roof, or candelabra a whole building—that slender plants can support a figure, or their stems, roots, or flowers put forth living beings. Yet no one condemns these extravagancies; on the contrary, they are so much admired, that no one cares whether they be possible or not, so much do mankind render themselves incapable of judging what is really deserving of approbation. For my own part, I hold that painting is to be esteemed only so far as it represents the truth. It is not sufficient that objects be well painted; it is also necessary that the design be consonant to reason, and in no respect offensive to good sense." Pliny also laments that in his time, gaudy colouring and quaint forms were held in greater estimation than the real beauties of art. But with all deference be it spoken, there is another side to the question, which these great authorities seem to have overlooked.

Conventional decorations of this kind were within the reach of thousands to whom paintings in the higher branches of art were inaccessible, and a more general diffusion of taste must have been at once the cause and effect of their universal adoption—how universal, the remains of Pompeii reveal to us. If we examine the ancient arabesques independently of these prejudices, we shall find endless beauty, variety and originality: graceful details, combined in consistent and ingenious motives and analogies, and great skill and freedom in the mode of execution. We shall also find reason to doubt whether the introduction of the arabesque style really had the effect of discouraging painting of a higher class, since even at Pompeii, poetical compositions of great merit are frequently combined with the lighter groundwork of the general decoration.

However fanciful and capricious the arabesque style may at first sight appear to be, there can be no doubt that it may be treated according to the general fixed principles of art, and that the artist will be more or less successful as he keeps these principles in view. A due balance of the composition is essential, so that the heavier parts may sustain the lighter through every gradation, and there must be such a disposition as not to cover too much or too little of the ground. Unity of design is to be studied in a combination of the parts with each other, and in the harmony of the details and accessories, which ought as much as possible to tend to some general aim. It adds very greatly to the value of this species of decoration, when it can be made by these means, significant as well as ornamental. It would lead us much too far to enter upon the subject of colour; but it may just be observed, that in the ancient decorative painting, the balance of colour is strictly attended to. Their walls usually exhibit a gradation of dark panels in the lower part, a breadth of the most brilliant colours in the middle and principal division, and a light ground thinly spread with decoration in the upper part, and in the ceiling, an arrangement dictated by the natural effects of light and shade, and reflection. As lightness and grace are the peculiar attributes of arabesque, the foliage which forms its most fertile resource should never be overloaded, its details and modes of ramification ought to be drawn from nature. The poems of Schiller and other German authors have lately been published, with a profusion of arabesque decoration in the margin, which are well worthy of attention, both for the ingenuity with which they are rendered illustrative of the text, and for the accuracy, the botanical accuracy, with which some of the foliage and flowers are represented, and which forms one of the greatest charms of these clever and original compositions.

Although the paintings in the Loggie of the Vatican pass under the name of Raffaello, it is not pretended that they are the work of his hand, nor even his designs. He was indeed the originator and director of the whole, and the character and influence of his taste is visibly stamped in every part. But his coadjutors in the work were artists, whose names are inferior to none in the Roman school but his own, such as Giulio Romano, Perino del Vaga, Benvenuto Tisi, and others, who were occupied not only in the execution but in the invention of the details. Francesco Penni and Andrea da Salerno are particularly noticed as being employed for the figures, Giovanni da Udine for the fruits and flowers, and Polydore Caravaggio for the reliefs. It may be worth digressing to mention, that M. Quatremere de Quincy is of opinion, that the sculptures of the Parthenon were produced by similar means, Phidias there performing exactly the same part as Raffaello in the Vatican—and it is indisputable that the combination of unity of design with variety of detail which characterizes Gothic architecture, could have been produced only by the same system, and by employing the minds as well as the hands, of those by whom the decorations were executed. When we see perfection attained in three distinct styles of art, in three distant ages, by means precisely similar, it is not too much to assume that these means are probably the right ones.

The Loggia of Raffaello, is an arcade in 13 compartments. The arches are open, or at least, were so originally, toward the court, of which the Loggia forms one side. The opposite side is a wall pierced with windows, one in each arch, giving light to the suite of rooms which contains the great frescoes of the prince of painters. The ceiling of each compartment forms a square cave, on the sides of which are the panels containing the series of scriptural paintings, the engravings from which are known as Raffaello’s Bible. These are his own designs, and some are known to have been touched with his hand. Both the lateral and cross arches are supported by pilasters about 16 feet high, paneled, and decorated with coloured arabesque on a white ground. Each pilaster on the wall side is flanked by a half pilaster, in which the arabesque is carried through on a smaller scale of composition. It is to these pilasters the present remarks will be confined. We shall find in them as much matter as with the collateral observations to which they will give rise, will fully occupy the time at our disposal this evening.

The description of the pilasters will be taken in the order in which Volpato has engraved them; that is to say, beginning on the side next the wall.¹

¹ No. 1. Notwithstanding the great variety in the composition and details of these works, we shall find a general unity of design prevailing throughout, with the exception of the last five of the series, which will be particularly noticed in their turn. Whatever form the composition may take, it is rendered subservient to the introduction of four medallions, or tablets, relieved from the back ground in stucco, of contrasted shapes—one like an antique shield—the next circular—the third rectangular, and the fourth in the form known as the vesica pons. These medallions occupy the upper part of the pilaster, to the extent of about one third of the whole panel, while the lower part, to the height of the dado, or somewhat higher, is generally filled in such a manner as to afford a weight of colour, sufficient to support itself by the side of that member of the architecture, and the members introduced into its panels, following in this respect the practice of the ancients. These medallions might appear to vio-
late the due balance of the arabesques, if they were identified with
them; but the composition is rescued from that fault, by the separate
character given to the decoration of the medallions, and by their
being detached, and hung as it were, independently upon the back-
ground. In the general arrangement of the whole, these medallions
perform a very important part, connecting the pilasters with the
panelled stuccos adjoining, both by their relief, and by means of an ac-
cordant style of decoration and a similarity in the subjects represen-
ted upon them, neither of which could have been well embodied
in the arabesque itself. (see Plate I, Fig. 1.)

It must be admitted, that these compositions considered separately,
are somewhat unequal, and the examples to be first passed in review
are by no means the best; but instruction may be derived from a con-
sideration of their defects. There are in this pilaster, (No. 1) many
graceful details, but the effect is less pleasing and satisfactory than in
some others where there is a greater unity of composition, and where
the objects are less varied and numerous; moreover, too many of the
forms in this example are somewhat stiff. The guillochi which oc-
cupies the lower part of the half pilaster, is extremely rich; and we
shall find throughout the series, that this part of the composition
bears a solid and Architectural character, in conformity with the prin-
ciple which has already been adverted to. Upon the stuccos it
is not my intention to dilate; I would merely draw your attention to
the beautiful simplicity of the panelling. The antique figures which
fill the compartments would require a separate dissertation to describe
them only. They harmonize, as before observed, with the subjects
contained in the medallions. The clusters of natural fruit and foliage
which surround the windows are continued throughout the series of
arches, and are greatly varied in detail, though precisely similar in
composition. There is nothing conventional in these festoons—the
clusters are simply connected together by a string and are composed
of the most familiar objects rendered with perfect truth. (Fig. 3.) The
melon, the orange, the cherry, the tomato, the olive, grapes of different
kinds, pomegranates, grains of every description, pine and cypress
cones, are those which most frequently recur, with their foliage and
blossoms. The artist has not even disdained the cabbage, the
cucumber, and the onion.

No. 2, has the same faults as the first. The frame, with the horse,
saddled and bridled, is quite in the spirit of the antique decorations,
but it divides the pilaster disagreeably, and is not a proper subject
to occupy the principal place in the composition. In the side pilaster
we have a rather thin and wiry scroll, of both the foliage and
flowers are conventional, but the convolvulus major twines beautifully
and naturally over the fret below.

In No. 3, a closely woven festoon of foliage and flowers is formed
into panels—not, I think, very happily, since the arrangement is such
as the eye does not very readily comprehend, and even if it were
more simple, it would scarcely be applicable, since it divides into
different parts the panel which is in itself a single feature of the
general design; its integrity is therefore destroyed by this mode
of decoration. The subjects which occupy the panels are, however,
well worthy of attention. The group of deer, the landscape, the
dog chasing a porcupine, the Cupid on the dolphin, and the two
winged children manouvring a dancing bear, are all in the true spirit
of the antique. The single figures are less so; an ancient painter
would not have placed them on a scrap of earth. In the Pompeian
decorations, the detached figures—I do not speak of such as are in-
closed in frames, but the detached figures—partake of the artificial
character of the style to which they are adopted, and if they are not
represented as floating in the air, they stand upon a bracket, or a
mere line, or on anything but the natural ground. In the panels of
the stucco are male and female chimeras, enveloped in a scroll formed
of the natural branches of the briar rose.

In No. 4, we arrive at a greater unity in the design, for though it
consists of many parts, yet they all bear upon each other, and are
mutually connected throughout. The temple which forms the centre
of the composition is altogether in the style of architecture which
holds so important a place in the arabesques of the baths of Titus
and Pompeii. I call it a style of architecture, for in the ancient
paintings, where it generally forms the framework of the composi-
tion, and contributes greatly to that unity of design which distin-
guishes the ancient arabesque, it assumes a regularity and consis-
tency which fairly entitle it to the appellation of a style. The sup-
porting figures are objectionable, for they are in motion—common
walking motion. Much more objectionable are the terminal figures
which rise from the acroteria of the temple.

My objection to these terminal figures is, that they are improbable.
Improbable, I mean, upon certain postulates, which it is necessary to
assume before we can reason upon these imaginary compositions at
all. The mythology of the ancient has peopled the elements with
beings compounded of the human and brute creation, their intelli-
gence being indicated by the first, and their fitness for the region they
are supposed to inhabit by the second. There is nothing in ancient
art, in which greater taste or judgment is displayed, than in some of
these combinations. The animal functions appear in no wise com-
promised by the mere interchange of corporeal members, between
different species. Such combinations, therefore, as long as they in-
volve no glaring disproportions, present nothing repugnant to the
mind; and we are so familiarized to them, that we pronounce upon
the success of the representation of a Triton, a Satyr, or a Centaur,
with as little hesitation as we might upon that of any of the animals
of which they are compounded. We are equally ready, or perhaps,
owing to a stronger association of ideas, more ready, to admit of
aerial beings, supporting themselves on wings, floating in the other,
or alighting upon a flower without bending the stalk, though these
are, in fact, less probable than those born of the ocean or the earth. Between animal and vegetable life there is also a sufficient analogy to attach some probability, or at least to afford an apology, for the graceful combinations between these two kingdoms of nature, invented by the ancients, and adopted to a very great extent in the compositions before us; but when we come to combine animal life with unorganized matter, the probability ceases; and if, as in the case before us, the unorganized portion is something artificial, and totally out of proportion besides, the combination becomes intolerable. Thus we acquiesce in the metamorphoses of Ovid or the Arabian Nights, as long as certain analogies are observed; but the transformation of the ships of Eneas into sea nymphs, is, as one of our greatest critics has observed, a violation of probability to which nothing can reconcile us.

No conventional form has been more abused than the terminus. Intelligence and immobility are the attributes which the ancients intended it to embody, but their opposite creation is totally different from anomalous compositions like this, into which it has been tortured.

The scroll in the half pilaster of this example is greatly superior to that in No. 2. It is more simple in its composition, and the leaves are broad and natural, and fill the space much more satisfactorily than a multiplicity of wiry lines and flimsy objects, producing confusion, and destructive of breadth of effect.

In No. 5, we arrive at a superior composition; for it must be repeated, we are examining the decoration of a single member of an extensive whole, and that however beautiful each may be, unity is a beauty in addition. No object in decoration has been so extensively used as the scroll. The ancients do not appear to have been afflicted with an unhappy craving for novelties, nor to have been haunted with the apprehension that beautiful forms of composition would become less beautiful by repetition. When the most appropriate forms in architecture and decoration were once ascertained, they were continually repeated, but marked with a fresh character, and stamped with originality by those refined and delicate touchings which were all-sufficient when they were properly appreciated. We need only refer to the temples of the ancients, to see how perniciously they adhered to an established principle, and to the varieties in the proportions of the Doric order, or the character of the Corinthian capital, varieties which we may be assured were neither capricious nor accidental, to see how studiously they availed themselves of all the resources of art in its details. In the same manner with regard to the ever-recurring form of the scroll, as long as the foliage and ramifications of nature are unexhausted, so long will it be capable of assuming an original character in the hands of the skilful artist. A striking illustration of this position may be drawn from the arabesques in the palace of Caprarola, where the pilasters of the Loggie are decorated with scrolls, all similar in composition, but each formed of a different species of natural foliage, without the intermixture of anything conventional, except the regularity of the convolutions. I regret that I can show but three of these beautiful scrolls, and those very slightly represented. They are composed of the olive, (Fig. 4), the vine, (Fig. 5) and the convolvulus, (Fig. 6.) The latter being rather thin in proportion to the others, is enriched with birds.

For the magnificent scroll before us we are indebted to the antique. It is an imitation of the well known marble in the Villa Medici, but the artist has made it his own by the skill with which he has adapted it to his purpose both in proportion and colour (see Plate I, Fig. 2.) I would particularly call your attention to the animals, the squirrels, the mice, the lizards, the snake, the grasshopper, and the snail, dispersed about the branches, so well calculated to fill the spaces they occupy, and at the same time producing a variety which would have been wanting, had the foliage only been extended with that object. To the scroll in the half pilaster, it is to be objected, that it is a repetition in small, of that in the principal compartment; but if examined separately, it will be found full of instruction, from the union it displays of natural objects with conventional forms. The spiral line of the antique scroll, is evidently drawn from the natural course of climbing plants. It is conventional in its openness and regularity. The involucra of plants furnish the hint for the base from which the antique scroll is made to spring, and the sphagnum of the liaceous tribe for the sheaths, of a conventional repetition of which, the ancient sculptured scrolls principally consist. Thus far for the general elements of the antique scroll, which the artist has implicitly followed in the example before us; but he has enriched his composition without disturbing its unity, by making every sheath produce a different branch, drawn immediately from nature. The birds present an equal variety, and are occupied according to their natural habits, in feeding on the berries and buds, or on the variety of insects which are also introduced. The arabesques in the side panels are to be particularly noticed in this example. A melita, however slight, is always to be desired, and here we see a very graceful one, in the two winged boys, who dip into a vase-like fountain. The winged bear,
which occupies the medallion, may be noticed, as a violation of probability. A being to cleave the air, should not be selected from the most heavy and awkward of animals. It is undoubtedly intended for a jeu d’esprit, and is quite in the spirit of the antique. The ancient frescoes are full of such whimsical combinations, but always, as in the present instance, occupying a subordinate place.

No. 6 is worthy of an attentive examination; the lower part is extremely fanciful, and well adapted to its purpose. For his principal object the artist has chosen the Diana of Ephesus, with her attributes, forming, with some arbitrary deceptions, a remarkably well balanced composition, of which the rectilinear shapes contrast in the happiest manner with the flowing lines above. The Diana constitutes a foreground, behind which rises a slender tree. There is nothing more graceful throughout the whole series than the branches of this tree, and the winged boys who sport among them and enjoy the fruit. (Fig. 7.) Equally graceful are those who gather barley from the Cornucopia, and grapes from the loaded trellis above.

No 7 is one of the most remarkable of the series. In this the artist has ventured, and with the most perfect success, to discard every thing conventional, and to represent a natural tree, balancing its irregularities of ramification and foliage by the numerous birds which occupy the branches, where they may be supposed to have been collected by the call of the bird-catcher, who is concealed in the underwood with his bird-call in his mouth. (See Plate I, Fig. 1.) One bird, fluttered by a limed twig, is about to fall into his hands. It is impossible to admire too much the skill with which this simple motto is worked out. The arabesque of the side pilaster is one of the best of this order; all the parts are graceful in themselves, and well balanced, both in form and colour. This composition is also to be remarked for the introduction of some of the heraldic insignia of the holy see. The keys in saltire, the umbrella, the papal tiara, and the fisherman’s ring, with which the successors of St. Peter are invested. I am rather surprised that this sort of allusion has not been more liberally used.

No. 8 is perhaps the least pleasing of the series. There is a total want of unity in the composition, which is merely a repetition of similar designs, and these not a little stiff and formal. There is likewise too great a weight, both of form and colour, toward the top; but the scroll in the half pilaster is beautiful, and closely resembles that in No. 4.

It will be unnecessary to dwell upon No. 9, since it is precisely the same in general character as No. 5, though varied in its details, in the disposition of the animals, and the mode of spreading the lighter ramifications at the top.

No. 10 bears nearly the same relation to No. 4, upon which we have already remarked at some length. It may be further observed in reference to Nos. 4 and 10, that folds of drapery are too broad and heavy to be successful in arabesque, its effect is seldom pleasing. I must also protest against the birds which crown this composition. Nature has provided a variety which makes it quite unnecessary to seek novelty by combing the neck of one species and the tail of another with imaginary wings. The first impression is that these birds are meant for swans; the second, and abiding one, that the artist did not know how to draw a swan—he has not mended them by dressing them in trousers. The scroll in the half pilaster is composed in the same manner as in No. 5, but is better filled.

The next example may be considered a pendant to No. 7, which, however, it by no means equals. The stem is a natural reed, each joint conventionally expanded into a calyx, from every one of which sprouts a branch of a different species; here are the wild celery, the rose, the blackberry, the arundo, the privet, the grape, the olive, and the barley. The panthers in the stucco panels are appropriately combined with the ivy and grape.

Of the more varied and fanciful compositions on this side of the Loggia, No. 12 is one of the best. It wants unity, and the introduction of so dull a reality as a curtain in the midst of so many objects of pure fancy is displeasing; neither can I reconcile myself to the terminus in the upper part. Independently of other objections, they are too essentially terrestrial to enter into combination with these light sprays—an aerial terminus is a contradiction. They are, however, well treated when compared with those in No. 4. The separate parts of this composition are greatly to be admired, especially the motto in the lower part, and the unity which pervades the fanciful combination above it.

No. 13 is in the same style, but much superior. Taking the lower half as complete in itself, nothing can be more gracefully designed, or more perfectly balanced, which latter is, perhaps, after all, the most important point in the composition of arabesques; they will certainly be found more or less pleasing on a first impression, as this condition is more or less perfectly fulfilled. The solidity of the base, the breadth of the parts forming the next step, the lightness of the Pompeian architecture above, and the flattening character of the objects which surmount it, constitute a gradation which satisfies the eye, while the variety of detail fills the imagination. The upper parts of both these examples abound too much in trivial and wavy details, such as ribbons and strings of jewellery, which are introduced to convey the idea of excessive lightness, but have rather a contrary effect, by producing confusion, and are also too artificial to harmonize with the general character of the composition.

The last on this side repeats No. 3 in the principal composition, and No. 10 in the half pilaster, and therefore requires no observation.

The twelve compositions which occupy the piers on the open side of the Loggia, differ remarkably from the 14 which have been described, and a perfect unity of design distinguishes the majority. This was, perhaps, the more easily accomplished, since (the architecture necessarily differing from that on the side next the wall) the dado is continued across the pilaster, and forms a separate series of panels, each of which is filled with a natural or imaginary being, adapted to the element of water. The half pilasters are also omitted on this side, and a greater breadth of design given to the succoses which are brought into immediate contact with the larger arabesque.

In No. 15, the artist has chosen the apparently incongruous subject of fish to combine with his foliage. In a painting by Hogarth we see in the fashionable furniture of one of his scenes, a composition of foliage inhabited by fish instead of birds, and though this absurdity be intended as a caricature of the taste of his day, it is no great exaggeration of the fact. In this design, the foliage and the fish are brought together without the slightest violation of probability; the fish have been hung to the branches; the variety of their forms and colours produce an admirable effect, and above all, they are perfect in the condition, more especially indispensable in objects not intrinsically graceful or pleasing, of being represented with the most absolute truth to nature. We have the haddock, the lobster, the dory, the cuttle-fish, the wheel, the perch, the shrimp, the crab, the gorbil, the mussels, the cockle, the mullet, and the anchovy. This example may teach us that objects for decoration may be sought throughout the whole range of Nature’s works with hopes of success.

A more graceful conception than the double scroll which forms the subject of No. 16 it is difficult to imagine. It combines unity of design with an unexceptionable balance of parts, and the most perfect lightness devoid of any thing trivial. This composition might be considered absolutely faultless, were not the two figures placed within the scroll rather too small to bear a proportion to some analogous forms, combined with other parts.

Of No. 17 it can hardly be said the effect is pleasing; but both the motto and the grouping of the musical instruments are greatly to be admired, as well as the skill with which the ends of the ribbon are made to fill up and balance the composition, which is well worthy of study, as showing how advantageously familiar artificial objects may
be employed in decoration, when used in their proper place, and not discordantly associated.

Unity is again lost sight of in the design No. 18, but the different objects which compose it, are harmonized upon a totally different principle from any which have been hitherto examined, and the effect is rather dependent upon colour than on form. The panels contrast brilliantly with the white background, and are relieved and rescued from heaviness by the sharp dark lines which surround them; this is quite antique. The component parts of the upper portion of this pilaster must not be passed over unnoticed,—the Cupid and Psyche, the lions with their cubs, the Satyrs grouped with the lower medalion, and the scroll work, which is entirely free from the trivial and confused appendages of which there is reason to complain in some of the former examples.

The general design of No. 19 is the same as in the last example, but its development is scarcely equal, except in the subjects which fill the panels, which are in the highest degree classical and elegant. I ought, perhaps, to have noticed the Tritons, male and female, which occupy the dado of the three last pilasters, but I cannot pass over the bird introduced into this; we are not only presented with the form of the creature, but the skeleton of the fish in its claw indicates its habits also, with the most scrupulous attention to nature; equally true are the bull-rushes in the back ground.

No. 20 appears to me inferior to any other on this side. The lower part is good, but misapplied, every portion being too minute for its place in the general design. The observation on the drapery need not be repeated. The upper part, besides containing too many trivial and wiry forms, exhibits two or three objectionable matters of detail which it will be proper to point out. The swaddled children are equally displeasing to the eye and the imagination, and are therefore improper objects for decoration; the heads are also objectionable. To masks there can be no objection—we are familiar with them as a decoration of the ancient theatre; the association does not desert us, though neither the mask nor the manner of its application may have any thing in common with its origin, and though it may be coloured to the life, it is but a mask. But if a bust be introduced, unless it be represented as a sculptured bust, it suggests the idea of mutilation, or what is still more degrading to its character, a coloured wig-block. And even if the heads could be tolerated, nothing can be more ungraceful than holding the festoon in the mouth. Again, in reference to these cornucopias (to say nothing of their being ill proportioned and badly drawn), the blossoms and foliage which issue from them are attached at the other end to the scroll above, so that we are in doubt to which member of the composition it belongs, or rather, we see that it confusedly belongs to both. On the sort of termini which finish this arabesque, enough has already been said.

The remainder of these compositions are of a different character from any that have preceded them, their basis being more architectural, and suited to be the framework of a series of figures which, in the five last examples, reach to a much higher order of art than mere decoration. The lower part of the design No. 21, is in itself beautiful, independently of the figures combined with it, which in composition and drawing, are truly worthy of the Roman school. They do not appear to form any connected subject, like the rest which follow, but the by-play, if it may be called so, by which they are united, greatly adds to their value. The attitude of these lower figures, so perfectly adapted to the place they occupy, has its motive in their retreat from the monstrosities by which they are threatened, and the monstrosities are held carelessly by the figures above who are occupied in imitating with looking glasses the dragons, whose undulating forms so gracefully supply the lighter materials of the composition. The medallions which have hitherto accompanied us, are laid aside in this and the remaining pilasters. (Fig. 8.)

No. 22 is the first of these connected designs to which I have adverted. In these groups we have the four seasons embodied in personifications truly Raphaelsque.—Spring distinguished as the pairing season—Summer by a group loaded with ripe grain, and the fruits of the season spread at their feet—Autumn by the vintage, represented with a grace and fancy which it is difficult to find words to characterize adequately, (Fig. 9,) and Winter by a composition well calculated as a base for the pyramid which rises from it. To point out the beauties of this painting as regards decoration, is to take a very narrow view of its merits; every one of the 14 figures it contains might be studied as an example of all that is great and graceful in the Roman school of art.

The next compartment (No. 24,) is also full of a moral intention. The principal figures are emblematical of the flight of time. The horary dial supports an admirable group of day and night, with their emblems, dominated by the personifications of the sun and moon; they are accompanied by the well known emblems of time and eternity, and we may find much meaning, even in the steel yard, classically weighted with heads of Janus regarding the past and the future. None of the series is more elegantly terminated than this, though the group does not appear to have any immediate relation to the main subject.

Nothing can be in a higher style of art, than the personifications of Faith, Hope, and Charity in No. 25. To enlarge upon their individual excellences would be foreign to the present purpose. I must only draw your attention to the manner in which they are made subservient to the general design of filling the space they are intended to decorate, and the spire-like form in which they are made to rise from the heavy to the light.

The last compartment is dedicated to the sciences of geography and astronomy. The terrestrial and celestial globes, borne by the genius below, each support figures emblematical of that part of the universe which they represent. On the one the earth-born Antaeus at the feet of Hercules, who is represented in his appropriate labour of supporting the heavens, while a winged being of celestial aspect crowns the other.

Having now completed the review of this series of arabesques, it is not my intention to detain you by any lengthened observations upon them, such as occurred having been expressed on the immediate occasions on which they arose. I began by stating the principles which I conceived might be illustrated by this review and in con-
elusion, I venture to suggest the examination and study of arabesque composition as practised by the ancients and the moderns—a comparison of the Baths of Titus, and the remains of Pompeii and Heracleaenae, with the Loggia of Raffaello, the Villa Madama and the Palazzo T, as one of the most instructive lessons that can be devised, upon the varied and original results that may be derived from the same materials, according to the different lights in which they are viewed, the different modes in which they are studied, and the different purposes to which they are applied. In the resources which the decorative artist can call to his aid, the ancients have greatly the advantage over the moderns, since we possess their materials and our own also. For as long as ancient authors are read, and ancient art appreciated, so long will allusion to the manners, customs, poetry, and religion of antiquity be familiar to us, and the symbols to which they gave rise be universally understood; indeed numberless allusions of this kind are constantly before us, and are so familiar that we forget to inquire their origin. In personification, and the embodiment of abstract ideas, the field is as open to us as to them, and we see to what advantage it may be turned by the examples we have just passed in review; and if we add to all these objects those derived from the useful arts and sciences which may be turned to account in the hands of the skilful decorator, his resources may be considered boundless. For as we have seen in these examples, it is not the familiar aspect of any object which should banish its representation from works of fancy. Everything depends upon its proper application. The ancients made the best use of whatever they considered most appropriate, and we must endeavour to do the same. Thus, on the pedestal of the Column in the Place Vendôme, a professed imitation of that of Trajan, modern arms and habiliments occupy the place of those of the Roman period sculptured on the original. Whether this translation be as well executed as it might be, is not now the question. It is noticed merely as being right in principle. One fertile source we have, totally unknown to the ancients, from which materials may be drawn for decoration, carrying with them the invaluable quality of being in all cases significant as well as ornamental—I mean the science of heraldry. I cannot help thinking that the Greeks, who used so much diversity of colour in their architecture, would have availed themselves liberally of the tints of heraldry in their decorations, had they been acquainted with it. From the personal allusions it conveys, it might be made a much more important feature than it even now is, in the decoration of private as well as public buildings, and we have only to study the works of the middle ages for invaluable hints on the mode in which it may be applied. The mere display of shields of arms is but one mode. We shall find heraldry intimately woven into the ornaments of our Gothic buildings, and he who can read its language, may often understand an allusion in what may appear, at first sight, a mere decoration. Thus, one of the mouldings of the tomb of Humphrey, Duke of Gloucester, at St. Albans, is filled with an ornament, which, on examination, resolves itself into a cup containing flowers, a device assumed by that Prince, says M. de B. in the college of Amis, "as a mark of his love for learning." Heraldry has not been neglected in modern Italian art, and a very well imagined arabesque may be seen at the town hall at Foligno, where the ceiling is covered with foliage spreading from the centre, on the ramifications of which are hung the shields of the nobility of Foligno for many generations. And at Macerata there is a church decorated in a very peculiar style, bearing throughout an allusion to the name of the founder.

A.D.

BUILDINGS IN BELGIUM.

BY GEORGE GODWIN, J.N., F.R.S., &C.

"Perhaps no study reveals to us more forcibly the social condition and true feeling of passed generations than that of their monuments."—M. Guizot.

Chapter I.

BELGIUM contains a multitude of interesting examples of architectural skill in the middle ages, eminently worthy of careful study, and sufficient, from the diversity of the epochs they mark and the character they bear, to illustrate fully a history of the rise and progress of Gothic architecture, and the re-birth of Italian art. An essay on the architecture of Belgium, its peculiarities, its gradual alteration, and its connexion with the architecture of other countries, would be a valuable work, and, so far as I know, is yet to be done, notwithstanding that most of her chief buildings are almost universally known. The present memoranda consist simply of the jottings made during a brief visit to the country in question, and are published with the feeling which has in other cases led the writer to take the same course, namely, that if every one will bring a stone, you may soon raise a pyramid.

The domestic architecture of Belgium offers an infinite variety, and affords numerous hints for present application. Within a very small circle, in some cases even in a single city, examples may be found of the different styles of building which have prevailed at intervals, say of fifty years, from the 11th or 12th century up to the present time. Such towns are a book which those who run may read, and afford a great amount of pleasure and information to those who will pause to think. At Tournay, a most interesting old town, close to the French frontier, towards the western extremity of Belgium, (of which I shall hereafter speak again), there are several exceedingly ancient houses; one of an interesting character is situated near the church of St. Briche. The whole is of stone, and terminates in a gable. The windows, about 5 feet high and 4 feet wide, are each divided into two openings by a small column with plain leafed capital. One of the lower windows has simply a rectangular mullion down the centre, the edges of which are chamfered to within a certain distance from the top and bottom. The string courses, consisting simply of a square member and a hollow, continue through the whole front, and form straight window heads, over which are introduced discharging arches. The adjoining front is precisely similar. In the Rue des Jesuits there are some houses of the same character, but of a somewhat more advanced period. The columns and caps are nearly the same as those before mentioned, and the upper part, perhaps 50 or 60 feet in extent, consists wholly of windows and small piers alternately.

Ghent and Malines display similarly ancient houses.

An early advance upon this arrangement would probably be the introduction of a transom to divide the windows into four, and so to form a croisée. In the gable of an old house at Ghent, near the Hotel de Ville, appears a large pointed window, quite ecclesiastical in aspect, with mullions, tracered head, and label. A house near the Grand Place at Tournay affords a very perfect example of the application of pointed architecture to a street front, at the beginning of the 16th century, and the Hotel d'Egmont at Ghent, shows another application of the same style at a period when it was beginning to exhibit symptoms of decline; as also on a much more elaborate scale, does the well known Maison des Franc Butchers in the same city.¹

Near the Eglise de Chêneau at Tournay is a large building, now the Horse Infirmary for the artillery, which would seem to be an example at a later stage of the decline. It is constructed of red brick and stone, and presents gables, pointed headed windows, other square windows divided by mullions, and large dormers in the roof. The mouldings, however, are Italianized, the discharging arches, partly stone and partly brick, which occur even over the pointed headed openings, are made into adornments, and all the ornaments which appear are of mixed design. Later still, the line of the gable became altered into

¹ Mr. Danaher has made a very interesting series of sketches to illustrate the gradual progression here only hinted at.
a scroll, the mullions of the windows disappeared, and the Gothic panelling on the face of the building gave place to pilasters and entablatures elaborately adorned with figures, fruit, and foliage, as may be seen in numberless examples remaining in most of the towns. The Town Halls and Belfries form a striking feature in Belgium, and in some cases are singularly beautiful. Amongst the privileges granted to the towns when they first acquired communal rights, none seem to have been deemed greater, or were more speedily acted upon, than the right of building a belfry to call together the citizens, and a hall as a general meeting place.

The Hall at Louvain, which has afforded a subject to so many of our artists, is now unquestionably one of the most perfect specimens of a civic building raised by the medieval architects, which remains to us. The whole of it, a pile of crocketed canopies, corbels sculptured into numberless figures, windows, panelling, and elegant turrets, has been restored in a very able manner.

The Town Halls of Bruges, Audenarde, Ghent, and Brussels, are other examples of great interest. The spire of the latter, which is remarkable for its lightness and elegance, is now being restored, and I cannot avoid making this an opportunity to remark, that the desire to restore the buildings left us by our fathers, which is, at this time, developing itself simultaneously in England, France, Germany and Belgium, is no unimportant sign, and will serve hereafter to characterize the 19th century. Valuable as the result is, the feelings which prompt to it, and of which it is but the evidence, are more important still.

The west front of St. Gudule at Brussels, the cathedral at Antwerp, and St. Bavon at Ghent, are amongst the principal buildings in Belgium, which have been lately repaired. More important perhaps than any, however, are the restorations now going on at the cathedral of Tournay, which is one of the most interesting structures in the country, whether regarded per se as a specimen of the architectural skill of two different periods of time, or as recalling by association the events of many ages.

Seen from a distance, with its forest of towers high above the surrounding buildings, its effect is very striking; nor are the pleasant anticipations so raised in any degree lessened by a close approach. In form, it is a Latin cross, with five towers; namely, one on the east, and one on the west side, at each end of the transept, and one at the centre of the cross. The transept is terminated at each end by a semi-circular apsis, similar to many churches in Cologne and other parts of Germany. The nave has an aisle on each side, separated by piers and small columns bearing semi-circular arches, which in various parts approach the horse-shoe form. Above these is a second range of piers and arches, of similar or greater height than the first, forming the front of a large gallery, extending the width of the aisles. Over these is a series of arches against the wall, springing from short piers. The clerestory and the vaulted ceiling were the work of barbarous repairers, in 1777, and took the place of the ancient wooden roof; they will shortly be restored to their original appearance.

All the capitals of the lower columns in the nave are sculptured to represent foliage, and are exceedingly sharp and clear. In earlier times, they were all painted and gilt, and further decorated by scripture mottoes around the abacus. Much of the stone-work is rough and has been covered with stucco: the columns and other parts that were exposed, are of Tournay stone polished.

The four great arches at the junction of the cross are pointed, and have also been embellished by colour, much of which is still visible.

The interior of the semi-circular absis, terminating the transept at either end, is exceedingly beautiful, and produces a very striking effect. The annexed sketch, (Fig. 1,) may serve to give some general idea of its arrangement. At the bottom, a series of six lofty columns two feet eight inches diameter, and about 24 feet high, built up of ten courses of stone, and placed at a short distance from the wall of the absis, support narrow semi-circular arches raised on legs. Over these are two triforia and a clerestory, and the whole terminates in a half dome with plain semi-circular arches raised on legs. The capitals of the columns consist of volutes and of leaves. The base of each pillar has four sculptured leaves at the angles of the pedestal.

Fig. 1.

Originally the choir was about one-third the length of the building, and terminated in an absis similar to those of the transept in form and style. This portion of the building, however, was rebuilt, as is mentioned hereafter, and is now an exceedingly fine specimen of the pointed style, resembling in some respects the choir of Cologne cathedral, although executed much before that wonderful building.

The present choir has an aisle and a series of small chapels on both sides, which continue round the east end. Lofty columns bearing acutely pointed arches, separate the aisles from the choir. In each spannril of these arches is a circular ornament in mosaic work, and

[1] These vaults are formed of rubble work, under a wooden roof, and are less than two feet in thickness.
above rise a very elegant triforium and lofty clerestory. Behind the triforium is a series of peculiar quatrefoil lights, blocked up and unknown until lately (as indeed was the whole of the triforium), but now again filled with stained glass.

The choir is elevated above the nave by three steps, for about one-third its extent, and then by a fourth the remainder of the length, and is paved with black and white marble in squares. The high altar has four additional steps. The pillars in the choir were originally constructed with that daring which characterizes many of the earlier efforts of pointed architecture, and soon gave symptoms of insufficient. They were then strengthened by additional masonry at the back, and even now are remarkable for their lightness and elegance. It may be mentioned, that when the choir was rebuilt, the old chancel arch which was probably semi-circular, was cut away to make room for a pointed arch; as also was the case at the entrance from the transept to the aisle of the choir on each side. Painting and gilding have been used throughout as a means of decoration, and will probably be again resorted to when the whole of the substantial repairs have been executed. A series of flying buttresses (seen in the sketch, at the head of the second chapter), surround the choir externally, and it is between these that the chapels are formed, terminating in gables. The roof of the choir above the vaulting is of oak, and of great height.

Round the outside of the clerestory of the nave there is a continuous gallery, formed within the thickness of the walls, and faced by small octagon columns and arches of the Tournay stone, originally polished.

Elsewhere there are various galleries in the walls, so that all parts of the building are practicable. The same stone is employed in the construction of the building as the rock consists of on which it stands, so that it may be said to be a continuation of the solid substratum. Nevertheless, there are many very serious fissures and settlements, especially in the transept and choir, which need extensive repair. The west front of the building has been disfigured by various alterations; a groined porch in the pointed style extends the whole length of the front, and above it a large pointed window has been introduced, so as to destroy entirely its original character. There is a variety of sculpture under the porch, but the greater part of it is modern and very uninteresting. The cathedral is entered by two doors, one on the north side of the nave, and the other on the south, adjoining the transept. The north door is seen in the external view of the north absis at the head of the next chapter, (Fig. 3.) and is of the transition period. It consists of a semi-circular archway beneath a pointed trefoil arch, the whole profusely adorned with ranges of sculptured figures, animals, and foliage. On each side of the light which occurs between the circular and the pointed arch, is a small twisted column. The four towers of the transept are each different in detail, and have been executed at different times. They all display, however, a mixture of pointed and semi-circular arches.

The whole length of the cathedral within the walls is, as nearly as I can estimate it, 420 feet. The transept, which is nearly in the centre of the building, is 212 feet from north to south. The width of the nave including the aisles, is 70 feet; the choir is a few feet wider. The height of the choir is 110 feet. As a datum for comparison, it may be mentioned, that Salisbury Cathedral, according to Mr. Britton, is 450 feet long within the walls, 75 feet wide in the nave, and that the height of the choir is 81 feet; in other words, it is 30 feet longer, 8 feet wider, and 29 feet lower than that of Tournay.

7 In a chapel, south side of choir, the spandrels of an arcade are painted to represent angels bearing scrolls.
8 These dying buttresses are double. The upper arch was apparently formed first, and this being found insufficient the lower arch was then added.
9 There is a curious gallery of this description round the Église de Chateau in Tournay.
10 The west front had originally two small towers at the angles. These towers at the extremity of the west front are found in many buildings in Belgium, at the Église de Chateau before mentioned, St. Bavon, Ghent, &c. (To be continued.)

CANDIDUS'S NOTE-BOOK.
FASCICULUS XLIV.

I. I must have liberty
Within as large a charter as the w'nd's
To blow on whom I please.
never be understood; and it will then, possibly, be found, that the in-
tercessions of saints, and the pride of heraldry, are not in accordance
with the free spirit of a Protestant, and a free people of the 19th
century; and we may then shake off this dull, unmanny copysim which
disgraces our school, and daring to think for ourselves, invent and
perfect an architecture suited to the ideas religious and moral of our
times, and in accordance with the materials and structure of an im-
proved practice!" There's hersesy for you, with a vengeance! What
say you to that Joseph Gwilt? Why, the smallest of the "small-fry"
could have utterly nothing half so mischievous and vile! "Invent, in-
deed!—perfect too!" By the heard of Vitruvius—if he were one—it is
truly scandalous.—"Dull, unmanny copysim!" What say you to that,
Sir Robert?—the audaciously of it must make your hair stand on end.
What say you again, Friend Welby, to that same fling at "copyism,"
and the expressive hint, that the spirit of our ancient architecture is
not exactly in accordance with the spirit of the 19th century! Well,
after all, you have reason to comfort yourselves that Cockrell did not
have a fling at Lord Shrewsbury and his "Inspired Virgins," who turn
out, it seems, to be just what might be expected of miracles and
miracle-mongers in this 19th century.

III. Architectural painters and draftsmen are privileged, it may be
presumed, to lie with impunity, a licence of which some avail them-
selves so freely, that some of their productions are no better than so
many downright graphic falsehoods, which, by greatly exaggerating
or flattening the buildings so shown, cause disappointment when we
afterwards behold them. It is a very common mode of lying, with
them, to draw their figures, which should always serve as a faithful
scale to the architecture, so much smaller than they ought to be as to
convey the idea of the buildings being very much larger than they
really are. Another common piece of deception is to throw in forced
effects of light and shade that are never to be seen in the real objects.
By no means is it an uncommon trick to put in, not merely positive,
but most violent and exaggerated shadows on the upper part of a
building, while all below is quite light:—shadows which we must
suppose are occasioned by a score of balloons hovering over us just
up in the air.

IV. It was to be hoped that the invention of the Daguerreotype
would ere this have been turned to a very great account for the study
of architecture, and have been made to supply us with perfect and
trustworthy representations of buildings, more especially of such as
have not yet been represented at all. With regard to subjects of the
latter kind, this does not appear even likely to be the case. Cer-
tainly it is not so with the "Excursions Daguerriennes" for there
some pains seem to have been taken to select some of the oldest
subjects possible, and to avoid any which in addition to their in-
trinsic attractions, would have those of novelty and freshness. This
is rather—or more than rather—provoking, so exceedingly perverse,
in fact, that one is quite puzzled to account for it. Those who pro-
vide the engravings for the large sheet almanacs, seem to have the
same relish for staleness of subject. The Cambridge almanac for this
year has an interior view of the hall of Trinity College, instead
of the facade of the new Assize Courts, as might have been expected,
and which, shown upon that scale, would have formed an interesting
architectural plate. Again, there has been so very little building
going on of late, and that little so undeserving of their notice, that the
"Stationers" have been obliged to go to Greenwich Hospital for the
subject of the engraving to their almanac. Well, some fifty
years hence, perhaps, the turn will come for Cockrell's Sun Fire
Office, and Mosshay's Commercial Hall.

V. A sort of materialism seems to be just now prevailing in archi-
tectural doctrine, that is more likely to give us able builders and
cunning "artists" than real artists in their profession. No doubt, in
a merely utilitarian point of view, it is far more important that we
should have the former than the latter. Art may be dispensed with,
or treated as something altogether subordinate; but then, let us, in
fairness, abate our claims in behalf of architecture itself, as one of
the fine arts, and to which, in its quality of such, we look for aesthetic
charm and power. "Mere builders," is quite as strong a term of
reproach as "mere artists;" and is one by very far more generally
applicable than the other, since there are but comparatively few in
the profession—and not everyone among the professors themselves—
who show themselves to be artists at all; most of them being no
better than respectable copyists and plagiarists, unable to catch the
spirit of their models, and both preserving that, and combining with
it some spirit of their own, to give us some fresh ideas worth having,
and produce works that might deserve to become models in their turn.
It must be admitted that the studies belonging to an architect are
very multifarious; yet, while undue stress is laid upon some,
which, after all, are but means—the mere scaffolding of his art—that
which is assuredly not the least important among them is overlooked,
namely, the study of design, by which is to be understood some-
thing more than that mechanical species of it, which may be learnt
seen dum artem. "But," say the feeble and the timid, "it is safer to
stick to mere rules: to pretend to deviate from them, and aim at
originality is very presumptuous, and moreover, exceedingly hazard-
ous and dangerous." No doubt: yet it is by that daring which some
call rashness, that glory is won, and through perils and hazards that
conquest is achieved—in art as well as in arms. Of course those
whose valour and prowess are calculated for nothing more arduous
and perilous than a show fight or review, do well to abstain from
entering a field where only master-spirits may hope to win, and
where even they may fail and fall.

VI. Greatly do I envy Professor Donaldson, the possession of that
pair of spectacles, which enables him to discern "lines of palaces at
Pimlico and on the north side of the New Road," and magnificence in
Regent Street! George Robins could hardly have been more liberal
of praise in one of his puffing advertisements; and from him such
puff would have been received for just what it is worth; but from a
Professor and ex cathedra it is un peu fort. Such excessive
liberality on the part of the Professor at University College, is the
more remarkable, because he could not find even one syllable of praise
to bestow on a certain building in Gower Street, which some hold to
be a very fair piece of architecture, although they are so fastidious
in their taste, as to have no admiration for Pimlico palaces—not even
for the palace, and for Regent Street magnificence. Perhaps the
Professor was afraid of alluding or calling the attention of his auditors
in any way, to the portico of the building they were assembled in,
knowing that its columns had been compared by one very great an-
chority in such matters, to "Ten Cyprians," a class of ladies that
ought not to be allowed at Colleges and Universities. As to the
great critical authority alluded to—one, by the bye, who holds archi-
tectural criticism generally, in abhorrence, much as he has scandalized
at "Wilkins' Corinthian Cyprians," he is quite enamoured with those of
St. Martin's Church.

NEW ARCHITECTURAL SOCIETY EXTRAORDINARY.

Some witty but malicious wag has just been amusing himself by
circulating a hoaxing "au d'april, which imports to be a list of the
officers of a new Architectural Society, and in so doing has made ex-
ceedingly free with many respectable names, attaching to several of
them some of the most ludicrous titles imaginable. We suspect that
it comes from some one who is no very great admirer of Mr. Gwilt
and his opinions, for that gentleman's name stands very conspicuously
at the head of the list, where he is sneeringly designated "Professor
of Latin architecture,"—a style of architecture never heard of before
—and as "Vitruvian Professor," which last title seems to be intended
to be a double shot, and to allude contrastingly to Mr. Hosking as the
"Anti-Vitruvian Professor," and therefore in Mr. Gwilt's opinion, a
Professor of Architectural Heresy and Radicalism. Then we have
Mr. Valentine Bartholomew, "Professor of Fruit and Flower-painting,"
—an odd sort of appointment in a college of architects; Mr. G. Aitch-
ison, "Professor of Concreting and Opus Incertum,"—in which last
there are, if no professors, plenty of practitioners already. How Mr.
Billings will relish the title of "Itinerant Delinicator," we know not;
but it is a tolerably safe one, since no one will care to rob him of it, the epithet being just next door to that of strolling player. Mr. W. Bartholomew is named as "Honorary Solicitor," and if by that is meant he is to do all the law business of the society "gratis for no-thing," he must be a real phoenix in his profession—something more wonderful than all other Professors put together. We never heard, before, of "Baptistographyer," yet such is the high-sounding title conferred upon a Mr. W.P. Griffith. Besides these, there are a "Custos," a "Recorder," and a "Catalogist." Of Professors of one kind or other there are no fewer than eight; so that the title is likely to become quite a drug—so dog cheap that no one will think it worth having. But the drollest thing of all still remains to be mentioned: would it be believed that these profession and professing "Free-masons" have got a female among them, contrary to the well-known regulations of that mysterious craft? And what office does the lady fill? Is she their "Professor or Professoress of cookery"? Oh, no! There would be nothing very ridiculous in that; especially as there is a "Gibbons' Carver," and there must, accordingly, be a cook to provide materials for him to operate upon. No, the lady's office is to be that of—guess if you can, but we defy you to do it; therefore not to tease you any longer, tell you it is to be that of "Embroidress!" Think of Professors, and a Vitruvian Professor among the rest, being jumbled up with an "Embroidress"—alas a Professor of Millinery! O, Vitruvius, how art thou fallen! Dignity of Art, how art thou sunk!—so low that ne'er shall we be able to dig thee out again!

Not contenting himself with this bit of quiz, the author of it has very unceremoniously mentioned several gentlemen as individuals on whom it is proposed to confer Honorary Fellowships, and has even had the audacity to make free with the name of Charles Barry; which is certainly carrying the joke a little too far. He has also put down those of both Willis and Whewell; and we need not say very blunderingly, since the "Vitruvian Professor" holds their writings in such contempt, that he has thought proper to omit them in the list of architectural works inserted in his Encyclopaedia. It being merry Christmas time, some license may perhaps be allowed to the jokers and lovers of fun; but we suspect that many of the parties who figure in this jeu d'esprit, will consider it very sorry fun—not at all better than a fort manuscrite plaisanterie.

RESTORATION OF THE CHURCH OF SAINT MARY, REDCLIFFE, BRISTOL.

[It affords us much pleasure to be able to lay before our readers the following address of the Vicar and Churchwardens of the church of St. Mary, Redcliffe, Bristol, on the proposed works necessary to be done to restore this noble specimen of ecclesiastical building to its pristine grandeur; and we are happy to see that the combined talent of Messrs. Britton and Hosking have been engaged to report upon the necessary works requisite to be done: the one is well known for his antiquarian disquisitions and his love for all that concerns the Christian architecture of Great Britain, and the other for his thorough knowledge of construction and architecture, which insure that the public will have that justice done to the building that it so well merits. We heartily join in the appeal, and do hope that every architect will exert his influence, in stimulating the public to come forward with subscriptions, for the restorations requisite this noble edifice.]

The Vicar, Churchwardens, and Vestry of the Parish of St. Mary, Redcliffe, having resolved upon a public and extended appeal on behalf of the venerable and once splendid fabric entrusted to their care, prepared and circulated, in July last, an address briefly stating the circumstances which appeared to them to justify such appeal. That address explained the preliminary steps which the parish authorities had adopted, and especially their selection of Mr. Britton to advise respecting the decayed state of their church, and the best mode of restoring it to its pristine integrity and beauty, with their reasons for such selection. The result of their communication with that gentleman was his calling to his aid Mr. Hosking, Professor of architecture and of the arts of construction, at King's College, London, whom the Vestry, at Mr. Britton's request, have associated with him in the commission.

These gentlemen having carefully and fully surveyed the church, presented to the parish authorities luminous and detailed reports, on all the matters referred to them, accompanied by plans and drawings illustrative of their views. In the conclusion of their preliminary address the parish authorities stated that the reports were thought too copious for printing on that occasion; but that in a subsequent appeal, an analysis should be given, to embrace their more leading and prominent parts, and illustrated by copies of some of the drawings. It is in fulfilment of this intention, and of the pledge contained in their former paper, that the Vicar, Churchwardens and Vestry, now present this more extended address, in the hope and belief that the public will feel as well satisfied as the parish authorities in their preliminary address stated themselves to be, that the able and eminent architects alluded to, have, in their consideration of the matters referred to them, "been governed by views not less honourable to their reputation for taste and science, than for sound and practical knowledge, and that could the views of those gentlemen be carried out, our city would possess a parochial church, and the west of England a national monument, of unequalled beauty, and one to be visited and admired by multitudes of strangers of our own and of foreign nations."

In their reports on the present state and contemplated repairs and restoration of the church of St. Mary, Redcliffe, Messrs. Britton and Hosking commence by drawing the attention of the parish authorities to the injuries sustained by the fabric, from the long-continued access of damp and moisture, both in the superstructure and foundation walls—produced, as to the former, by the insufficient means for carrying off the rain and snow— and, as to the latter, by the want of drainage: both of which deficiencies they principally ascribe to the original arrangement for the discharge of water from the roofs, and want of drainage round the fabric. To the former of these defects, they attribute, in a great degree, the injury to, if not destruction of, the external faces of the Masons' work upon the walls and buttresses. They have, in much detail, set out the nature, extent, and causes of the mischief; and, in a subsequent part of their report, have suggested, with like detail, the extensive and efficient measures recommended for remedying the evils alluded to, and for preventing their future recurrence.

They describe the roof covering as, throughout, in a very defective state, though heavy expense is annually incurred in repairing it; and they suggest its entire re-arrangement and re-construction, upon the principles described in their reports. They have also ascertained and have very accurately described, an original defect existing in the great tower, evidenced in a bulging outwards of the external faces of that part of the structure, and produced by an inequality of strength and resisting power between the finely-wrought and closely-jointed masonry of the faces, and the rubble backing which constitutes the main bulk of the walls; and they state that, with the exception of the tower and the flank wall and buttresses of the south aisle of the chancel, all the walls and foundations, throughout, appear to be perfectly sound and but little injured. They attribute the settlement outwards of the flank wall first noticed to the want of proper drainage before alluded to, and to the too near approach of graves to the foundations of the wall in question, which are not, in that part of the fabric, more than four or five feet in depth;
and they state that, by an attempt formerly made, to prevent the flank from going further, or to hold it up, mischief has been occasioned to the pillars which stand between it and the chancel, and, through those pillars, to the clerestory resting upon them. They express their opinion that the chancel is in an insecure state therefrom, and point out in very strong and clear terms the mischief and danger to be apprehended, unless immediate attention be given thereto; and they enter, at considerable detail, into the comparative inefficiency of the repairs which have been from time to time effected.

Recurring to the tower, they state, that the solid structure of this beautiful work is generally sound and trustworthy, though its exterior surface has almost wholly perished; and that from the delapidated state of the whole exterior and especially of the enrichments previously noticed by them, the tower is unsafe to approach; and they therefore recommend means for excluding persons from passing within reach of the danger to be apprehended from the constant liability of fragments of stone, of no mean size, to become detached, and to fall in every direction.

They represent the masons' work of the spire as generally sound, though the surface of the stone upon the exterior is rapidly disintegrating from the causes described in the report.

In proceeding to advise as to the solid and substantial repair of the fabric, in its more important parts and the restoration of the ornamental parts, Messrs. Britton and Hosking state that so intimate a connexion exists between the parts of such a building as that under consideration as to render what may appear to be merely ornamental in most cases essential to the stability of the structure—that they feel themselves compelled to report on these two heads together; and they furnish very able and sufficient grounds for their determination—but dividing the subject into two parts, viz.:—

First, the tower and spire—and second, the church with the lady chapel, the porches and other accessories.

With respect to the first, it would be injustice to the architects to give in any other language than their own, the suggestions they have offered, viz.:—

"The Tower and Spire.—This singularly beautiful composition is altogether distinct in style and date from the Church, which has been added to it, and deserves, as it requires, to be considered, not as a merely provincial edifice, and far less as a simple parish steeple, but as a national monument, and in the first rank of the many noble structures of the kind in existence in this country. In magnitude it is exceeded by few; in destined altitude, the larger Cathedrals alone will excel it; and in chaste simplicity of design, combined with elaborately beautiful, but subdued and appropriate, decoration, Redcliffe tower is surpassed by none; whilst it is pre-eminent in its position, on a lofty bank of the Avon, within the commercial capital of the west of England. We have already intimated, that the solid structure of the tower is sound and trustworthy, and that it is capable of being easily made to bear all that it was ever intended to carry. The structural arrangement of the tower itself, and of the existing portion of the spire, give the complete evidence that the original design contemplated as it provided for a spire of the form and proportion exhibited in the accompanying engraving of the church. It would appear, however, that when the church was built the idea of completing the spire was abandoned, as the south-western buttresses of the tower were reduced in projection, and otherwise altered to compose with the west front of the church—and the south-eastern angle was altered, throughout, to extend the nave of the church uninterruptedly to its western front. The fact and skill with which the outer, or south-western angle of the tower was altered, and the fine taste with which the turret pier, in front of the church, which composes with the reduced buttress of the tower, is arranged, to connect the parts of the composition, are most admirable; but not so the arrangement at the other angle—where a low, heavy arch, and an unmeaning blank, upon a heavier pier, obtrude themselves immediately within the church door—contrasting, most disadvantageously too, with the composition of the arches of the aisle, and with the clerestory on the other side of the entrance.

"It may be remarked here, that, at the time Redcliffe church was built, the spire which produced the original design of the magnificent superstructure to the tower no longer existed; spires were not built to Gloucester cathedral nor to Bath Abbey church, in the 13th century—as they had been at Salisbury, Norwich, and Litchfield, in the 13th and 14th centuries; comparatively small spires, on lofty towers, as at Louth and Newcastle—or lanterns, as at Boston, indicate the prevailing taste, in that respect, when this church was built, and the abutments of the spire of the original design were altered or removed. In this manner the incomplete or demolished spire was left, and the original composition was shorn of its fair proportions.

"In compliance with the instructions to us, to advise as to such alterations in the restoration of the ornamental parts of the fabric both external and internal as may seem necessary for reinstating it to its ancient and pristine beauty, we urge, most strongly, the necessity of restoring, at the same time, the perished surfaces of the tower, and its immediate accessories, adapting it to receive the completed spire, and carrying on, to completion, that beautiful feature of a masterwork of architectural composition, which, in its truncated state, is but an unspectable deformity. Thus the original design may be both restored and completed, and Bristol possess a noble national monument, that will add to the beauty of her locality and to her pre-eminence amongst English cities.

"In restoring the tower, as contradistinguished from the superimposed spire, it will, of course, be proper that the work should be set upright on all its faces; and, in doing this, it will become necessary to take out and restate the whole of the ashlar of the surfaces, even when it might otherwise remain, though that, indeed, is of very small extent. Moreover, all the stones upon which the enrichments occur must, of necessity, be drawn, wherever the enriched surfaces are defective, and these requirements together would involve the reinstatement of all the external surfaces of the tower. Paring old work, and pinning in patches of new stone, where there is not any left to pare, we consider altogether out of the question—as paring would reduce the original proportions of the design—and pinning in, among the pared faces, pieces in the place of stones altogether ruined, would not produce a restoration of the fabric to its ancient and pristine beauty. The absolutely necessary restoration of the faces of the tower, with its buttresses, turrets, pinnacles, niches, canopies, pediments, windows, and their enrichments, parapets, coronals, and corbels, will give the means of doing all that is necessary, with a trifling exception, to fit the tower to receive the spire of its full dimensions. This exception involves an alteration within the church; but we shall be able to show that what is required there can be made, not only consistent with, but most desirable for, the services of the interior.

"The existing portion of the spire is, fortunately, quite enough to give the means of developing the original design, whilst it affords demonstrative evidence that a complete spire was contemplated by the original designer of the structure. If lines be drawn from points within the footings of the buttresses of the tower, through the base of the spire, on the summit of the tower, they will follow the sides of the spire, as far as it now exists, and meet at such a height as similar compositions of equal date would justify by analogy. We have drawn such lines, or rather we have set up the present compartment, as it exists, and find that its thrust is within the abutments afforded by the buttresses, and that the sub-structure generally has the strength necessary to carry the superstructure resulting from carrying it up to the height indicated; which height results from a continuation of the same lines upwards, and is further justified by the best existing examples of works of the same class.

"The decorations of the spire, as it exists, are of singular beauty and propriety; the ribs are exquisitely moulded, and the characteristic enrichment of the vertical and pointed mouldings of the tower below, is carried with great good taste and beautiful effect up into the spire, so that nothing has to be imagined in that respect; and we may say with confidence, that the de-
The general style of architecture and the ornamental details of the church above indicated are replete with beauty, and present to the eye of the tasteful and intelligent observer a series of exquisite subjects for study and contemplation as viewed from different points. The view from the south-east, as shown in the annexed woodcut, represents the tall and narrow south transept, with its aisles, windows, highly enriched flying and attached buttresses, perforated parapets, and puffed pinnacles; the south porch, of two stories, and newly designed staircase turret, the flying buttresses and clerestory windows of the nave, with the bold crocketed pinnacles, which surmounts the stairs at the south-west angle; rising above the west end of the northern aisle are seen the upper or belfry story of the noble tower, with its richly adorned panels, boss-enriched mouldings, and perforated parapet; the bold and finely proportioned octagonal pinnacles at the angles of the tower; and rising from among them the lofty graceful spire, crowning and adorning the whole. Of this last splendid and heaven-pointing architectural member of a Christian edifice, there are numerous examples both in England and on the Continent, which are now admired as they deserve to be admired; but, however meritorious and beautiful may be the spires of Strasburg, Salisbury, Freyburg, Lichfield, Norwich, Louth, or others of less note, Redcliffe spire, in form and detail, as indicated by its existing portion,¹ and as it is susceptible of being rendered, with the tower, its legitimate base, may challenge a comparison with them all.

¹ The "existing portion" of the spire is not more than one-fifth of the whole height, or up to the first enriched band.
CHURCH OF ST. MARY, REDCLIFFE, BRISTOL.

VIEW OF THE NAVE, ETC., LOOKING TOWARDS THE EAST, RESTORED.

Divested of pews, seats, and other furniture of a Protestant church, the above print shows the architectural character and details of the interior of this truly beautiful edifice. If not equal in sculptured decoration to the gorgeous chapels of Henry VII, London, and King's College, Cambridge, it will bear comparison with those justly famed buildings, and will be found to surpass most of the cathedrals and other large churches of our own and of foreign countries in this respect. Although in miniature, this beautiful delineation in wood engraving displays the finely moulded and shafted piers or pillars, with the arches to the aisles, and the panelled walls above them in the situation of the triforium of the large cathedrals. Over this traceried wall is a series of clerestory windows of large dimensions, and of fine forms and proportions, with mullions and tracery. These, it is reasonably inferred, were originally filled with stained glass "casting a dim, religious light" over the whole scene. Connecting, and apparently tying together, the two side walls, is a groin-vaulted ceiling, profusely adorned with intertwining moulded ribs, foliated tracery, and richly sculptured bosses spreading over the whole. In the view presented by the engraving, the eye ranges through a beautiful vista full of the most charming architectural effects. It requires but little stretch of fancy to imagine the exquisite, and indeed sublime, appearance of the whole, were the windows filled with pictured glass, and the ribs, bosses, and capitals of the vaulted ceilings, and of the shafted pillars, with gold and colours "richly dight."
sign, as we present it, of the tower, with the restored spire, is a true
sentiment of the original intention of the first designer. We may have
omitted to state hitherto, however, what is most satisfactory to know, that in
the midst of the dilapidation and disintegration which pervade the work,
nothing in the moulded forms or other enrichments, and nothing in the forms
and proportions generally, is entirely lost; but specimens remain, from which
restorations may be made with certain truth.

"It will be remarked, that the basement of the tower, in the drawing of
the elevation of the west front, shows a greater depth of faced work than
appears at present. This we consider it desirable to restore, to prevent the
structure from losing any part of its apparent elevation, in raising the level
of Redcliffe Street before the north-west entrance to the enclosure; and we
have suggested, in the drawings, a re-arrangement of the steps of approach
to the church, in accordance with this view. We propose to alter the win-
dows of the tower, from their present forms and proportions, to others,
more in character with the design of the superstructure."

For the reasons detailed in the report, Messrs. Britton and Hos-
ing recommend that attention should be first directed to the resto-
ration of the tower and spire; and that the former should, under the
circumstances, not be deferred any longer, if it be desired to preserve
this beautiful monument from utter destruction.

Speaking of "the church, with the lady chapel, the porches, and
other accessories," after the recommendations before alluded to, as to
what are termed the hydraulic arrangements and the proposed re-
construction of the roofs—Messrs. Britton and Hosking suggest a new
gateway at the north-west corner of the church enclosure, and other
arrangements consequent upon the recent alterations under the Bristol
Improvement Act, and for giving more effect thereby to the beautiful
declivity under consideration; and, after their valuable suggestions for the
substantial repair of the fabric, in the south flank of the chancel and
the transept, they refer to their drawings, as showing with suffi-
cient clearness the restorations they propose of the various parts of
the exterior of the building; which restorations, they state, are
mostly from existing authority within the building itself—and where
no specimen exists of the original parts, the restorations are stated to
be made, to the best of their judgment, from analogy. Repeating
their difficulty of separating the substantial from the ornamental parts
they go on to show that many portions commonly considered merely
ornamental are either absolutely necessary, or highly useful, to the
substantial structure; and after naming several instances of this sort,
they add:—

"We do not contemplate, however, and cannot imagine that the neces-
sary and useful reparations are required to be made in merely shaped blocks
of stone without the mouldings and other decorations appropriate to them;
and, for ourselves, had rather see the church a picturesque ruin, than be
instrumental in restoring it to strength without its native beauty. We propo-
se, therefore, the restoration of all the decorations that ever existed upon
the surfaces of the work, and that with new materials, and not by paring
and patching the old."

They add, however, that, in some few cases, the heads of the win-
dows, with the tracery in them, may, perhaps, be preserved.

The architects propose to move the modern attachment to the
south porch, also the lobby to the lady chapel, and likewise the sheds
and other unsightly objects about the church; and of the doorway and
steps at the south-east side of the north porch; they further suggest
many provisions and restorations consequent on such removals.

AS TO THE INTERIOR OF THE CHURCH.—The suggestions of Messrs.
Britton and Hosking refer to matters of which they describe the re-
stitution for the most part as easy. But the most important re-
stitution of the interior is that at the east end, involving the removal
of Hogarth's pictures, and other inappropriate attachments, and the
reinstatement of the east and clerestory windows; and they hope to
find that reparations only will be wanted to the screen, between the
chancel and the lady chapel. The latter will want certain alterations,
including a new floor.

In the restoration of the spire will be involved some alterations,
pointed out by them, at the west end of the church, including a new
arrangement for the organ; and they express their hope, that as the
whole of the lead and glass must be removed from the windows for the
restoration of the mullions and tracery, it may, in the principal ones at least,
be reinstated with stained glass of an appropriate character.

They also propose in detail numerous and important alterations in the
re-arrangement of the parts and scales, by which, with an increased
seat accommodation, and better command from the pulpit, reading-
desk and altar, a more perfect view of the building may be obtained,
whilst all the beautiful pillars shall be in every case insulated, that
the eye may range over their lofty and symmetrical forms and pro-
portions, from the base to the summit.

The reports of Messrs. Britton and Hosking, with their accompa-
nying drawings, though (for want of more time and labour than they
have yet been able to bestow) not made with the fulness of detail re-
quired for actual operations, are, nevertheless, the result of adme-
asurements and of careful delineation of the most important parts;
and their observations arise from close examination of the work in
general and in detail, upon personal survey and attentive study and
consideration of what they have observed; and their estimates sub-
joined are the result of such survey and consideration, and also upon
comparison with the cost of other large works of analogous extent
and character.

THE TOWER AND SPIRE.—The complete reinstatement and resto-
ration of the tower with its pinnacles, and all its decorations, in the
manner, and with the stone they contemplate adopting, will cost about £5,200.

The re-construction and completion of the spire, according to the
data afforded by the existing portion thereof, and according to the
drawing of the west front restored, and making the requisite addi-
tions to the buttresses of the tower, and including the scaffolding and
machinery necessary, will cost about £3,600.

The CHURCH, with the lady chapel, the porches, and other acces-

1st.—The hydraulic arrangements, including new roofs to the church
and lady chapel, the re-arrangement of the north-west approach,
with the earthworks, drains, &c., as recommended in their general
report, after giving credit for old materials, will cost £1,550.

2nd.—The substantial repair and reinstatement of the interiors, and
the repair, reinstatement, and perfect restoration of the whole of the
exteriors of the church, lady chapel, and porches, including the re-
working of the whole of the external decorations in the stone alluded
to, together with the alterations and presumed improvements recom-
ended in the general report, it is estimated will cost nearly £21,400.

3rd.—The re-arrangement and refitting of the interior of the church
as proposed by Messrs. Britton and Hosking, will cost £2,600.

The whole presenting a total outlay of £37,350, which, with a due
estimate for contingencies, in works so extensive, and of such com-
paratively novel character, cannot, in the judgment of the parish au-
thorities, be safely calculated at a sum much less than £49,000.

It is, however, stated by the architects, that the expense under the
2nd head may admit of reduction, by their finding, on further exami-
nation, portions of the work capable of remaining, or of being re-
worked and re-applied in places less exposed to the weather, and it
is their opinion, that the part of the work contemplated in this section
may, after precautions are taken to secure it, generally be distributed
over any reasonable number of years.

In allusion to the large sum required for effecting the object in all
its proposed details, the parish authorities can but repeat, in the lan-
guage of their preliminary address, that such an amount is only to be
raised by the liberal co-operation of those whose providence has
blessed with the ability and the desire to aid in such objects as that for which this appeal is intended: and upon those of our own locality who have been so favoured by providence, they repeat their confidence, that an appeal will not be made in vain for the restoration of a fabric, which, if not wholly the work of a Bristol Merchant, is to be ascribed principally to one of that class. Their confidence is strengthened by the able and energetic support they have received from many and influential quarters, and especially from our local press, by one of whose editors it has been well and eloquently said, that "the question for the public—for the church-going public in particular—to answer, is,—Shall decay be suffered to proceed until restoration shall have become impossible? The amount required (£40,000) for the complete repair of the fabric is certainly great, but when we recollect the large sums which have been raised for the restoration of Hereford Cathedral, and of York Minster, we cannot doubt that the nobility, gentry, and wealthy commoners of Gloucestershire, Somersetshire, and the neighbouring counties will evince equal liberality in worthy upholding—"The pride of Bristol and the western land."

The parish authorities, whilst they feel that they cannot, without propriety, divest themselves of the responsibility of carrying out, so far as they shall be enabled to do, the repair and restoration contemplated, feel sensibly that the public, from whom the means of accomplishment is so largely to be drawn, are entitled to every reasonable security for the due appropriation of the sums contributed, and it is therefore the desire of the parish authorities, at an early period after any considerable subscription shall be obtained, to convene a meeting of the subscribers, by the majority of whom, subscribing not less than £10 each, six contributors of not less than £50 each shall be chosen, who, with the members of the vestry for the time being, shall form a committee for carrying out such repair and restoration, and for controlling the monies received, and the expenditure thereof.

The parish authorities in aid of the object intended, propose to anticipate, as far as they possibly can be advised to do, the revenues of the estates vested in them for the repair and support of the church, and by means of which, that object has been hitherto (however inadequately) accomplished without the parish having been ever burdened by a church rate, and from this source they will apply the sum of £2,000, to be paid, as they propose the individual contributions shall be paid, by five equal and successive yearly instalments, to meet the expenditure as it will probably annually progress.

In conclusion, the vicar, churchwardens and vestry, of St. Mary, Redcliffe, venture to quote and apply to their church, the language used by the learned and Very Reverend Dean of Hereford, in reference to his own cathedral, which at the present moment is in a dangerous state; but which is likely to be preserved and renovated by the united efforts of the benevolent friends of the church and of Archeology. "Restoration, is the grand object to be achieved, not mending and patching." * * * * * * "I earnestly intreat that restoration may be regarded as the one thing sought—sound and legitimate restoration, for which there is sufficient authority." To the preceding appeal the parish authorities append the following remarks and suggestions by their senior architect, who, as an antiquary and author, has laboured nearly half a century to elucidate and illustrate the ecclesiastical architecture of Great Britain.

M. R. WHEELE Thos. PROCTOR John FAULKER, Churchwardens.

EXTRACTS FROM THE REMARKS AND SUGGESTIONS BY MR. BRITTON. To those persons who are not acquainted with Redcliffe Church, it may be both interesting and useful to give a short account of its peculiarities, beauties, and historic annals. As a parochial Christian temple it is acknowledged to rank, if not the first, at least in the first class, amongst the many fine sacred edifices of our country. As compared with the cathedral and conventual churches of England, it surpasses most in symmetry of design—in harmony and unity of character—in rich and elaborate adornment—in the picturesque composition of exterior forms and parts—and in the fascinating combination of clustered pillars, millioned windows, panelled walls, and groined ceilings of the interior. I know of no building, to compare with it in all these features, in Great Britain, and I feel assured that there is none superior in graceful design, and beauty of detail, in all civilized Europe. Except the cathedral of Salisbury, which is nearly of one age and design throughout, the other cathedrals, and indeed most of the large parish and conventual churches, consist of heterogeneous parts, of varied and discordant dates and styles.

The accompanying views of Redcliffe Church, though on a small scale, cannot fail to impress every eye that can see, and every mind that can appreciate the beauties and merits of architectural design, that the church, now fast approaching ruin, was once, as it may again be made, a splendid edifice; a temple eminently adapted for the sooth-saying and sublime devotions of Christian worship, and also calculated to impress every spectator with wonder, delight, and admiration.

The architect and the antiquary who read plans and sections of buildings, as the musician reads notes, will instantly perceive, that the church referred to is systematically and beautifully arranged; that its interior abounds with clustered pillars, and richly-ornamented ceilings; that its walls are pierced with large windows, divided by mullions, and strengthened with buttresses to resist the thrust of the arched ceilings; that it has a transept of unusual design, being divided into three nearly equal parts; that there is a presbytery, or chancel, with aisles, divided from it by richly-devised screens; that there is a lady-chapel, east of the chancel, separated by another open screen; that there are two small apartments, for a resident chantry-priest, north of the chancel-aisle, in one of which is a fire-place, showing it to have been a dwelling, the whole being of unusual occurrence; that there is a double porch on the north flank of the church, manifesting in form, style of walls, ribs, and stairs, different ages of erection; also a porch on the south side, differing, again, from the double north porch in every respect; that the wider and stronger walls at the north-west angle of the plan, show the foundation of a tower; that there is a doorway for entrance at the west-end, central to the nave; and that different flights of steps, from north to south, traverse the west-end, and show that the ground ascends, quickly, in that direction. Aided by the accompanying engravings, of a view of the church from the north-east, and interior; any person may readily understand the architectural characteristics of the church referred to; and those who have studied Christian architecture will immediately perceive its peculiarities of form and arrangement, as well as the chase profusion of its ornamental details.

Although essential and substantial repairs and restoration be the main objects in the contemplated works, these will be applied to the interior even more than to the exterior of the building; for if the latter may be regarded as the shell, the former is the kernel—if the last be the case, the first is the jewel intended to be preserved. Indeed, as the inside of Redcliffe Church was in its original and finished state an architectural design of pre-eminent richness and beauty—as it was destined by its founder and architect to surpass all its neighbours in originality of composition and elaborate finish, so was it adapted to satisfy the wants and wishes of those for whose devotions it was intended—the present architects, emulous to follow such example, propose to render it fully and completely adapted for the rites, as well as the habits, of its Protestant occupants. In doing this, they consider it material to provide accommodation for the many, rather than merely to please the few; they think the clergyman and his congregation should be in such close communion, that the former may be seen, as well as heard by the latter. If the numerous shafted
pills tend to interfere with this communion in some degree, the few
sittings, so placed as to be out of view of the minister, will only be
resorted to on emergencies. In designing and disposing the altar,
the desk, and the pulpit, the organ, and the font, as well as the re-
quired number of seats, the most scrupulous attention will be paid by
the architects to the ancient usages of the Anglican church, and they
confidently anticipate many striking and beautiful scenes and effects
when the whole is completed, the subordinate appendages being made
to correspond and harmonize with the architectural disposition and
character of the church. A learned and travelled clergyman who has
devoted some years to the study of the church architecture of the
middle ages, writes to me thus—"The harmonious effect of Redcliffe
Church must at one time have been quite unrivalled. I am not aware
of any cathedral or parish church, either in England or abroad, that
contains an equal amount of rich and uniform vaulting. The bosses,
more particularly, both in quality and quantity, surpass all that I have
met with elsewhere."

To accommodate and afford every degree of comfort to even
larger congregations than have generally assembled within the walls
of this church, we have made such arrangement of the seats, as shall
bring all persons more fully and freely within sight and hearing of the
minister; and have also taken especial care to display the complete
height and design of all the graceful clustered pillars of the edifice.
There are four palpable varieties of Christian architecture in
Redcliffe church, manifesting as many architects, and as many dif-
ferent times when they were respectively designed and erected. The
inner north porch, or vestibule—the tower and spire—the outer north
porch—the body of the church, with the lady chapel, and the south
porch—we feel assured were built successively, and it is generally
admitted, that an older church was removed to give place to the
present nave and chancel with their aisles and the transept. The
oldest of these members, i.e. the vestibule, is of a date between A.D.
1200 and 1230. "In 1207 Lord Robert de Berkeley granted to Red-
cliffe church, at the request of William, the chaplain, his fountain of
water from Huge well, for the friars of St. John the Baptist in Red-
cliffe." Lands were conferred on the same church, about that time,
plainly showing that there was one then in the parish. The tower
and spire we may safely refer to the reign of Edward I, as corre-
sponding with known specimens of that age. According to the
chronicles of Bristol, Simon de Burton was mayor in 1293,
"began to build the church of St. Mary de Redcliffe, when John
Lamyngton was chaplain,"—(Evans's "Chronological Outline.")
Seyer, in his "Memoirs of Bristol" (Vol. II., p. 77) from MS. Calen-
dar, more cautious and particular, says, "It was about the year 1293
or 1294 that Simon de Burton, a person of wealth and consequence,
who was Mayor of Bristol in that year, and bore the same office six
times, built the church of St. Mary, Redcliffe, where the eastern end
now is." Here we find it positively stated by one writer, that the
church was built, and by another that it was begun, at the above date.
To us it is quite clear that no part of the present church is so early as
1294.

YORKSHIRE ARCHITECTURAL SOCIETY.

Sir—My attention has been drawn to a letter in the last number of
your Journal, containing remarks on the Yorkshire Architectural Society. What
is personal in the letter may be safely left unanswered, as the tone in which
it is written will be its best counter-agent.

With respect to the Society, your anonymous correspondent has made
several statements, of the falseness of which I hope he was ignorant; these
appear to require some notice.

In his letter, it is said "The prospectus contains the names of two archi-
tects only, and neither of them attended the Autumn meeting." Before
the Autumn meeting, the prospectus contained the names of twelve
architects; I saw four present at the meeting, and believe more attended.

Your correspondent says, "Two meetings are to be held in the year, and
from the information given at the last, it appears, that for general ac-
commodation, they are to be in the remote corners of the country."

Two general public meetings will be held during the year, the places of
meeting being various, and appointed by the Committee, so as to suit the
convenience of the members generally.

Again, "All admitted must be members of the Established High Anglo-
Catholic Church." It is true that this Society for promoting the study of
Ecclesiastical architecture, admits only churchmen; but without respect to
their peculiar sentiments. No exclusion of any member of the church has
yet taken place, and the Society, amongst its 400 members, includes many
churchmen of different opinions.

The last misstatement is, that "the standard for all buildings is to be
Parker's Glossary."

At the request of a dignitary of the church, a list of elementary works on
Gothic architecture was added at the end of the report, as a guide to any
member beginning the study of architecture; in this list Mr. Parker's
Glossary was mentioned, together with the works of Rickman, Flaxam, &
This so far as I know, is the only foundation for the imaginative writer's
assertion, "that the standard for all buildings is to be Parker's Glossary."

Whether the insertion of such venturesome statements on the authority
of an anonymous writer unis the character of a respectable periodical, I leave
to your judgment.

I am obliged by your having pointed out in your Editorial remarks an
unintentional omission in the advertisement there alluded to. It was con-
sidered, or rather assumed without consideration, so much a matter of course,
that the architect whose plan should be chosen, would have the carrying
out of his design, that no express mention of this was thought necessary.

I am, Sir,
Your obedient Servant,
S. WILKINSON,
Hon. Sec. to the Yorkshire Architectural Society.

Leeds, Dec. 5th, 1842.

THE KENTISH TOWN COMPETITION.

Sir—Should what I am about to say appear too pointed against a parti-
cular party, that individual has mainly to thank himself for the pointedness
of some of my remarks. When we find a man pursuing that very course
which he has both loudly and publicly reproved in others, and protested
against—we must suppose, upon principle—when we see a would-be Cato
all at once changed into a Clothian, such an offender has little reason to look
for that lenity which might perhaps be extended to those, who, whatever
their conduct may be, at least make no parade of being greatly more upright
unintentional omissions than their neighbours.

That after expressing himself decidedly hostile to competition, after actu-
ally saying, "I have endeavoured to go into the strongest possible condemna-
tion of which I am capable, of the depressing effect of competition in ar-
chitectural design;" that after thus pledging himself in print, and the
strongest possible manner, to be opposed to the system of competition in
any shape, Mr. Bartholomew should have become, or have even thought of
becoming a competitor for the intended church at Kentish Town, is indeed
most strange. He cannot disavow those words, and a great many others to
the same effect, unless he should now choose to say, that although his name
appears upon the title-page, he is not the bona fide author of the work; and did
not even know until after its publication, what opinions it really contained;
yet hardly will he be expected to such evasion. It must therefore put up with
the mortification of having been so imprudent as to publish a good many
very harsh reflections that now recoil upon himself. Hardly is it possible
to conceive how a man who has denounced the whole system of competition
in the most unmeasured—even virulent terms, as one compounded of fully
and knavery, and which he accordingly lauded earnestly to put down,
should now abet it; should not only join in a public competition, but in doing
so, should unfairly evade the restrictions laid upon others, having good
reason to know that his doing so would be winked at.

In the list of printed conditions, one was to the effect that none of the
drawings sent in should be coloured, but merely tinted in sepia. This
was sufficiently explicit; there was no possibility of misinterpreting it.
Nevertheless, Mr. Bartholomew's principal elevation was a coloured drawing; and so far
he violated the instructions which his rivals had been obliged to conform
to: consequently he ought in justice to have been put hors de combat at
THE INVENTOR OF THE DREDGING MACHINE.

Sir—I observe, with some surprise, from a review in your Journal of last month, that you still consider the claim of the inventor of dredging by steam power to be amongst the number of those which are not yet satisfactorily established. You refer to a paper in the Civil Engineer and Architect's Journal, for January, 1839, wherein the invention is unreservedly ascribed to my grandfather, John Hughes, and during the four years which have elapsed since the publication of that paper, no syllable has ever been advanced in opposition to this claim—a fact which carries with it peculiar weight to the minds of those who, like myself, are fully aware of the very large claim to merit which your Journal commands. An individual, however, has at last thought proper to assert—I am willing to believe without the sanction of Messrs. Rennie—that the dredging machine is the invention of the late Mr. Rennie, his father, who first used it at the Hull Docks. In commenting upon this assertion, you observe truly, that a very important fact is not mentioned, namely, the year in which Mr. Rennie first introduced it at the Hull Docks. I shall, therefore, supply this omission in order that you, Sir, and the readers of the Journal, may estimate the value of the assertion thus rashly hazarded by a self-constituted champion of Mr. Rennie. It will be found that the first steam dredging engine employed at Hull was that used for cleansing out the Number Dock, which was not opened till the 30th of June, 1809; and the following passage from Mr. Timperley's account of this dock will fix the time at which the engine was first used.

"This dock was not cleansed for three years and a half after it was opened, the dredging machine and mud boats not being completed until then." Hence it appears that the dredging machine could not have been employed at Hull before the end of 1812 or the beginning of 1813.

While this is the fact with respect to Mr. Rennie's claim, I am in possession of a report by my grandfather, dated in 1829, where he describes minutely every particular of his invention of the engine, and first employment of her at Woolwich, as far back as the year 1804; and not until it can be shown that the engine was invented before this last date will the claim of my ancestor be at all invalidated. I believe that Messrs. Rennie have far too high a reputation for honesty and truth to dispute for one moment a fact with which their respected father must have been so perfectly well acquainted, as that of the invention of the machine, and her first employment by my grandfather at Woolwich, in the year 1801.

At the same time, it is possible that a person less intimately acquainted with them must have been misled by a history of this nature, might be misled by the fact that dredging machines, on the old bag and spoon principle, were employed at Hull 50 or 60 years ago. It is even admitted, that a bucket engine worked by horses, was used at Hull from about the year 1782. This engine was probably the work of Mr. Rennie. That it bore no resemblance however to the modern steam dredging engine is abundantly proved by the fact, that many years after the horse machine was erected at Hull, the application of steam power to the dredging engine was unsuccessfully attempted by Trevethick and many other able engineers. Had Mr. Rennie's machine of 1782, been anything like the steam dredging engine, the simple application of steam could scarcely have baffled the exactions of so great a man as Richard Trevethick, with others of his contemporaries.

With respect to your observation that the late Mr. Rennie, together with his talented sons, have brought the machine to that great perfection it has now attained, I would simply remark, that the engine built by Messrs. Donkin for William Hughes of Inverness, and used by him on the Caledonian Canal, was the most perfect ever constructed. See accounts of this engine in Baron Dupin's work on the resources of Great Britain, in your Journal for January, 1839, and in a paper read before the Institution of Civil Engineers during the last session.

I am, Sir,
Your obedient servant,
S. Duke Street, Westminster,
December 15th, 1842.

SAMUEL HUGHES.

AMERICAN MARINE STEAM ENGINES.

Sir—A late number of your Journal contained some remarks concerning American Marine Steam Engines, which were in spirit very unlike the usual tone of the English press in descanting upon "Brother Jonathan's" available genius in such matters. Caustid, fair, impartial criticism, no matter how close it may chance to "cut," will do much towards removing those mental prejudices which unhappily exist to such an extent, that the mere imprint of "American" or "English," is oftentimes of itself sufficient to place the merits of any work without the pale of respectful controversy.

This should not be; there is not the least of necessity or of policy in being thus deprived of the benefits of each other's experience; in advantages in some shape or other, most undoubtedly belong to each, and only require to be known in order to be secured. As an illustration, might be adduced the acquaintance already formed through the establishment of your Trans-Atlantic Steam Navigation Companies. One or two instances will suffice. In the English marine engine we see a connecting rod 15 feet long and 101 inches diameter, subject to the same direct stress with the connecting rod of the American engine, and which is 24 feet long and 6 inches diameter; two thirds less in area, and one third greater in length, and yet performing equally well the same labour! By this, we are taught, that

1 See Mr. Timperley's account of the Harbour and Docks at Kingston-upon-Hull. Transactions of the Institution of Civil Engineers, vol. 1, p. 22.
while the English engines are certainly at one extreme, we are probably at the other. Again; the Great Western, if you please, comes over here with decks as “clean” as a “man of war,” and returns with the singular notion, that on her quarter deck, she can erected, at a trifling expense, a saloon equal in every respect—and superior in many—to the one below, and making an addition to her accommodations equal to one third of all her cabin room below deck!

Notwithstanding the unequalled degree of perfection to which steam navigation upon our rivers has attained—excepting, of course, the great river of the west—the impression is very prevalent abroad, that in the attempt to compete with the “Lion of the seas,” we shall be found wanting—an impression unfortunately, most consistent with a certain illegitimate specimen of “Yankee enterprise,” which has recently visited your shores. We think, however, that the time is not far distant when, with a ship exceeding in length the ordinary proportion, with engines having greater length of stroke so as to admit of working steam at a greater pressure without adding weight to the working parts, with paddle wheels large in diameter, very narrow, and making revolutions not less than 20 per minute; and with boilers adapted to a pressure of 15lb. to 20lb., we shall be able somewhat to “shorten the distance” which separates us from the “land of our fathers.” Certain it is, that our ship-builders and engineers will not be satisfied with a steamer which will require, for a passage to Liverpool, more than ten days of good weather.

You were pleased to notice in a favourable manner the engines of the Spanish steamers Regent and Congress, built by the late firm of Ward, Stillman and Co., of the Novelty iron works, New York, and to intimate a wish to have the details of their arrangement. In answer to which, I take pleasure in sending to you a detailed account of those vessels, together with so much of a drawing of their engines, as will answer the purpose of your inquiry, and which I am authorized to do by Messrs. Stillman and Co.

**VIEW OF THE UPPER VALVES.**


**Vessels**

- **Length on deck**: 154 0
- **Breadth**: 30 8
- **Ditto at water line**: 28 8
- **Depth of hold**: 14 6
- **Draft of water**: 8 6
- **Burthen**: 671 tons.

Frame of white oak, live oak, locust and cedar. The floor of white oak, laid close and caulked inside and out. Planked with white oak; fastened throughout with copper thorough bolts, composition spikes and locust treenails.

**Engines**

- **Diameter of cylinders**: 12½ inches.
- **Length of stroke**: 4 feet 7 inches.
- **Diameter of paddle wheels**: 18 feet.
- **Length of board**: 7 feet 6 inches, and width 2 feet 6 inches.
- **Pressure of steam**: 100 lbs.
- **Number of revolutions per minute**: 26.
- **Total weight of engines, wheels and boilers**: 100 tons.
- **Two copper boilers**: 22 tons.
- **Length of boilers**: 14 feet, height 9 feet, and breadth 8 feet.
- **Total of fire surface**: 1100 feet.
- **Speed of vessels**: 10 miles per hour.

Cost of vessel, engines and boilers, about 150,000 dollars.

It would be trifling, I fear, with the patience of your readers, to enter into a detailed description of the drawings, representing, as they do—with one or two exceptions—but an “old acquaintance,” the “side lever engine,” the principal deviation from which, is the steam valves, and perhaps the air-pump bucket. The valves are shown in the section in the same position as in the drawings you refer to as having received, and which has recently been published in the London Mechanics' Magazine. As to the merit of this arrangement of the valves, I will now offer an opinion, except that they are not generally used here for large engines.

As English engineers—either from sterility to the opinion of Watt, or from much actual experience—have held us guilty of divers “barbarisms,” in our substitutions for the use of the “slide valve,” I shall make this matter the subject of another communication, accompanied with a sketch of the most approved form of the “double” or “balance valve.”

The bucket of the air-pump, as shown in the separate sketch, for ought I know, may not be peculiar to this country, nor is it universally adopted here; it has been found, however—in situations where the condensing water is free from sand—to be far more efficient and durable than any other in use.

The “bilge injection,” shown near the bottom of the condenser, is here thought to be an essential part of the engine of every steam vessel. And instances have occurred in which the use of it has been attended with the saving of much life and property.

Your permission will, from time to time furnish your readers with notices—accompanied with drawings—of such improvements in American engineering, as may be thought interesting, or of such of its features as are not familiar to our transatlantic brethren generally.

**New York, July 1842.**

W. F. S.

In our Journal for June last, we noticed that the Spanish government had ordered, and obtained from New York two war steamers, named the “Regent” and “Congress,” and in commenting thereon we observed, we wished some further information before we gave any opinion on the subject; we were favoured with a lithographed external view of the engines, but we desired to look below the surface. Our wish has now been compiled with, we are in possession of an apparently perfect section of the engines of the Regent and Congress steam ships, together with F. W. S.'s remarks thereon, and which we now publish. We thank him, and think, if his intentions are supported by engineers of the Old and New World; it will do much towards the expansion of prejudice, the extension of knowledge, and general good of mankind; that we heartily co-operate in this view, we plainly avow, as in fact our remarks in our last December number fully prove. We are, therefore, surprised at the opening paragraph of our correspondent, and we are unconscious of having admitted any thing into our columns which could offend his taste. If we have descended upon “Brother Jonathan,” it was more in playfulness than anger, not as an opposing race, but as descendants of one common stock, to which genius is common. We think, however, our correspondent's reproaches are misapplied, as we do not recollect using the phrase he complains of. With this exordium we at once proceed to an analysis and consideration of the engines of the Regent and Congress.

The engines are of the beam kind, and scarcely to be distinguished from those of the Megara by Steward, published by Wollaston in his Tredgold, pl. 49, vol. 2. The architecture is very similar to the engines of the Tiger, by Edward Bury. (See Tredgold, vol. 2, pl. 110 and 110 A.) In one point they differ, in the use of circular valves instead of the D or Murdoch slide, and in this it resembles another cut belonging to the American engine, which is called the Royal William (now Isabella II.) which made the voyage to England in 1832, and subsequently figured in the Spanish war.
The cylinders are 12 inches in diameter and 4 ft. 7 in. stroke; at 26 strokes or 238 feet the power is equal to 715 horses each, or 143 horses collectively. This is nominal power as calculated by the rules of the late Mr. Watt, applicable to steam of 21 or 3 lb. per inch, but in this case we have a pressure on the safety valve of 10 lb. per square inch, so that the actual power will probably be 150 per cent. above this, depending entirely upon the extent slab used, and we may further observe, that with a suitable arrangement, circular valves may be made to avoid any danger of over-expansion, at pleasure. The air pump is 22 inches in diameter, and about 2 ft. 6 in. stroke, = content of 6 6/3 cubic feet. Cylinder 422 in. x 4 ft. 7 in. long = 49 46 feet content, which divided by 6 6/3 makes the cylinder 7 5 times larger than the pump, just the usual proportions of English engines. The condenser is 2 ft. 5 in. fore and aft, 3 ft. 5 in. in width, and 4 ft. high, with proper deductions is equal to a content of 24 cubic feet, and 7 1/2 = 24 nearly 5 cubic feet per h.p.

The circular steam valves are 113 in. in diameter, = 105 5/6 area, the eduction valves are 10 in. diameter, = 78 54/6 area, or rather more than a square inch per horse, a very ample allowance, and much exceeding Mr. Watt's rules, as will be seen by reference to Farea and other works, but taking into consideration the increased density of the steam employed, is judicious, and about on a par with modern slide valve practice. Our correspondent is wrong in supposing that English engineers have adhered to the slide valve "from strict fidelity to the opinions of Watt." It is otherwise; they have departed therefrom and followed Murdoch, his disciple, who patented the D, triangular, or other shaped sliding valve, in his specification of 1790. (See Farea, p. 67.) We are at a loss, also, to find any novelty in the construction of the circular valves; they appear to us precisely similar to those used by Mr. Watt in his engines of 1808. He used circular pipes, and here we have rectangular passages. (See Farea, plate 20.) We are equally obtuse respecting the air pump, of which we have an isometrical drawing, and can find nothing new therein; if our correspondent alludes to the packing ring similar to that of the piston, we may say that this system has been followed in this country since the year 1826, perhaps earlier.

The billige injection is in the same category.

There is merit in the adaptation of a double heat expansion valve, though it is by no means new, and we think we can suggest an improvement, as the lower face can never be tinted (see the annexed engraving). The other parts of these engines are so much like the best English practice, that it is needless to pursue the inquiry farther. The space occupied in the vessel for each engine is 16 ft. fore and aft, and about 5 ft. 9 in. over the main beams. On the whole, we think the engines of the Regent and Congress to be highly creditable to Messrs. Ward, Stillman & Co., of New York, by whom they were manufactured, not only as evincing considerable judgment in detail, but more so, in their selection of the common beam engine, which, after all, appears to be the best kind yet produced.

THE NEW HOUSES OF PARLIAMENT.

The fifth contract for erecting this national and truly magnificent work has just been entered into, and Messrs. Grisell and Peto are again the successful competitors. This contract or portion of the work is by far the most important that has yet taken place, embracing as it does the Victoria Tower, the Royal Gallery, the Houses of Lords and Commons, with other important and necessary adjuncts thereto. The following particulars have been obtained.

The Victoria Tower, or Royal entrance, necessarily occupies the first position in the arrangement, whether as regards the order of description or the magnitude of its structure, which perhaps will be one of the richest and most gigantic specimens of modern Architecture that this or any other country can boast. Beneath this tower the Royal entrance will be formed, presenting an area of 60 feet square, into which the Royal and other state carriages will be enabled to drive with the most perfect ease, turn round at the foot of the Royal staircase, and depart at the entrance on the south side. The upper stories of the tower will be used as secure depositories for public records and state documents. The external square of the tower will be 78 feet at the principal floor level, from which point it will be ornamented with the richest specimens of Gothic sculpture to the height of 240 feet, reaching to the base of the four crowned turrets by which it will be surmounted. The entire height, from the bottom of the tower to the top of the turrets, will be 500 feet.

The Royal entrance-hall or vestibule is the next object of interest included in the present contract, and will be approached from the right-hand side of the tower, leading from the principal staircase to the Royal Gallery.

For the Royal Gallery, the next in order, no pains have been spared on the design to render this portion of the building as perfect and valuable as possible. The upper part of the walls will be of the most elaborately-sculptured designs of Gothic ornaments, while the lower portion of the walls is divided into compartments intended for the reception of the most exquisite subjects in fresco painting.

The Royal Robing-room is next approached from the Royal Gallery, and will strictly harmonize with the fittings and ornaments of the latter. It will be a most splendid apartment, 40 feet in length and 30 feet in width, immediately adjoining the house of Lords, with entrances for the Sovereign on one side of the room.

The Bishops' Robing-room, a large apartment on the right-hand side of the Robing-room of Her Majesty, will be appropriated to the use of the spiritual peers.

The House of Lords comes next in the order of arrangement, and will be situated in the principal story, preserving a level throughout with the old floor of St. Stephen's Chapel, so that the entrance for the peers may either be obtained along the corridors from the river front, or by that leading from Old Palace-yard. The size of the House of Lords, as well as that of the House of Commons, will be reduced to the smallest possible limits commensurate with the required accommodation, and to give them that form and arrangement which will afford the greatest number of sittings in the smallest space, bring the members nearest to each other and to the speaker, and be the most convenient for carrying on the ordinary routine of business.

The two houses will be placed as nearly as possible in the centre of the whole mass of buildings, this being considered the position best adapted for communication with each other, and with their respective offices and accommodations; for easy access from the various entrances and approaches, public and private; for security from any possible danger, that may arise from their form and size to be exactly fitted to the wants of each house; for the purposes of lighting, warming, and ventilating in the most convenient manner; and for making any modifications or alterations in which may be thought desirable without deranging the plans and elevations.

It is to be noticed that the architectural style is covering any members' seats under the galleries, as well as any seats whatever behind the wooback or the Speaker's chair.

From the House of Lords a spacious oblong interval will lead directly to the great central hall, immediately under the centre tower. This hall will be a large apartment, of a circular form, and 60 feet in diameter, and the principal public approach to the committee-rooms from it will be by a broad flight of steps to a large waiting-room on the first floor, from which there will be a broad and commodious stairway ascending to the sittings of each house, and to the offices connected with them. When the Houses commence their sittings, and the daily business is at an end, the public may retire either by the principal staircase, or that by which leads to Westminster Hall. The central tower will rise in an octagonal form, and will be 270 feet in height.

From the central hall, proceeding northward, will be the Commons' corridor and lobby, leading to the House of Commons, with the residence of officers in that division on the east side of New Palace-yard.

Attached to each House of Parliament will be refreshment-rooms and offices, and the approaches of the Sovereign, the members of both houses, and the public; the clerks' and other offices are so arranged as to be wholly independent of each other, with the means of making them entirely or partially in communication.

The members and officers attending committees, it is arranged, may go or return by private staircases communicating with their respective houses and offices.

The whole of the official residences will have separate external entrances and staircases; the principal floor of that for the Speaker will be expressly designed for state levees or Parliamentary dinners, and will be fitted up on a scale of great splendour.

The libraries and committee-rooms of each house are placed towards the river, for the convenience of light, and freed from noise and disturbance, and the former are so arranged on the principal floor as to be en suite, with the power of extending them at pleasure, by including the adjoining committee-rooms.

The ancient chapel of St. Stephen, the crypt, and cloisters are preserved; over the crypt the spacious apartment will form a continuation to the House of Commons, to the area of which is appended the Chamber of the House of Lords. This will be fitted up in the same style of ornament as the Royal Gallery and the corridors, with the introduction of choice subjects in fresco painting.

Another important feature will also be found in the construction of the two houses for the purpose of a complete and thorough ventilation. This department has been placed under the superintendence of Dr. Reid, who after a variety of trials of different plans and experiments, has adopted a mode of ventilation by which not only the houses of Parliament but every separate office and apartment in the building will be free from unwholesome vapours. It is to be hoped that the three great towers shall be made available for this purpose, and from a certain height that the masonry of them shall be hollow, and pierced in several places for the reception and egress of air. According to the state of the wind, as might be received from the Victoria or the houses in the northern and southern extremities.

The form of the Victoria Tower has been already described; the clock tower will also be of the square form, finishing spirally, and of the height of 270 feet. The air thus obtained will be forced by machinery through the vaults under the body of the whole edifice, thence it will be discharged by means.
the opinion that from street, Hanover-square, the residence of Mr. Prius in terially boards. Mr. Prius had sustained the value of one, principal boards, and the decorations are of the most extensive character. The northern and southern fronts are ornamented with elaborately-sculptured niches in which are placed statues of the various kings who reigned in England prior to the Conquest.

Along the eastern front, immediately under the principal floor windows is so ornamented band, on which is displayed in strong relief, in old English characters, the names of every sovereign who has reigned in England since the Conquest, commencing in chronological order with William the Conqueror, and terminating with that of Queen Victoria, and above each are the Royal arms of England richly sculptured.—Standard.

LAW PROCEEDINGS.

HOARD NUISANCE.

In the Court of Queen's Bench, Friday, December 2nd. (Sittings at New Prin at Westminster, before Mr. Justice Coleridge and a Special Jury.)

MURRAY P. ELGER.

The Solicitor-General, Mr. Platt, and Mr. M. Smith, conducted the case for the plaintiff; and Mr. Thesiger, Mr. Dundas, and Mr. Watson, that of the defendant.

This was an action brought by a gentleman residing at No. 16, George-street, Hanover-square, to recover compensation for the injury which he had sustained by reason of the defendant having erected a "hoard," for which house open hoarding had been afterwards substituted.

It appeared that the premises occupied by the plaintiff abutted on those occupied by the defendant, who, in 1839, had erected the hoard in question, for which the open hoarding had been substituted, within 10 feet of the dining-room windows of the plaintiff. The object was not to recover damages, but to get rid of the vomans. The walls of the plaintiff's house before and after the erection of this obstruction, stated that the light in the lower rooms of the house had been considerably diminished, that the walls had become damp in consequence of the free circulation of air being impeded, and that the provisions in the larder had frequently been spoiled from the same cause.

Several architects and surveyors gave it as their opinion that the value of the house was diminished by one-third, and Dr. Ure stated that he had performed several experiments which convinced him that the light in the plaintiff's dining-room had undergone a diminution of six feet of height by the erection of the hoard and three degrees by the open hoards. Mr. Facey corroborated Dr. Ure's evidence, and the medical attendant of the family deposed that Mrs. Murray's health had suffered materially in consequence.

Mr. Thesiger contended that the plaintiff had no right to recover for any loss of prospect or comfort, and that the evidence as to the obstruction of light and air was most unsatisfactory.

Mr. Justice Coleridge having summed up, the Jury found for the plaintiff, with nominal damages.

PROFESSIONAL CHARGES.

In the Court of Queen's Bench, Friday, December 2nd. (Sittings at New Prin at Westminster, before Mr. Justice Coleridge and a Common Jury.)

DOBSON R. CROZIER.

Mr. Platt and Mr. C. Clark were counsel for the plaintiff; and Mr. Whatley and Mr. Petersdorff for the defendant.

This was an action to recover £34 5s. 6d., for work and labour done by the plaintiff, who is an architect.

It appeared that the plaintiff had drawn up certain plans and specifications for the erection of a house for the defendant, for which tenders had been offered by builders, but which plan had not been carried into effect. He had subsequently drawn other plans and specifications, from which the house had been erected. The defendant had paid £25 into court, being 3 per cent. on the money expended in carrying into execution the accepted plans. The plaintiff claimed in addition £10 for his trouble in drawing the rejected plans, and some other items, making together the sum of £53, for which the action was brought.

Several surveyors were called for the defendant, who stated that the expense of the commission to charge £2 per cent. for rejected plans, but they disallowed all items but that charge.

The learned Judge having summed up, the jury returned a verdict for the plaintiff for £10, in addition to the money paid into court.

BLACKWALL RAILWAY.—INFRINGEMENT OF PATENT.

In the Court of Queen's Bench, Monday, December 19th. Before a Special Jury.

CURTIS & the DIRECTORS.

This was an action for the alleged infringement of a patent which had been taken out by the plaintiff, for connecting and disconnecting the draught or ground rope of a railway, with railway carriages, when the rope was in motion. The plan was specially applicable to railways where the carriages were drawn, as on the Blackwall Railway, by means of a rope moved by an engine placed at the spot, towards which the carriages were desired to be drawn. The defendants had adopted a plan for effecting this purpose, which it was alleged was essentially the same as that invented by the plaintiff.

The defence was, that the plans were not the same, and that that which was in use on the Blackwall Railway had been suggested to the directors some time before the specification of the plaintiff was published. There was a great deal of evidence given as to the practicality of ever attaching a rope to a railway carriage when the rope was in motion, and much doubt was thrown upon the possibility of such a performance; but a person, named Daru, stated that he had twice done it when in the service of the Blackwall Railway company, once in company with a rope accidently got detached, and once at the Limehouse station, when no passengers were in the carriage, for the purpose of an experiment. He, however, said, that it required a "good man" to do it, and the appearance of the witness showed that he came within this expression, in the particular meaning he gave himself. Mr. Thesiger contended that the plaintiff, who, had occupied the whole of the day, was terminated by the jury interfering, and stating that they were of opinion the powers used by the two parties were not the same, when the plaintiff consented to be non-utilized.

ROYAL EXCHANGE.

We hope it may not turn out that there was more of hurry than good speed manifested in the competition for the sculpture which is to adorn the pediment of the portico. Quick work it certainly was, when after being set in on the evening of the preceding day, the designs were "examined" on the 23rd November, and the same, in coming into play at last, the majority of votes being in favour of Mr. Westmacott—whom rumour had previously marked out as likely to be the fortunate competitor. After so much has been said relative to the manner in which competitions are managed andgrave us we have been thought that at any rate a little more tact and adroitness would have been employed on this occasion. Whether such was really the case or not, it certainly now looks as if it had been a preconcerted affair; for hardly is it possible to suppose that the committee could competently judge off-hand of the merits of the designs as works of art—unless indeed the one chosen was so evidently superior to the two others, as to have no room for doubt or question—which is not very probable. We ourselves saw one of the rejected designs, or rather two different designs by Mr. Watson, the artist who has lately given such public personality in the new Committee of the Bank Hall in Threadneedle Street; and having seen them, we certainly doubt very much at present if the one "selected" be—we will not say of greater, but of equal merit. Upon Hamlet's principle of "Assume a virtue, if you have it not," there might have been the appearance of a little deliberation; there might have been a delay of a month or two, during which, artists and those known to be judges of art should have been allowed to inspect the designs, and public opinion in regard to them, so far taken, and taken also into consideration. Possibly the one which is to be executed is the best design, and shall be the only one; but the best is not necessarily the one which was decided by lottery. If it be worth while to bestow so considerable a sum as Three Thousand Guineas or Pounds on the decoration of the pediment, it was surely worth while to bestow far more scrupulous attention upon the design itself, beforehand. For it is not to be supposed that those who formed the Blackwall Committee have, in this instance, shown themselves to be men of business and dispatch, who can make up their minds very quickly, without any nonsensical "shilly-shallying." Still, with all our misgivings, we are willing to hope for the best; though as poor Mrs. Nickely says, "we ought never to be over and above sanctuary in our expectations!"
THE FINE ARTS.—THE ROYAL ACADEMY.

On Saturday, the 10th ult., there was a very numerous meeting of the members of the Academy, in Trafalgar-square.


At nine o'clock the President commenced the business of the evening, by stating the objects the Academy had in view, by giving those annual rewards to the students who gave tangible proofs of talent, vigilance, and application in the various classes of drawing, painting, sculpture, and architecture; and he added, in addition to the rewards in the respective classes, to all of which, except that of models from the life subject, the medals were cheerfully given by the Council; and the reason for not giving a medal in that class, arose from there only being one candidate, and therefore there could be no competition. The merits of the chalk drawings made from the living models, and from the antique statues, were mentioned in terms of high commendation by the President, who observed emphatically, that the style of drawing these difficult objects had considerably improved within the last two or three years, which he stated arose from the alterations made, deviating from the late method, and which had been judiciously made by the present keeper of the Academy. To the copies in oil from Guido’s picture of “Fortune,” the President gave high and deserved commendation, as well as to the architectural plans, elevations, and sections of the beautiful Church of Walbrook.

The prizes were then distributed in the following order, viz.—

To Mr. James Clarke Hook, for the best copy made in the school of painting, the silver medal, with the lectures of the Professors Barry, Barry, and Fuseli.

To Mr. Alfred Rankley, for the next best copy made in the painting school, the silver medal.

To Mr. J. C. Hook, for the best drawing from the living models, the silver medal.

To Mr. John Clayton, for the best drawings of the ground plan, sections, &c., of St. Stephen’s Church, Walbrook, the silver medal.

To Mr. James Harwood, for the best drawings from the antique, the silver medal.

To Mr. Alfred Cotley, for the best model from an antique statue, the silver medal.

After the delivery of the prizes, the President concluded the public business of the evening with an address from the chair, which was replete with the soundest practical observations upon the state, condition, and prospects of the arts in this country. We regret that our limits do not allow us to give a full report of this able and eloquent discourse; but amongst the points he touched upon with energy and feeling were, that unworthy and groundless prejudice that still remains in the minds of a few of the noble and wealthy classes in England, which would place foreign modern arts far above that of Great Britain, even at the present day. This morbid desire to set up every country above their own in matters of art, is remarkably common; and more so, perhaps, in those parts of England than it has been of late; we have done our part in demolishing this unnatural, this monstrous doctrine, and it has been damaged irretrievably. After the President had clearly and with much energy pointed out the gross absurdities and contradictions of the few anti-national connoisseurs who still exist, he properly noticed another unnatural practice which militates against the arts of the United Kingdom—namely, the vituperation poured forth phœno flamme by the minor press, generally, against the native artists and their works. The President went into many topics professionally interesting, and, on concluding his address, was warmly applauded.

The general assembly then proceeded to appoint officers for the ensuing year, when Sir Martin Archer Shee was unanimously elected President.


THERIOGRAPHY.

Art of Copying Engravings, or any Printed Characters from Paper on Metal Plates; and on the Recent Discovery of Moser, relative to the Formation of Images in the Dark. By Mr. Robert Hunt. Read at the Meeting of the Cornwall Polytechnic Society, on the 8th Nov. of which excellent Society Mr. Hunt is the secretary.

The Journal of the Academy of Sciences of France, for the 18th of July, 1842, contains a communication made by M. Regnault, from M. Moser, of Konigsberg, “Sur la formation des images Daguerriennes”; in which he announces the fact, that “when two bodies are applied together, they impress their images upon each other.” The Journal of the 28th of August contains a second communication from M. Moser, in which the results of his researches are summed up in 26 paragraphs. From these I select the following, which alone are to be considered on the present occasion:—All bodies radiate light, even in complete darkness.—This light does not appear to be allied to phosphorescence, for there is no difference perceived whether the bodies have been long in the dark, or whether they have just been exposed to daylight, or even to direct solar light.—Two bodies instantly impress their images on each other, even in complete darkness. However, for the image to be appreciable, it is necessary, because of the divergence of the rays, that the distance of the bodies should not be very considerable.—To render the image visible, the vapour of water, mercury, iodine, &c. may be used.—There exists latent light in all bodies, as well as latent heat.

The announcement at the last meeting of the British Association of these discoveries, naturally excited a more than ordinary degree of interest. A discovery of this kind, changing, as it does, the features, not only of the theories of light adopted by philosophers, but also the commonly received opinions of mankind, was more calculated to awaken attention than anything which has been brought before the public since the publication of Daguerre’s photographic process. Having instituted a series of experiments, the results of which appear to prove that these phenomena are not produced by latent light, I am desirous of recording them.

I would not be understood as denying the absorption of light by bodies; of this I think we have abundant proof, and it is a matter well deserving attention. If we pluck a Nasturtium when the sun is shining brightly on the flower, and carry it into a dark room, we shall still be enabled to see it by the light which it emits. The human hand will sometimes exhibit the same phenomenon, and many other instances might be adduced in proof of the absorption of light; and I believe, indeed, of the principle that light is latent in bodies. I have only to show that the conclusions of M. Moser have been formed somewhat hastily, being led, no doubt, by the striking similarity which exists between the effects produced on the Daguerreotype plates under the influence of light, and by the juxtaposition of bodies in the dark, to consider them as the work of the same element.

1. Dr. Draper, in the Philosophical Magazine for September 1846, mentions a fact which has been long known, that “if a piece of very cold clear glass, or what is better, a cold polished metallic reflector, has a little object, such as a piece of metal, laid on it, and the surface be breathed over once, the object is exhibited on the surface as often as you breath another time on the surface, a spectral figure of it may be seen, and this singular phenomenon may be exhibited for many days after the first trial is made.” Several other similar experiments are mentioned, all of them going to show that some mysterious molecular change has taken place on the metallic surface, which occasions it to condense vapours unequally.

2. On repeating this simple experiment, I find that it is necessary for the production of a good effect, to use metallic plates; for instance, a piece of gold or platinum on a plate of copper or of silver, will make a very decided image, whereas, copper or silver on their respective plates give but a very faint one, and bodies which are bad conductors of heat placed on good conductors, make decidedly the strongest impressions when thus treated.

3. I placed upon a well polished copper plate, a small piece of silver, a large piece of metal, and a penny. The plate was gently warmed by passing a spirit lamp along its under surface: when cold, the plate was exposed to the vapour of mercury; each piece had its impression, but those made by the gold and the large metal were most distinct; not only was the disc marked, but the lettering on each was copied.

4. The mercury media was supported upon slips of wood, placed on the copper, one-eighth of an inch above the metal, and the mercury mercurialization, the space the metal covered was well marked, and for a considerable distance around the mercury was unequally deposited, giving a shaded border to the image.

5. The above coins and medals were all placed on the plate, and it was made too hot to be handled, and allowed to cool without their being removed; impressions were made on the plate in the following order: small gold, large silver, large copper, small silver, half-crown, large gold. The mass of the metal was found to influence materially the result; a large piece of copper making a better image than a small piece of silver. When this plate was exposed to vapour, the
results were as before (3, 4). On rubbing off the vapour, it was found that the gold and silver had made permanent impressions on the copper.

6. The above being repeated with a still greater heat, the image of the copper coin was, as well as the others, most faithfully given, but the gold lead, and silver only made permanent impressions.

7. A silvered copper plate was now tried with a moderate warmth (5). Mercury was then poured over the polished and uniformly silvered gold and copper; the silver marked, but not well defined.

8. Having repeated the above experiments many times with the same results. I was desirous of ascertaining if electricity had any similar effect; and powerful discharges were passed through and over the plate and discs, and it was subjected to a long continued current without any effect. The silver had been cleaned off from the plate (7), it was now warmed with the coins and medals upon it, and submitted to discharges from a very large Leyden jar; on exposing it to mercurial vapour, the impressions were very prettily brought out, and strange to say, spectral images of those which had been received on the plate when it was silvered (7). Thus proving that the influence, whatever it may be, was exercised to some depth in the metal.

9. I placed upon a plate of copper, blue, red, and orange coloured glasses, pieces of crown and dilt glass, mica, and a square of tracing paper. These were allowed to remain in contact half an hour. The space occupied by the red glass was well marked, that covered by the orange was least distinct, but the blue glass left no impression; the shapes of the flint and crown glass were well made out, and a remarkably strong impression where the crown glass rested on the tracing paper, but the mica had not made any impression.

10. The impression remained unchanged after the escape of the mercurial vapour, heat was again applied to dissipated it, the impression still remained.

11. The experiment repeated, but the vapour of iodine used instead of that of mercury. The impressions of the glasses appeared in the same order as before, but also a very beautiful image of the mica was developed, and the paper well marked out, showing some relation to exist between the substances applied.

12. Placed the glasses used above (9, &c.), with a piece of well smoked glass, for half an hour one-twelfth of an inch below a polished plate of copper. The vapour of mercury brought out the image of the smoked glass only.

13. All these glasses were placed on the copper, and slightly warmed; red and smoked glasses gave, after vaporization, equally distinct images, the orange and red, the experiment repeated; after the escape of the mercurial vapour, heat was again applied to dissipate it, the impression still remained.

14. An etching made upon a smoked etching ground on glass, the copper and glass being placed in contact. The image of the glass only could be brought out.

15. A design cut in paper was pressed close to a copper plate by a piece of glass, and then exposed to a gentle heat; the impression was brought out by the vapour of mercury in beautiful distinctiveness. On endeavouring to rub off the vapour, it was found that all those parts which the paper covered amalgamated with mercury, which was removed from the rest of the plate; hence there resulted a perfectly permanent white picture on a polished copper plate.

16. The coloured glasses before named (9, 12), were placed on a plate of copper, with a thick piece of charcoal, a copper coin, the mica, and the paper, and exposed to fervent sunshine. Mercurial vapour brought up the images in the following order—smoked glass, crown glass, red glass, mica beautifully delineated, orange glass, paper, charcoal, the coin, blue glass; thus distinctly proving, that the only rays which had any influence on the metal, were the solar rays. This experiment was repeated on different metals, and with various materials, the plate being exposed to steam, mercury, and iodine; I invariably found, that those bodies which absorbed or permitted the penetration of the most heat, gave the best images. The blue and violet rays could not be detected to leave any evidence of action, and as spectra imprinted on photographic papers by light which had permeated these glasses, gave evidence of the invisible rays which passed them freely, we may also consider those as entirely without the power of effecting any change on compact simple bodies.

17. In a paper which I published in the Philosophical Magazine for October, 1849, I mentioned some instances in which I had copied printed pages and engravings on iodized paper, b mere contact and exposure to the influence of the surface of the iodine, or artificial heat. I then, calculating the probability of our being enabled, by some process as the one I then named, which process as the one I then named, to copy pictures and the like, proposed the name of Thermography, to distinguish it from Photography.

18. I now tried the effects of a print in close contact with a well-polished copper plate. When exposed to mercury, I found that the outline was very faithfully copied, and the metal.

19. A paper ornament was pressed between two plates of glass, and warmed, the impression was brought out with tolerable distinctness on the under and warmest glass, but scarcely traceable on the other.

20. Rose leaves were faithfully copied on a piece of tin plate, exposed to the full influence of sunshine, but a much better impression was obtained by a prolonged exposure in the dark.

21. With a view of ascertaining the distance at which bodies might be copied, I placed upon a plate of polished copper, a thick piece of plate glass, over this a square of metal, and several other things, each larger being than the immediately preceding; these were all covered by a deal box, which was more than half an inch distant from the plate, when a position for a night. On exposing to the vapour of mercury, it was found that each article was copied, the bottom of the deal box more faithfully than any of the others, the grain of the wood being imaged on the plate.

22. Having found, by a series of experiments, that a blackened paper made a better image than a white one, I very anxiously tried to effect the copying of a print by means of red heat. But the heat was only partial, so that on a silver plate amalgamated on one surface, and the mercury brought to a very high polish, that I produced anything of good promise. By carefully preparing the amalgamated surface of the copper, I was at length enabled to copy from paper line-engravings, wood-cuts, and lithographs, with surprising accuracy. The first specimens produced (which were submitted to inspection), exhibit a minuteness of detail and sharpness of outline quite equal to the early Daguerreotypes and the photographic copies, prepared with chloride of silver.

The following is the process at present adopted by me, which I consider far from perfect, but which affords us very delicate images. A well polished plate of copper is rubbed over with the nitrate of mercury, and then placed with the nitrate of gold, and the plate is covered with a film of mercury. The copper was heated, the paper being placed upon it, and was pressed to the nitrate of mercury, and the plate is warmed, the print was then pressed upon it, and was pressed close to the copper plate by a piece of glass, and then exposed to a gentle heat; the impression was brought out by the vapour of mercury in beautiful distinctiveness. On endeavouring to rub off the vapour, it was found that all those parts which the paper covered amalgamated with mercury, which was removed from the rest of the plate; hence there resulted a perfectly permanent white picture on a polished copper plate.

These are matters which can only be decided by a series of well conducted experiments. Although attention was called to the singular manner in which vapours disposed themselves in spaces which were lighted by the sun, and which were left free, thus forming the subject of a new branch of the science of light, yet it is certain that the discovery must be regarded as of the highest interest, and that it will eventually be found that some purely chemical excitement produces a molecular change, or that a thermo-electric action is induced, which effects some change in the polarities of the ultimate atoms of the solid.
NOTES ON EARTH WORK, EXCAVATION, CUTTING, AND FORMING EMBANKMENT UPON RAILWAYS.

ARTICLE IV.—SUPERINTENDENCE, ACCOUNTS, AND MEASUREMENTS.

"Modern practice has reduced it to a price per cubic yard."—Professor Pigot's Lecture, Dec. 1811.

In pursuance of my promise given at the conclusion of my former paper, I shall now attempt to give a description of the methods in use during the execution of railways, as regards the supervision, both on the part of the Company and in the cases of regular and sub-engineers, engineer in chief, resident, assistant, and sub-engineers, but the duties of the resident and assistant it will only be necessary for me to notice.

The resident controls the whole line and the assistants, and confers with the Directors at all their meetings for finance, and when the line exceeds 50 miles in length, the duties will be so multiplied that two will be required.

The assistants are subordinate to the resident, and have generally a division of 10 miles each, or perhaps a length of, say, three contracts. The duties of an assistant is to observe that the works are executed according to plan, and that the materials are of proper quality, and if not so, to complain, first to the contractor, and if not satisfactory, to the resident, or, if the plan is defective, that it be so altered as to be made in the dimensions without the sanction of the resident, and if any change is ordered, to ascertain the difference for or against the contractor jointly with him or his agent, to enter these measurements in a book, and to make a return monthly to the resident, as also of all materials received on the Company's account, as rails, chairs, keys, sleepers, blocks, &c. He is also to make a return each fortnight, of the number of men employed by the contractor, to measure works for monthly payments, and price them by the schedule attached to the contract.

In taking the measurements, he will much facilitate his work by making them as near as possible to given points, so as to save re-measurements. He is also to see that all levels are executed with reference to bench marks and gradients given, and to preserve the centre or trig line, especially in curves, and to give the half width of railway, and to see that no more land is enclosed than has been purchased, and finally to be in frequent communication with the resident, and if any thing unexpectedly occurs, to lose no time in communicating it. From this is derived the responsibility for the measurement, which is the assistant engineer for the monthly payments. The clerk keeps the books, &c. and invoices. The foremen superintend their own trade, and examine the goods sent to the works, with the invoice, both as regard quality and quantity; they also send in a weekly return of all the men's time individually, and the nature of his employment, whether on extra or contract work, and any materials sent to other works, each individual workman making a return to him on a printed form provided for the purpose. The timekeepers collect the names of the ganger's men employed at occasional daywork, and count the number of men in each gang four times daily, and take an average as to their time employed for the day. One day is retained in hand from each man employed at daywork, until he is discharged, the wages being paid on the Saturday, although not for that day, but the Saturday preceding, counting from each Friday night.

I will, perhaps, better explain myself by giving, as it were, instructions to a set of men on a contract as to the manner they should adopt in keeping the accounts as to that to which they are attached. It is to oblige the ganger's account, with the weekly men received, and enter to his credit the quantities and prices he is to have for his work; to fill up a weekly summary, showing how many men have been employed upon each separate description of work, and to render a perfectly separate account for work done without express sanction of superintendent, and to pay no day man except on a Saturday, unless he discharge himself entirely from the works, when he is to pay the back day kept in hand. He is to receive the invoices after they are examined by the foreman, whose duty it is to receive the goods. The invoices to be filed until the monthly or quarterly bills are delivered for examination. The invoices to be copied into the day book, materials sent to or received from other works to be entered in books expressly for that purpose, bricks, lime and sand will be kept in separate accounts, backed with the party's name who supplies each material. No goods to be sent from this place without authority from the president in writing, until the work is complete, and then sent to the contract at the next Saturday, as it will not be paid at a subsequent period; and his account for taskwork must be settled monthly.

The superintendent lets and measures the works, and is responsible for the levels, and he is in fact the whole executive, the contractor being the capitalist or speculator. In the proceeding account, no notice is taken of truck system, tonnage shops, menage shops, &c.; all measures, or any of the tricks of contractors without capital, or such as those would be sure to have the lowest estimate; but the proceedings of a wealthy and reputable contractor are recorded, and from having seen service in both camps, I can bear testimony as to the good effects, both morally and physically, of their being met with the proceeds. The men's work is measured by the contractor as open for an indefinite time, would be much checked, if engineers would not certify contracts completed, until the contractors previously lodged with them copies of all their extra claims.

With respect to measurement of works in progress, the various branches are measured by numbered boards, &c. The ganger's account is kept by the superintendents, being the only one, and all accounts in the same district, and by the same men, as nearly as possible, the same measure works, &c. are perfectly inapplicable. From the broken nature of the ground, it assumes shapes so various and smooth at the different benches, gullets and levels; it is, therefore, necessary to take the dimensions on the ground, and by computation, ascertain the cubic contents, the former gives the contents in yards by multiplication, and the latter gives greater facility for the application of practice, or the division by aliquot parts: and the total can easily be converted into yards by dividing the number of cubic feet in a yard. In the one case, all dimensions are taken in feet and inches, and in the other, they are taken in inches, without being divided, and afterwards converted into a hundred division; this latter method is most used by old practitioners: but feet and inches are now being more used than formerly.

The dimensions are recorded in two columns; one for the length, breadth, and depth, placed one over the other always in the same succession; the other columns being filled up for the cubic contents of each dimension as it is squared, so as to make the addition of the several items into a total more easy. The dimensions of finished cuttings are taken at each chain's length, by a line stretched across the natural surface of the ground, and a staff held in the centre, by an assistant, and a mean of the two ends taken for the depth. The width is likewise measured and the length and dimensions of each part of the chain. The length is measured along the centre of the cutting. The dimensions of each hole in broken work is taken similarly, but is recorded as only on account, and at a subsequent measurement it is re-taken from a certain fixed point or chain in the section, which the measurement book will tell if kept on a uniform plan.

In making the monthly return of work executed, all previous measurements are annulled in toto; and the return made is the total quantity done, and not that that is done between each measurement. When a work is very rugged, it is usual to take the measurement of the embankment, and not the cutting, on account of the fewer dimensions. The cuttings are measured generally every night, the whole time being divided into tenths, and the pay is on account, from the timekeeper's return; and in some cases the number of wagons are computed as a check. The persons who act as timekeepers, are generally of the class that has seen better days; the excavators are a migratory herd, they are a collection of the agricultural labourers, spanglers and daymen of the picturesque country-side, and who have left their native locality to better their condition; so that in works of this sort, trusting too much to the honour of such men will not do; and the more checks there are the better, or one stands the chance of knowing experimentally the meaning of the term "sloping," which by this time is fully known in France.

I have said nothing as to the mode in which the directors, engineer, and secretary, keep a check on each other; I think, however, that it is done by a system of sub-committees of finance, and the division of the line into districts, and that no monies are paid by the banker without the signatures of three of the directors and the secretary; being on an analogous plan to that adopted in olden times by corpo-
rate bodies:—"The wardens each to have a key and a chest with three locks, and each to keep a key." I hope some one who has had a seat at the board will supply the information, as also the form of each printed paper used in each department—say engineer's department, printed forms for return of number of men, specification of rails, and general specification for works, number of yards done on each contract, return for each subdivision of the line, and schedule of prices, and tickets of return for materials received, &c. In superintendent of line, a pass book for free riding on the service of the company, memorandum of coaching department, code of signals, instructions and duties of guards, general regulations for police, superintendent, inspectors, constables, switchmen and gatekeepers; instructions for the use of signal flags. Police department, return of train before or after time, number of engine, name of driver, number and description of carriages, trucks, wagons, horse boxes, and inspectors' remarks, and occurrences at the different stations, viz., number of coaches of 1st, 2nd, or 3rd class, and carriage trucks, vans, wagons, and mails leaving each station and left behind; also, a return of the name of upper guard, whether delayed by passengers or water, with the time of arrival, when due and despatched from each station.

There are also a return of absentees, whose wages are suspended, viz., number of column, name, quality, where stationed, and cause of absence, and amount of wages. In addition to the above related departments, there are the printed time tables, and the ticket system; of colours for the different classes, and whether going east, west, north, to notice the returns or accounts rendered by police, when a line is south, or on the up or down trains.

In conclusion, the mention of defalcations must not be omitted that have taken place in the staff of the companies, which have amounted to upwards of six cases, and those invariably in the secretary's department; and in no one case am I aware that they have been brought to trial. The engineers generally come in for the greatest share of odium when works are unsuccessful, but I think the blame ought to be divided between the solicitor, secretary, and other officers, or the committee, which is indefinite enough. The engineer is of necessity obliged to be somewhat acquainted with his business, as influence and patronage will not so exclusively prevail as in other departments. I have known a line of railway where a quorum director slid into the office of superintendent, with £500 a-year; he was originally a druggist, having a seat at the board, which the sub-engineer had not; he was enabled to coerce him to do his duty, with no extra pay, he was a fluent speaker, and often saved the directors from attack; he could not, however, retain his ground, and both he and the body of directors acted shabbily to their employees, and illegally to their employers, the unfortunate shareholders. I may go on for some time longer, but am afraid of the editorial pruning hook; so for the present, conclude.

St. Ain's, Newcastle-on-Tyne. O. T.

REVIEWS.

COMPANION TO THE ALMANAC, FOR 1843.

On returning to this publication, we might dispense with prefatory remark; nevertheless, we have one to make by way of suggestion to its publishers, viz., that as they must now afford materials enough for the purpose, were all the architectural chapters from the commencement of the series collected together and reprinted, with such alterations and additions as might be found requisite, they would form a very useful and convenient volume—one that would to a certain extent serve as a Pocket Companion and Architectural Guide to the Tourist. As a sequence to this suggestion, we will venture another to publishers abroad, which is, that an "Annuaire" of new buildings, &c., for France and Germany—one for each country—is a desideratum.

Messrs. Wyatt and Brandon here make their début in the "Companion," with some eclat; there being three different buildings by them, and one of them very superior for a building of the kind, although—perhaps it would be nearer the truth to say because—it is in that picturesque style the Lombardic, against which, however, the Camden Society folks object, because, forsooth, it is not sufficiently "Christian" for their strait-laced notions, upon matters that are purely conventional, and have nothing whatever to do with genuine religion. To object—otherwise than as taste is concerned, against the abandonment of the usages observed by our Roman Catholic builders, is surely ultra-squeamishness, after we have abandoned Romanism itself, with its idle pomposity and all its trumpery. Pu-
character. The tower and spire, however, rising together to the height of 290 feet, and placed campagna-wise at the south-west angle of the front, will be a very good and bold feature in the exterior. Of Mr. Pugin's Catholic Church, near the Blind School, no further mention is made, but we suppose that when completed, it will be fully described, and at present it certainly promises well—for there is much excellent detail in doors and windows, some of which will be rather highly decorative of the Gothic general manner is truly admirable, but how much it is, even that is better than what has been much unaptly called the "stone and starvation" style.

The Wesleyans seem to be patronizing architecture; their College or "Theological Institution" at Richmond, is an extensive stone structure in the Tudor style, and with some novelty in its design; but the general view of it does not give the effect of shadowed parts being indistinct and confused. Whether the execution be as satisfactory as the design, we pretend not to say; but as far as the general character of its façade goes, it appears to be a building that would not disgrace either of our universities. Mr. Cockerell's Sun Assurance Office is spoken of, upon the whole, with commendation, yet not without some exceptions. The first floor windows are objected to as being rather poor and trivial in design, and as requiring further enrichment which might have been so applied as to fill up the plain spaces or panels between the rusticated piers in which they are set. Had this been done, they would certainly have been more important features in the composition, and not give the same expression to their situation; and there is a similarity at the same time have given original character to the whole. The ensemble, too, would have been more in keeping. The interior of the new libraries at Cambridge—that is, the north wing, the only portion as yet finished—another work by the same architect, is also described as being greatly better than the exterior, and the principal room is said to be a very noble apartment. Another building at Cambridge, and of which a tolerably full account is here given—which is certainly not the case in Le Keux's Memorials of Cambridge, there being there scarcely a syllable relative to it—is that for the new county courts, by Messrs. Wyatt and Brandon. The façade consists of an Italian Doric order in plasters, comprising a lesser one of insalating columns from which spring arches, after the manner of a Venetian window. Of these the five centre ones are open so as to form a recessed loggia or arcade, and produce a bold effect of light and shade. The idea is borrowed from Palladio's Basilica at Vicenza, but also exhibits, as is here remarked, a considerable degree of improvement upon the original; though, in this respect, the best may be said of the first. We do not mean that Palladio, that may seem little less than treason to those who hold his works to be the ne plus ultra of refined taste. Of the "Brunswick Buildings" at Liverpool, some account was given in our last volume, at page 278, therefore we need here say no more than that its visitor, the Companion fully bears out the description of it, and shows it to be a work of the best modern architecture. Under the head of "Railways of Great Britain" we have a brief record of the progress of railways since Nov. 1, 1841, by which it appears that, from that time to the present, there is a total extent of 1761 miles more brought into operation.


As one of a series of similar works devoted to separate branches of study, and which has been stamped by public favour, and as a useful and ornamental companion for the student, this Encyclopædia will, no doubt, prove a successful publication. In the present reception, it is not that we can object to any of the numerous works on architecture, but that we can object to any of them bearing upon matters which are but very remotely connected with architecture properly so termed, that it is to this last department we must confine ourselves for the present. And we begin by remarking that one great disadvantage attending works of the kind is that, however satisfactorily they are executed, as regards their main purpose, namely, the instructing the student who has yet to learn, they are apt to disappoint those who are already familiar with the subject treated of, and of course acquainted beforehand with the substance of the information thus collected together. Allowance must, therefore, be made for want of novelty, since the whole ground must be gone over again, and nothing can be displayed only in the writer's views and opinions, and in his corrections of or additions to what has previously been said by others. We must, accordingly, restrict our observations to the architectural portion of the work, but to those opinions thrown out in it, which come immediately from Mr. Gwilt as their author; for it is these alone that can be made to serve as chief means of specimens, in a mere notice like the present, of so extensive a work.

One thing which is clearly enough apparent is, that Mr. Gwilt has not written ad captandum, at least not as far as the profession are concerned, for he expresses himself more than once by no means very encouragingly in regard to the present state of the art in this country, and it may be a true observation that half the discussion is ended before it is begun; for with him for uttering such opinion, unpleasant as it may be, provided it be uttered in sincerity; but it is to be regretted, that, as he has not scrupled to make so severe an allegation, he did not also allege some of the grounds on which it is formed. Possibly he may mean, not that there is greater architectural talent in France, but that greater encouragement is given to it there than here. Be this as it may, we must not despise the attempt; and it may not be impossible that in our own way, where, according to him, it is rather checked than encouraged by the government—which qualification would have softened the asperity of the censure. Very far be it from us to object to the expression of censure, for it is that which gives value to praise, and which procures improvement by holding up faults for correction; still we do not exactly approve of that species of it which deals in such vague generalities that it is hardly possible to meet and combat it. We own that too many opportunities are made mere jobs of in this country—that interest and favouritism too frequently supersedes merit, and that false emotion, which often turns out in the end to be very expensive, has been the bane of many of our public buildings. The Architectural Theory and Practice of the Institution of Civil Engineers, for example—would be a tolerably fair specimen of the kind. But the writer of this work is not restricted to one style, and with regard to ability in Gothic architecture, we stand very far superior to any of our continental neighbours.

We do not dissent, however, very much from Mr. Gwilt, when he tells us that "the splendour of the government offices in this country, seems to be in an inverse ratio from the renown of the department," in instance of which he refers us to the Doge's Palace and the "Treasury," or "King's House" at St. Mark's, or the "Museo Pio-Clementino," or the "Treasurer's Office," &c., in which he brings out the description of those buildings, to which he has added the Custom-House—a most miserable affair in point of architecture, and also the Mint, which has no merit, certainly not that of character, to recommend it. It is notorious that his opinion of the National Gallery is the reverse of favourable, as is likewise that which he entertains of the London University; nor do we suppose that he thinks very highly of either the Post-office, or the British Museum, for though he has not expressly censured, neither has he expressly excepted them from the rest. But it is rather, we trust, with reference to the past than to the immediate present, that there is or henceforth will be room for improvement in many of our public buildings. From the government and those in power, towards architecture and the other fine arts. Something like a public voice in their behalf has lately made itself heard amidst all the never-ceasing din and squabbling of politics, and the daily palaver of the public press. The erection of such a noble fabric as the new Houses of Parliament will at least wipe off many of the reproaches which have been heaped upon our government and those in power, towards architecture and the other fine arts. We will not risk our credit by predictions that may possibly be falsified by the event: fresco-painting may not succeed here, as far as by success is meant the satisfying public expectation and public taste; but it is a good augury, ad interim, that any discussion on the subject of it should have been treated as matter of public interest.

There is no difficulty in getting Mr. Gwilt's "expository sidenotes," as from Buckingham Palace, in the section devoted to that class of buildings, more especially as he is exceedingly chary indeed of any thing like praise towards another structure, which some have thought they could not extol too magnificently. "We regret," he says, "that in this country we can offer no model of a palace for the student. Windsor Castle, with all its beauties, which, however, consists so much of the personal taste of the builder, will not assist us." Ungrazious and captious as this opinion may appear to many, it does not at all shock us. What we object to is, not the opinion itself, but to the ipse dixit tone in which it is uttered, without explanation on the part of the writer, so that we are at a loss to know whether it is the workman's quality, taste, or the architect's skill in arrangement chiefly, or the style and the design.1 We almost suspect

1 As neither Mr. Paynter nor Mr. Britton has attempted to enter into a critical examination of the edifice as it came from Sir Jeffery's hands—
that it is to these last he objects, and that he is disposed to class Sir Jeffry Wyatt with others as "architects," for he has omitted his name as well as that of Wilkins in his list of architects, as he has likewise that of James Wyatt; which omissions cannot have been other than intentional, and are therefore particularly significant. However lighty we may now estimate him, James Wyatt is most indisputably an historic name in the annals of English architecture, and the taste of a more sober and refined judgment than that of some of those who are registered and catalogued by the histrio-nigraphers of art, and of whom there is very little more than their dates to record. The name of Schinkel ought to have been inserted, unless the list was actually printed before his death was known in this country, which as it comes nearly at the end of the volume, we can hardly believe; and, as far as the list goes, there is no favourite or not, his name has spread throughout Europe; and if names so distinguished are to be omitted at pleasure, we may perhaps, ere long, see that of Palladio expunged from a table of eminent architects. At any rate the precedent is an unfortunate one.

It cannot be expected that we should pretend to go regularly through a work so comprehensive, or have as yet thoroughly examined it; therefore—for the present at least—our readers must be content with our pointing out some of the passages and remarks which we noted in looking over the work. Among them are some which hit hard at the new Royal Exchange, animadverting on the want of judgment manifested, in leaving that public edifice, intended for the Exchange itself, uncovered; which, however, he admits to be a matter of taste; "for if our merchants prefer exposure to the inclemency of the season, it is not our business to complain of their fancy." But that is not all; for after speaking of the Bourse at Paris, as an excellent model for buildings of that class, he adds, "the mercantile society of London discoursed by allowing only £150,000 for a similar purpose here; and even for this sum they cut up their building into little slices, to reimburse themselves by rents for the miserable outlay. So much for the spirit and liberality of the British merchant!" Though that spirit will most assuredly not obtain for its writer the freedom of the city of London, or any other civic honour, yet we are not aware that Schinkel is no favourite of Mr. Gwilt's; for, in point of architectural taste, he is hardly so much at variance with such men as Jones and Wren, who, with their trumpery colouring and violent effects, mislead the silly men and common-place critics, that usually decide upon the merits of their works." This is severe enough, nor is it entirely free from prejudice—a little overcharged, perhaps, both in opinion and expression, therefore Mr. Gwilt must not be very much surprised if some should attempt to retaliate, and charge him with making use of very coarse language; be it as it may, we ourselves do not like his work the less for its occasional pungeancy of expression, which, even when we dissent from the sentiment, is more to our taste than the smirking, wishy-washy style of many other writers.

The more practical part of the work contains a great deal of information—of course not entirely fresh, and therefore more or less familiar to professional men; but it renders this Encyclopaedia a complete elementary course for the student, affording him, in a single volume, the instruction that he must else gather for himself from a variety of publications. Still, it is questionable whether it would not be more useful if some of the sections separately, in the form of a supplement to be bought up with the rest by those who choose to take it, because so much matter of that kind, incorporated as it now is in the volume, may deter not a few from becoming purchasers.

(To be continued.)


Another part of this excellent work has appeared, which is fully equal in interest to the former numbers; it contains a rich specimen of the Lombard style, the Carthusian Church near Pavia, Italy; the façade is covered with most elaborate ornament, which is shown in detail in another plate. The third place is a view of the Cathedral of Bann, in Germany, a fine specimen of the Norman style; the principal elements, however, present in general, the characteristics of the modified Byzantine style, but not so pure as that style. The eastern apsis, with its two towers, seem to belong to the close of the eleventh century or the beginning of the twelfth. This edifice contains some excellent points, from which the architect may glean with advantage, and turn to good account for some of our new churches. We know of no work that will add so much to the detail and practice of the architect as the one before us.


We have been able only to give a cursory glance at this work, but from what we have seen, we have no hesitation in pronouncing it to be a work of the highest use, both to the practical man and the amateur. Next month we shall return to it.

SEWERS OF THE METROPOLIS.

We are heartily glad that some agitation has taken place on this subject, having been introduced by the Poor Law Commissioners. We are sorry that we cannot insert Mr. Chadwick's grand chairman of the Westminster Commissioners, but we hope to advert to it next month; for although we do not agree with Mr. Chadwick in many points, we strongly hold that the present system of sewer administration is susceptible of improvement, so as greatly to relieve the proprietor and builder, and induce parties to construct sewers who now shirr from such a responsibility.
NOTES OF THE MONTH.

The new Law Courts in Guildhall-yard are to be immediately erected from the designs of Mr. Tite, F. R. S. The elevation next to Guildhall-yard is to be in the Gothic style, and the other side, now occupied by the Guildhall Police Office, &c., it is said, to be refronted, to correspond in appearance. Guildhall Chapel formerly occupied the site of the Law Courts, and the style of that edifice might well be used in the present design; at the same time we sincerely hope that the style of Guildhall front will not be adopted, but that the present opportunity will be taken advantage of to get rid of the cocked-hats and other barbarisms which Master Dance was pleased to call Gothic, and which we should call Gothic par excellence. Several of the Common Council have advocated such a course, and we hope will persevere.

The ground for the new Conservative Club, in St. James-street is cleared of the much admired Travellers' Club. The Travellers' Club is, as Messrs. Basevi, and the present building, the building on the with much satisfaction, the building on the much occupied as the merit they possess. We have before expressed our opinion that much of value connected with Persian art remains to be discovered, and recent discoveries in the East tend to confirm this. The remains of Persian art which have as yet reached Europe, show a promise of something better than we have yet seen, and illustrate the influence of Persian on Greek art, of which abundant evidence is shown in the Lycian marbles.

On the Travellers' Club a new attic is being raised, so as to relieve the garden-front now swept away by the Reform Club and Athenaeum. The addition is in the same chaste style as the rest of the building. The only part which is looked upon with doubt is the insertion of the German arcade, with its curious roof. The interior is to be decorated by Sang, a German artist, with arabesques, and used as a smoking-room. In reference to Barry's application of colour we have heard some remarks upon the decoration of the groined arcade at the Travellers' Club. This he has had painted in imitation of granite, thus appearing to violate probability, as it would be difficult to work granite in such a fashion. The Noah's Ark on the top of the Mansion House has at last been removed, to the great satisfaction of the public.

Catherine-street is rapidly advancing, and will make a fine street. Guildhall is, as we have announced, to be improved. St. Lawrence Jewry is to be improved, and the change will centre on the roof. The interior is to be decorated by Sang, a German artist, with arabesques, and used as a smoking-room. In reference to Barry's application of colour we have heard some remarks upon the decoration of the groined arcade at the Travellers' Club. This he has had painted in imitation of granite, thus appearing to violate probability, as it would be difficult to work granite in such a fashion.

The widening of Potters-lane, at the Fleet-street end, is determined upon, and the buildings on the south side are to be removed.

Mr. Barry's works in Trafalgar-square now begin to show themselves. The shaft of Mr. Raillon's Nelson column is nearly completed, and the bronze capital which is being cast at Woolwich is in an advanced state. A new Hall and Library are to be built in Lincoln's-inn, from the designs of Mr. Hardwicke and are, we understand, to be in the style of the old parts of Hampton Court.

We have seen a line engraving of Barry, by Hurland, which is in private circulation; it is 8 inches by 63 inches, and beautifully executed, but we do not consider it a striking likeness.

METROPOLITAN IMPROVEMENTS.

Whitehall, November 30th.—The Queen has been pleased to appoint the Earl of Lincoln, Lord Lyttleton, Lord Colborne, the Right Hon. James Charles Herries, the Right Hon. the Lord Mayor of the city of London, Sir Robert Harvy Ingles, Bart. Sir Charles Lemon, Bart., Henry Thomas Hope, Esq., Henry Gally Knight, Esq., Alexander Milne, Esq., the Hon. Charles Gore, Sir Robert Smirke, Knt., and Charles Barry, Esq., to be Her Majesty's Commissioners for inquiring into and considering the most effectual means of improving the metropolis, and of providing increased facilities of communication within the same. The Queen has also been pleased to appoint Trench Walsham Phillips, Esq., to be Secretary to the said Commission.

IRON STEAM VESSELS.

Sir,—The writer of a paper on steam navigation in the November number of the Journal says, "The iron of which vessels are composed has been found to become brittle in the course of years, so that, although tough at first, it will, in the course of time, lose its durability, when struck by a hard and sharp body." May I be allowed to remark that some of the friends of iron ship-building are startled by the assertion contained in this sentence, and would be glad to know whether the author of it can point to any instance of such "starring which has actually taken place. Until this can be done, examples of the Aaron Marshall, which is stated in the same number of the Journal to have been at work from 1822 to 1830, without requiring any repairs, although she had been repeatedly aground in the Seine, with her cargo on board, and which vessel is also stated to be now at work,—of the steamer built by the Hersely Company for the Shannon, in 1829, and now in good order,—and of other iron vessels, do not appear to favour very strongly the serious objection raised against iron vessels in the paper quoted above.

I am, respectfully,
A. M.

MEDIHURST'S WATER VALVE.

Sir,—Excuse my troubling you with the following remarks:—I have been much surprised by repeatedly seeing reference made to a water valve invented by Mr. Medhurst, and particularly a description of it by Mr. Vignoles in his lecture in Cornwall, reported lately in the Railway Times, where he remarks that it is a very ingenious contrivance, the only objection being that the country the railway passes through must be perfectly level—a serious objection certainly, but not the characteristic of the principle of the Medhurst valve. That valve is unqualified with the principle of the common pump as not to know that when the tube is exhausted of air, the water will rush in to supply its place, and so render the tube ineffectual. Another objection is that the communication between the piston and carriage being on one side only, the pipe must necessarily be on one side also—a very unmechanical contrivance, to say the best of it. The advantage of the water freezing, or rusting of the piston, are left quite out of the question.

A YOUNG MECHANIC.

CONTRIVANCE FOR DESTROYING SMOKE.

Sir,—At a meeting held at the Leeds Music Hall about ten months ago, I had the pleasure of examining a variety of models and drawings of patented smoke-consuming apparatus; also of hearing the same explained by the inventors thereof, or by their representatives. Previous to this meeting, I had paid little or no attention to "smoke burning," as it is commonly termed, but since, I have done quite to the contrary; I have been continually on the listen, and in full expectation to see from an individual, whose signature has occasionally appeared in your pages, a contrivance to effect the object in question more agreeable to my fancy than any I had seen. My expectation in this respect not being realised, and receiving from a printed notice received from the Leeds Board of Works, about three weeks ago, that the period is fast approaching when all the "wholesale smoke manufacturers" within the borough of Leeds will, by Act of Parliament, be compelled to check, to a great extent, that nuisance which has been so long complained of, I began to think it high time to do something by way of experiment to diminish the periodical dense volume which rolled from my own chimney-top.
During the last three or four months, I have had frequent opportunities of witnessing the operation of several different kinds of apparatus for consuming smoke, some of them patented and some not; the whole effect of the latter was wanting some improvement to render them capable of accomplishing their intended purpose still more effectually. This circumstance caused me to try a plan of my own, the success of which has induced me to hand you the present communication. After all the discussion and bother that has of late been driven up and down the country concerning the consumption of smoke, "smoke burning" is, nevertheless, in my humble opinion, as far as Englishmen have been enabled to succeed in the science, attended with so little difficulty as to be accomplished with very little trouble and expense. My furnace was recently one of the ordinary description, though it is now entitled to the name of a "smoke-burner," and the difference of the state in which it now is, and that which it formerly was, is simply this: Cold air being admitted through a regulating door or valve built in the wall on one side of the ash pit, into a space or chamber formed within the wall which supports the fire-bridge, ascends through a narrow aperture extending across the top of the bridge, that is from one side of the boiler to the other through the fle in which mingles, with the smoke, the air renders combustion more complete. The air thus admitted into the fle can have no effect any longer than it assists combustion; for this reason, if the engine may be a little attentive, he will generally find that the air valve may be shut in about four minutes after each renewal of the fire.

There are many "smoke burners" now in constant operation in this neighbourhood, some few of them appear to answer tolerably well, while others, of the very same plan, appear to have no effect whatever. This circumstance renders it impossible for a stranger to distinguish the chimneys which have "smoke burners" attached to them, from those which have not. I do not mean to say the plan I here describe is a perfect remedy for preventing the smoke of chimneys; it is such as I am convinced will protect me against any interference of the Leeds improvement commissioners; it has a better effect in accomplishing its object than a great majority of those in the neighbourhood; and it is inferior to none I have yet witnessed, except in one point, and that is of all others the most important, viz. ECONOMY.

From your humble servant,

Near Leeds, Nov. 29, 1842.

FLEECE.

[We did not think it necessary to give the drawing forwarded by our correspondent, as we consider that the description will be sufficiently understood without it; this "smoke burner" is, we believe, identical with the same as one that was patented some years since, which patent has expired.—Ed.]

BLAST ENGINES.

Sir—I shall feel obliged by an explanation from you or from some of your correspondents in an early number of your valuable Journal, of the following irregularity of blast from a blast engine.

The engine blows four furnaces, three on one side, and one on the other side. There are two receivers, one exactly opposite to the gable of the engine house, into which the air is first forced, and another situated nearly equidistant from the three furnaces on one side of the engine. The blast to the three furnaces is taken from the bottom of the receiver at the engine house, and to the other furnaces, within a short space, of the top, and about one foot above the orifice through which the blast passes from the engine to the receiver. I applied a mercurial gauge to various parts of the pipe leading to the single furnace, and I found the pressure varying irregularly from a quarter to three and a half pounds on the square inch; whereas the pressure on the pipes leading to the three furnaces kept uniformly three and a half pounds.

I am, Sir,
Your most obedient servant,

Clyde Iron Works, Glasgow,

William Ferrie.

December 27, 1842.

ON THE STRENGTH OF BEAMS.

Sir—The above sketch shows the situation of the supports, &c., of a cast iron beam I lately had an occasion to make use of for carrying a load of about seven tons at each end. The distance between the supports, being six times as great as that between the centre of each load, W, and the nearest support. Now, I should feel myself highly obliged if some of your scientific readers would be kind enough to furnish the Journal with a correct method of shaping beams of this class; also the best formula for computing their strength. To prove where a beam of this kind would break, I took a parallel square bar of cast iron, divided its length, and placed it upon two supports, as seen in the sketch, then submitted it to a pressure, acting equally upon the points, W, W, till it broke in the points, c, c. Was I not to infer from this circumstance, that beams of the present kind require to be made strongest between the points of support?—Query—Would this inference be consistent with your theory? I don't remember seeing in any author on the subject, any satisfactory information relating to this class of beams; still it is a form which in general practice is often found very convenient; and I have no doubt that if some of your able correspondents would give the subject a thorough investigation, the result thereof would be generally received as being of great practical importance.

Leeds, Dec. 17, 1842.

Concrete.

OBSTRUCTIONS TO WINDOWS.

Sir—I have repeatedly endeavoured to obtain definite information on the subject of obstructions to windows (which have acquired a right by being opened upon adjoining property the requisite length of time) but having been unable to obtain any thing to be relied on, perhaps you, or some of your numerous and well informed correspondents can afford light on the following subjects.

1. Suppose a window to be opened upon an adjoining property, and (by neglect of the owner of such adjoining property) to acquire a right to remain open. What space of ground is required to be left open for its use, say in a direct line from its face, or the face of the wall in which it is built or opened?

2. Does the opening such window (of course it being possessed of the right as above) give any right to space on each side, or more than its own width?

3. Does it preclude the building of any structure beneath it, or as high as its sill?

These queries, you will perceive, are intended to cover all the ground of right of occupancy inherent in windows, which have been allowed to remain open a length of time sufficient to give what is termed a right of light.

By replying to the above, or giving it a place in your valuable journal,

You will oblige,

West Derby, Dec. 5, 1842.

An Old Subscriber.

[We rather suspect that our correspondent will find some difficulty in obtaining a satisfactory answer to his queries, 1 and 2; we believe that there has not been any defined distance settled. At a trial, much depends upon the hard seeing of witnesses on both sides, so as to whether a building erected near a window does obstruct the light and free circulation of air. After bearing of evidence, it is left to the Judge and Jury who may try the cause to determine the point. In answer to the third query, there is no doubt that the owner of the soil has a right to build beneath the window or as high as the sill; if in London, the roof must be 18 inches below or from the opening, to conform to the building act.—Ed.]

SMITH'S PATENT WIRE ROPE.

At the Society of Arts, on Wednesday, the 14th December, a paper by Mr. A. Smith was read, "On the properties of Wire, as applied in the Manufacture of Rope for Mining and Railway Purposes, Standing Rigging, Lightning Conductors, &c." After some preliminary remarks on the increment of strength, as compared with diminution of bulk, resulting from the processes of drawing and annealing the wire, Mr. Smith gave a table of the strength of single wire, and of various gauges, the breaking weights having been obtained by experiment with the testing machine. This was followed by a table of tests of the comparative strengths of the Government hempen-ropes, and Mr. Smith's wire-ropes, from experiments ordered by the Admiralty in March, 1837. Another table gave the comparative sizes, with the weight, and cost per fathom, of iron-wire rope, hempen-ropes,
and chain of equal strength. The general results are, that standing rigging of wire-ropes, of equal strength with the hemp-ropes, one-third of the size and half the weight, may be fitted at about two-thirds of the cost.

In the statistical tables of Mr. Smith's paper it is stated, in reference to the advantages of a reduced surface of rigging, that "the standing rigging now fitted in her Majesty's Navy presents a surface of upwards of 600,000 square feet, which is about equal to the surface of the sails of twenty-four first-class frigates;" and in reference to the advantages of the absorption of moisture by the hemp-ropes, that "one hemp rope, one and a half inches in circumference, will absorb half a pound weight of water, and will contract one inch in length. The standing and running rigging of a first-rate measures about 30,000 fathoms, and will, consequently, when wet, contract in length, on an average, about 850 yards, or nearly half a mile, and will absorb about seven tons of water, which, being principally carried aloft, will materially affect her sailing." 

Mr. Smith explained the construction of an apparatus termed a "screw lanyard," which he substitutes for the ordinary lanyards and dead-eyes of the shrouds, for the purpose of tightening the wire-ropes of rigging. It consists of a piece of Russell's wrought-iron tubing, with a screw at each end, working in right and left.

The ship's lightening conductor is described as a copper-wire rope, securely fitted to the trucks and mast-head caps, and descending from the top-gallant and top-masts down the rigging, and over the ship's side, where it is inserted in a copper-plate, in contact with the sheathing below the water-line.

On the 21st of December, Mr. Smith continued his communication. He commenced by explaining the tenacity and elasticity of various metals, and experimented by a testing machine on wires of platinum, gold, silver, copper, and iron. He first tried a piece of platinum wire, two inches in length, 

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<tr>
<th>Diameter (inch)</th>
<th>Weight (g)</th>
<th>Results</th>
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<tr>
<td>0.001</td>
<td>10.4</td>
<td>Tighten</td>
</tr>
<tr>
<td>0.002</td>
<td>10.4</td>
<td>Tighten</td>
</tr>
<tr>
<td>0.003</td>
<td>10.4</td>
<td>Tighten</td>
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The gold wire, of the same length and size, (weight 5 dwts. 10 grs.) broke at 32 lbs.; silver, same size and length (weight 4 dwts. 14 grs.), broke at 250 lbs.; copper, (3 dwts. 12 grs.) broke at 150 lbs.; and iron, 3 dwts., at 310 lbs. A copper rod, one-fourth of an inch in diameter, was then tested, which withstand a tension of 2,000 lbs.; and an iron one, a quarter of an inch, which the plate, applied equal to upwards of 3,000 lbs. A wire bridge, of 33 feet span, was erected in the room, the construction of which Mr. Smith explained. The wire rope, forming its principal support, weighed 56 lbs.; the angle-irons, 112 lbs.; and the other parts, including the braces, 56 lbs.; and 112 lbs. for the platform or footpath, composed of boards — thus making the whole weight only three cwt. and a half, and which might be completed by four men, in about three days, at a cost not exceeding 15$, and, at the most, be taken down or put up in half an hour.

These descriptions of bridges were described as very useful for military purposes, and for throwing over deep cuttings in railways, &c. Mr. Smith, stated, that for general practical purposes the cost might be taken at 35 per foot run, with a breadth of three feet. Two smaller models of bridges, on different principles of construction, were also shown.

KEENE'S MARBLE CEMENT.

At the Society of Arts a paper was lately read by Mr. White, on "Keene's Marble Cement." It is described as a combination of sulphate of lime and alum. The gypsum undergoes the same preparation as for plaster of Paris, being deprived of its water of crystallisation by baking. It is then steeped in a saturated solution of alum, and this compound, when calcined and reduced to a powder, is in a fit state for use. The cement has been extensively applied as a stucco, but the finer qualities (when coloured by the simple process of fusing mineral colours in the water with which the cement powder is finally mixed for working) being susceptible of a high degree of polish, produce beautiful imitations of mosaic, and other inlaid marbles, scagliola, &c.

The cement is not adapted to hydraulic purposes, or for exposure to the weather, but has been used as a stucco in the internal decoration of Windsor and Buckingham Palaces. From its extreme hardness, it has been found serviceable when used for imbedding and setting the tiles of tessellated pavements, &c., and has been adopted for this purpose at the French Protestant Church, the new fire-proof chambers in Shorter's court, and the Reform Club House. In the course of the discussion which followed, Mr. C. H. Smith and Mr. Lee adverted to the extreme hardness of the cement as its principal recommendation, when applied as stucco and for mouldings.

We have seen some of the imitations of mosaic and inlaid marbles referred to in the above paper; we can say, and truly, that they are beautiful, and in point of polish superior to scagliola; we have also seen some fine specimens of grout, imitations in plinths for halls, fireplace-pieces, columns, pilasters, &c.; and I must not forget to mention the imitations of statuary and ornaments, after the Greek. For the purposes of interior ornament, we consider this cement a great acquisition to the architect. We, therefore, strongly recommend the profession to visit Messrs. White's works, where may be seen various applications of the cement for decorative architecture, particularly two table tops, containing several imitations of rare marbles.

THE SILOMETER, DERIVOMETERS, SUB-MARINE THERMOMETER, AND STEAM-ENGINE INDICATOR OF M. CLEMENT.

At the request of a subscriber to give some information relative to M. Clement's Nautical instruments, for which Government lately made a grant, we make the following extracts from the Mechanick' Magazine:—

1. The Silometer is the title given to a substitute for the common log, which has been recently invented by M. Clement, of Rochford, and is so well thought of by the French Admiralty, that it has been ordered to be forthwith supplied to the different ships of the Royal Navy of France. It is a most ingeniously constructed instrument, and promises to be of great practical utility. To describe it as well as we can in words, the lower copper bowl of the instrument, is attached to a moveable plug of the same metal, which slides in a copper tube that passes through the centre of the vessel to the keel; to this plug is attached a lever, which, by means of a vertical rod, acts on a second lever placed on the deck of the vessel, and connected with a spiral spring; the tension of which constitutes an equilibrium with the pressure of the water on the ball, and serves to measure the rate at which the ship is moving, by means of a hand, the movements of which on a graduated dial, indicate, at every movement, not only the speed of the ship, but also the distance run in any given time.

2. The second invention is called a "Derivometer;' it is an instrument to ascertain a ship's leeway, and is moved by a paddle, that may be placed under the keel at will, and is supported by a plug sliding in a tube like that of the Silometer, but turning with the paddle and the rod. The motion is transmitted from the paddle by means of a spiral spring; it is an instrument one of which indicates the leeway to larboard, the other to starboard. When at anchor, the instrument will show clearly the direction of the currents.

3. The third invention is a Sub-marine Thermometer. It appears from the thermometrical observations of many scientific navigators, that in seas of unfavourable depth, the water is not so cold as over banks, and that over banks near the shore it is less cold than over those at a greater distance, but colder than in the open sea. M. Clement's thermometer is kept constantly under water at the same depth, and indicates the different temperatures of the water by means of a dial placed on the deck of the vessel, and always open to examination. The immediate action is communicated by wheels, the working of which turns two hands upon the dial, the one marking the single degrees, and the other the tens. The whole is enclosed in a case, which is fixed to one side of the vessel, and the height of the apparatus is at the lowest part of the tube, in immediate contact with the water, and always at the same height.

4. The fourth invention consists of an instrument which indicates constantly the elasticity of the steam both in high and low-pressure engines, and the level also of the water in the boilers. The instrument may also be applied to the piston of an engine, so as to show the loss of power sustained by the steam in its way to it. A tube, similar to the manometer, is affixed to the instrument through which the steam ascends, and is introduced into a copper or brass box placed on the deck of the vessel, and upon which a graduated dial indicates, by means of a hand, to the officer of the watch, the effects of the engine, without his having to send below to ascertain it. M. Clement has obtained patents for these different inventions both in France and this country. Following experiments made by order of the Lords of the Admiralty on board of the Lightning steamer, we extract from the Government report:—

"Thursday, October 13, 1842."

"About one mile and a quarter below Gravelend commenced a trial between Massey's patent log and M. Clement's silometer. After a run of two hours and a half (being off Sheerness)—"

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<tr>
<th>Distance</th>
<th>Time</th>
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<tr>
<td>6 miles</td>
<td>2 hours, 30 minutes</td>
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"At 25 minutes past 4 o'clock, p.m., altered the course four points, during which operation the silometer showed a diminution of speed from 8 miles per hour to 7 miles. At 50 minutes past 8 o'clock p.m., off South Foreland, commenced a trial between Massey's log and the silometer."

"On Friday morning took in Massey's log, and found the distance from Abroad the South Foreland to about 7 miles to the eastward of the Overy—"
by Massey's log 844 miles; by sibellometer 824; by tables 85 miles. Moved soundings with, viz., boat, brass guns, anchors, oars, &c.; for an instant the speed, as shown by the sibellometer, diminished to 7.4 miles per hour, but it almost immediately decreased to the former speed of 8 miles per hour. Moved the same weight forward, but could not perceive any sensible difference in the speed of the vessel. The sibellometer varied from 8.1 to 8.2 miles per hour. Tried the speed of the vessel by the common log, which gave 81 miles. The sibellometer indicated exactly the same.

10 o'clock, A.M., on Friday, when about two miles past the Nabb Light, tried Massey's log, and found the distance to the entrance of Portsmouth harbour—by Massey's log 80 miles exactly; by sibellometer 8 miles exactly. During the passage round to Portsmouth, the speed of the vessel was purposely checked, by blowing off the steam, to see the effect on the sibellometer. The speed, as shown by that instrument, was gradually reduced from eight miles per hour to four miles, at which point it stood steady. On the order being given for full speed, the sibellometer showed a gradual increase of speed, till it came to 8 miles per hour, as before. On the return of the Lightning from Portsmouth to Woolwich, the distance performed was found to be—by Massey's log 119 miles; by the sibellometer 118.6.

The sibellometer has a dial upon deck, which constantly shows the number of miles per hour that the vessel is going; consequently it is easy to discover, under all circumstances, what is the speed of the vessel, and the most advantageous quantity and distribution of the sails for obtaining the greatest speed. As the sibellometer shows immediately the effect which every alteration in the sails or trim of the ship has on its velocity, it follows, also, that ships fitted with the sibellometer can constantly maintain the speed they may have agreed upon, and so keep company together, and maintain the same relative position, though, from the darkness of the night, or thickness of the weather, they cannot see each other. To ascertain the distance run after any number of hours, it is simply to take the number of minutes one of the watches of the sibellometer has gained over the other, and to multiply that number by the number of miles obtained from the heaving of the lead, or from the information of the pilot—

The Marine Thermometer—The trials with this instrument on board the Lightning, commenced at 11 o'clock on Thursday morning, October 13, previous to leaving Woolwich harbour, and on taking the centigrade, it was found to be 12°. At 25 minutes past three o'clock P.M., in five fathoms channel, on the beach, depth of water 24 feet; temp. was 71°; sibellometer 23 degrees, depth of water, as stated by the pilot, it indicated 15-25°; off Dover 16°; and in Portsmouth harbour, 14-2. From these indications it appears that the marine thermometer in its variations followed the inequalities of the bottom of the sea, so as to indicate the temperatures ascertained from the heaving of the lead, or from the information of the pilot—at that, is, on the approach of shallow water the thermometer fell, and on the approach of deep water it rose, and distinguished the difference very distinctly and rapidly, according to the transition from shallow to deep water, and vice versa. It may, therefore, be inferred that the marine thermometer would indicate the approach to rocks and icebergs, from the influence these bodies are known to have on the temperature of the sea for a considerable distance.

The dial of the marine thermometer is also on deck, and shows, by inspection merely, the exact depth of water in which the vessel may be sailing at the time.

Sunderland Harbour Floating Dock.—Application is intended to be made in the ensuing Parliament for an act to authorise the Wear Commissioners to convert the lower part of the Tidal Harbour of Sunderland into a floating Dock, by a course of dams, piers of masonry, with navigable gates between, across the River Wear. The works are intended to confine or impound seven feet of water above the low-water mark of the average spring tides in this part of the harbour; 100 acres of water will thus be rendered available: 75 acres for the New Dock, and the remainder for navigation and the Folly End an average depth of 12 feet. Facilities for moving ships in and out of loading berths, and increased accommodation for ships of a larger class, will thus be secured. The navigable gates to be each 90 feet in width of opening, with sluices or checkers in them for letting off the water in the case of the tide rising above the level of the dock. These gates will be provided with a pair of paddle wheels driven by a belt of power after high water, or until the water has ebbed out to the height above specified. Ample time will, therefore, be given for ships passing outwards. The gates are to remain closed until the tide has again lowered to the level of the channel, or, of these shallower parts of the dock, and at the Folly End an average depth of 12 feet. The works are intended to be carried out by a dock company, and the navigation of the stream will again proceed as at present. It is also proposed to construct a Tidal Dock or Basin, to contain 25 sail of vessels, for the purpose of having an entrance to the great Dock always available. Mr. Murray, the Commissioner’s engineer, has prepared the necessary plans for the intended work. The Parliamentary plans have been lodged.

The New Barracks at Preston.—We understand that the plans and specifications for the new barracks at Fulwood, near Preston, have at length passed, and received the confirmation of the Hon. Board of Ordnance. They will be on the most magnificent and complete scale, superior to any in the kingdom, to accommodate 2,000 men, with stabling for 700 horses.

Preston Chronicle.
MISCELLANEA.

THE TOWER OF NAPOLEON.—The construction of the tower of the Emperor Napoleon is about to be commenced, and for the last few days a model of the work has been exposed to public view at the Invalides. An equestrian statue of the Emperor is to be placed in the middle of the great court, and on the pedestal will be represented the arrival of his ashes at the place where they are to be deposited. In order to receive such immolated remains will be ornamented on each side by two gigantic statues and two lions couchant. This entrance will be surmounted with an altar on column. The present altar and its rich canopy must be removed to admit of this arrangement.

THE TUILERIES AND THE LOUVRE.—The Globe notices a rumour, that during the next session of the States-General the plaintiffs will unite the plan for uniting the palaces of the Tuileries and the Louvre by a screen, resembling in architecture the façade front of the Quay de Louvre, and thus forming one of the finest squares in Europe, will be presented. The centre will, it is said, according to this project, be ornamented with an equestrian statue of the Duke of Orleans, and the works are to be entrusted to the direction of the Civil List. The expense to be divided into thirds: one to be borne by the Civil List—one by the State—and the last by the city, to be laid out in embellishments. If this project is adopted, the idea of pulling down the Pont-Neuf, the Quai d’Orléans and des Orfevres, and the Rue de Harlay will be relinquished, and the new wing or screen of the Louvre will be appropriated to the Royal library.

THE NEW CORN EXCHANGE, GLASGOW.—The spacious and beautiful hall which has been erected in Hope-street as a Corn Exchange, for the accommodation of the country trade, will be opened on the 23rd November, for the first time, when the respective stalls were taken possession of by their tenants, and a good deal of business transacted. As this building, independent altogether of the important object it is destined to serve, is an ornament of a very high order to that part of the city which it clings to, and is erected in the most splendid style of architecture, the exterior is finely relieved by a handsome range of Roman windows, and is decorated all round the spot with a massive balustrade, while the entrance which fronts Hope-street, is adorned with a beautiful portico, formed of Corinthian columns, 21 feet in height, finished with a corresponding entablature and pediment. The front has been designed in a style of great chasteness and purity, the work executed with much skill, and the entire building presents a noble and imposing appearance. The hall within is exceedingly spacious, and is divided by a beautiful marble screen, altogether different from that of any other building in the city. It is entirely lighted from cupolas tastefully introduced into the panels of the ceiling, and ornamented by a magnificent lantern light 50 feet by 30, formed in the centre of the building, and supported by eight columns, fluted, and ornamented in the Corinthian style. The dimensions of the hall are 90 feet by 57; the height of the ceiling 22 feet; and, viewed as a whole, it has an exceedingly light and elegant appearance. There have been erected round the hall 36 stalls for the grain merchants, so formed as to give facilities for exposure and ventilation. The large room, without writing tables, is intended for a public library.

THE NEW ROYAL EXCHANGE.—Notices have been given by the city authorities for pulling down the building in the New Corn Exchange opposite the Bank (known as Bank-buildings) in the course of the spring, and the space when cleared, is to be the site for the statue of the Duke of Wellington, immediately in front of the great portico of the Exchange. The progress made in the building itself is most astonishingly great, reflecting the highest credit upon Mr. Large, the architect. In the course of this year the work will be in great forwardness, and it will certainly be finished in the summer of the following year. The sculpturc of the pedestal Mr. Westwood undertakes to complete by the 1st of May, 1814.

TIMBER TANK.—A wrought iron cylinder, 31 feet long and 6 feet diameter, has been erected in Portsmouth Dock Yard, for the purpose of "burnetizing" timber under pressure. It is composed of plates half an inch thick, and 40 inches wide, and is divided into 42 inches square, for the admission of logs. It is fitted with two air pumps of 14 inches diameter, for extracting the air, and two force pumps for increasing the pressure when filled with the solution. On a trial lately made before the Admiralty engineer Mr. Kingston, the cylinder has been charged with 20 loads of timber, the air pumps which are arranged to be driven by Lord Dundonald's rotary engine, were set to work, and a vacuum of 262 inches was obtained in 9 minutes. A cock in the connecting pipe was then opened, and the solution rushed to the vacuum from the eustern. When the cylinder was filled with the solution, the force pumps were set to work, and the pressure was raised to 200 lb. on the square inch. Under this pressure there was not the slightest leakage from any part of the cylinder, nor from the doors. The timber was removed on the following day, and a log was cut up, when it was found that the solution had penetrated to the very heart of the timber. The pressure which the apparatus is to be put to in future is to be 100 lb. on the square inch, as this is found to be sufficient for the due saturation of the timber within 24 hours, under the process of previous exhaustion of the air. The whole of the work was executed by Messrs. Westmacott & Company, the cylinder having been riveted up by their patent rivetting machine, to which its great tightness may be attributed.

NEW IRON STEAMER, "THE MAGICIAN."—An iron vessel, of 360 tons burthen, built by Messrs. Ditchburn and Maier, with engines of 110 horse power, by Messrs. Pen and Son, and fitted with Morgan's patent tubes, boilers, and Howard's cooling apparatus, was tried last month, on the Thames, and was found to be very superior, and must not be thought to be surpassed. The following account of experiments we extract from the Woolwich correspondent of the Times:—The experiments were made on the 16th, 17th, and 18th of November. The vessel left Woolwich about ten o'clock, a.m., on the 16th, and in about half an hour afterwards passed the Rhenish machine, which had left Woolwich at nine o'clock. At about half-past 11 o'clock she stopped for a few minutes at Gravesend, and then proceeded with a strong breeze ahead, and adverse tide, and at a quarter past one o'clock passed the Nore-light vessel; arrived at Ramesgate at 23 minutes past four o'clock, when the weather was so severe, that none of the London steam-vessels arrived during the course of day. The weather continued so boisterous during the 17th, that the Widgeon steam-vessel was under the necessity of putting into Ramesgate harbour at an early hour for shelter. The Magician, however, left Ramesgate shortly after 11 o'clock, a.m., the wind blowing at the time from the north-east, and made her 33 miles in 5 hours 26 minutes past 12 o'clock passed Dover Pier, with a very heavy sea running. At 24 minutes past one o'clock, when opposite Folkestone, she put back for Ramesgate, where she arrived at 44 minutes past three o'clock. On the 18th the Magician left Ramesgate at 17 minutes past ten o'clock, a.m., with blow, and tide, and at 14 minutes past three o'clock, p.m., arrived off Woolwich. The average speed of the engines from Ramesgate to Woolwich was 35 revolutions per minute, length of stroke three feet six inches, height of steam-gauge seven inches, height of barometer 29 inches. The boilers are constructed on the tubular principle, very small, and generate steam well. The consumption of coal was about 6½ lb. per horse-power per hour, and the vessel was found to be extremely easy and dry in a heavy sea. The average speed of the vessel from Ramesgate to Woolwich, the distance being estimated at 85 miles, in five hours, was equal to 14 knots, or 17 statute miles per hour.

DOVER.—Few persons are perhaps aware that our harbour commissioners have undertaken to make their harbour more extensive, to improve it, as to doubt, as it lies beyond a matter of question that the Government intend making Dover harbour one of refuge. All the "old buildings," including the Dover Castle Inn, Amherst Battery, and the warehouses and buildings occupied by the Dover merchants, are only "improvements," and may be pulled down, and their sites thrown into the harbour. The whole of Union street also is to come down, with the exception of Messrs. Lattram's Bank and the York Hotel. The railway will clear away Beech-street, the whole of the long building which is now in this street, and include nearly all the shipwrights in Dover, not excepting Mr. Duke, whose residence will also come down. These changes must have an extraordinary effect on all the trades of Dover, who will speedily be called into action for the purpose of supplying the "houseless wanderers" with places wherein to hide their belongings. —Dover Chronicle.
New Locomotive Engines—"The Man of Kent."—Messrs. Rennie have turned out another locomotive that promises to excel the "Satellite," sent out by the same firm about 12 months since, and which has been working on the Brighton Railways with so much satisfaction and economy, the average consumption of coke being not more than 20 lbs. per mile, with a train of eight or nine carriages. It lately performed the distance from Croydon to Brighton, 40½ miles, with six carriages, in 52 minutes, including three stoppages of three minutes each, which deducted, make the actual time running about 50 minutes. This engine has been running not one shilling has been laid out for repairs. "The Man of Kent" promises even to excel these excellent qualities of the "Satellite." It is a splendid specimen of engineering work, and possesses several improvements; among others, an immense engine-diameter, which is almost circular in diameter, with a jacket, which will always be kept charged with hot steam; a second improvement, is the introduction of a damper, so constructed, that the apertures of the tubes next the smoke-box may be wholly or partially eclipsed simply by the driver turning a handle, which may be easily available; a third and most important improvement is in the regulator, which is generally circular consequently difficult to keep tight—it is now a slide valve. The centre of gravity is kept down by the spring being below instead of above the axles, as usual. We hope next month to have some account of its performance.

South Eastern Railway Works.—The stupendous works now proceeding for the formation of the South Eastern Railway between Dover and Folkestone are rapidly progressing, and extensive preparations are making to throw down a large portion of Rundown cliff, just beyond the Shakespeare tunnel, to make way for the sea wall. During last month experiments were made by Messrs. Stephenson, Maudsley, and Hutchinson, and General Pasley is expected to be present at the grand operation; this blast was to be effected by the enormous charge of 18,000 lbs. of gunpowder; it will be exploded by the electric spark from a galvanic battery, carried by a distant operator, who has hitherto been quite satisfactory, and it is expected at once to dislodge a portion of the cliff many tens of thousands of tons in weight.

Comparative Cost of English and Foreign Railways.—In his Robert Stephenson's elaborate and important report, addressed to the directors of the South Eastern Railway, on the system of railways, as now projected by the French government, he gives an analysis of the cost of railways in England, selecting three lines—the Northern and Eastern, the York and North Midland, and the Birmingham and Derby—as cases similar in their results to those in France now under consideration; from this, and also an analysis of the cost of the English and French lines, it appears the average cost of the French line in England is 25,450£, the French line 23,000£, and the Belgian lines, 16,200£; thus showing a difference in the cost in favour of the Belgian lines over the English of no less a sum than 9,244£ per mile, and over the French of 6,794£.

Burning Lens Worked by the Drummond or Oxygen-Hydrogen Light.—A colossal burning lens, three feet in diameter, and weighing 3 cwt., has been erected in the Royal Adelaide Gallery, intended to be worked by the Drummond, or oxygen-hydrogen light. Some private experiments of this power of the Drummond light have taken place, when it was found that the bulb of a differential thermometer introduced into the focus, at a distance of 16 ft., was heated to nearly 640°F. It was decided to test the hypothesis that a focus of this power could be obtained. It has been long asserted that the heat accompanying light obtained by artificial means does not produce heat capable of being transmitted and concentrated through lenses; these experiments fully prove the contrary.

Price of Gas.—Gas is manufactured in Manchester by the Commissioners of Police, and though sold at from 5s. to 6s. the 1,000 cubic feet, yields a revenue of 12,000£, or 15,000£ per annum to the town. The large consumers pay 5s. the 1,000 feet. [In Dublin the charge, when burnt by meter, is 10s. the 1,000 feet, and the quality so inferior in illuminating power, as to be of value only for heating purposes. Our civic authorities would follow the example of the Manchester Commissioners, it might prevent the necessity for aburgh rate, and confer a boon on the gas consumers.]—Dublin Advertiser.

An Immense Block of Granite has been landed at Mr. Tuckill's wharf, Greenwich; it is from the Haytor Company's quarries, Dartmoor; measuring 10 feet 6 inches in diameter, and weighing 42 tons. It is to be used as a covering for a mausoleum in Kensal-green Cemetery.

Bell Rock Lighthouse.—During the late gales which have done so much damage to shipping, particularly between the 19th and 22nd of October, the sea sprays appear, by the monthly returns from the Bell Rock Lighthouse, to have risen in the building to the height of thirty and forty feet every tide. While this heavy sea ran, one of those great detached masses of stone familiar to the lightkeepers by the name of "Travellers," was forced across the sea by the power of the wind, and it was seen by the lightkeepers, where it destroyed part of the cast-iron landing hawser. This stone measured about 7 feet in length, 3½ feet in breadth, 2½ feet in thickness, and must have weighed 30 tons at least. They say that on leaving the sea, the lighthouse keepers are provided with quary tools, with which they broke it up and arrested its progress, but it was no easy task from the run of the sea. The nearest seat which visit the Bell Rock are from the North-east, but the present gale was chiefly from the North-west; and it is not a little remarkable that the Frith of Forth was but little affected during this storm above the island of May.
LIST OF NEW PATENTS.

GRANTED IN ENGLAND FROM NOVEMBER 20TH TO DECEMBER 22ND, 1842.

Six Months allowed for Enrolment, unless otherwise expressed.

Felix Napoleon Target, of Blackheath, gentleman, Loue Castelaine, of Elgin, chemist, and Adolphe Amblil, of Black-lane, aforesaid, artist, for "a new method of refining or manufacturing sugar."—Sealed Nov. 25.

James Smith, of Coventry, card-stamper, for "improvements in weaving ribbons and other articles of fabric."—Nov. 25.

Charles Heard Wild, of Birmingham, engineer, for "an improved mode of constructing roofs for fire-proof buildings."—Nov. 25.

Isham Baggs, of Wharton-street, in the county of Middlesex, chemist, for "improvements in producing light."—Nov. 25.

Francis Oldham Ward, of St. Martin’s-lane, gentleman, and Mark Freeman, of Sutton, in the county of Surrey, gentleman, for "improvements in candle-plates; apparatus, and instruments employed in the use of candles and rushlights."—Nov. 25.

Punia Theodorus Halli, of Finsbury-circus, wine-merchant, for "improvements in the construction of railways and other carriages, and in apparatus connected therewith."—Nov. 25.

William Henry Fox Talbot, of Lacey Abbey, Wilts, Esq., for "improvements in cementing or covering metals with other metals."—Nov. 25.

Thomas Shawall, of Birmingham, agent, for "certain improved machinery for cutting or shaping leather, paper, linen, lattings, silks, and other fabriles."—Dec. 3.

Eheazer Tinnis, of Birmingham, manufacturer, for "improvements in apparatus for rendering the proper steam pressure"—Dec. 21.

Edward Coshold, of Medford, in the county of Suffolk, clerk, M.A., for "improvements in instruments for writing or marking, part or parts of which improvements are applicable to brushes for water-colour drawing."—Dec. 21.

John Stubbs, of Nottingham, hosiery, for "improved combinations of machinery to be employed for manufacturing certain parts of articles in stocking or lace fabriles."—Dec. 3.

Don Pedro Pouchant de Glasgow, civil engineer, for "a certain improvement or improvements in the construction of machinery for manufacturing sugar."—Dec. 3.

John Sealy, of Bridgwater, merchant, for "an improved tile."—Two months.—Dec. 3.

Charles Heard Wild, of Birmingham, engineer, for "an improved switch for steam locomotives."—Dec. 3.

Thomas Howard, of Hyde Chester, manufacturer, for "improvements in machinery for preparing and spining cotton, wool, flax, silk, and similar fibrous materials."—Dec. 3.

William Hancock, Jun., of Amwell-street, gentleman, for "improvements in bands, straps, and cards for driving machinery and other mechanical purposes."—Dec. 3.

Frederick William Etheridge, of Fraddon, gentleman, for "improvements in the manufacture of bricks, tiles, and other similar plastic substances."—Dec. 3.

William Henry Stucley, of Guildford-street, Esq., for "improvements in filtering water, and other fluids."—Dec. 3.

William Pope, of the Edgeware-road, ironmonger, for "an improved stove."—Dec. 3.

William Osley English, of Kingston-upon-Hull, distiller, for "improvements in purifying spirits of turpentine, spirits of tar, and naphthn."—(A communication.)—Dec. 8.

William George Jones, of Vauxhall-terrace, practical chemist, and George Parkinson, gentleman, for "improvements in apparatus for exercising certain organic bodies or substances, in order to obtain products or materials therefrom for the manufacture of candles and other purposes."—Dec. 8.

William Smith Harris and Septimus Hamels, both of Leicester, cotton-winders and copartners, for "improvements in the manufacture of reels for reeling cotton and linen thread."—Dec. 8.

William Kempson, of the Borough of Leicester, manufacturer, for "improvements in the manufacture of wuffles, stuffs, stuffs, tippets, muslins, pelisses, and the rendering the same, more durable, neat, glossy, bright, soft, strong, costly, durable, elastic, strong, and trimming for parts of dress."—Dec. 8.

George Port, of St. Mary-at-Hill, soda water manufacturer, and William Hall of Woolwich, engineer, for "improvements in producing aerated liquors."—Dec. 8.

Richard Barber, of Leicester,实实在在 manufacturer, for "improvements in the manufacture of boots, shoes, and clogs."—Dec. 8.

Charles Edward Newton, of Manchester, engineer, for "improvements in the manufacture of metallic hoops and tyres for wheels, and in the method of fixing the same for use, and also improvements in the machinery or apparatus to be employed therein."—Dec. 8.

Frederick Edward Newton, of Hanley-cube, civil engineer, for "improvements in the construction and arrangements of one or more of the carpets, or other vehicles used on road or other roads."—(A communication.)—Dec. 8.

William Lomas, of Manchester, worsted-spinner, and Isaac Shimwell, of the same place, worsted-spinner, for "improvements in the manufacture of fringes, cords, and other similar small wares, and also in the machinery or apparatus for producing the same."—Dec. 8.

John Grantham, of Liverpool, engineer, for "improvements in the constructions and arrangements of the engines and their appendages for propelling vessels on water."—Dec. 8.

James Brown, of Soho, Birmingham, engineer, for "improvements in steam engines and steam propelling machinery."—Dec. 8.

Benjamin Pottergill, of Manchester, machine-maker, for "improvements in machines called mules, and other machines for spinning cotton, wool, and other fibrous substances."—Dec. 8.

Perseus Moses Parsons, of Waterloo-road, Surry, civil engineer, for "improvements in steam engines and boilers, and in motive machinery connected therewith."—Dec. 8.

Charles Keene, of New Bond-street, hosier, for "improvements in the manufacture of hose, socks, drawers, gloves, mitts, caps, comforters, and cuffs."—Dec. 15.

William Paine, of Sutton-street, Clerkenwell, manufacturer, for, "improvements in the manufacture of cotton."—Dec. 15.

Thomas Cardwell, of Bombay, in the East Indies, merchant, for "improvements in the construction of precess for compressing cotton and other articles."—Dec. 15.

Moses Poole, of Lincolns-inn, gentleman, for "improvements in dressing mill stones."—(A communication.)—Dec. 15.

Charles Maurice Ellise Sautter, of Austin Friars, in the City of London, gentleman, for "improvements in the manufacture of sulphuric acid."—(A communication.)—Dec. 15.

Guillaume Simon Richaud, of the Sublaniere Hotel, Leicester-square, engineer, for "improvements in apparatus for exercising the fingers of the human hand in order to facilitate the use of all the pianos forte and other instruments."—(A communication.)—Dec. 15.

James Winchester, of Noel-street, hatter, for "improvements in steam boilers, and in the methods of applying steam or other power to locomotive purposes."—Dec. 15.

Edward Robert Rigby, and Charles John Rigby, of Gracechurch-street, brush manufacturers and copartners, for "improvements in the manufacture of certain articles in which bristles have been or are now used."—Dec. 21.

Gabriel Hippolyte Moreau, of Leicester-square, gentleman, for "improvements in propelling vessels."—Dec. 21.

Gabriel Hippolyte Moreau, of Leicester-square, gentleman, for "improvements in steam generators."—Dec. 21.

John Squire, of Tonghill, Corwall, engineer, for "improvements in steam boilers or generators."—Dec. 21.

Taverner John Miller, of Millbank-street, Westminster, oil merchant, for "improvements in apparatus for supporting a person in bed, or when reclining."—Dec. 21.

William Bridges, of Birmingham, button-tool-maker, for "improvements in button."—Dec. 21.

Henry Purser Vale, late of Fleet-street, gentleman, for "improvements in combining mechanical instruments for obtaining power."—Dec. 22.

Joseph Deamam, of Smethwick, Stafford, ironmaster, for "an improvement in the manufacture of malleable iron."—Dec. 22.

William Godfrey Mueller, of Wimbleton, chemist, for "improvements in the manufacture of soda in the evaporation of brine, and in the concentration and manufacture of sulphuric acid."—Dec. 22.

Robert Wilson, manufacturer at the works of Messrs. Nasmyths Gaskell and Co., at Patricroft, near Manchester, engineer, for "improvements in locomotive and other steam engines."—Dec. 22.

James Morris, of Cateaton-street, merchant, for "improvements in locomotive and other steam-engines."—Dec. 22.

THE VARIATION OF THE COMPASS.

Observations made at the Royal Observatory, Greenwich, by G. B. AIRY, Astronomer Royal.

Mean Magnetic Declination for the month of September. 1842—23° 14’ 11’’

The observations of the Magnetic Dip are suspended, when they are resumed the results will be recorded as usual.

NEW HYDRAULIC ENGINE.—At the Taif Vale Railway, we learn, by the Cambrian, that a very complete hydraulic engine is now at work, for the raising and tipping of coal, to be shipped from the terminus of the Taif Vale Railway, at the East docks, Cardiff. It is only just set to work, but exhibits the principle of the hydraulic balance very beautifully, and with the most perfect practical results.
BUILDINGS IN BELGIUM.

BY GEORGE GODWIN, Jun., F.R.S., &c.

"Perhaps no study reveals to us more forcibly the social condition and true feeling of passed generations than that of their monuments." — M. Guizot.

Chapter II.

Concerning the age of the Cathedral, there has been some controversy. Monsieur B. C. Dumortier, a member of the Belgic Chamber of Representatives and of the Royal Academy of Brussels, (and in company with whom the writer had the good fortune to examine the building) published first in 1837, some remarks on the Cathedral, and then in 1841, a second pamphlet, with a view to prove that the nave of the existing building belonged to the 6th century. These essays display much learning and ingenuity, but more enthusiasm, and this latter has served to blind the writer to all that militated against his desire to obtain unlimited reverence for his favourite building, and like an unruled Pegasus, has carried him far away from the goal he sought, namely the truth. Absence of direct statement by early writers that the nave was destroyed, serves to prove to M. Dumortier, (as in some similar cases it has been urged by other continental antiquaries) that it has not been rebuilt, and so far from the fact that pointed arches form an essential feature in it being deemed sufficient to weaken his opinion, it is proof strong as holy writ that the system of pointed architecture arose in Belgium, and that in the cathedral of Tournay is to be found its first out-budding. In confirmation of his opinion, M. Dumortier informed me, that a charter had been recently discovered dated 1237, proving that the architect of Cologne Cathedral was a Belgian. It sets forth that the monks of Cologne, in consideration of the services performed by Master Gerard, of St. Trond (Gerardus de Sancto Trudone), in directing the construction of their Cathedral, had assigned to him a certain estate of land.

Although apart from the present purpose, I cannot avoid repeating here a portion of the King of Prussia's speech when laying the first stone of the new works in completion of the last mentioned wonderful building. "Here where the ground stone lies," said the king, "here by these towers, will arise the noblest portal in the world. Germany builds it—may it be for her, with God's will, the portal of a new era, great and good. Far from her be all wickedness, all iniquity, and all that is genuine and therefore un-German. May disunion between the German princes and their people, between different faiths and different classes, never find this road; and never may that feeling appear here, which, in former times stopped the progress of this temple—aye, even stopped the advance of our Fatherland. Men of Cologne, the possession of this building is a high privilege for your city, enjoyed by none other, and nobly this day have you acknowledged that it is so. Shout, then, with me, and while you shout will I strike the ground-stone,—shout loudly with me your rallying cry, ten centuries old, 'Cologne for ever!'" And then, while a thousand voices re-echoed "Cologne for ever!" the ancient crane on the top of the south tower was once again put into motion, and was seen slowly raising a pinnacle of stone. The amount both of time and money required to complete the Cathedral renders the issue somewhat doubtful. Let us hope, however, that this fear may be unfounded, and that this magnificent building may gradually gain its intended proportions—an emblem of unity, a worthy offering to God, and an ornament to the world.

To return, however, to Tournay; there is sufficient evidence to induce the belief that the Cathedral was founded at the end of the 3rd century, and rebuilt about the middle of the 5th century, with the aid of Clovis, by St. Eleutherius. Chilperic in 578, endowed the Cathedral largely, and his original deed of gift "cusa sigillata," remained amongst the archives of the chapter until they were burnt in 1566. Louis le-dictataire added to the cloisters of the Cathedral in 817, and Charles the Simple further endowed it. Soon after this, however, namely in 882, the Normans ravaged Belgium with fire and sword, and inspired such universal dread, that the people, adding to their prayers "from the fury of the Northmen, Good Lord deliver us," fled in all directions. Tournay, rich and important as it then was, did not escape; the walls and the chief buildings were destroyed, and the inhabitants were forced to abandon the town, to which it seems they did not return until the beginning of the 10th century. At the time of this invasion there can be little doubt the Cathedral was pillaged, and partly if not wholly demolished; and it is probable that its re-erection was not attempted until the close of the 10th century, in which the inhabitants returned, or rather the beginning of the 11th. All analogy shows that earlier than this, the nave and transepts could hardly have been commenced, and that it was probably much later before they were completed. If analogy, however, were deemed insufficient to remove
the ground for controversy respecting the age of the cathedral, it would seem to be destroyed by the recent discovery of a M. S. entitled "Ritae Officii divini ecclesiae Tournaci," and dated 1656. This gives a list of the various fêtes formerly celebrated in the Cathedral, and points out the 9th of May (which was then annually celebrated), as the anniversary of the dedication of the church, in the following words: "Dedicatio ecclesiae, est festum dies in populo intrat munus. Triplex est cum octavi et duplo primum classis;" and then, "Fideisclerit novae, anno 1066." Monsieur T. Le Maistre d'Anstaing, who mentions this MS. in his very interesting work on the Cathedral, remarks that doubtless there were more consecrations than one, for example that of the choir, and those after partial restorations; but that this being the first, was properly regarded as the most important, and, being duly observed, had been handed down to the date of the MS. alluded to.

In a comparatively short space of time after this date, if the historian Jean Cousin is to be believed, the choir becoming too small and probably being injured by the events of troublous times, was cleared away to make room for a more magnificent structure. Cousin states, that the first stone of the new choir was laid in 1110; and that it was finished about 90 years afterwards or more. His authority for this statement, however, does not appear. According to certain old chroniclers quoted by M. d'Anstaing, it was vaulted in 1242, at the expense of Walter de Marvis; but it would seem that divine service had been performed in it previous to that date, its dedicating being ascribed to the year 1120.

At the end of the twelfth century, pointed architecture was but just developing itself, so that we must conclude either that the choir of the Cathedral of Tournai is one of the earliest monuments of that style, or that the received statements are erroneous. I am inclined to believe the former.

In concluding these remarks on the Cathedral of Tournai, it is gratifying to be able to say, that the sum of £20,000 has been voted by the nation (to be expended in ten years) for the restoration of this noble building, and that under the direction of M. Renard, the architect, there is every reason to expect it will be carried out efficiently.

When speaking of the Town Hall at Louvain, the writer intended mentioning, that what is stated to be the original drawing of the west front of the Cathedral of that town is preserved there, together with a very elaborate and beautifully executed model of the same in stone as it was executed, with a singularly lofty tower and spire in the centre, and another on either side of it; only one of the side towers, however, is shown. The drawing is on vellum, 9 ft. high and 2 feet 9 inches wide, and is oarsely but carefully executed. The model is about 24 feet high and 7 feet 6 inches wide at the base, and is now in an excellent state of repair. The centre spire, which is said to have been above 500 feet high (an extraordinary elevation, exceeding, by 100 feet, that of the spire of Salisbury Cathedral) was destroyed in 1606 by a storm, and in its fall ruined the side towers.

The interior of the Cathedral affords an excellent specimen of pointed architecture. The choir is separated from the nave by a highly decorated roof-loft of three arches with numerous sculptured figures under canopies. Above the loft is a rood of very large size, with figures of the Virgin and St. John at the foot (without which a rood was not deemed complete) profusely adorned with colours and gliding.

The font, situated at the west end of the nave, has an elaborate Gothic crane of iron attached to the wall near it, for the purpose of supporting the cover, now removed. One of the chapels in the north aisle of the nave has a balustrade or low screen of coloured marbles, exquisitely sculptured in the style of Louis XIV. And under the arch which separates the choir from its side aisle, on the north side of the grand altar, is a sculptured stone tabernacle of very elaborate richness, reaching the whole height of the arch, perhaps about 30 feet. It is a hexagon in plan, tapering upwards to a point, and is supported on six small pillars round its circumference, and one in the centre.

The pulpit in the Cathedral at Malines (a most interesting town) represents the same subject, but is differently arranged. St. Paul and his horse are on the ground at the foot of a mass of rock forming the body of the pulpit. Our Saviour on the cross, the Virgin, and other figures, enter into the composition; a stem of a fallen tree serves as a seat to the stairs; and a continuation of the rock work, from which the Holy Spirit in the shape of a dove, descends over the head of the preacher, forms the canopy.

In the church of St. Andrew, at Antwerp, the pulpit represents Andrew and Peter called from their nets by our Saviour. It is ascribed to Van Hool and Van Gheel. The pulpit in the Cathedral of the same city is a curious composition, consisting of twining shrubs and birds, said to be the work of Verbruggen. This artist also executed the pulpit in St. Gudule, at Brussels, which represents the expulsion of Adam and Eve from Paradise, and is perhaps better known than any of those I have already mentioned. The pulpit at Notre Dame, in Brussels, is a representation of Elijah fed by ravens. In some cases part of the sculpture is in wood and part in marble; as for example, in the Cathedral at Ghent, where the pulpit is of large size and elaborate design, embracing many figures.

In 1633 the writer laid before the Royal Institute of British Architects, a series of drawings illustrative of the ruins of the ancient monastery of St. Bavon in the city last mentioned, namely Ghent. These remains are situated in the old citadel on the eastern side of the town near the Antwerp Gate, a quarter not generally visited. They consist chiefly of a large rectangular building unroofed, the remains of cloisters, and a small octagonal building of two stories, (known as the chapel of St. Macaire) communicating with the cloisters and standing within the square court surrounded by them. The accompanying sketch (Fig. 2), represents the interior of the lower story of the chapel which is much more perfect than any other part of the building. It is vaulted with rubble stone with flat shallow ribs diverging from the centre, and terminating in large corbels of column form. The vault has been covered with stucco, and ornamented with colours, now for the part most destroyed. One of the eight sides of the building is wider than the others, for the purpose of admitting a double archway of the cloisters, and a second side is occupied by an

* In the church at Leau, a place little known, there is a tabernacle of somewhat similar outline in the style of the Renaissance, and of very extraordinary workmanship.*
beginning of the 16th century the whole establishment was destroyed, in order to construct a citadel on the site.\textsuperscript{10}

In the " Notice Historique de Gand" it is stated that in 1007, Baudouin, Bishop of Neoy, and Liebert, Bishop of Cambray, consecrated the church of St. Bavon, and deposited there, in a private chapel, the relics of St. Macaire, who, it was supposed, had freed the city from the plague by his prayers, some few years before. The style of the octagon building before mentioned, still called the chapel of St. Macaire, agrees with this date satisfactorily.\textsuperscript{11}

**Candidus's Note-Book.**

**Fasciculus XLV.**

"I must have liberty
Withal, as large a charter as the winds,
To blow on whom I please."

I. Although not propounded ex cathedra, the doctrine broached by the Premier Professor, has made quite an assenasion, filling all with surprise, and some with a panic feeling. It is the opinion of more than one in the profession that our architectural Professors are nearly all bewitched. As if it was not enough to have Hosking preach down Vitruvianism, we have now Cockrell preaching up rank architectural Radicalism. He goes to the extent of turning every thing topsy-turvy, without regard to those most comfortable of all things—our prejudices.

What is to become of our reverence for precedent and authority, if copyism is henceforth to be proscribed, and every one expected to give us his own ideas? It may be all very well for those who possess taste, and have ideas of their own; but then what is to become of those poor devils who have none? If they must neither borrow nor steal, their fate will be hard indeed. While Professor Pugin would merely lead us back to the "dark ages," bidding us look for light and enlightenment there, the Royal Academy Professor would fain turn us adrift, to grope about in more than Egyptian darkness. Surely it is better to be tethered to a stake with a yard or two of rope, than to have the precious liberty of rambling at will blindfold among pitfalls and precipices. So, at any rate, think some. After copyism has served them so well, they must now hear it reviled by the ugly epithets of "dull" and "unmanly," and that by a Professor, too! Why, he might as well have called it "staged" and "old-fashioned," for that was, no doubt, his meaning.

As to invention, that is, of a truth, most venturesome work, but then, be it remembered,

"Things out of hope, are compass'd oft by vent'ring."

II. It argues very great forbearance on the part of Welly Pugin that he has not had a fling at Abbotsford, for it is certainly quite as miserable and trumpery as any of the architectural "monstrosities" he has shown up in his "Contrasts," or quizzed in his "True Principles," although concocted out of the ideas of so many persons who were successively consulted by the "Great Magician," but who have shown themselves to be no conjurers. Stark, Terry, Burn, Gore, Atkinson, all prescribed in turn, and bedecked till they bedevilled it. Whichever be the best of Scott's works, Abbotsford is decidedly his worst—mere "Carpenter's Gothic," and a "Tea-Garden Castle." Fortunate would it be for the credit of his own taste, and also for the credit of those employed upon that pet fancy of his, were it to be demolished at once, instead of being piously preserved as a monu-

\textsuperscript{9} The crosses upon ancient altar stones were intended to mark the spots adorned with chrism at its dedication. A Pontifical printed at Rome in 1596, and now preserved in the British Museum, shows that a bishop when consecrating a church, was enjoined to mark with his thumb dipped in the chrism, twelve crosses on the walls of the church, and others on the door, altar, &c. See *Archaeologia*, vol. XXV, p. 243, 275.

\textsuperscript{10} The area of the cloister is about 100 feet square; the diameter of the octagonal building is about 20 feet.
ment of Scott’s "civility" in architecture. Attempts in the Gothic style by Scotch architects are almost without exception intolerably bad, many of them utterly contemptible. Taymouth Castle, about which the newspapers made so much fuss a few months ago, is in point of architecture, most unsalable. The noble owner of that big house possesses an infinitely superior specimen of architecture in a small one called the Forest Cottage, which he has lately erected in Inveroran. Homely in character, as its name denotes, yet at the same time something more than a mere cottage, itidealizes that character most happily, bringing forward some of its most picturesque traits, without any paucity affection. It is in itself eminently picturesque, which is more than can be averred of those things which pretend to "Picturesque" by title, and for the none.

III. That the lord of Abbotsford himself could be sufficiently severe upon other persons’ architectural whims, is evident from a postscript of a letter of his to Mr. Morritt, of Rokeby Park, and who was then at Brighton; saying, “Will you do me a favour? Set fire to the Chinese stables, and if it embrace the whole of the Pavilion, it will rid me of a great eyesore.”! As this was written in the February of 1826, immediately after the crash that bid low his fortunes, and reduced him to beggary—at any rate to that sort of nominal beggary which thousands would call luxurious influence—hardly is it to be supposed that his so expressed opinion of the Pavilion at Brighton was a mere sally of wantonness and gaîté de cœur. The Pavilion might have been rendered a good specimen of the style it pretends to, and so far have been satisfactory, whatever may be objected to the choice of such style for such purpose. Instead of which it is a finical and insipid, not to say paltry imitation of that style, with little character than that of toyishness and gimerack, certainly with no “heartiness of character” about it, nor any gusto. The “pimping pagoda taste” of George IV. is not yet extinct in the family, for a Chinese conservatory, or something of that sort, is now erecting in the gardens of Buckingham Palace, but whether it is of porcelain, or common crockery quality, is not said.

IV. Were the reviewers to pay Mr. Gwilt in his own coin, they would say nothing of his book, except that, being the work of a living contemporary, delicacy prevented them from expressing any opinion relative to it; besides, their silence would be far more gratifying than any remarks, however complimentary, from a class of critics whom Mr. Gwilt himself denounces as a set of meddles blunderers and blackheads. He has shown himself most dreadfully sore upon the subject of reviewers and anonymous criticism, and for no other reason, it appears, than because an article in the Foreign Quarterly spoke in commendation of Schinkel and the German school of architecture. Any other person than Mr. Gwilt would have been thankful for the information there first conveyed upon the subject, whether he agreed with all the writer’s opinions or not: whereas the meek Joseph assailed him as virulently as if that article had been a personal attack upon himself, and spluttered in a very big strain about “small fry” writers and anonymous critics—or rather those who set up for critics, though utterly ignorant of the subjects they profess to treat. Does Mr. Gwilt then suppose that professional men never write in literary journals, or subjects connected with their own pursuits? Is he not aware, poor man, that among the anonymous scribblers in the periodical he fell foul upon, there was no less a nobody than Sir Walter Scott? Can he be so ignorant as not to know that Cowper, Byron, Southey, Moore, Hallam, Brougham, Horner, the Rev. Sydney Smith, not to mention Bishops, have been anonymous reviewers? It will be well for him should he not find out at last, that that it had been better had he condescended to publish anonymously, himself. None will envy him the fame he will now get by not doing so.

V. “Nothing is so tiresome,” says Sir Walter Scott, “as walking through some beautiful scene with a minute philosopher, a botanist, or pebble-gatherer, who is eternally calling your attention from the grand features of the natural picture, to look at grasses and chuckey-stones.” Mutatis mutandis, this may be applied to those minute critics in architecture who attend chiefly to inferior matters, such as the proportions or correctness of an order as an order, without regard to any further effect, or its coherence with the rest of the building. Any thing of that kind which happens not to be in distinct conformity with standard, and therefore only general, rules,—which we are rather to be guided by than tied down to, is at once pronounced by them to be faulty and incorrect, yet at the same time they can tolerate infinitely greater faults, far more reprehensible licenses, and that which is the greatest defect of all, let the style be what it may, the utter want of all artist-like feeling. By a minute critic, however, is not to be understood one who examines merely the minutiae and details of a building—for that is more than every one of the tribe is capable of doing; but one who looks at every thing piecemeal, and who dwells exclusively upon individual particulars and detached circumstances, without taking into consideration whether there be any thing to call for, to justify, or to account for what he only perceives to be uncommon. Your minute critic is generally a stomach stickler for precedent, and not without reason, since precedent and authority are the crutches which help him along. Deprived of their aid, he comes to the ground. In any case out of the ordinary course he feels quite put out, and unable to make any thing of it, takes his revenge by pointing out what does not accord with usual practice, and therefore, as he will have it, a blunder or a solecism. How the minute philosopher chuckles when he detects some homologically small infringement of a mere pettifogging rule. Yet how obstrusely blind is he apt to show himself in regard to every thing which does not come within the compass of rules and routine.

VI. By no means would it be amiss were public spirit and architectural zeal to be displayed in completing and giving the finishing touches to some of our modern buildings, as well as in the restoration of decayed ones. Many there are which admit of being greatly improved by corrections, and by omissions in them, more or less obvious, being supplied. Such is certainly the case with the National Gallery for one, and there even seems to have been some idea at one time of doing something more to that building. Barry having actually been consulted on the subject. Greatly might the United Service Club House be improved by giving it a cornice, and throwing some spirit and richness into its other features. Nay, perhaps even the Conservative might be converted into a tolerably satisfactory design, were carte blanche for such alteration to be granted to some one who possessed both ingenuity and taste. At all events we may now expect to find that that building has served as a wholesome warning to the architects of the forthcoming new Conservative Club House in St. James’s Street, and that they will show themselves Radical Reformers in point of architectural taste.

EXPRESSION IN ARCHITECTURE.

The expression, or as it is sometimes termed, the language of architecture, is a subject which has engaged the attention and employed the talents of many writers, both amongst professors of the art and others, nor is it at all uncommon to hear it said that every building which makes any pretensions to style and taste, should express by its design and character, the purpose for which it is intended. Although it is by no means my intention to deny that buildings of almost every class are capable of great and varied expression, yet to suppose that this expression may be varied so as to indicate all the different purposes of modern buildings appears to me as absurd as to deny all power of expression to the art. The characters of sublimity, majesty, grandeur, gaiety, or gloom, may be and frequently are imparted to a structure by the skill of its designer; but this is very different from the building indicating the intended purpose of its erection. We may see this by considering that gloom and solemnity are features equally characteristic of a prison or of a tomb, that grandeur and majesty are qualities of expression as appropriate in a palace as in a senate house, whilst gaiety and elegance are generally considered as characters equally to be impressed on the decorations of the private house and of the theatre. A great number of buildings must, indeed,
always share in the same external style and expression, though erected for and adapted to very different purposes. We might as well expect the face of each individual whom we meet to express his particular pursuit and profession, and lay open to us his thoughts and intentions, as to look upon the façade of a building as the index of the purposes for which it was erected. The human face, indeed, is considered, and with unquestionable propriety considered as the index of the soul, as the outward sign by which we may read the feelings of the man, and being accustomed from the dawn of reason, perhaps intuitively, perhaps from experience acquired in infancy, to consider the features as indicative of the various passions, and our more mature years confirming this experience, we become so firmly convinced of the truth of these principles as to rely on the inferences we draw from them; and believing all men subject to the same feelings, the same joys and sorrows as ourselves, we make no distinction in our application of them; but consider, that whatever may be a man's rank, his race, his sation, or his name, without regard to climate or complexon, whether he be an inhabitant of the polar circles, or the torrid zone, we may read in his face the passions of his soul. But though he may thus plainly and universally read the feelings of the man, the cause of those feelings is yet hidden from us; and although the expression of the features we look upon may induce in us corresponding emotions, we are unable to divine its origin. We may thus see the emotions of joy or fear spread rapidly through a crowd ignorant of their cause; each individual being immediately affected by his neighbor's animadversion, and the expression, or thought himself remote from danger, becoming at once alarmed by the fear expressed in surrounding faces, which indicate that something unknown is to be dreaded, by its portentous indistinguishable manner, rendered yet more fearful. In the arts of painting and sculpture, the artist copying the human face and figure, gives to his productions the expression he may choose, and in proportion to the intensity of that expression is the emotion raised, but the cause of such expression is sought for in the accessories, or combinations of the piece; and our experience of human feelings leads us to judge whether the passion expressed is in accordance with its exciting cause. If then in these most expressive arts the feelings excited do not lead us to the reason which induced the artist to give such particular expression to his work, if we are liable to be deceived in interpreting the meaning of allegorical painting and sculpture, how shall we in architecture, where neither nature nor experience teach us to decide, how shall we say what particular character shall indicate a particular building. We have here no standard of expression; the ideas of different nations on this subject are as various as their languages; and in examining the remains of ancient edifices, we do not decide upon the purposes for which they were built, from their architectural character, but the accessories and combinations of their construction.

The Gothic style, which is by us considered as peculiarly characteristic of a church, would most assuredly not be viewed in the same light by an ancient Greek. One of our large churches, or cathedrals, would unquestionably produce emotion in the breast of any man who had a soul to feel; but this, I am persuaded, would arise from the grandeur of the structure, from the insignificance into which the spectator sinks while gazing through the long drawn aisle, or looking up to the arched and ponderous roof, and from the majestic evidence of superior constructive skill around him, and not from any feeling that such a style proclaimed, by its silent but unerring expression, that he was in the House of God. As on the human face we may read the feelings of the mind, may trace gaiety, gloom, resolution, or despair, so may we be impressed by the design of a building with the emotions corresponding to sublimity, grandeur, magnificence, or elevation; but as we cannot determine the cause of the passions expressed upon the human features, so we cannot impart to any structure, vary its character as we may, the power to express whether it be a temple, a palace, a senate-house or an exchange. And as mankind differ as to the expression proper to be given to a statue or a painting, so will they disagree as to the character proper for a building, nor can we hope that architecture shall speak in the same language to us all, until all shall only have been educated alike but shall have acquired the same prejudices, habits, tastes, and feelings.

A. D.

THE VELOCITY OF WATER IN VERTICAL PIPES.

We have received a voluminous communication from Mr. Shuttleworth, purporting to be a reply to the notice in our December number, of his system of railway propulsion. The extreme length of his letter, which occupies thirty closely written pages, would be a total bar to its insertion, even were it an argumentative treatise instead of being almost entirely discursive. We have received from another correspondent, however, a communication on the same subject, deserving much more attention, in which the writer states argumentatively his objections to two of the positions introduced incidentally in the article on Mr. Shuttleworth's hydraulic railway. The question of the velocities acquired by water flowing down vertical pipes is, indeed, important and interesting; we shall therefore, after allowing our correspondent to speak for himself, pursue the inquiry, not only for the purpose of defending our previously expressed opinions, but with the view of arriving at some satisfactory conclusions on a subject that has given rise to much discussion, and respecting which, as it appears to us, very erroneous notions continue to be entertained.

The following is the letter to which we refer.

"London, December 21st, 1842.

"Sir—Agreeing with the writer of the remarks on Mr. Shuttleworth's Hydraulic Propulsion system, which appeared in your Journal of last month, that it is a pity to see so much talent, ingenuity, labour and expense lavished upon an invention evidently impracticable, I must at the same time call into question the reasoning by which the writer has arrived at this conclusion, or at least that part of it which relates to the flowing of water through a vertical pipe; I do so more particularly, as the subject is important, and, I believe, new; also because, from the editorial character of the article, it might mislead many of your readers. I shall endeavour to show that the writer has committed two important errors in the fifth paragraph of that article; first, in explaining the uniform flow of the water in the column, by the cohesive attraction of the particles of water. Secondly, in saying that this uniform velocity is half that due to the height of the column of water flowing through a small orifice, he appears to think that, supposing the height of the water constant, the issuing velocity diminishes as the aperture increases. Now, it is evident that such is not the case, as by increasing the diameter of the orifice, the friction of the sides decreases in a greater ratio than the area of the orifice increases. This is so evident, that I believe it requires no further explanation.

"Assuming the Irishman's privilege of going backwards, I shall first endeavour to demonstrate the second error, by proving the velocity of the issuing water (and therefore, as will be proved in the second part) of the whole column, to be expressed by the formula \( \sqrt{\frac{g}{x}} \), where \( x \) expresses the height, modified by the resistance of the air and friction. The friction, however, may be omitted, as being very trifling in a vertical pipe, when compared with the retarding effect of the atmosphere.

"When the water first enters the pipe, there is a slight decrease of velocity, in consequence of the "reurs contracta," which in all works on hydraulics, is generally allowed for, by changing the \( g \) in the above formula to \( 5 \); it then assumes a vertical direction, its velocity increasing as the square root of the height, until the resistance of the air, increasing as the square of the velocity, becomes equal to the momentum of the water. At equilibrium then existing between the accelerating and retarding forces, the velocity would be uniform. As will be seen from the following equations, it would require an immense length of vertical pipe before this uniform velocity could be produced. Let \( c \) represent the velocity, \( h \) the height, \( s \) the specific
gravity of water expressed in pounds, and $k$ the number by which you must divide the square of the velocity, in order to find the resistance of the air; it is generally taken as equal to 500 lb.

* You have then three equations and three unknown quantities.

1st. $s = r$, resistance of the air at the moment of equilibrium.

2nd. $v^2 = \frac{w}{r}$

3rd. $v^2 = 64 \times \text{taking } S \text{ as the multiplier.}$

After a certain height when the water flows directly into the air, but in the case of the hydraulic railway, where the vertical pipe deflects into one horizontal, the velocity of the water issuing from the vertical pipe will be gradually diminished, in consequence of the friction of the horizontal pipe, and therefore the velocity of the whole column (as will be seen) will be reduced to that of the water issuing from the extremity of the horizontal pipe.

I shall next proceed to show that cohesion does not account for the uniform flow of the whole column so simply, and consequently not so well, as the pressure of the atmosphere on the surface of the water.

For suppose that in some part of the passage of the water through the pipe, two consecutive portions separated, a vacuum would be formed between them, consequently the atmosphere would act as an accelerating force on the upper portion, and as a retarding force on the lower portion, and evidently would cause the junction of the two parts—a vacuum then ceasing, the whole column would move together. A familiar illustration of this explanation is afforded by the well-known experiment of half-a-crown, and a piece of paper of the same form placed at the back, falling together to the ground. It is not the action of gravity alone which makes them fall together, but the pressure of the atmosphere on the half-crown. It is, I believe, clear, if these results be correctly deduced from sound principles, that cohesion does not satisfactorily explain the uniform flow of the column of water, and certainly does not reduce the velocity by one half, and consequently demonstrates the errors of the fifth paragraph, alluded to at the commencement of this letter. Some curious results, explaining the uniform flow of the column, even in the case of the atmosphere not acting on the surface of the water, might be deduced from the above equations, by differentiating them.

* You would oblige me by inserting this letter.

"I remain, Sir, your obedient servant,

"T. F——N."

Before we reply to the two points to which our correspondent particularly directs attention, we must correct a misapprehension he appears to have, respecting the statement of the diminution of velocity by increase of aperture. What we stated was, "that if the size of the aperture approximate to that of the pipe, the velocity will be diminished, and that if the aperture be of the same size as the pipe, so that the whole column must fall as rapidly as the issuing fluid, the velocity will be diminished one half, without making allowance for friction."

We never intended to assert, as our correspondent appears to imagine, that the velocity of water through a small aperture would be greater than through a large one, unless the aperture be increased so much as to bear a sensible proportion to the size of the containing vessel.

We shall reverse the order in which our correspondent has considered the subject, and direct attention in the first instance to the cause of the continuously equal flow of water down a vertical pipe, because the main question rests on the admitted uniform flow of the fluid. The initial and the final velocities being the same, there must, as we contend, be a deviation in this case from the usual law that regulates the velocities of falling bodies. With respect to the cause of this equal fall of water, the difference between us is rather a difference in form than in substance. Our correspondent admits that the flow is uniform, but he attributes it entirely to the pressure of the atmosphere; we attribute its immediate cause to the cohesion of the particles of the fluid, without which, the pressure of the atmosphere could have no effect. Were it not for the cohesion of the particles of the water, they would immediately separate in falling, and the particles would fall independently and with different degrees of velocity. Their cohesion prevents this. Each particle of water in the pipe coheres to the particle immediately above it, with sufficient force to overcome the minutely different degrees of gravitating momentum, due to the difference in their respective times of falling. The effect of this continuity of cohesion, transmitted from particle to particle, is to form a running rope of water in the pipe. This rope of water, if we may be allowed the expression, being supposed of equal size throughout, must have an equal velocity in every part of its course; for as water is practically incompressible, a motion communicated to one part of the fluid in the pipe will be communicated to all other parts as effectually as if it were a solid moveable column. It is true that the pressure of the atmosphere tends materially to prevent the separation of the water flowing down a vertical pipe, in the manner stated by our correspondent; but were it not for the cohesion of the fluid particles, the pressure of the atmosphere would have no effect. Small round shot, for example, would not fall down a vertical pipe in a continuous stream, but in separate particles, and with differing velocities. The experiment of the half-crown and piece of paper, adduced by our correspondent as an illustration of his explanation, is not, we conceive, applicable to the purpose. It is not the pressure of the atmosphere on the paper that causes it to fall in the same time as the half-crown, for it is well known, that in a vacuum, even a feather will fall to the ground as soon as a guinea. The cause of the paper falling through the air in the same time as the half-crown, must be attributed not to the pressure of the atmosphere, but to the avoidance of resistance from the air, in consequence of the paper following closely in the wake of the half-crown, which sustains all the resistance.

It will be a curious, and we believe a new point, to ascertain to what extent atmospheric pressure influences the flow of water down vertical pipes. Many of our readers may have noticed the force with which water in a reservoir is drawn into the orifice of a long vertical pipe as the fluid flows down. This force results from the weight of water in the pipe, and from the pressure of the atmosphere on the surface of the water in the reservoir; the one tending to separate the cohering column of fluid, and to produce a vacuum, the other pressing in the water to counteract this effort. If the hand be held on the orifice it is pressed against the aperture with a force corresponding, within certain limits, to the height of water in the pipe. Were the length of the pipe greater than 33 feet, so that the weight of water surpassed the pressure of the atmosphere, a Torricellian vacuum would be produced, between the surface of the water in the pipe and the hand, and the latter would be drawn, or forced, against the orifice with a pressure equal to that of the atmosphere. No additional length of pipe would then increase the pressure. The vacuous space between the hand and the water in the pipe would be increased, but the pressure would evidently remain the same. The inferences to be drawn from these premises, are—first, that the velocity of the flow increases with the length of the vertical pipe, until the column of water balances the pressure of the atmosphere; secondly, that when an equilibrium is established between the column of water and the pressure of the atmosphere, the maximum effect is produced, and no additional length of pipe will add to the velocity of the flow from the reservoir.

Having thus disposed of the first objection raised by our correspondent, we shall proceed to consider the point on which we more essentially differ. Our position is, that the velocity with which water issues from a vertical pipe is half the final velocity due to the height of
the column. Our correspondent disputes this position; but instead of adducing arguments to prove that it is an "important error," he takes for granted the very question in dispute, and thereupon founds a formula for determining another question, with which the present has no immediate connexion. We affirmed, that the velocity of water flowing through vertical pipes differs from the velocity of water issuing from an orifice, in the bottom of a large column of equal height; we stated, also, the cause of this difference, and its amount. Our correspondent, by way of refuting this opinion, assumes that there is no difference; and then proceeds, on the ordinary data for calculating the velocities of falling bodies, to estimate the height from which a body must fall, before an equilibrium is established between the accelerating force of gravitation and the resistance of the air. We shall not imitate this summary process of disposing of the subject in dispute, but shall endeavour to show that, according to the generally recognized laws of motion, the velocity of water issuing from a long vertical pipe, cannot be the velocity which is due to the height; and we shall then show the cause of this apparent deviation from the usual law.

In the first place, it must be borne in mind, that it is admitted, that a pipe having the same diameter throughout, continues full during the flow of water through it; therefore, as water is incompressible, the velocity of the water must be the same at the top of the pipe as at the bottom. Suppose the pipe to be 16 feet vertical, and to be covered with water just sufficiently to keep it constantly full. Then, as the velocity due to a height of 16 ft. is, in round numbers, 32 ft. per second, if the water issue from the pipe with that velocity, the same velocity must be communicated to the fluid in all parts of the pipe, as it forms part of the hypothesis that the velocity is uniform. We should, therefore, be obliged to assume the existence of some force, which could communicate to the water flowing into a tube from a state of rest, a velocity equal to that which it would acquire after falling freely through 16 ft. It can scarcely be asserted, that the pressure of the atmosphere would communicate this additional velocity, for the upward pressure on the fluid at the bottom of the pipe must always counterbalance the downward pressure on the top; and were the pipe a very long one, the upward pressure would be the greater, owing to the increasing density of air at lower elevations. There is, indeed, norationally conceivable force called into action but gravitation; and if the whole column of water instantly acquire a velocity, which is due only to a fall through its whole length, the force of gravitation must, in some unaccountable manner, be doubled; for the momentum of a column of water, moving with a uniform velocity of 32 feet per second, is equal to the mean momentum of the same weight, were its motion to increase progressively from a state of rest to a velocity of 64 feet. There is not, however, the slightest ground for assuming that the force of gravitation produces any such effect. The final velocity of a body falling freely through 16 feet is, within a fraction, 32 feet per second; the mean velocity of the fall will therefore be one half, or 16 feet per second; and that, we contend, is the velocity with which a continuous and equal column of water would fall through a vertical pipe 16 feet long; putting out of consideration the friction of the pipe and the resistance of the air. In the case of water issuing through an orifice, the velocity due to a height of 16 feet is 32 feet per second, when the areas of the column and of the orifice are greatly disproportional; but it appears from the preceding reasoning, that the whole column of fluid would issue with only half that velocity, which was the point to be proved.

Having, therefore, shown that the conclusion at which we have arrived may be deduced as a necessary consequence of the continuous uniform flow of water in vertical pipes, we shall next proceed to consider the conditions of water when flowing down vertical pipes, and when issuing from an orifice; and we shall endeavour to arrive at the same conclusion by a different process of reasoning.

It was demonstrated by Daniel Bernoulli, that the impulse of a

"vein" of fluid falling perpendicularly, is equal to the weight of a column whose base is the area of the vein, and whose height is twice the fall producing the velocity. For example; if r be taken as the final velocity of the efflux acquired by falling freely from a height \( h \), then it is well known that a body falling with the final velocity, during the time of the fall, will pass through a space equal to \( 2h \), or twice the height. As the water commences and continues to flow through an orifice with the final velocity due to the height, the quantity of water falling through the aperture in a given time is double the quantity that would flow through it if the flow commenced with the initial velocity of a falling body, and progressively increased to its final velocity.

Bernoulli's hypothetical vein of fluid was without any tangible boundaries, and the particles of the fluid in the vein were supposed to be pressed against, and changing places with all the other particles in the containing vessel. It is this transmission of the pressure through the fluid, that causes the difference between the imaginary vein of fluid and a real pipe passing from the orifice to the surface. When the communication between the orifice and all other parts of the vessel is free, the water near the orifice is forced out, not only by the weight of the particles immediately above it, but all the particles of fluid are pressing towards the aperture and contributing towards the effect. The space occupied by the particles of fluid forced through the aperture, is immediately filled by other particles sustaining equal pressure. The continuity and equality of the pressure are thus preserved, which consequently maintains an equal and continuous flow, the height of the fluid being supposed constant.

The velocity at the first moment of efflux is the same as would be acquired by a body falling freely from the surface, because the whole gravitating effects of the perpendicular vein of fluid instantly act on the portion of water above the orifice, and this action is continued, because the pressure remains free and constant. When a vertical pipe passes from the orifice to the surface of the water, so as to exclude the action of the surrounding fluid, the conditions are essentially changed. Suppose such a pipe to be filled with water, the base of the vein of water within, when at rest, would sustain the same pressure as another equal area on the bottom of the vessel, the heights being equal. But as the force then acting on the lowest lamina of the fluid is produced solely by the pressure of the lamina of fluid above, were the lowest one to separate from the upper by the impulse of this pressure, the force would instantly cease, for the lamina immediately above the lowest not being impelled with equal force, would not have the same velocity. The adhesion of the particles of water would, however, prevent the falling vein of fluid from being divided, because the difference of the force acting on one minute lamina, and that acting on the fluid particles immediately above, would not equal the cohesive attraction which holds them together.

The vein of fluid would, therefore, cohere and fall through the vertical length of pipe as a solid mass. Again; as the upper part of the vertical vein of fluid in the pipe would be as free to move under the influence of gravitation, when the supporting base was removed, as the lower portions of the vein, and as the force would be exerted in the same time, the velocities they would respectively acquire, would be the same; and they would fall through equal spaces in equal times. The length of pipe we have assumed to be 16 feet, therefore, it would be emptied by the fall of water in one second, the final velocity on issuing from the pipe would be 32 feet per second, and the mean of the initial and final velocities would be 16 feet per second.

If we suppose the water just to cover the top of the pipe, so as to keep it constantly full, the flow of water would then, it is admitted, be uniform instead of being accelerated, as in the preceding illustration. The water at the lower portion of the pipe would be retarded in its fall, by the continuity of cohesion between the particles of the fluid, in the falling vein; or, in other words, the velocity due to the
fall at the bottom of the pipe, would be diminished, and a greater velocity than is due to the fall, would be imparted to the fluid in the upper part of the pipe, to produce a mean velocity. The mean between the initial velocity and 32 is 16. Thus, in whatever mode the question is considered, we arrive at the same conclusion, that the velocity with which water issues from a vertical pipe, (not exceeding 33 feet in length,) is one-half the velocity due to the height of the column.

We trust we have proved, even to the satisfaction of our correspondent, that there are no errors in our reasoning on this subject; and that he was induced to think so, in one case by a misapprehension of our meaning, and in others by a hasty consideration of the main proposition: which appears, though in reality it does not, to deviate from the recognised laws of hydrodynamics. The theory of the flow of water through pipes well deserves a more full consideration than we have now time or space to bestow upon it, and to which we shall probably return.

JAMES NASMYTH'S PATENT DIRECT ACTION STEAM FORGE HAMMER.

The truly valuable qualities possessed by wrought iron as the material of all others the best adapted to withstand force, has rendered its use as a mechanical agent almost universal, so important are the purposes it serves in enabling man to combat with the elements, and as it were bend them to his will, that we may almost measure the progress of civilization in any nation by the quantity of that inestimable material they convert to their use; hence it is that Great Britain owes no small portion of her power, wealth, and mechanical supremacy to her superior knowledge of the use and capabilities of this the most serviceable of all substances.

National improvement is always indicated and accompanied by increased consumption (by reason of increased application) of wrought iron; by its use man first emerges from the savage state, and by its extended employment the most civilized nations not only maintain, but advance in their improvement. It is, perhaps, unnecessary here to remark how entirely we are indebted to wrought iron for the services of the steam engine; and its innumerable progeny of happy results, to say nothing of railways and steam vessels, in the very harshest of which, as well as in other ships, it is rapidly manifesting its superiority over wood, and so giving to the world another magnificent evidence of its all but universality of application. Hence it is that few mechanical improvements are of more real importance than those which relate to the manufacture of wrought iron, not only in respect to its production in the first instance, but also to our increased facilities, and means of working it into such forms as may be rendered desirable and necessary.

By a property almost peculiar to wrought iron, namely its all but unmeltableness, its applications would have been very limited, by reason of the difficulty we should have experienced in fashioning it into any required form, but by another peculiarity, namely its capability of being welded, we have the loss of convenience arising from its unmeltableness more than made up to us, and where we add to this its extreme malleability, by which property and by the assistance of heat, it is capable of being forged into any required form, our command over it is only limited by our means of applying the requisite force, whether by compression, as in the case of the process of rolling, or by blows, as in the case of forging by the hammer; this latter process being by far the most important, not only in respect to its affording us the means of giving to masses of wrought iron the requisite shape and form, but also, when the process of hammering is carried on with due energy, while the iron is at a welding heat, the effect of such hammering is productive of a most important improvement in the quality of the iron, as regards its tenacity and consequent capability of resisting strains without the risk of fracture, this gain of strength arising from the more intimate contact or union brought about between the particles of the iron, by reason of the more perfect expulsion of all those impurities which otherwise, by separating the particles or filames of the iron, so impair its strength. Hence we have one of the many important reasons why it is so desirable that we should have the means of hammering iron when at the proper welding heat, with all due energy, whatever be the size or form of the mass in question.

The great success which has attended the application of the steam engine in the case of steam ships, and in other instances, has produced a demand for enormous forgeries of wrought iron, such as paddle shafts, cranks, &c. that no small difficulty is now felt in the execution of large parts of them, having attained to such a magnitude as to be all but beyond the power and capability of the largest forge hammers to execute them.

The approach of this point of ultimate capability has long been felt, not only by the vast difficulty and expense by the ordinary means, such enormous forgeries being so frequently attended by the destruction of the machinery employed, but also by the frequent occurrence of unsoundness being the certain result of inadequate means, and the exceeding the limits and capabilities of the machinery hitherto employed for the purpose, arising from a defect inherent in the principle on which such machinery has been constructed, the evils of which have been rendered more and more apparent by every successive attempt to enlarge the apparatus, with a view to endeavour to enable it to cope with the increase in the magnitude of the forgeries it was required to execute.

It was with the view to remove those defects in the principle on which such forge hammers were constructed, and to produce such a hammer as should, in the most simple manner, attain all that was desirable in our means of forging the very largest class of work, and that in a manner infinitely more convenient, perfect, and economical, that led me to contrive my direct action steam hammer, which I shall now proceed to describe, and which has realized my most sanguine expectations of its advantages.

In order to give such of my readers as are not minutely acquainted with the subject, a more clear view of the advantages possessed by this direct action steam hammer over those of forge hammers of the ordinary construction, I must refer them to Fig. 1, which is intended to represent a forge hammer of the largest class, and generally arranged according to the most improved principle. According to the scale on which this sketch is made out, such a hammer would be fully what is called a seven ton hammer, and consequently adapted (so far as its principles of construction will permit) for the execution of the largest class of work.

One chief and universal feature in all such hammers, is, that the power which causes them to rise and fall, and so give out blows on the work on the anvil, consists of rotary motion, which originating in the rectilinear motion of the piston of the steam engine, is conveyed to the hammer by and through the medium of revolving shafts, wheels, &c. and finally converted into its original up and down motion by means of the cam wheel, marked D in the sketch; thus, by a very roundabout course we have brought our power back again into the form it first existed, namely, rectilinear motion, or as nearly so as the radial action of the hammer will permit. And what advantage have we obtained by causing our power to travel to its object by such a roundabout course? none that I ever could see; and as to the disadvantages, they are many and most serious. In the first place, there is great loss of power, on account of the very unfavourable manner in which the momentum of the fly-wheel on the cam shaft D communicates its motion to the helve of the hammer, by a jolting action most unfavourable to the economical communication of power; add to which the vast space of the forge shop, occupied by all the intermediate apparatus of a complete steam engine, with its requisite fly-wheels, shafts, beams, and very costly foundations, which, in order to endeavour to maintain the apparatus in due order, has to be made of more than ordinary substantialiy; so much so that, to resist the destructive effect of the vibration, given to the entire machinery by the action of the hammer, the foundations have to be made so solid...
as to cost, in some cases, nearly as much as the whole metallic part of the apparatus.

With respect to the action of such a forge hammer, as seen in Fig. 1, it will be found that one grand defect in principle exists, namely, that when engaged in hammering a large piece of work, as that seen in the sketch, by reason of the work occupying the greater part of the clear space between the anvil face and that of the hammer, we have thereby a slight blow when we are doing a large piece of work, and a heavy blow when we are hammering a small or thinner piece of work, which is just the very reverse of what we could desire. And in the execution of large work this is found to be a most serious evil, in as much as, from the nature of the case, we would wish to have the most powerful and energetic blows that it is possible to command. The result of this is, that neither is the mass rendered so sound as we would desire, nor is it brought to its required form except by repeated beatings, at the very great sacrifice of time and iron, in so far as, ere the limited blows of the hammer have produced the required change of form, the welding heat has gone off, and all blows after this tend rather to loosen than compact or solidify the mass. Again, we have another very serious evil, namely, the very confined limits of the space between the hammer face at its highest, and that of the face of the anvil, which renders it quite incapable of admitting or operating upon a mass of any great breadth or height; and besides having the machinery of the hammer quite in the way, in many cases we have also this other disadvantage, namely, that except for one thickness of work, the hammer face and anvil are not parallel, as will be evident on referring to the sketch, and considering that the face of the hammer acts radial to the centre, S, Fig. 1, in which it rocks. This evil is to a small extent obviated, by means being given to raise up the tail or centre, S, but this process is not only difficult, but can only be done between the heats.

With a view to relieve all these defects, I have contrived my direct action steam hammer, which is represented in one of its many forms and applications in Fig. 2.

It consists simply of a cylinder C turned as it were upside down, that is, its piston rod comes out at the bottom of the cylinder instead of (as in most cases) out of the top; this cylinder is supported over the anvil K by two upright standards, O O, the end of the piston rod being attached to a block or mass of cast iron, B, guided in its descent by planed guides or ribs cast on the edge of each standard. This block of cast iron is the hammer or blow-giving part of the apparatus, while the cylinder, with its piston and piston rod, supplies in the most

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Fig. 1.—View of the Old Tilting Hammer.

Fig. 2.—Nasmyth's Direct Action Steam Hammer.

Fig. 3.—Self-acting.
simple, straightforward, and direct manner, the power by which the striking block B is lifted, or raised up. Gravity performs the downward action for us in a most direct manner. In order to set this steam hammer in action, steam of such a pressure as operating upon the underside of the piston, will a little more than balance the weight of the block B, is conveyed from a suitable boiler, (situated in any convenient part of the premises,) through the pipe P into the valve box, in which a slide valve of the most simple form works. The valve being up, permits the steam to press upon the underside of the piston, and up goes the block B to any height (within the limits of the length of the cylinder) which the forge man may require. The handle E is now moved in the contrary direction, which not only prevents any further admission of steam, but also permits that which had entered, to escape by the pipe L; the instant this is done, the block B descends with all the energy and force due to its weight and the height through which it falls, and discharges its full and entire momentum upon the work then on the anvil, with such tremendous effect, as to set the blows of all previous hammers at utter defiance! In fact, the power of such a hammer is only limited by the size we please to make it, as the principle is capable of being carried out to any extent; whereas, in the case of such hammers as in Fig. 1, they have their limits, by reason of the very mass of material causing them to be weak per se, by the intestinal contraction of the iron which composes their mass, and which in their action is so destructive and trying to such a form; the consequence is they generally break over just behind the neck.

I have only alluded to the means which this steam hammer gives of obtaining tremendous blows. But energetic and powerful as it is, it is at the same time one of the most striking examples of the manageability of the power of steam; inasmuch as, when we desire to have any variety in the intensity of the blow, varying from the most gentle sub-cracking tap, to the most awful smash, we have simply to work the valve handle in proportion, and by so regulating the exit of the steam we can let down the block, like closing a well hung window, or arrest its downward progress in an instant at any part of its stroke, and retain it there at any required height at any required time; on the other hand, by duly regulating the entrance of the steam, we can lift the block to any required height, from the face of the anvil or surface of the work, and so regulate the amount or rapidity of the blows accordingly.

The form and arrangement of the steam hammer, as given in Fig. 2, is such as present experience shows to be most convenient, according to the scale on which the sketch is made out, the distance between the standards O O gives a clear space of 12 feet, namely, six feet on each side of the centre of the anvil, and six feet height clear over head, as figured in the sketch. But these proportions may of course be varied at will, as the principle of this steam hammer affords every facility to extention or otherwise. The space on each side of the anvil, in front and behind, being quite clear of all machinery, gives every facility to the introduction and management of the work, when we progress, as will be evident and fully appreciated by practical men.

The comparatively small space which the entire apparatus of the steam hammer occupies, may be judged of by a glance at the sketch, Fig. 2, as compared with that of the ordinary construction in Fig. 1. Had I turned the standards in the sketch, Fig. 2, so as to give a side or edge view, the contrast in respect to space occupied would have been much more striking. As regards the comparative original cost, any one the least accustomed to such matters will at once see the vast advantage in that respect in favour of the steam hammer, to say nothing of its vast superiority as to efficiency and little liability to derangement; in fact, so simple is it, that there is scarcely anything to go wrong. One great source of its durability in this respect is the manner in which the mass of the block is raised, namely, through the medium of the most elastic of all bodies—steam; which, in place of any destructive jerk, as in the case of motion conveyed by impulse through solid media, so apparent and destructive in its effect in the case of the apparatus of the ordinary forge hammer, with the steam hammer the lifting motion is performed so smoothly as to be absolutely silent in its action, as if the great block had forgotten, for the while, that it had any weight at all. I do not intend here to rival the celebrated Catterfello by wondering at my own wonders! but truly the action of this simple but most powerful machine, is not a little striking, both in its action as well as effect. I think experience will prove that I am not too far yielding to sanguine expectations when I state, that the vast facilities which this invention gives to the treatment of large masses of wrought iron, will introduce quite a new era in the manufacture and working of wrought iron. We have now, by means of this steam hammer, a power and capability of producing forgings of wrought iron of any dimensions, whose soundness will give the best evidence of the value of the invention in that respect, and from the vast facilities of executing the most ponderous and acquired forms the saving of time and finish which can be attained under such a hammer will also prove that a great step has been made in the mechanical arts. In conclusion, it may perhaps be as well to remark on the valuable and important influence which such
a hammer will have upon the quality of iron, as in the case of boiler plates and such like, the quality of which, as regards soundness, entirely depends on the efficient manner in which they have been hammered and consolidated in the primary process of faggoting or shingling, namely, the forming into one perfectly solid mass, the block of iron from which such boiler plates, &c. are rolled. Nine tenths of the defects which are met with in boiler plates, and which have caused such disastrous results, namely, defects from blisters, have arisen or may be traced to imperfect consolidation resulting from inadequate means of hammering the original mass into a truly solid block, by our having the power to force out all the scoria, which, otherwise lodging between the piece of pieces of which the faggot is composed, gives rise to the most serious defects, which every practical man has had to deplore. It will, in like manner, be scarcely requisite that I state any of the advantages that will arise in our having, by means of the energetic action of the steam hammer, a perfect security against unsound anchors, the importance of which requires no words to set forth. In short, we have now at command an almost new power, inasmuch as, by means of this steam hammer, we have an accession to our means of dealing with power in the form and state of percussion, such as has never been attained before, and that in the most simple, straightforward, and effectual manner.

Fig. 3 shows the application of the hammer A for forging an iron shaft laid over the anvil or block B, and is made self-acting, as will be seen by a reference to the cut, that when the tappets D come in contact with the pin or spring on the block E, the steam valve C is opened or closed.

Fig. 4 shows the application of the steam hammer for coppers, passes, &c. The hammer M works in the guides P and S, suspended by the rods R to the beam above, like an inverted truss: the action of the man pulling down the lever N opens the valve, so as to admit the steam for raising the piston and with it the hammer.

I may remark, that one boiler can be made to work any number of steam hammers, as the steam has only to be conducted to each by pipes, and the power let on and shut off in the same manner as gas; and in most iron forges, the waste heat of the furnace will more than furnish the requisite steam. There are many other applications and details connected with this important invention, but reluctance to further trespass on your readers' attention, and the space of your columns, causes me to defer to a future opportunity.

But I trust the high importance of the subject will plead my excuse for the length I have allowed my remarks to extend to.

With most sincere respect,

Bridgewater Foundry, 

JAMES NASMYTH.

OBSTRUCTION TO WINDOWS.

Sir,—Your Old Subscriber at West Derby does not, I think, quite understand the nature of a right gained by prescription to a window overlooking a neighbours' land. In the case put by him, the right is not, as I conceive, so much to the window as to an easement of light and air through the window, and consequently "much (query, all) must depend upon the hard earning of witnesses on both sides, as to whether a building erected near a window does or does not obstruct the light and free circulation of air." Indeed I doubt very much whether proof that a building had been erected within two feet of the window would be proper evidence to rely upon, unless it were also proved that the said building had prevented a certain quantity of light and air from finding its way to the window. With regard to question 3, it is obvious that the right being to light and air, and not to space, a building may be erected as high as the upper side (beyond the limits of the building act) of the window sill, it being impossible that such an erection should obstruct the free passage of either to the window.

6th January, 1843.

I am, Sir,

Yours very obediently,

R. R. A.
lands of the county could not be made without first, the Westminster Commissioners constructing a new sewer, or lowering an old one, then the Holborn and Finsbury doing the same. So, also, if either commissions wished to divert the upland waters, by constructing catch water drains, so as to prevent too great a flow down any particular district, and prevent the lower parts of the metropolis from being inundated, it cannot be done, and the consequence is, that each commission is obliged to cut about and alter the old sewers, to get rid of the evil in the best way they can.

Mr. Donaldson tells us that

"During the present century, and particularly since the removal of old London Bridge, every opportunity has been taken to lower the outlets. For instance, the Essex Street sewer, between 1816 and 1836, has been lowered from its outfall at the Thames to near Great Russell Street. Bloomsbury, in length 5,800 feet. The eastern branch of the Harthorn Lane sewer, between 1831 and 1839, from Long Acre to the New Road, by the line of Tottenham Court Road, &c., in length 4,500 feet. Another branch of the Harthorn Lane sewer, between 1820 and 1837, from the south end of the Haymarket to Oxford Street, by the line of Princes Street, Wardour Street, &c., in length 3,000 feet. The whole of the King Street sewer, between 1820 and 1832, from the Westminster Bridge to St. James's Park, 1,200 feet. The Wood Street sewer, between 1824 and 1827, the College Street sewer, between 1824 and 1832, and the Romney Row or Horseferry Road sewers, in 1840, have been lowered and rebuilt of enlarged dimensions from their outlets for their whole extent, being a length of 8,500 feet, presenting in these lines alone a total of only 21,450 feet."

Here, then, we have a fearful summary of expenses incurred in lowering the old sewage only, and we think an inquiry might be usefully directed to see if all the commissions had been united, whether it would not have been far cheaper and more effective to run new lines of sewer from the river Thames through districts which had no sewers and to have joined the old sewage at some distant point, and thereby have relieved the old sewers in the lower levels.

By this arrangement, we should have had the old sewers still remaining, which might have answered the purposes of draining either high or low lands, and have obtained an immense additional length of new sewerage at the same expense. We do not mean to say that in all cases under the present system of separate commissions, this could have been effected; but it is a fair subject for enquiry, and can only be got at, by having a thorough examination of all the plans and levels of the present sewerage, in every district, connected with the metropolis.

Mr. Donaldson subsequently calls our attention to the vast works that have been executed for the improvement of the King's Scholar's Pond Sewer; let us give his own words.

"But the greatest work ever executed by this or any other commission has been that effected on the King's Scholar's Pond Sewer, which has been wholly rebuilt for an extent of upwards of three miles, from the River Side to the Regent's Park within the last 24 years. It has been so vastly deepened and enlarged since the year 1816, that property of the most valuable description, in the neighbourhood of the sewer, at Pinlucico, including Buckingham Palace, the lower floors of which are below the highest tide level, and most of the streets adjacent to the sewer between Piccadilly and the Regent's Park, have been benefited to an incalculable extent. In the whole, the whole neighbourhood was inundated by over the sudden fall of rain, so that many of the houses in Berkeley Square, Bruton Street, Aver Row, South Molton Street, Wigmore Street, South Street, Baker Street, and Spring Street, were greatly depreciated in value; and some houses in Berkeley Street and Bruton Street remained unoccupied for many months together, in consequence of the water running over the summer months those premises were subject to have their lower floors burst up during thunder storms, and the water to rise so as to extinguish the kitchen fires, &c.

"One of the great means for remedying these evils was designed and carried into effect by Mr. Dowley. I especially allude to the entire removal of two immense stone piers, which had at some former time been built in the water way of the sewer, and which piers supported certain parts of the heavy and lofty walls of the houses in Grafton Street, St. George's. These piers, one measuring 53 feet in length, the other a more square form, whereby the water way was divided into two channels, were formerly considered advantageous to the property lower down the line of sewer, by penning back the torrent of water in times of storms. The work of taking out these obstructions as also removing two great projections, and putting in an inverted arch throughout the whole length of sewer between Hay Hill and Bruton Street, in length 550 feet, at a greatly increased depth, was performed from within side the sewer, which had its course under buildings. These works proved of such vast importance to the sewage of the district, that what was formerly reported to be impracticable by several eminent engineers, amongst whom were the late Mr. John Rennie, Mr. Jessop, Mr. Chapman, Mr. Devan of Lendal, and others, was actually and speedily performed, and was afterwards inspected by some of these gentlemen, as also by a numerous committee of the commissioners, who not only approved of the work that had been so done, unseen by any one other than by the workmen employed, but were somewhat surprised that so bold an attempt had been successfully accomplished.

"In the prosecution of the operations necessary for reconstructing this one line of sewer, various instances may be cited to show that, at all events, the management and execution were entrusted to an officer of this court who knew something of his profession, and to any one, who is acquainted with that part of the district lying between Piccadilly and Oxford Street, it must be manifest, that cases requiring ability, for Oxford Street, and St. Martin's Lane of course, is frequent. I mean such difficult cases as passing a sewer seven feet six inches wide in the clear with side walls two bricks thick, at a depth of 22 feet and upwards, along White Horse Street, Piccadilly, a street only 20 feet wide. Again, carrying the same sewer through Sun Court, Curzon Street, which is less in width than that of the external distances of the sewer itself, and informing us of its course under and close to buildings of great magnitude, nearly the whole way from the lower end of Berkeley Square to Oxford Street and in most instances at a depth of from 10 to 12 feet below the foundations of the contiguous buildings. Surely, these were works, which, by their nature and extent might be considered of a scientific and high order of civil engineering, and such as have only been approached by some recent works, perhaps, of the city commission of sewers."

With all due deference to the talents of Mr. Donaldson, we are inclined to doubt the latter part of his statement, that these works "might be considered of a scientific and high order of civil engineering." Instead of enlarging this sewer, and rebuilding it, with all its original sinineness, the course we should have preferred, would have been to have run a new sewer from where the Scholar's Pond sewer enters Oxford Street, and run parallel to Oxford Street, and united it with the Regent Street sewer belonging to the crown. No doubt we shall be told, this could not be done, as the Westminster Commissioners have no power to enter the Regent Street sewer, this then would at once have proved the great necessity of uniting the several commissions; now, if this plan could have been adopted, it would have relieved the large pressure of water flowing down the sewer, and inundating the houses as represented in Mr. Donaldson's report, and would have saved the great expense incurred in removing the large piers under the houses in Grafton Street, and rebuilding the tortuous part of the sewer in the vicinity of Curzon Street; and another advantage gained, would have been in giving Oxford Street a sewer, which had none. Similar relief might have been given to other portions of the large sewers which were overpowered with the upland water, and new sewers given to such portions as had none before; for instance, another sewer might have been constructed, to have commenced about Berkeley Street, and run along Piccadilly, and discharged itself into the Regent Street sewer, near the Quadrant, connecting with it the sewers of the side streets, which would have relieved the Scholar's Pond Sewer and have given Piccadilly a sewer which it was deficient of until lately. And again, the sewer of Pall Mall might have been diverted into the Regent Street sewer, although it comes to within a few yards of it the sewage is carried into the Scholar's Pond Sewer, and has to travel a distance of a mile and a half before it discharges itself into the Thames, whereas, if the former plan had been adopted, the discharge into the Thames would have been within half a mile. If these collateral sewers had been built, the vast sums of money in reconstituting a considerable portion of the Scholar's Pond Sewer, and building the large approaches described in Mr. Donaldson's address, might have been saved
and part of the cost devoted to the new sewers we have described. We think that we could point out several other improvements that might have been adopted, if the commissions had been united; but we have already trespassed beyond our original intention upon this portion of the subject, and must now turn our attention to the more important part respecting the form, construction, and expense of the present sewers of the Westminster, Holborn, and Finsbury, and Regent Street commissions.

We will first proceed to inquire into the present cost of constructing sewers, and see how far they might be modified, so as to induce builders of small tenements to construct sewers, in preference to cesspools; in order to do this, we are at once brought to another bone of contention between the present combatants; one commission contends that the oval sewer is the best form, whilst another flatly contradicts it, and says that sewers with upright sides are the best; we must therefore first hear what Mr. Donaldson says upon the subject.

"With respect to the form of section of sewers, our commissioners have very wisely adhered to that, which experience has proved to be substantial and best calculated for the purpose. We are to recollect that underground constructions must be built so as to last for ages; otherwise a continued re-building of sewers causes a constant breaking up of the streets, and obstruction to thoroughfares, and a suspension to a certain degree of the commerce of the trade people on the line. The sewers must be large enough not merely for the ordinary service of relieving soil drainage, but also for carrying off the torrents of water, which fall during violent storms. Hence a large capacity must be given them. Again, this large dimension is not without a further use in enabling the officers and workman to inspect and repair them with sufficient facility, the width even of our second sized sewers enabling two workmen to pass each other. As regards the upward sides of the sewer, it must be borne in mind that all circular work constructed of brick can only be formed by making the joints more open at the extrados than at the intrados, for the square shape of the brick does not lend itself to other than rectangular construction. Now these open joints are filled with mortar when the sewer is in a moist state, and before it is set, the earth to the depth of several feet is filled in, the centres are struck, and the consequent is an irregular settlement of the whole work; whereas with spreading footings, an invert at bottom, a circular arch at top, and upright side walls, most of these inconveniences are avoided, and the sewer, even if the earth be washed away at the top or sides, as sometimes happens from the bursting of one of the large main pipes of the water companies, stands upright and alone on its board base, whereas the oval sewer must have inevitably fallen over. I may also add two other important reasons for giving as much square construction as possible to the body of the sewer, and these are, greater security against imperfect workmanship, and detection of false thicknesses of work at sides. Besides, in the event of its being judged expedient to increase the depth of a sewer by putting in a new bottom by underpinning, this operation becomes comparatively easy with upright side walls—almost impracticable when they are curved. Much stress is laid in the report upon the curved side walls as materially aiding the rapidity of the current. But, in fact, the ordinary sewage rarely rises above the invert, and when it does, there is such a force in the volume of water, that no perceptible obstruction is offered by the absence of the complete circular form."

If, on comparing the sewers of the Westminster Commissioners, Fig. 1 and 2, with those of the Holborn and Finsbury Commissioners, Fig. 2 and 3, it must be seen that Mr. Donaldson's remarks about circular work are completely futile, for his objections apply equally to the arch and invert of the Westminster as they do to the Holborn and Finsbury; and as to the sides, the radiating of the courses in the oval form is so trifling, that it is not worth naming. And again, all the commissioners tell us that such an accident ever occurred, as the bursting of a main pipe, and of washing away the earth to the extent of endangering an oval sewer. We have frequently heard, that during the construction of the upright sewers, of their falling in, but 

never heard of such a case with the oval sewer. 20 years ago, we happen to have been engaged in the construction of about 1000 feet of sewage of the oval form, as shown in Fig. 5, built upon the crown lands in the vicinity of Regent's Park, and up to the present time we have never heard of a single failure, either during the construction or since; we think this fully justifies us in pronouncing that the oval form is most effective, and in point of expense infinitely to be preferred. Now let us compare the expense of both forms, we will take the cost of the materials and labour the same in both cases, 1s. per foot reduced, or 13½ 12s. per rod of brickwork, and 1s. per cubic yard for digging, strutting and filling in or removing the surplus ground, the top of the sewer being taken as 6 feet below the surface of the ground.

![Fig. 1, first class.](image1)

![Fig. 2, second class.](image2)

![Fig. 3, first class.](image3)

![Fig. 4, second class.](image4)

![Fig. 5.](image5)

Westminster Sewers.

<table>
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<th>Digging</th>
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<td>17 ft</td>
<td>31½ yds</td>
</tr>
<tr>
<td>2nd</td>
<td>15 ft</td>
<td>3 yds</td>
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Holborn and Finsbury Sewers.

<table>
<thead>
<tr>
<th>Class</th>
<th>Seawork</th>
<th>Digging</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>12 ft</td>
<td>3 yds</td>
</tr>
<tr>
<td>2nd</td>
<td>9 ft</td>
<td>2½ yds</td>
</tr>
</tbody>
</table>

Note: 1. We could find several cases of the Westminster sewers falling in during the recent season, and the upright sides failing in, as at Notting Hill, and also in the vicinity of the King's Road, Cheaps. But we are told by the worthy chairman, that they were built by private individuals, and not by the commission. Let us ask Mr. Donaldson under whose direction and super. attendance are they built? Dare a builder alter the form, or lay a brick con. 

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[2] We give the preference to the oval sewer, Fig. 5, over that of Fig. 4, as the larger part of the oval is downward, which allows a greater flow of water to pass off quicker; we also consider that the extra half-brick thickness of the sides of Fig. 5, oval sewer, perfectly useless, and might with safety be omitted, which would reduce the cost of the sewer, 1s. 6d. per foot.
CONCRETE, ITS INTRODUCTION, COMPOSITION, USES, AND COMPARATIVE EXPENSE.

Concrete was first used in this country by Sir Robert Smirke, at the erection of the Penitentiary at Millbank, afterwards at the under-setting of the walls of the New Custom House; and has been generally used by the above named architect in the public buildings since erected under his care, especially at the club house of the Oxford and Cambridge University in Pall Mall, where the whole area of the building, and to the extent of two feet beyond the line of the lowest footing, was covered to a depth of 21 feet, the depth being increased to 4 feet under all the walls that rise to the roof; in the specification of the last named building it is thus described. "For the grouted stratum clean river gravel is to be provided, and mixed with lime ground or pounded to a fine powder; it is to be well mixed with the gravel, twice turned over before it is wheeled to the excavation, and it is to be thrown from a height of not less than 6 feet in every part. A man to be kept treading down and puddling the mass as it is thrown down; the proportion of materials to be 6 parts of gravel to one of Dorking, Merstham, or Haling stone lime." It has now become, in the present day, the most favourable expedient resorted to for artificial foundations. Mr. Ranger, of Brighton, improved the above hint by using hot water to facilitate the setting, for which he took out a patent for making artificial stone. A detailed account of the application of Mr. Ranger's artificial stone to the building of docks and river walls at Chatham and Woolwich, is given in the Ist vol. of the Journal, being a paper by Lieut. Denison, from the Papers of the Corps of Royal Engineers. Analogous to concrete is beton, from which it differs, in broken stone being used instead of gravel, in the proportion of two of stone to one of lime or pozzolana of Italy, a description of which, taken from the Franklin Journal, appeared in Vol. 3, page 265, of your valuable periodical. Since the introduction of concrete, some little difference of opinion as to the proportions of materials and manner of mixing them has arisen among engineers. I therefore give the composition from several specifications:—No. 1. The concrete to consist of 5 parts of clean gravel, perfectly freed from loam or clay, with a proper proportion of small gravel and sand, as well as large, and one part of lime measured dry, the lime to be mixed into a perfectly smooth uniform paste, as for the mortar, but with more water, and then thoroughly mixed with the gravel. —No. 2. The concrete to be composed of sandy gravel and well burnt lime, in the proportion of 3 of the former to 1 of the latter. The gravel to be free from all earthy matter, and the pebbles not to exceed one inch in diameter.
The lime is to be used in a hot state when slacked, and to be immediately mixed, using no more water than is sufficient to incorporate them. After being twice turned, it is to be wheeled on to a stage 10 feet high, and let fall into the trench; it is not to be puddled or disturbed in any way until perfectly set.—No. 3. All concrete must be composed of gravel perfectly clean, and mixed with fresh well-burnt lime in the proportion of 6 of gravel to 1 of lime. The lime and gravel to be mixed in a dry state, and a sufficient quantity of water afterwards added.—No. 4. Concrete to be composed of good lime, gravel, and sand, in the proportion of 1 to 3 of lime, and it should be laid in about 12 inch layers or courses, and pitched from a height of 10 to 12 feet, neither should it be disturbed until properly concreted and set.

In the above five opinions, including that of Sir Robert Smirke, we have the relative proportions of gravel and lime, varying from 3 to 9; and No. 1 states the lime and water to be first mixed, in which No. 2 nearly coincides, whilst No. 3 insists on the gravel and lime being first mixed, and then the water added; Nos. 4 and 2 coincide that the concrete is not to be disturbed after it is thrown into the trench, whilst Sir Robert Smirke expressly states that parties are to be employed puddling the mass. The whole are agreed in specifying that the material is to be thrown from a height. From considerable practice and experience in the mixing of concrete, I think that the lime need not be ground, but simply mixed with the gravel, and then, by the addition of water, it will fall into an impalpable powder, also that it is unnecessary to be at the expense of puddling the mass after being deposited in the trenches, neither is there any advantage to be derived from discharging the mixture from a height, both of which operations increase the expense of the concrete, and as the concrete in the act of setting expands in bulk, I think that alone a sufficient proof of the unutility of both of the above mentioned operations, their tendency being to condense the mass, whilst its own natural tendency is to expand. With respect to the proportion of lime and gravel, I think the less lime the better will be the concrete, and that the proportion of 8 to 1 of lime is decidedly better than 3 of gravel to 1 of lime. As to the quality of materials employed, the lime must be stone lime, fresh from the kiln; that from chalk will not do, and hydraulic or flux lime is to be preferred to stone limes. With respect to gravel, if obtained from a pit, the ochreous or serpens is to be preferred, and if loam is present, so as to soil the sand, the gravel must be washed, if the gravel be obtained from rivers by dredging, alluvial and vegetable deposits are to be avoided; and if the gravel contain vegetable refuse, it must be screened or washed. Shelly sharp gravel is the best, the proportion of small or large pebbles, and the due quantity of sand, is soon learned with a little practice.

As to the uses of concrete, it is principally adopted as an artificial foundation, and from four to six feet is a sufficient depth, and extending two feet beyond the space to be occupied with the building. The following testimony of the utility of concrete, is from Weale’s Bridges, page 31. “Piling will probably never be found more safe than a body of concrete; the latter cannot be too much esteemed, for its durable and almost imperishable nature, besides being quite as safe and, perhaps, more durable than piling,” and from the paper of Lieutenant Denison, before alluded to, we have the following ratification of its uses. “Concrete cannot be advantageously employed as a building material.” “It may be employed with advantage in backing retaining walls.” L. K. Brunel, Esq. C. E., has used concrete as a foundation, nearly exclusively and universally in the bridges on the Great Western Railway; and in the celebrated bridge of Maidenhead, the land arches are backed with concrete, to the depth of 10 feet, and the abutments of the large arches are also backed with concrete. In culverts under-meadow embankments, the same able engineer has extensively used concrete as a backing material, the brickwork being kept thin, and then enveloped in a mass of concrete, in the form of a polygon, of six sides, or, of the form of two truncated cones, with their bases joined.

Concrete was used on the Great Western Railway, wherever it could be employed, as a backing material; its use is now rapidly extending to the provinces, and bids fair to supersede all other means now employed for making a foundation; it is much improved by being mixed with oxide of iron, smith’s scales, and roasted iron stone, or any material containing iron. As regards the comparative expense, brickwork being the most common building material, has been taken as the standard of comparison with concrete for price, and its cost in most districts will be found from one-third to one-sixth the price of brickwork, taking a cubic yard as the quantity of each material, the latter will cost 5s. and the former 21s, both, to a great extent, being regulated by the vicinity of brickyards, and the facility of obtaining gravel. I have known concrete executed at 3s. 3d., 3s. 6d., 4s. 1d., 5s., 7s. 6d., 8s. 6d., and 11s. 6d. per cubic yard, although the most common price is 7s. 6d.; as to brickwork, the general price is 21s., and the range is from 14s. to 27s. 6d. per cubic yard. The London price being 25s. per cent. dearer than the country. The facility of obtaining lime regulates the cost of concrete; the price of lime per cubic yard, measured dry in clots, at Dorking in Surrey, is 11s.; Barrow in Leicestershire 21s.; Bulwell in Nottinghamshire 9s. 6d.; Breendon in Derbyshire 15s. 6d.; Harefield in Buckinghamshire 16s. 6d.; Fulwell, Durham County 9s. The measures of lime, also, vary much; in some places it is sold by the cubic yard, measured dry, which is decidedly the best method adopted; it would be desirable if it was universal. It used to be sold in London by the hundred, as it was called, not of weight, but a measure, a yard square, and a yard and one inch deep, which will be equal to 10 or 13 bushels, but it is now sold by the cubic yard. The Fulwell and Barrow lime is sold by the quarter, eight of which make a ton and a half. Lime is also sold by the boll and chaldron; a chaldron will be about 31 tons, a single horse cart about six bolls. In agricultural districts, the bushel, boll and quarter are used; in colliery districts, the chaldron and ton are the standard of measure. With respect to the cost of gravel, provided it can be obtained on ground belonging to the company, the getting, screening, and cartage will cost 1s. 6d. to 2s. per cubic yard; if it be obtained from the gravel pits of the country, the charge will be per ton, from 2s. 6d. to 2s. 11d., if screened 3s. 3d. to 3s. 10d., if broken 6s. 10d. A cubic yard will weigh from 24 to 27 cwt. If the gravel is dredged or brought from the shores of a river, the cost will be 2s. 6d. per yard, or nearly the same as from the pit. The prices of the various operations of getting, screening, and washing gravel are respectively 10d. and 12d. per cubic yard. The price of excavation is also included in the price of concrete in all railway specifications, which will be about 4d. per cubic yard, generally the excavation is of limited extent, and consequently more expensive than an extensive excavation, and when the gravel is obtained on the ground of the Company or proprietor, the excavation is a double operation, the hole having to be refilled with other materials in lieu of the gravel obtained. From the experience of several thousands of yards and variety of situations, I find the cost of mixing the materials, or as it is termed concreting, to be 1s. per cubic yard, and taking the proportion of material at 5 to 1, the following will be a fair estimate of the cost of concrete:

<table>
<thead>
<tr>
<th>Material</th>
<th>Cost per Cubic Yard</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 cubic yard of lime</td>
<td>1s. 5d.</td>
</tr>
<tr>
<td>5 do of Gravel at 2s. 6d.</td>
<td>12s. 6d.</td>
</tr>
<tr>
<td>Labour mixing at 1s. per yard</td>
<td>6s. 0d.</td>
</tr>
<tr>
<td>6 yards of excavation at 4s.</td>
<td>2s. 0d.</td>
</tr>
<tr>
<td>Waste, contingencies and profit, at 1s.</td>
<td>6s. 0d.</td>
</tr>
</tbody>
</table>

Concrete will set in 24 hours; the specific gravity is 125, or about the same as brickwork, although brickwork is sometimes 165 lb. per cubic foot. Lieutenant Denison gives the strength of concrete S = \( \frac{1}{10^2} \) The constant S being 9.5, and comparing concrete to York stone, the proportion is as 1 to 13.

The following works may be consulted; Colonel Pasley, on Calcareous Cement: Weale, 1839.—Akin on ditto, In Transactions of So-
WIRE ROPE LIGHTNING CONDUCTORS.

Sir—Having seen, in some of the recent numbers of the Mechanics' Magazine, a long discussion as to the priority of claim, respecting the wire rope as a substitute for metal rods, in conductors, I beg to call your attention to a paragraph, which appeared in a work, published by Sir John Herschel, more than 10 years ago. He says thus; that wire rope has long been used at Munich in preference to metallic rods, for lightning conductors. I think this proves that the subject has been long tried and practised, before Mr. M. J. Roberts brought forward the subject.

Your insertion of this will oblige

A Subscriber.

WROUGHT IRON AXLES.

Sir—It is worthy of remark how slowly well proved facts, individually acknowledged and acted upon, become generally admitted; it is to be regretted that we are not more communicative of those events which strike us in our daily practice, and which, if announced as soon as discovered, would so materially and rapidly tend to general improvement. There is, perhaps, no instance in which this can be more clearly exemplified than in the use of wrought iron; it is scarcely possible to refer to the subject without an example being readily laid before you. Every manufacturer has had more or less his attention drawn to the fact, that in its various applications wrought iron is subject to become brittle. Iron spindles, piston rods, fire bars, crow bars, chisels, and many other things, are known to lose their fibrous quality after being in use for a length of time, varying according to the nature of the service they have had to perform. By some it has been considered that the iron originally employed was of bad quality, and the circumstances when discovered has not been otherwise attended to than by replacing the broken piece; but in many instances the phenomena has been clearly established, closely examined, and well attended to, and that for years together, without, however, having become a generally acknowledged fact, sufficiently positive to justify the opinion that wrought iron, applied for certain purposes ought only to be allowed to perform a previously determined quantity of work, after which it becomes requisite to re-forge the piece.

In most cases the fracture may be unattended with danger to human life, but in others, as in connexion with railways, where hundreds of lives may depend on the strength of an axle, it daily becomes more evident that extraordinary precautions must be resorted to for the purpose of avoiding accidents, and I would, with regard to railway axles, suggest (as a precautionary measure) the propriety of limiting the distance they should be allowed to run previous to their being thrown out as unfit for service, and that whether apparently in good condition or not. Such is the perfection with which these axles can now be manufactured, that when a suitable quality of iron is used, it may be confidently asserted that every axle turned out of the shop after due examination may be considered to be sound, and that by limiting the work it is allowed to perform, the fracture of an axle would become a very improbable event.

Having been lately in Paris, I mentioned the circumstance to M. Arnaux, the directing manager of the extensive works belonging to the Messageries Lafite & Caillard, persuaded that from a person whose attention has been for so many years engaged on this subject, I should obtain some positive information; he showed me a number of axles which he had caused to be broken, after they had performed their allotted quantity of work; they all broke short and brittle, the fracture invariably indicating the progress of the disease. The fracture commences at the lower angle of the axe on the side of the traction, which is evidently in fixed axles the point of greatest fatigue, and in those axles which have given way under the weight of the load, the fissure has in some instances nearly traversed the axe before it broke entirely, and it is then very easy to trace the accident from its engine. I will endeavour to describe its usual appearance by the following diagram; the arrow shows the direction in which the carriage moves.

The fracture invariably originates at the angle a, and appears to progress at intervals by zones as shown by the lines in the diagrams, the first, at the point b becoming perfectly black, the colour of each being lighter as they gradually extend from this point, and as the contact of the two sides of the fracture becomes more intimate, the grain of the iron towards the angle a is coarse, and has a large crystalline texture, which diminishes in size as the fracture approaches the angle b, at which point the metal remains slightly fibrous, having evidently undergone a more rapid deterioration at its point of greatest strain.

M. Arnaux informed me, that in consequence of this effect, to which he has for a long time paid great attention, he has come to the conclusion that an axle can only safely run a distance of 30,000 leagues, or about 75,000 English miles; when an axe has run that distance, he invariably takes it out, places it between two new bars of iron, and welds them together so as to form a new axe. If the carriage usually runs over a paved road, such as is frequently met with in France, the axe is not allowed to run so great a distance, and a certain degree of wear in the collar then determines the period at which the axe is thrown out, not in consequence of the wear of the collar, but because that degree of wear has proved, by experience, that it is prudent to renew the axles in order to avoid a fracture.

Here, then, we have the proof of an important principle in the application of wrought iron, being well established and long known to one, and probably to many individually, without having come to the knowledge of railway engineers, who are thus compelled to arrive at this important truth by dint of actual experience, obtained through the medium of a series of lamentable accidents, and they could not acquire their information in any other way, unless made acquainted with the circumstance by those who have previously purchased their knowledge.

The question, then, admitting the above statement to be correct, will be, how great a distance it may be prudent to allow railway axles of different descriptions to run; and to solve this question, it will be advisable, in the first instance, to adopt a term which may certainly be within the limit of perfect safety, until the greatest distance that can be safely adopted may have been determined by a series of well conducted experiments.

Iron exposed to great heat undergoes the same kind of deterioration. I examined, in the same establishment, several bars taken from a furnace in which they heat their wheel hoops; the part of the bar directly exposed to the fire offered the same crystalline appearance as the broken axles, which gradually diminished towards the end that was out of the fire, and the end of the bar which was out of the fire altogether, had the appearance of good tough iron. The portion which had suffered most from its direct contact with the heat, having been doubled over and welded entirely, recovered its fibrous quality, and stood a cold bend as well as any iron that had not been in the fire.

Should you find this communication worthy a place in the Journal, you will oblige, by its insertion.

Your obedient servant,

20th January, 1843.

Improvement in the steam engine is so much sought after, so many are engaged in the pursuit, and economy in the consumption of fuel is a question of so much importance, that no apology need be offered on presenting a plan to attain that object, and which has been found here or elsewhere to be an absolute improvement.

The simple apparatus which I am about to describe, (for which I obtained two patents abroad,) has been applied very successfully, and is now getting into extensive use. I believe it to be unknown in this country, except to a few persons to whom I have explained it; and as it will on most occasions be found to be useful, I propose to make it known through the medium of your truly valuable columns, which being open to communications of the kind, and much read, I should be happy to introduce this to your readers through so respectable a channel.

The advantage of using steam expansively does not require demonstration, it is too universally acknowledged to admit of any doubt; I must, however, enter a little into the subject, to point out the benefit to be derived from the application of my slide valve, but will endeavour to be as concise as possible.

An engine working without expansion, receives the steam on its piston during the whole length of stroke, its speed being regulated by contracting more or less the passage through the throttle valve, thereby to a certain extent wire-drawing the steam. The speed of the engine is effectually regulated by this means, but a considerable quantity of steam is thereby thrown away, as I will endeavour to show.

It frequently happens that an engine is lightly loaded, and as the loss to which it allude is comparatively greater with a light load than with a full one, on account of the wire-drawing becoming more complete, I will take for example an engine working with such a load as will require the orifice through the throttle valve to be sensibly contracted, in order to keep down the speed of the piston.

When the engine passes over her centre, the motion of the piston is very slow, and the orifice of the throttle valve will allow the steam to rush into the cylinder in sufficient quantity to exert its full pressure; but as the speed of the piston increases, the quantity of steam admitted becomes insufficient to fill the space at full pressure behind the piston.

The piston continues increasing in speed until it reaches the middle of the cylinder, where it is the greatest, from that point to the end of the stroke the speed decreases until the motion is reversed; there is necessarily a point of the stroke at which the speed is so slow, that the quantity of steam admitted through the throttle valve will be proportionate to the speed of the piston, and from that point until the end of the stroke, as the speed of the piston decreases, the steam will accumulate in the cylinder, and the pressure will increase; but at that moment the position of the leverage of the crank is such, that the increasing pressure of the steam produces comparatively little effect on the speed of the engine, and at the moment at which the pressure reaches its maximum, the slide valve is reversed, and the contents of the cylinder are thrown into the condenser.

The quantity of steam thrown into the cylinder at the beginning of the stroke is not lost, because it continues to act expansively on the piston, and becomes a portion of that volume of steam which determines the speed of the engine and the relative steam passage through the throttle valve; but as I said above, the volume of steam thrown in towards the end of the stroke, only serves to fill the cylinder uselessly at the moment when its contents are about to be thrown into the condenser.

If the engine happens to have a light fly-wheel, the evil is considerably increased, because the speed of the engine will sensibly decrease towards the end of the stroke, the orifice of the throttle valve will be enlarged by the action of the governor, and an increased volume of steam will be admitted into the cylinder just in time to be thrown away.

By working the steam expansively, the above-mentioned loss is avoided; and if the resistance to be overcome was constant—as for instance, to raise a given quantity of water to a given height in a given time,—then the fixed expansion would answer every purpose; and this is, perhaps, the only instance in which that can be said to be the case.

Generally speaking, the load is variable, and when that is the case, the point of the stroke at which the steam is cut off should also be variable, so that the steam employed should exert its full pressure while it is being admitted to the piston, in order to produce the full effect of expansion from the moment it is cut off until the end of the stroke.

For this to be carried out efficiently, the engine itself must determine the point of the stroke at which the steam should be cut off, and the governor is sufficient for the purpose. I think I may infer, that the valve hereafter described, will be found useful for all engines which require a governor to regulate their motion.

The present system of advancing the eccentric, and constructing the working valve, so that the steam is cut off at about three fourths of the stroke, is an immense improvement, but stops short of what is wanted, particularly for those engines which work with high steam pressures.

The elasticity of steam being subject to the same law that governs the elasticity of atmospheric air, as determined by Mariotte, the elasticity being proportionate to its density, then a volume equal to 200 under a pressure = 2, will be reduced to 100 under a pressure = 4, and will expand so as to represent 100, the pressure being reduced to = 1.

This being the case, let us suppose the length of the stroke of the cylinder of a steam engine divided into 20 equal parts, and that steam of four atmospheres is acting upon the piston during the whole of the stroke; the consumption of steam will be represented by 20 x 4 = 80, and the sum of the forces will also be 20 x 4 = 80; in this case the consumption of steam will be as 1, and the power exerted will also be 1.

Take the same cylinder, and admit steam of the same pressure during 36 = 3 of the length of stroke, the quantity of steam expended will be 15 x 4 = 60, and the sum of the forces will be 15 x 4 = 60 for the first 15 spaces, and 16 x 77 for the remaining 5.

The consumption of steam will be 60 = 1.

The power exerted will be 60 + 16 x 77 = 76 x 77 = 1.27.

(See diagram No. 1.)

Again, in the same cylinder, admit the steam only during 36 = 3 the length of stroke, the quantity of steam used will be 10 x 4 = 40, and the sum of the forces will be 10 x 4 = 40 for the first 10 spaces, and for the remaining 10 spaces it will be 26x7.

The consumption of steam in this case will be 40 = 1.

The power exerted will be 40 + 26 x 77 = 66 x 77 = 1.66.

(See diagram No. 2.)
Carry this again further out, by admitting the steam only during \( \frac{3}{4} \) of the stroke, and we shall find for the expenditure of steam \( 5 \times 4 = 20 \), and the sum of the forces for the first five spaces will be \( 5 \times 4 = 20 \), and for the remaining 15 it will be 26-2s.

The consumption of steam in this case will be 20 = 1.
The power exerted will be 20 + 26-2s = 46-2s = 2-31.

(See diagram No. 3.)

To obtain the greatest possible advantage from steam it is requisite:
1st. To employ it expensively.
2nd. To admit it into the cylinder at its full pressure without being withdrawn.
3rd. That the portion of the stroke during which it is admitted freely, should be determined by the engine governor.

The construction of this self-acting slide expansion valve, will be understood by inspection of Figs. 1, 2:
A, being the face of the cylinder.
H, the slide valve, acting exactly the same as the ordinary slide valve.
I, a moveable metallic plate, worked by friction against the back of the slide valve H, as far each way as will be permitted by the cam or tappet \( a \), the position of which will be determined by the governor.

When the points of the tappets are approached so as to hold the plate I, the slide valve H, alone will move, and the steam will act only during a very small portion of the stroke of the piston.

When the points of the tappets separate, the plate I, will be carried along with the valve, until brought in contact with the tappets, and the greater the distance between the points of the tappets, the longer the steam will be admitted into the cylinder.

When the tappets are sufficiently thrown back to prevent the plate I, from reaching them during the whole length of the stroke of the valve, the fixed bracket K, will then place the plate I in the middle of the slide valve, and the steam will be admitted during the whole length of stroke of the piston, with the exception of what portion may be cut off by the advance of the eccentric.

The two spindles which carry the tappets \( a \), pass through stuffing boxes reserved on one side of the valve box, and are turned by two sectors fixed on their extreme ends, and working into each other; the tappets therefore move simultaneously in contrary directions, a lever fixed to the top sector being worked by the governor, so as to separate the points of the tappets \( a \), as the speed of the engine diminishes, and to approach them nearer together as the speed increases, and in this way steam will be admitted in such volumes into the cylinder, as will effectually regulate the speed of the engine without ever contracting the orifice of the throttle valve.

This summary explanation is quite sufficient to show the principle upon which this valve is constructed, and by what means the purpose is effected; what follows, is a somewhat more detailed account of the same, useful only as entering a little more minutely upon the subject, and giving some instructions to be attended to in its construction.

To facilitate the setting of the metallic plate I, attention must be paid to the position of the tappets \( a \), because upon their position depends the proper effect of the valve. The upper sector G, is keyed on the end of the spindle, and the lever \( L \), is fixed to the sector by two screws \( s \), running through oval holes in the sector, which permit the spindle to be turned a little either way, so as to move the points of the upper tappets a little nearer to, or a little further from the plate I.

On the lower spindle the same facility is obtained, by keying a plate on the spindle, instead of fixing the sector itself, and then by fixing the sector to the plate by two screws, giving play in the holes as above, the bottom tappets can also be varied as may be required.

To cause the plate I to adhere to and follow the valve II, in its motion, a spring K, is fixed on the back of the plate I, and the two ends of the spring slide in a groove, formed by two side pieces fixed to the slide valve; this spring is so disposed as to press the plate against the back of the valve.

I have occasionally applied this valve to engines that required to have more steam thrown on to one side of the piston than on the other, and have thereby been able to do away with a considerable counterweight—for instance, in direct engines, where there is considerably more weight in the down than in the up stroke. I have found it very useful; and in another case, in which a cold water pump was attached to one end of the beam, and lifted water from a very deep well.

The motion of the valve being determined by an eccentric, is exactly the
same as that of the piston determined by the crank, but with this condition, that the valve is at its greatest speed while the piston is at its lowest.

If the circle described by the crank pin is divided into equal parts round its circumference, the motion of the piston, commencing from the end of the cylinder, will increase as the versed sine of the arc described, until it reaches the middle of the cylinder, while that of the valve will be as the sine of the arc; and as the difference of the versed sines is constantly increasing, while the difference of the sines decreases, the result will be, that the motion of the plate 1, on the back of the valve, must be less the longer the steam has to act upon the piston. The impulses of the tappets must therefore be worked by a motion of the same description as that of the eccentric, and this is obtained by means of the bell crank, A, B, the long arm A being worked by the governor, and made to describe an angle of 90°, the arm B, being horizontal when the governor balls are open, and vertical when they are closed; a graduated quadrant C, being fixed against the valve box, a hand fixed to the extremity of the arm B, of the lever A, B, will show during what portion of the stroke of the piston the steam is admitted into the cylinder.

The pin being pulled out from the lower joint of the lever E, the lever F, will be thrown up by the action of the plate 1, against the tappets; the plate being no longer stopped by the tappets will be directed into the middle of the slide valve by the fixed bracket K, and the steam will be admitted to the piston until cut off in the usual manner by the slide valve.

When it is requisite to stop the engine, this pin must be withdrawn, because it is requisite that the plate 1, should be always in the middle of the back of the slide valve to be ready for starting; the small quantity of steam that would otherwise be admitted would not suffice to start the engine.

This valve, which I have applied to a great many engines, and which has also been applied by others, answers perfectly well; it is, therefore, not merely a speculative idea that I am laying before your readers.

I applied one pair of them to a locomotive engine, but the result was not so favourable as I anticipated; not that this valve is not applicable to this kind of engine, but because I applied it in an improper manner, and without having beforehand taken into due consideration the several points in which the locomotive differs from other engines. I considerably increased the power of the engine, but did not save fuel, which is one of the principal objects I had in view. I made the cylinder too large; and did not sufficiently provide for the very great speed with which the piston of a locomotive travels, so that I produced in the slide valve the wire-drawing of the steam, which I avoided in the regulating valve; it must also be observed, that a sufficient blast must be determined in the funnel, to secure the generation of a sufficient quantity of steam; this was provided for, but in an improper manner, being only obtained by contracting the orifice of the blast, which would only enable me to obtain a proper effect under a given load and upon a constant gradient; and as on a railroad these two conditions are constantly varying, it is evident that the area of the orifice of the blast should vary also, not only when the steam is worked expansively, but on all occasions. I therefore took out a patent for an apparatus, by the use of which, the blast could be regulated with the greatest nicety, and obtained permission to make a series of experiments with the apparatus, on one of the most powerful locomotives, unfortunately not the one to which the expansion valve was applied, and the result was, what might have been anticipated; the variable blast did not require any assistance, and acted perfectly well in every respect; whereas the expansion valve, which requires absolutely the variable blast, did not produce its full effect without it.

From the very liberal conduct of the company, I am persuaded, that if I had remained longer in France, they would have authorized me to complete these experiments; but family affairs having called me back to England, they remain in an imperfect state, as far as regards locomotives. I, however, went far enough with the experiments to feel convinced, that by the application of the expansion valve in conjunction with the variable blast, a considerable improvement would be effected in the locomotive engine.

London, 19th October, 1812.


IMPROVEMENT IN THE MANUFACTURE OF GAS.—A workman employed at Esk Mill, Edinburgh, named J. Lothian, is said to have perfected a most important improvement, whereby a saving of one-half of metal, fuel, and fire is effected by a new construction of the flues, and situating of the retort. His principle of building flues is also said to be well worthy the attention of those having small establishments, where gas is required. A few days since, he made, in 4½ hours, by one small retort, 816 cubic feet of gas, the same being prepared from various substances.

THE YORKSHIRE ARCHITECTURAL SOCIETY.

Sir,—However well-intentioned the regulation may be, that all who are admitted into this society "must be members of the Established High Anglo-Catholic Church," it appears to me to be one of a very questionable kind, whether as regards propriety or expediency. What is exactly meant by the Anglo-Catholic Church, I for one, know not, the term being to me altogether a novel one; but let it mean what it may, it seems that Anglo-Catholicism does not interfere with the "peculiar sentiments" of those who profess it! This, however, is touching upon different ground; what I have to object to, is the mixing up religions at all with secular matters, for the doing so is apt to lead to the former being made use of as a mere stalking-horse, and rendered subservient to worldly interests.

Had the restricting sine qua non been that all members must be thoroughly acquainted with Ecclesiastical architecture, that would have been a very intelligible and proper regulation, and would have answered every purpose, if it really is supposed that no one who is not likewise a member of the Anglo-Catholic Church, can have suitable feeling for, or do justice to that particular style of the art. Or if such be not the case, why should the society exclude architectural talent and ability merely because they may not happen to wear the badge of what it holds to be religious orthodoxy? If such affected strictness be not cost, I know not what is. As far as religion is concerned, it would perhaps be more honest and more consistent on the part of this Protestant church, sternly to reject at once and altogether, in any degree, particulars of, or reminds us of Roman-Catholicism, its idolatrous worship, its vain and purer superstitions. Instead of deploiring the barbarous spoliations and ravages committed by iconoclasts and puritans, we ought to abstain from attempting in any degree to revive or encourage a taste for a style of architecture, to which we can never do complete justice, but at the very best must always remain immeasurably behind the original models, if merely because we neither have occasion for, nor can possibly admit into our churches, that amplitude of space, and that prodigal display of architecture and art, which, if it does not imperiously demand it, Romanism regards as manifestation of piety. For our churches, we require no long array of ailes and chapels; neither splendid sacristies, nor gorgeous altars: we have neither processions, nor saintworship; in fact, do not even know anything of, or in any way recognise, many of the saints to whom our churches are nominally dedicated; or rather merely called after for form's sake, and in order to distinguish one building of the kind from another in ordinary discourse. What are St. Giles, St. Pancras, St. Olave, St. Chad, &c., to us Protestants, except so many names, which might as well be those of Egyptian kings?

Therefore, if such matters are of no moment—no scandal to our Protestantism, why should we now become all at once so excessively scrupulous in regard to what are equally matters of indifference? If it can be shown that it is indispensably necessary a man should belong to the Anglo-Catholic Church, in order to acquire himself worthy in building churches, let it be done.

Rickman, who understood Gothic architecture and our ecclesiastical buildings, as well or better than most in the profession—although Gwilt has not thought either him or his work worth any mention—was brought up in the tenets of quakerism, which, though it did not prevent his being employed professionally at some of the colleges at Cambridge, would now have excluded him from the Yorkshire Architectural Society.

It may be said that all this has scarcely anything in common with the objects of your Journal, and it certainly ought not; but if people will mix up religion and party spirit, such matters must unavoidably be agitated, and find their way into publications like your own. If qualification of any kind be required from those who seek to become members of the Yorkshire Architectural Society, it would surely be sufficient precaution against the admission of the unworthy, were it made a law that every one—at least every one actually belonging to the profession—should send in as a testimonial of his ability, some original study or design in ecclesiastical architecture; and if his taste should be found orthodox, he might be allowed to pass muster without inquiry as to the orthodoxy of his religious tenets.

I remain, &c.,
O. E. D.
Canadian Board of Works.

Sin—As you have uniformly taken high and strong ground when discussing the subject of the Canadian Board of Works, and the public difficulties, system as injurious to the community as it is degrading, and indeed, ruinous to the profession, the following remarks on some of the works now in progress or to be soon undertaken by the provincial government of Canada, may not be without interest to your readers. I believe this the more readily, as you have, in your 1st p. and last p. of the American Railroad Journal, showing the, in every way, injurious and demoralizing effects of the system here, which paper I should have had much more pleasure in condensing for, and otherwise adopting to the English reader, had I supposed the communication useful to you otherwise than as a reference. While I now offer to the public works of Canada, will only too clearly show, that it is not easy to speak too strongly of the wretched system of carrying on these undertakings by agents of government, and with the public money, without any other responsibility than that to party.

You remark, in your report, on the unprecedented rapine of the St. Lawrence, by canals round the rapids above Montreal. These canals are three in number.

1. The Lachine canal, round the Lachine rapids, connecting Montreal with Lake St. Louis, a distance of nine miles. This canal has been in operation nine or ten years, and the locks are 100 feet long in the chamber, 30 feet wide, and 5 feet deep.

2. The Beauharnois canal, on the other or south-west of the St. Lawrence, connecting Lake St. Louis with Lake St. Francis, round the Cascades, 140 feet wide, &c. This canal, designed in July, 1817, is to have locks 200 feet long in the chamber, 55 feet wide, and 3 feet deep, with lockage 50 feet, cost about £400,000, and the effective working distance of the canal, 3.5 feet. At the present time, it is finished, and the excavation of the canal above the Longue South rapids. This canal is nearly or quite finished, is 111 miles long, with locks 200 feet long, 55 feet wide, and 3 feet water on the sill. Prism of canal 140 feet at water line, 100 feet wide at bottom, and 10 feet deep. Lockage about 45 feet, cost above £400,000, and with no other receipts, can be put into operation within a year.

3. The Cornwall canal, round some of the worst points in the river, which, for the next 35 miles, has a current of from three to eight miles per hour. The aggregate length will be about 40 miles, and the total lockage about 150 feet.

You will observe that the Beauharnois canal has been commenced on the south side of the St. Lawrence, in justification of which the chairman of the board of works wrote the letter, a copy of which, in a Montreal paper, I forward to you, in consequence, in whose name, for the most part, this was written, engaged me to examine the question, and, finding no data, or indeed, any engineering information whatever in that paper, I was under no necessity of making such surveys as would enable me to give an opinion, which was the following effect: that, the incidental works being trifling, and the lockage of course the same on both sides, the difference in cost, £100,000, must be sought for in the earthwork. But, the total cost of this, and of the works of this nature, on the Merrimack, is only £30,000, so that the difference of £100,000 became quite impracticable, as is indeed at once obvious to any eye at all accustomed to judge of ground. After my reports were laid before the select committee at Kingston, the board sent in their "estimates," unaccompanied by any report, in which they made out their case; by,

1. Comparing the worst known line on the north side; that is, the last line run by the board, and designated as No. 10 in the letter I send you, with the best line on the south side, that making a difference of £30,000 against the north side.

2. By comparing a canal 15 miles long on the north side, reaching from still water to still water, with a canal 12 miles long on the south side, having its western terminus at the foot of a strong current, with extensive rocky shoals, and a depth of 4 feet only. The cost of the canal on Lake St. Francis, which I showed in my evidence, it would cost at least £40,000 to overcome.

My reports will be found in the evidence, a copy of which will be sent to you, and they will enable you at once to sift the facts from the vast quantity of irrelevant matter, with which the board have endeavored to mystify the very simple points on which the investigation turns.

I will now request your attention to a dispatch of the Colonial Secretary to the Governor-General, dated 2d of April, 1812, in which Lord Stanley writes: "It can hardly be doubted that works so extensive, and calculated to remove such obstructions to the progress of commerce and navigation on the Canadas, as the present plan contemplates, would be superintended by the best professional assistance which it is possible to obtain. Her Majesty's government entertain no doubt of the anxious desire of the Canadian Board of Works to discharge with fidelity the arduous duties which will devolve upon them. I can have no doubt the anxiety which they must feel to have associated with them in this important office, the professional assistance which it is in the power of the mother country to furnish.

"It is therefore, my intention, in anticipation of the acquiescence, which I cannot for a moment doubt, of the colonial legislature, in the general arrangements suggested by Her Majesty's government, to send over an officer of engineers, whom, as Her Majesty's commissioner, I trust the legislature will have no difficulty in associating with the board of works, in the superintending the execution of the works, to which they are so fully engaged, and which experience may probably enable the undertakings to be conducted with the greatest economy, and which must be alike the interest of the colony and of this country."

Sir Charles Bagot replies, 28th of April, 1812: "Of course, as her Majesty's commissioner, I have no objection to the board of works, and the experience which may be gained in the execution of the works which may be undertaken, and point out the reasons which induce you to prefer a civil to a military engineer.

"On this subject, I have only to observe, that if provision be made by the legislature for the payment of such an officer, (which, I agree with you, will be very desirable,) Her Majesty's government would have no objection for a military over a civil engineer, nor any wish on the subject, but to procure the services of the most competent person who could be engaged for this purpose.

"You may therefore rest assured, that, had this officer been sent out the canal could not possibly have been placed on the south side of the St. Lawrence.

"For, the examinations which I would have found it his duty to make, before giving his acquiescence, would have shewn him that the south side had no advantages in an engineering point of view; and no English engineer, or military man, interested in the success of Her Majesty's general, that "ceteris paribus" be will probably (1) give the preference to the north side. The stern reply of Lord Stanley to this flippant remark, in which he expresses his regret at the sacrifice of the military advantages, and the line on the north side of the St. Lawrence, cannot fail to strike you as proper and manly, as well as decidedly called for.

"But the great object of the work is commercial; and, in this point of view, the examinations of the engineer of Her Majesty's government, would have shewn him, that the line on the south-east or left side of the St. Lawrence, which would be the several canalsaver's word, is at much less expense than the "preferred" to the north side, constitutes now the only argument in favour of continuing it on that side of the river. I am, however, of opinion, that this will avail little, if Lord Stanley send out an engineer—civil or military. I care not which—what is wanting is the desire on the part of the Government, as well as national interests may be advanced by the construction of a canal on the north side, in such a manner and of such dimensions as prudence, experience, and common sense shall point out.

"Lord Stanley will hardly be told, that, the canal having been commenced, it is useless to look back—that it is better now to submit to the imposition, infamous though it be, than sacrifice the work already done—that the honour of the government will be sufficiently appeased by dismissing the board of works with disgrace, and similar arguments of those whose only escape from a wretched barrow—if so railed a term may be applied—lies in the momentary and imaginary value which the construction of a "ship canal" to the "great lakes" along the Seigneurie of Beauharnois may give to that property in the London market. But should Her Majesty's government be of opinion, that must be done, the other questions of the plan, such as the superintendency of the canal on the south side, cannot be stopped, but Sir Robert Peel—the unwavering friend of private enterprise, the grand secret of British supremacy—whose policy would never have originally given the imperial security for £1,500,000 sterling, "cette pile humble," as it was contemptuously termed by a leading French member of parliament, finds all the decided obstacles to the abandonment of the plan.

"The English system of government is not the French, which may be supposed to have been a Canadian surveyor, his very name being even unknown. Survey No. 2, by Mr. Mills, led that gentleman to give the pre-
erience to the north side, (Nos. 4, 7, 8, 9, and 10, have obviously no bearing on the question.) No. 5 was by a country surveyor, and he merely points out some disadvantages in one route on the north side. No. 6, Mr. Baird never examined the north side; and, though in Kingston at the time, was not called upon to give his opinion on the subject of navigation; "consists in a violent current and lee shore; that a vessel which can navigate the canal, can neither get in nor out at the western terminus; that the three channels are pure fabrications, and that this is not the first extensive effort to break through a mountainous country, or at the rate of 90¢d., per barrel per mile, for small quantities (in full loads for 1 t.;) the rates from Buffalo to Albany, 363 miles, average 38c., per barrel of flour, or 108d., per mile = 16 per cent. more than the rate of heavy freight charge on the Western Railway of Massachusetts.

This latter is a private road, without any monopoly; the Erie canal is a State (government) work, closed between 4 and 5 months every year, and sustained by a monopoly unparalleled on either side of the Atlantic. The enlargement of this canal is postponed indefinitely, because the State has been left to meet the interest of the money squandered on this and other legislative engineering follies, pointed out in Vol. III. (p. 122 et seq.)

Without stopping to inquire how soon this course will become necessary in Canada, I will ask, what intelligent Canadian or Englishman, who has visited North America, and can form a just view of the condition of the trade of the latter country is likely to require, not equal, but ten times greater accommodation than that of New York? Should the trade of the St. Lawrence, twenty years hence, equal that of the Erie canal at this time. It will show an increase unequalled in the annals of this country. Look at the most, if not the only, successful work in Canada, the Champlain and St. Lawrence Railway, 15 miles long, and which cost not quite $10,000,000, on which 50 per cent. has been paid to the stockholders during the last six years, because the capital was small, and the outlay made with some reference to the wants of some one particular line. While on the scale of the Great Western Railway, it would have been as profitable to the stockholders as the St. Lawrence canals are likely to prove to the Province. One mile and a quarter of the Cornwall canal has cost as much as the 15 miles of the St. Lawrence Railway, including cars, engines, buildings, wharves, and steam forage-boat of 390 tons. While the Engineer of the New York & Erie has already made a better profit than the cost; a fair illustration of the mode of conducting public works by private companies, as compared with that generally pursued in New York and Canada, where the helm is only too often in the hands of political adventurers and contractors, whose primary object is to get every thing to gain by governmental extravagance, naturally employ kindled spirits to execute their designs, which are, usually, the expenditures of large sums in certain districts, without any regard to the wants or interests of the community.

The gross receipts on the Erie canal for 1849, were 1,957,334 dollars = 43c. per mile and a quarter. The tolls on the present Lachine canal are 24c., current per barrel per mile; and on the Rideau canal, 21c., current per barrel per mile, or more than twice the total cost per mile through, 105c., currency, as above. The Erie canal of New York, with which these canals are to compete, has locks 90 feet long, 15 feet wide, and 33 feet water, prism of canal, 21 feet at bottom, 40 feet at water line, and 3 to 4 feet deep. The tolls are 1.6d., currency per barrel of flour, for 360 miles = 45c., currency per barrel per mile = about one fourth the cost of the Lachine canal! thus showing an immense advantage in favor of the Erie canal—an advantage due to the cheapness of its construction; in other words, to its reasonable dimensions. It is an interesting fact to be noticed, by referring to the following table, obtained by dividing two or three times its original cost in enlarging the Lachine canal? The high tolls have driven the forwarders to try the Lachine Rapids, and during the past summer and autumn a vast number of boats have gone safely over. There is a great depth of water, but the channel is narrow and crooked. (The whole canal is a mile in width, and the smallest current at which it can be navigated is 8 to 10 feet.) the inclination of the surface of the water being such, that the force of gravity acts on the boat, thus producing a great velocity through the water in addition to that of the current. A heavily laden barge overtook a light steamer in the rapids, fortunately without injury to either—and the first season of this navigation has passed without accident. Now were individuals expending their own money on these canals, they would endeavour to ascertain whether the income—the true test of the accommodation to be offered to the trade—would justify the construction of canals of a size unknown, 50,000,000, 150,000,000, or 200,000,000, in calculations and investigations necessary to show how this reduction of freight was to be effected, and why barges of 150 tons were so much less efficient than vessels of 900 to 1200 tons. But in place of this, the public have heard nothing beyond vague assertions as that "the St. Lawrence is the natural water course of the continent; that all ----", the Erie canal, with its pitiful craft of 50 tons burden—omitting all mention, or more probably ignorant of its small cost and low tolls—has yielded such large returns to the state of New York, what may not be expected from the "ship canals" of Canada, when "sea-going" vessels shall "float on Ontario and Illinois." But the truth is, that all these talk is mere _extravagance_, not worth noticing—and innumerable other equally preposterous views and bombastic expressions, which are only likely to prove as ruinous as they are ridiculous.

My view of the canal, which the State of New York has been endeavoring to enlarge to a size somewhat greater than that of the—according to Canadian ideas—little Lachine canal, and on which she has thrown away $3,000,000, is now admitted to be equal to any trade which can be expected, though there is no St. Lawrence to distance all competition for the down freight, no Hudson to compete with for the up freight, and although it enjoys a monopoly of all western freight, the people of New York not being permitted to use the railways along side of this canal on any terms—not even in winter—for the transportation of freight. These railways are owned by private companies, the government dreads their competition, and not without reason. For instance, flour is carried from Albany to Boston for 1s. 6d., sterling per ton, and valued at 60¢, per ton, by rail; whereas, 1s. 6d. by canal, and a mountainous country, or at the rate of 90¢d., per barrel per mile, for small quantities (in full loads for 1 t.;) the rates from Buffalo to Albany, 363 miles, average 38c., per barrel of flour, or 108d., per mile = 16 per cent. more than the rate of heavy freight charge on the Western Railway of Massachusetts.

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It was remarked, by the President of the Institution, (I think,) that many of the young engineers of England must necessarily look to the colonies for employment, hence the state and prospects of the profession in Canada cannot be received with indifference by British engineers in general; and it is on this account that I think the course of the Canadian government should not escape the scrutiny of the leading members of the Institution in London.

The honour and advancement of the colony and of the profession, as far as public works are concerned, must be considered as the same; and it is hard to say whether the Canadian Board of Works are doing more to injure the trade of the country, or else to effectually extinguish in Canada, that vital principle of British institutions—private enterprise.

I am, Sir,
Your obedient servant,

W. R. CASEY.

THE EDUCATION OF AN ENGINEER.

To which is added a few remarks bearing on the prospects of Engineering and its Disciplines.

By H. F. CLIFFORD.

Our estimate of the value of any scientific pursuit, consists chiefly in the degree of importance we assign to the amount and nature of the several qualifications due to its proper attainment. When we reflect upon the character—upon the profession of engineers, we are not long in discovering it to be a science requiring much deep and intellectual study, assisted by steady perseverance, long and incessant application to arrive at a just appreciation of all those practical data which experience can alone furnish, and impress vividly on the mind; one in which the laborious duties of the artisan must be blended with the sound theories of the refined mathematician, one, in fact, embodying the perfection of theory with practice; but to define engineering in the full sense of the word, would be an endless task, for in that single word is comprehended a general knowledge of all the arts and sciences of which human ingenuity can devise to supply the conveniences of the present advanced and rapidly progressing state of civilization. This definition may, indeed, appear vague to some; but when we are informed of the vast grasp it takes of all those sciences which require no ordinary mind to cultivate and condense for the purpose of obtaining a thorough comprehension of the numerous ramifications of so noble and deeply interesting a study, we cannot be called preposterous in placing it second to few, if any, of our standard professions. Since, however, engineering as a comprehensive and distinct science has become fully recognised, and taken up its full position high in the rank of secular callings, there must have been long felt a growing deficiency of some fixed laws or definite principles to guide such individuals as were destined to attaching themselves to the profession, answering to what their various instructions, as politicians and intriguers, but their inferiors as men and engineers, are pleased to direct, and have nothing to do with the projecting of the works, as will be easily believed.

The amount of the income and expenses at $50,000 currency, and the toll at 3d. currency per barrel of flour, it would require 4,000,000 barrels, about 12,000,000 barrels for towing through the nine miles canal. The 10 miles of canal would cost more than insurance and pilotage from Kingston to Montreal. The insurance is three-eighths of 1d. per pound; the pilotage about 2d. per 1,000 barrels.

The Government must be provided with one lock, and the entire present annual downstream trade would pass through the Cornwall canal in 24 hours—the up trade before dinner, or at a point before breakfast. The river is equal to millions of tons per day, and the vast saving of time—already important between Lake and Montreal—is an inseparable argument against the canals for the downstream trade. There will be no doubt the canal to Lake Erie, and it is required, is by estimate, $150,000 to complete it. (Memorandum, 12th August, 1841.) The cost of building the locks has been about £250,000, and the currency, Mr. Killaly’s—doubled nearly annually an inconceivable factor—of the contrary, notwithstanding. The principal part of this is from down— and a part also from American trade. With a navigation equal to that of the upper St. Lawrence, the income would be about $500,000. Its principal hopes of success rests on the beginning, and I think it will be, for reasons given in my paper on “the spring trade” in the American Railroad Journal of April 15th, 1842.

Vessels drawing 12 to 14 feet water are brought with difficulty up to Montreal; and as for taking “ships” through 500 feet lockage up to Lake.
and supply them with the necessary machinery: and moreover, it is not
nor will there ever be none, a sufficient demand to employ all those first-rate
works of the best abilities and for whose advantage a perfect
guarantee for a good article. Again, owing to the slow and gradual
development of the system of constructing manufactories on the continent,
conducted by skilful Englishmen, there is every reason to believe that when
the system arrives at a state of maturity, the foreign consumption of English
machinery, especially locomotives, will be almost entirely annihilated. It is
true, however, that there is a body of men, managers of large works, re-
ceiving a large number of subordinates, and in whose human sympathies pre-
sents fair means of remuneration: but then what man is there accustomed to
the usual comforts of life who would sink the better part of his early life in
a workshop, as would be necessary to fulfill creditably such a situation? No.
Such offices are chiefly held by men who, originally of the better class of
mechanics, have gradually raised themselves above the level of their brethren
by the exhibition of no ordinary talents, and have thus become entitled to the
appraisal of the highest class. It may be, however, that the taste and
knowledge of ornamentation, as well as of the beautiful, may be necessary,
and that the pupil should, during the time of his apprenticeship, acquire
a good understanding of the general principles of architecture; and, in order to prepare his mind
more fully for the reception of its future tenant, pursue some standard ele-
mentary work on engineering.

Having completed his sixteenth year, and assiduously devoted all his energy
to the investigation of the foregoing subjects, let the embryo engineer be
now placed in some first-rate manufactuary, where there is a great variety of
work executed, for a space of not less than three years. We repeat, first-rate
manufactuary, for as his standard of judgment of mechanical productions will
be formed in a great measure by the quality of work passing under his notice
during this time, it is proper he should connect himself with one of the highest
men of the business, by keeping a careful and attentive eye on those
regarding land, marine, and locomotive engines, mull-work work, and, in
fact, machinery in general. But this information, we can assure him, is not
to be purchased in the character of an onlooker. He must keep the same
hours as his fellow workmen (pro tempore stante); he must exchange his ordi-
nary attire for the fustian suit, the drawing room and easy chair for the
workshop and the vice, and go through the various gradations of the service
'till he is found competent to undertake some responsible situation over the
workmen. And it is a well known fact, that it is impossible for a man to
pass a correct and conscientious opinion with regard to the execution of any
mechanical work, unless the individual in question has himself gone through a
regular system of practical application. It is true the beginner, unused to the
rough habits of a workship, and unaccustomed to associate with such
character of men as he finds locomotive building calls especial care for
its subsequent utility, and let it be a leading principle throughout the entire
course, to ascertain correctly and set a due value upon the proportionate
strengths and properties of materials in general, that the engineer may be
able to adapt with confidence such invaluable knowledge when he may here-
after find it available. For the requisite strength is alike conducive to sym-
metry of figure and economy of material—an intimate acquain	ance with the
relative functions of the various machines and the concomitant
paraphernalia. The foundry must likewise have its due share of impor-
tance, and the student should contrive to obtain an introduction to some
established foundry, and in the latter devolve a short period to analyzing the
processes of smelting, puddling, casting and forging, and thus render himself
capable of passing a good judgment on the quality of malleable and cast iron,
when coming under his notice for engineering purposes on future occasions.
Although mining engineering is reckoned a distinct branch, and requires long
experience underground as a viewer to sustain any responsible situation, still
a short time passed in investigating colliery work in some well regulated
work shop, will make him acquainted with much valuable information
concerning pumping engines, and the general arrangement of the mechanical
department, as would be of material service to him. During his residence at
the manufactuary, practice in drawing should be kept up by perusal visits
to the drawing office, and he should endeavor on all occasions to procure
for himself copies or tracings of any useful piece of mechanism, and thus, by
the principle out in time, amass a series of practical illustrations of
invaluable use in after life. Lastly, in order to render the former part of his
education ultimately serviceable, the pupil should, during the time of his
apprenticeship, after work hours, pursue attentively such works as treat more
immediately on subjects forming the constituent elements of his profession, and for the
purpose of blending amusement with instruction, we could suggest reading at his
more leisure hours, and thus keep pace with the constant improvements.
the crossing of the road and grand comprehensive and unifying
totality, the pupil may easily refresh himself with the pleasing intelligence,
that the remainder of his duties are comparatively easy to the ordeal he has
already passed through. The next step is to place himself under the di-
rection of an eminent civil engineer, who has railways and other works con-
ected with this department of engineering under his superintendence in
the character of an assistant. In this new state of things, the pupil should strive
to hard to obtain some inferior but by all means to live up to the standard
for there never is that care and attention bestowed on any object that is
simply dependent on our own caprice. The pupil should, therefore, consider it
a matter of paramount importance to endeavour sedulously to create a
high confidence in his own and his superior's mind, that may lead, as soon
as possible, to his entrustment with some minor office, the creditable discharge
of which depends entirely on his own exertions. For confidence, let it be
understood, is the capability of expressing a decided and correct opinion with
regard to any question that may arise, and which can only be given in cases
where a thorough comprehension by experience of the details of the point at
issue is positively entertained. With civil engineering commences a new era, Railway
making, with its surveying, levelling, cutting and embanking, bridge
building, drainage and other works, will serve to keep the mind continually
occupied; the pupil will be required to be himself a master of the art and
science of managing harbours, jocks and light houses, the formation of canals, will
severally claim a proportionate degree of careful consideration. Common road-making,
arming and ventilating, general principles of carpentry and masonry, with a
train of minor but no less useful qualifications, will in due order require each
its own peculiar study: basly a real concise method of making esti-
mates and getting up specifications for contract works, will be found of great
tility; the engineer can only be obtained by ascertaining on all occasions the
prices of every description of materials for engineering purposes in the dif-
ferent localities, the latter by continual reference to specifications of works
already executed. Here, then, is a broad field open to the successful practice
of acquired knowledge, whilst design and construction present favourable
opportunities for the display of any talents or ingenuity the young engineer
may be fortunate enough to possess. To acquire complete knowledge of the
strength and properties of wood, stone, and iron, should be considered a
matter of the utmost importance, and a few months could be profitably passed in
an architect's office of good repute. We have mentioned the preceding
qualifications en masse, but they should be carefully and discriminatingly
adjusted to the age, ability, and progress of the student. Let the different
subjects be presented to his notice in their most elementary shapes at the
outset of his career, and his abilities may be readily fixed upon them, and
then for the intellectual faculties having mastered the approaches, will grasp
with a firmer hold upon matured development the more complicated facts.
And it should not be lost sight of, that the amount of information acquired,
depends almost entirely upon the youth's own assiduity, as he will not find
persons continually at his elbow, as in the schoolroom, either urging him on
or threatening him with punishment for neglect of duty. He must see

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1 By proportionate strength we mean the relative strength the sever-
parts of any piece of mechanism should bear to one another. Tredgold,
Bar-
low, &c.

2 Smeaton's experiments.
clearly it is to his own interest to make the best possible use of his time. It is not within the limits of an article for a Journal, to enter more fully into detail, but we have endeavored in as brief a manner as consistent with the nature and magnitude of the subject, to draw the outline of a plan of education, that from recent trial, we can seriously recommend for adoption. This scheme would be calculated to give a permanent character to a few branches of instruction, such as are now taught on the several schools for engineers that have lately sprung into existence. However radically good the principles and intentions of any establishment may be, professing to teach a young man engineering, however well such principles may be carried out and matured by able and efficient masters, they will fall immeasurably short of their purpose, when compared with the preceding course. For it is not within the limits of those rooms-rook, elsewhere, to convey an adequate conception of the benefits which can only be acquired by constant every day association with bodies of men, whose daily bread is earned with the sweat of their bow, and who can readily and satisfactorily explain any questions or doubts that may arise connected with their individual trades. The latter course may, indeed, materially assist the embryo engineer in the earlier part of his career; but having arrived at a suitable age, the workshop, and not the school, is the way the young man must be brought, by a slow and interminable process, to the laying of the permanent rails, will be found far more congenial to the spirit and practice of engineering. In conclusion, it is our decided opinion, that an individual educated according to our method, and possessing, in a fair degree, all the advantages arising from it, will be fully competent, at the expiration of his articles, to undertake some responsible and remunerating situation; and it is not too much to anticipate, that he will not only be materially benefit any works with which he may be connected, and with good natural talents, assisted by the standard ability, he may possibly shine forth a bright star in the wide sphere of a distinguished profession; and should he not be fortunate enough to rival the memories of Brindley, Smethew, Telford, Watt, Stephenson or Brunel, he may perhaps leave behind him lasting monuments of his skill, that would do credit to his more illustrious and deservedly renowned predecessors.

Now for a few words bearing on the prospects of engineering, and its disciples. When we review the statistics of railways, and reflect upon the enormous quantity of money (£70,000,000) expended by private individuals on such speculation, within the limited period of railway existence—when we consider the little return such parties have had for their investments, and that, up to the present period, not one company has failed to pay off—notwithstanding the fulsome exhibition of prosperity, in the declaration of a moderate dividend to the shareholders—when, moreover, we consider the ruinous state of trade, the prevalence of distress, the sluggish circulation of specie this last two or three years, caused by the deficiency of large money holders, we should feel surprised at the Russified of the above, and many other contingent circumstances, at finding engineering in the unpromising condition it has presented of late. It is now generally admitted, that this huge expenditure has been the prevailing feature of railways hitherto constructed; and it should be the aim of future companies to complete their engagements with as much economy as consistent with the durability and magnificence of their undertakings. With this object, let increased expense be expended on the great arteries diverging from the metropolis, for such may be looked upon as public works, and have a reputation to hold up; but smaller veins branching from the main trunk, should be made at the least possible cost. Once let a right spirit of economy be established between the directors of railways and their engineer, and we shall soon have a public confidence restored, and a new impulse given to the profession. There are many lines that must be laid out and finished, to render the ramifications of the system complete in England. The grand link connecting Scotland will never be two ruinous to yet wanting in the chain. Ireland is as yet unconnected,—would not a good system of internal locomotive communication go a long way to improve the civilization and better the condition of that unhappy and distressed country, and, by increasing its trade, desire, if of its manufactures, and its market and trade. And is not her soil as capable of sustaining rails, and yielding profit too, as any other hand? And we do think that, could the government overcome its present difficulties, and improve the revenue, it would do well to assist a spirited public in their meritorious desire to form a thorough railway communication throughout the entire kingdom, at least in such cases as presented estimable motives on the part of the public to invest in this branch of business. And the public were too prone to believe, at the commencement of the railway mania, that in committing their money to the coffers of the company, it was to be multiplied to the unanswerable height of their expectation; but their too sanguine anticipations were disappointed, and safe experience begat caution—we hope not discouragement; for it was not likely, upon contemplation, that an impetuous torrent, the characteristic of early railway speculations, bursting from its source, could finally subside and settle in anything like a normal current of permanent activity. We feel, in every properly constituted member of the profession will meet with his due share of employment.

Now, when we meditate on the crowded state of the avenues to all descriptions of vocations for the last few years, we cannot feel astonished that, upon the introduction of a comparatively new profession, as engineering, public attention should be diverted into a fresh channel, and some with avidity seek its novel holding. While this has been the case during the period, too, there were comparatively very few men who had been really trained to the profession; numbers, however, upon ascertaining the necessary qualifications, went vigorously to work—but then time was an essential requisite to collect materials, and in the interim a body of men, termed surveyors, possessing a tolerably good knowledge of their business, with a smattering of a few scientific subjects bearing some analogy to this line of engineering, availed themselves of the opportunity, managed to get employed (for want of better substitutes) in some interior capacity at first, until gradually acquainting themselves with a few of the details, arrogated to themselves the term of "Civil Engineers;" and before the genuine pupil had matured his education, these men had obtained, and do now hold, several of the best situations in the service. This incident will doubtless explain why there have been, and will continue to be, a number of these young men found in the various departments, it is a known fact that many have left the profession, their patience quite exhausted. Again, did the younger seton of a respectable family, in the innocence of boyish delight, sketch anything resembling a steam-engine, the anxious parent felt persuaded "the boy was a genius," and only required to be educated as an engineer to develop extraordinary talent. A great number of these geniuses, however, soon found that engineering being properly understood, was not a easy matter, flounarded off for a while, and at length gave it up as a hopeless business. Nevertheless there were many, having endured much tribulation, passed the rubicon, and thus swelled the numerical strength of the profession. It would appear, therefore, from the preceding analysis, that whilst the demand was falling off, the supply of bona fide engineers and self-sustained adventurers were increasing in a formidable ratio. The present supply being consequently, so much larger than the demand, if it be any, that, being at the bottom of the wheel, the next change will, in all likelihood, brighten the prospect. Upon reviewing the system of railway policy abroad, we cannot but advise the matured pupil to strive hard for employment at home before seeking it elsewhere; for Englishmen are not treated on the continent with that good feeling and generous acknowledgment of their worthiness to which they are justly entitled. There is likewise much jealousy existing amongst the French, and it is almost invariably happens that such English engineers as have been led by promising hopes into enter into engagements have, upon a short trial of their continental neighbours, found their position so unpleasant as to cause resignation of office, if possible, and in default of that, to put up with much unmerited insolvency, or have been unceremoniously discharged at the immediate expiration of the clauses of agreement, but not before their vital superiority (in offices, not abilities) have taken good care to reap a rich harvest of experimental knowledge from the solid acquirements of their employers. Many there are too, wearied with long inactivity, and despairing of obtaining situations in their own country have turned their attention to colonial prospects. But here, we fear, they will fall far short of their expectations; for the present condition of our colonies is not of that settled and flourishing nature to favour the designs of the accomplished engineer. The fact is, a country must be in a tolerably advanced state of civilization—must possess extended commerce, interior trade—must have substantial resources of its own, and contain a strong body of capitalists devoted to the execution of public work, before it can be pronounced in a fit state to admit of engineering operations with any hope of success.

It is true a few surveyors may meet with employment in the more recent settlements of New Zealand and Australia, to test the exploring staffs in plotting out the ground for future emigrants, and there is no doubt of the existence of certain districts in America (especially the more southern parts) where the mechanical department might be carried on to a very profitable extent. But then what man is there, without some very definite plans for, and sure prospect of speedy success, a voluntary exile from his own country, to which he is attached, and which he could embark his living in such truly eutatidial speculations? What are we to do then, is the general and anxious inquiry. Wait patiently, till the tide of fortune takes a more favourable turn, which we hope is not far distant. There is much left to be done in old England; and could the country once again recover from the depressed state, under which withering influence it has so long laboured, there is no doubt that engineers would find much more activity. And when every properly constituted member of the profession will meet with his due share of employment.

An Artisan Well in the Sea.—An attempt is now being made at Brighton, to obtain water from underneath the chalk under the sea. The operations for this purpose are being carried on at the head of the chain pier, and it is confidently expected that the strata of chalk existing in this spot will not exceed 70 feet in thickness, through which, on arriving at the green sand, a constant unfaulling supply of pure water is anticipated.
ROYAL ACADEMY.

Professor Cockebee's Lectures on Architecture.

(From the Athenaeum.)

The Professor began by quoting the regulation of the Royal Academy as to the Lectures on Architecture—"That the Professor shall read annually six public lectures, calculated to form the taste of the students, to instruct them in the laws and rules of each department of art; point out the beauties and faults of celebrated productions, to fit them for an unprejudiced study of books on the art, and for a critical examination of structures." It is understood that these lectures were to be given by a Professor in the full practice of his profession, according to the dictum of Vitruvius, "that it is the union of the parts of the whole, that makes the architect," and although he felt that it was precisely this circumstance that gave all the value in the eyes of the students to these lectures, yet it was obvious that in the midst of the distractions and bustle of professional practice, the Professor laboured under great disadvantages. It was much to be desired that the means at the disposal of the Royal Academy could enable it to extend these lectures according to the model of the French Academy, which, on architecture alone, had established five classes, each having a separate professor—namely, 1. Theory; 2. History; 3. Mathematicks; 4. Stereometry and Construction (in which important class two lecturers were appointed); 5. Perspective. Such liberal instruction secured the honour of the profession, and protected the public against empirical practice; and gave the French architects, in particular, that advantage in foreign countries, which the unassisted genius, perseverance, and enterprise of our own countrymen found it difficult to contend with. Aware of this mortifying inferiority in our public education, the students would exert themselves so much the more in their private studies to supply the deficiency, and would learn from this well digested system the course they should pursue. This Academy had, indeed, been founded for instruction (George III), and great were the obligations of the arts and the public to his memory; but the means by which it existed were of its own creation, and those means were barely sufficient to fulfil its engagement, to support gratuitously the whole of the present interests of architecture in this country, which was the object in view.

It is a well known maxim of nations of the Continent, that the fine arts are eminently calculated to increase human happiness and exalt human character, and greatly contribute to the reputation as well as the real interest of a country, especially of a manufacturing country. But the austere government of England makes the fine arts no part of its glory, nor of its peace. And it is not for the sympathy and patronage of the public, even this limited institution could not exist; nor would the country escape the reproach of the Celestials of "outer barbarism." The fine arts have, indeed, the countenance of the supreme head, and of "the powers that be"—the Ministers of the day, who cannot, as gentlemen, renounce the attribute of taste; but they have uniformly shown by their public conduct, that they do not consider it their duty amongst the people a political duty.

It is now more than a hundred years that Thomson, the best informed upon the arts of all our poets, indignantly denounced on our national inferiority and neglect of this branch of intellectual culture, and complained with grief, in his Ode to Liberty—

"That finer arts (save what the Muse has sung, In daring flight above all modern wing,) Neglected droop their head."

Foreigners have attributed this disregard of the rulers of an ingenious and a great people to various causes—to physical insensibility, to the sordid nature of our commercial habits, or the adverse propensity of the Protestant religion—to which objections the history of the ancient dynasties of this country (never inferior in the fine arts), the abundant enthusiasm of individual artists of our own times, and the public sympathy, are direct refutations. Finally, they have fixed the reproach on the government, by painting at the Schools of Design the establishment; for they say, truly, that so soon as the inferiority of our design in manufactures drove us from the foreign markets, we took the alarm, and immediately formed schools of design, a Unicum of those on the continent; not from a generous love of art, but, confessedly, from the well-grounded fear of loss in trade. The members of this Unicum have been called the barbarians by the historians, and they may be considered as a better sense of what is due to our intellectual position in Europe, and they have willingly given their gratuities attention to its conduct. But the instruction of youth must be accomplished with the higher prospect of employment in the honour and Design of establishing, by pointing out to them that the decoration of the parliamentary palace at Westminster, and the interest taken by an illustrious personage in that great object, hold out to us the hopes of equality at least in these noble studies with the improving countries of the continent, and the opening of a new career for genius and industry.

But an erroneous and misconceived scepticism as to the utility of Academies of fine art altogether, has long been fashionable, which has not, however, been applied to others, for no one has ever yet despaired because a Newton or a Locke are not annually produced from Cambridge and Oxford; and but of these it has been plausibly said, that no Michael Angelos, Raphaels, or Palladios have been produced by them since their foundation in the 17th century; it is forgotten, however, that the patronage and immense employment which elicited the talents of those masters, have also been wanting; and that the want of the feeling, the labour, and all the expensive machinery by which they can be brought to bear, Academies can do little more than preserve and transmit the rudiments of art.

Academies were established as depositories of learning and practice in the fine arts, and the means of their preservation and transmission through the vicissitudes of the times. The enlightened and commerical Colbert had been both a predecessor and ancient of the French Academy, under his own countryman, the Constable Bourbon, a public calamity might have been produced to the knowledge and ruin them for half a century, without some fixed and corporate body and abode. He never dreamt that, in the absence of the fostering patronage and employment of government, the Academy could do more than fulfil these negative objects. The Academies in France had done good work in many respects; it had sustained the credit of the country in fine art, and had reared talents which were now part and parcel of English history. Through good and evil report it had nourished the flame; and it was consolatory to find that they had transferred it to better hands through good and adverse circumstances; for now they had the happiness to see two professors in the Universities of London, the British Institute of Architects, large public patronage in Art Unions, &c., and a growing interest in the Universities of Oxford and Cambridge towards fine art generally.

Architecture, as a science, is so closely connected with the arts, and so intelligibly and intimately connected with the architectural, that it is difficult to distinguish between them; and the phenomena of beauty and ideality in the form and aspect of her contributions to architecture, become an essential member of the fine arts, the more essential since her conclusions are more undefined and remote than any other branches of the fine arts, save Poetry and Music, with whom her nearer relationship than with painting, sculpture, i.e., more nearly with the whole composition of beauty and forms of her combinations, she must never forget her obligations to her sisters painting and sculpture, by whose aid alone she becomes the ars regina, and keeps in view her prototype, Nature, ever equally solicitous of beauty and of use. And the moment she declines her counsels, her properties become anomalous, and she descends to the mere building art.

In Egypt, where painting and sculpture were in comparatively small extent, and again in the middle ages, proportions were wholly capricious, and subject to no order or regularity; nor have any been ever attributed to them even by the greatest admirers of Egyptian or Gothic architecture. On the contrary, the Greeks, aided by the union of the three arts, soon established that analogy with the organized productions of nature, which fixed the proportions of architecture in so determinate a form as not to be safely departed from, and which, whether in the days of Phidias, or Raphael and Michael Angelo, or any other renowned period of art, has been approved and adopted as just and incontrovertible.

The fulfilment of the duty of the Professor under a limited number of lectures, had been a subject of some anxiety and difficulty. The history of the first was, that the only safe and general introduction to the study, had been his first course, "Ars architectura," says Sir C. Viren, "is founded on the experience of all ages, promoted by the vast treasures of all the great monarchs, and the skill of the greatest artists and geometers, every one emulating each other. And experiments in this kind being greatly expensive and enormous, if it be, as it is, the real end of architecture, to possess a kind of art, and antiquity more than fancy." With respect to the duration and progress of this art, it might be said that a hundred years were but as a day; being made for ages, it could not, therefore, be subjected to the vicissitudes of fashion, and the slowness of its progress and invention ought to inspire us with respect for antiquity and the authority of example, and to press that presumption which too often assumes to dispense with them.

In fact, at every epoch in which the art had raised itself to its highest conceptions, we find not only artists but historians, archeologists, and historians, occupied in describing its laws, its production, its conquests, and seeking out its antiquities. There are many histories of architecture more or less complete; Canini's work promises to supply the history of ancient architecture which Winkelman had left very insufficient. D'Agincourt's "Histoire de l'Art par ses Maistres," is an admirable work; it treats of the art from its decline to its revival and restoration. Durand's "Parallel des Edifices anciens et modernes," on the same scale, is highly illustrative of the history of architecture.

The second course (that of last year) had treated chiefly the literature of the French Academies, showing out the scientific instruction quoted above, namely, to fit the students for an unprejudiced study of books in the art." It had been well said by a learned prelate, "that we do not live in an ignorant age, but certainly not in a learned one," and it was painful to see those authors who had been canonized by the French Academies attacked and discredited, as Vitruvius, or held, discredited, as the old Italian and French authors, and above all, the admirable Albiet, the Bacon of the art, and others of the greatest interest. The obvious consequence was, that new lights, fashionable concerns, and heritical opinions, were coming into us like the large ocean, as a well might the lawyer or the dandy dispense with books as the
architects. In the very dawn of literature the architect was required to be learned. In the Memorabilia of Xenophon, Socrates inquires, “But what employment do you intend to excel in, O Eutheneus, that you collect so many books? Is it architecture? for this art, too, you will find no little knowledge necessary.”

A familiar example of the great utility of these researches had been given in the quotation from Philibert de l’Orme (lib. ii. c. xi.), of the specification for concrete, written in the latter part of the sixteenth century, and corresponding precisely with the recent, so-called discovery of this method of securing foundations. During the last century our architects had discontinued the ancient practice, having adopted the most fallacious fashion of wood-sleepers, to the ruin of many fine buildings. It was, then, the ignorance of this invaluable and most instructive and amusing author, Philibert de l’Orme, which had led to so fatal a lapse.

With reference to Vitruvius, the commentators, in forty-one editions, since his discovery in 1416, were shown to have made but slow progress, and to have done the author but little justice; and ever since the unscrupulous Schneider published his edition in 1807, ten important discoveries, illustrating the correctness of his theories, had been made by modern travellers and architects.

In the present course the Professor considered the consideration of the more difficult, but no less important, injection of the Academic regulation, “that these lectures should be calculated to form the taste of the students, to instruct them in the laws and principles of composition, and fit them for a critical examination of structures.”

Those laws and principles which are technical, were treated and were explained by the masterly exhibits on which constituted architecture a fine art, were more subtle, but not less vital, to those who aspired to the heights of elements of the art, namely, the sublime and beautiful. Such inquiries had employed the most learned and ingenious minds in all ages; and although the theorists are frequently demoniacal things, and must be treated with great caution, they are the great sources of the laws of the world’s social movements of the art, namely, the sublime and beautiful. Such inquiries had employed the most learned and ingenious minds in all ages; and although the theories are frequently demoniacal things, and must be treated with great caution, they are the great sources of the laws of the art.

In the following lectures the Professor proposes to review the examples cited in his former courses with reference to these important principles.

Lecture I.

The Professor said, that the improvement of the human faculties was exhibited in the history of Architecture. Natura, indeed, has formed an admirable object. The art might be termed the epitome of civilization, and the highest fruit of human thought, and order and combination, of every discovery in science, and of every conception of beauty. Political history was of comparatively inferior interest, and betrayed, for the most part, the depravity of our species. The natural faculties of man, those of agriculture, or commerce, their unvarying succession, brief endurance, and disappointment, leave melancholy convictions; but in the occupation of architecture, man finds the employment of those higher aspirations and idealities for which he feels himself born, as well as of his physical faculties. And in the universal exercise of the beautiful and the sublime, he has found a sphere in which he has been frequently exalted to the greatest heights in the pursuits of social life, and in that of the first fruits of social civilization.

Such inquiries afford the only means by which the principles of this or any other art can be ascertained, and the artist can be enabled to determine whether the beauty he creates is temporary or permanent. This authority is adapted to the accidental prejudices of his age or to the uniform constitution of the mind; and whatever the science of criticism can afford for the improvement or correction of taste must altogether depend upon the previous knowledge of the nature and laws of this faculty.

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Until I find out a place for the temple of the Lord, an habitation for the mighty God of Jacob.

In excavating the foundations of the temple at Ephraim, the remains of burnt offerings and sacrifices were discovered, mixed, no doubt, with libations and tears and aspirations as warm as those of David;—at Seirmus we find the steps in front of one of the temples worn down almost to an inclined plane, by the feet of the devot. So again of the accomplishments of these votaries amongst men. All ages shall find in Solomon's temple... full expression in the eighth chapter of the First Book of Kings, the dedication of the temple by Solomon.

The resemblance of the plan of the Tabernacle in the Wilderness, and with its surrounding court (the first in our series, n. c. 192), and still more, of the temple at Ephraim, to which the whole of the vaults, down to the Antinnes at the end of the second century of our era, is very remarkable. In the first the parallelogram is preceded by a portico of an irregular number, namely, of five columns. In the second (1012 n. c.) we have the temple in Antis.

If, however, we consider, we are still more struck with their correspondence; we find for instance, the irregular number in the temple of Jupiter at Agrigentum, one of the largest and most important of antiquity; seven columns compose the front; and we are reminded of Solomon's saying, (Ist, v. 11), "Wisdom built up her house; she has hewn out her seven columns." Again, at Pustum we have a temple (miscalled a basilica), with nine columns in the front. Other examples also might be cited. Again, of the Temple of Solomon, that of Thienis at Rhammus, and the frequent temple in Antis, with its praxus and heiron, is the constant copy. The altar, the stylobate, the table of shew-bread, are all traced either in existing remains, in bas-reliefs, or in medals.

The connexion of classic and sacred architecture is thus apparent; and the author of "The Plagiariums of the Heathen Detected," (Mr. Wood, of Bath,) is borne out in this comparison of the most ancient temple architecture. The common error (one to be carefully avoided) is the attempt to trace this resemblance in the styles, or the ichnographic figure of the parts and orders—the mere venture of the scheme; and the failure in strainiong the texts and examples (Corinthisian or Doric) to a perfect correspomence. Wood, Vitruvius, Wilkins, has always thrown a doubt upon these interesting investigations; but the comparison of the plan of the temple, the Tabernacle, with that of the Temple of Solomon, would show, that the most ancient of the Druids, but the most ancient by far is the parallelogram, after the Tabernacle: in fact, the earliest inhabitants of the bordering countries were apparently monotheists; their connexion with the Jews through Tyre and Sidon, their respect for a people of superior knowledge and religious instinct, the mighty effect of the professors of paganism, the Jews, and amongst them the idol took the place of the ark; with both, the temple was the Domus Dei; both were religions of sacrifice.

The ritual was thus the originator of the form of the temple, and must always be so. The temple in Athens became (with a view to ornament, and by the works of masters) a kind of grand order, or portico, or monumental order, or temple. The most beautiful of the Greek temple was not, then, an invention of taste, but one of ritual; and in the consideration of templar architecture, in all times and countries, this important fact must be carefully born in mind.

Another point of resemblance of classical and Jewish architecture, of great import, since it is the hinge upon which the whole system of ancient architecture turns, is the employment of "costly stones, even great stones, stones of ten cubits, stones of eight cubits." Upon this practice the whole character and taste of sacred and classical architecture depends. The tenth book of Vitruvius treats chiefly on large stones and their transport. The type of Domus Dei admitted of no extension; only the mode of giving magnificence and dignity to temples, thus circumcrised in form and composition, was by the employment of monolithic masses, and by the expression of the dignity of the temple by the dimensions and sculpture. The ancient world is full of examples of this remarkable principle, and the last and most signal one is that in the temple at Balbec, by the Antonines, in which three stone measure, in the aggregate, upwards of 199 feet in length.

The size, his upon the arrangement of plans of Greek and Roman temples, would be too long, and must be referred to the publications upon them specifically; but as brought together in this view it may be observed, that the temple at Ephesus, the size of which we learn alone from Phiny, exceeded all others; and also the measurements of the temple at Ephesus, and of the great temple to Jupiter especially (at Athens, Agrigentum, Selinus, Balbec, and Rome) to about 338 feet in length, might lead us to suspect the text of Phiny. Vitruvius gives us a few hints of the arrangement of the ancient temples to numbers in his third book, with reference to the dimensions of temples. The investigation of this subject might be attended with curious results. The frequent dimension 338, by the addition of the stylobats, or by the superimposition of the stylobats, will exhibit the size, in inches, of these instances, upwards of 60 feet in diameter in the temple. The occupation of the whole of these interiors by the idol, their employment as a vast niche to receive the god (in ivory and gold, at Olympia and Athens), had something of monstrous, but magnificent; and invested with the art of Phidias, we may understand how come we have admitted the solid temple; the stone altars to the God. Which we are told, in the presence of the beauty and majesty of the godhead, as figured by that great master.

Arrived at that period (315 A. P.) in which the Christian religion was adopted by the state, the range of temples now exhibited displays a total reverse of the previous arrangement. The old ritual of external worship and of sacrifice was abrogated. It was now internal and of the heart; the portions were now inclosed; a vast area covered with a roof, of which the basilica was the best model, constituted the Christian temple. Upon this the arches of triumph, either plain or exedra, the dome, in plan as well as in every other situation. The theory of the church of Constantine is handed down to us by Eusebius, bishop of Cesarea; he describes the church of Tyre [which the Professor exhibited] and many others of the Christian churches, the dimensions and arrangement of sacred edifices, which may be very profitably consulted by the architect. The basiliacs of St. Peter's and that of St. Paul's at Rome, in the form of the Latin cross, become the types of the Christian church throughout Western Europe, with very small variations; the plan of the dome, which then only modified it, down to the present day.

It was said that 1800 churches and religious structures were built during the reigns of Constantine and Justinian: these of the former were in the basilica form, which is liable to decay; those of the latter, to the square and rectangular plans. The early churches were of the Greek cross of equal lengths. The transept was covered with a large dome, and the ends of the cross with minor ones, forming a group highly favourable to architectural effect. This form, executed in Santa Sophia, became the model of the world, and the dome also, 120 feet in diameter, exceeded any executed since the Pantheon at Rome.

The Professor exhibited several Greek churches at Arta, Thessalonica, and other parts of Greece, measured by himself, as also the valuable researches on the Greek church architecture of the sixth and seventh centuries, by M. Touchard, which are important to the study of the history of architecture and to the practical architect. The churches of Russia were all upon this plan. Procopius was the author, who might be consulted with reference to this era of the art.

The dome, which had become the distinguishing feature of the Eastern church, introduced into Italy, under the exarchate at Ravenna, in the church of Santa Vital, 510 A.D.; and again at Venice, in St. Mark's, built by a Greek architect (976—1071). Until the eleventh century, the dome formed no part of the western church, except in those instances; it was then that the Pisans, the richest and most commercial people of Italy, began their great church (1063), and adorned the transept with this new feature.

The rivalry of nations is the great fulcrum of so many a noble effect, in arts as well as politics; and to this motive chiefly, we may attribute the bold scheme of Arnolpho de Lapo, in the church of Santa Maria, at Florence, in 1290; in which, doubtless, after the model of the Pantheon, he proposed to place a dome, of nearly equal magnitude, over the transept, but raised into the air in a way hitherto unattempted, except at Constantinople, where, however, the space was one-sixth smaller. But the invention was too grand, and the building too costly; and it was conceived and executed, and it was completed and finished twenty years after, that Brunelleschi accomplished the work, as related in the very amusing and instructive account by Vasari.

It was just one hundred years after this successful work that Michael Angelo executed the dome at St. Peter's, confessely in imitation of it, as he told himself, in contending with his master.
their unexamined hardnood and practical science, though the remarks on their principles of structure and of art, which the future lectures will have occasion to offer, will show that neither the geometrical nor the scientific architect need regret the imperfect condition of the Equitable Gas Company. One thing is certain, the model design of our own churches, except to that characteristic prudence of our countrymen, which requires the full accomplishment of every enterprise undertaken, it may not be easy to determine; certain it is, that all the churches of this country are complete in their design and features, whereas those of the eighteenth century are very rarely complete.

The words of our poet, though not always applicable to architects, unhappily, may be so to our pastors and masters.

When we mean to build, we first survey the plot, Then draw the model: which if we find exceeds ability, What do we then, but draw anew the model in fewer offices.  

—Consult surveyors, know our own estate, How able such a work to undergo. Or else we build like those, who half thro' give o'er, And leave their part created cost.

A naked subject to the watery clouds, And waste for curfus Winter's tyranny.

With reference to the gradual verticality which the sections of this series of columns assume, we might say, that the earliest were of the earth earth, and the latter we will assume the regularity which Assur were designed. Thus, the height of the Pantheon, at Rome, was equal to its diameter, or as 10 to 10; that of Venus, and Rome, was as 12 to 10; that of the Baths of Caracalla, as 11 to 10; of St. Peter's, at Rome, as 17 to 10; of St. Paul's, London, 29 to 10, as also of Lincoln; and that of Cologne was as 31 to 10.

The last great temple of Christendom, was the Magdalene Church at Paris; it is 325 feet long by 136 feet wide and 120 feet high, and equalled the smallest temple at Baalbec. It was the work of more than a century. In England, great activity has been given to the work of re-building during the last twenty-five years, but the warmest admirers of those zealou works could never pretend that any regulated architectural spirit has directed those works. No church of a monumental character had been attempted. The ascendancy of the new church jury, though it is the most favourable to art, as it is not unlikely, that under good direction, it may flourish in a few years. But there is much pedantry abroad, and an absence of all originality and intrinsic character in the taste of the day, which leads to the Roman Catholic form, the basilia, suited to a demonstrative form of worship, rather than the auditorium required by our ritual. Venetian for antiquity is to be respected and encouraged, but its transition to superstition is easy. The divines of 1668 have left us models, erected under the direction of Sir C. Wren, which have not been surpassed. Seven of the city churches were exhibited (measured by which whole churches may be considered as remarkable for their adaptation to our form of worship—offering the largest area, with the smallest obstruction to the sight and hearing—as they were ingenuous and admirable in taste and structure.

The favourite design of Sir J. Wren (laid down from the model now in St. Paul's), was also exhibited. It was a precious legacy to posterity, which had never been surpassed in architectural beauty and arrangement, for the Anglo-Protestant Catholic church, and would probably at some future time be executed.

The attachment to our national architecture may be indulged with great propriety by the adoption of the forms of the Lady Chapels, modified and suited to our ritual—as those of Wells, Ely, and others; or of the chapter houses; and the Greek church. The basilica form requires length lusuated to our services, and the fragments or curtailed portions of that form, often practised with small success in our recent churches, seems to point to the greater advantage of the vertical arrangement, which the models, the Fessor ventured to suggest, in the churches of Wren, and the examples quoted, would assure us to.

### The Metropolitan Paving Act.

As important case came before Mr. Hardwick at the Marlborough Police office, on the 24th of December last, arising out of a dispute between the Equitable Gas Company and the Commissioners of Paving for the parish of St. James, who, pursuant to the 57th section of the 3rd and 4th of George the 4th, they stood thus—No water or gas light company shall break or take up the pavement in any street for the purpose of laying down any main or pipes of water, unless notice in writing be given to the surveyor of pavements three days previous to such breaking up, etc. The water and gas companies are placed upon the same footing, and in the case of pipes, the taking up of the street is not required. By no gas company can take or break up any pavement for the purpose of laying down any new mains or pipes without the consent in writing of the Board of Pavements. When my attention was first called to this question, by a reporter from the Equitable Gas Company, in the disjunctive, the word "pipes" must be taken to include pipes of every description, and that the Board of Pavements was right in their view of the case. But on a more attentive perusal of this section, and especially of the following one, that impression has been much removed; and I am now inclined to think that the difficulty in the matter has arisen from the ambiguous use of terms, from using different expressions to signify one and the same thing; for example:—In the beginning of the 12th section, which directs of what materials mains should be, the language there used is worthy of observation. "That all new or complete mains, or pipes laid down in any street by any water or gas company, whether such new or complete mains of pipes shall or shall not be substituted for, or added to, any other complete mains or pipes, shall be of iron alone." Here in these few lines we have three different expressions—"mains, or pipes, main of pipes, and main of which pipes were laid down." In the next clause separate and distinct mention is made of service-pipes, which may be either of iron or lead, or other durable material; from which I am induced to infer that, possibly, "or" is a typographical error for "of, or at least to be taken in a disjunctive sense, but, as it is frequently expressed, an alternative of terms, a definition or explanation of the same thing in different words. Thus "main" being purely a technical word of the most comprehensive signification, the terms "pipes" and "mains or pipes" have been added and used as an alternative term to give it a clearer and more definite meaning for the purposes of this act, and therefore the expression "mains or pipes," in the clause under discussion, may not unfairly be read as synonymous with "mains of pipes," or pipes forming the main. If this should be the right view of the case, the complaint must be revised; as the pipe in question laid down is a service, not a main pipe, it requires notice only, not the consent of the board.

Mr. Smith argued that the 11th section of the act of Parliament related both to main and service pipes, whether they were for gas or water companies.

Mr. Hardwick said this question only applied to mains.

After a long discussion, Mr. Hardwick said he still adhered to the conclusion he had just read.

Mr. Smith observed, that unless there was a conviction before the magistrate, he had no power of appeal.

Mr. Hardwick said the proper court of tribunal was the Court of Queen's Bench.

Mr. Clarkson had waited patiently while this discussion was going on. He was, however, very much surprised to hear [that Mr. Smith had declared] that the gas company, in their action to recover the costs [of which Mr. (Clarksou) was proud to call his learned friends—viz., the present At torney-General (Sir F. Pollock), or former Attorney-General (Lord Campbell)], Mr. Adolphus, and another learned friend, all of whom had given opinions on the subject. In which Mr. Smith said he contended that the mains having been laid down at the house of any person applying, common law and common sense gave him the power, which the law of England gave every man, of having his own subsoil opened. He did not know whether it was, as the worthy magistrate had observed, a typographical mistake in the act of Parliament in substituting "or" for "of, or one of those tinkerings which he had so frequently observed in the machinery of acts of Parliament, but he must say the act was most defective. It was wind without sense; sometimes the word "mains" was used, and sometimes the word "pipes," and it was evident the draftsman had no idea what things it would be, if a collector was to come to a person who wished his gas to be laid on in the front of his house, and say he did not like his look; or, if another was to be asked to lay on the water, to say he did not admire his politics. Would such proceedings be tolerated? He was certain not. The trenching of the mains had been going on, and had not had a right of breaking up the street, and in his opinion he was fortified by the opinions of the eminent legal authorties he had mentioned. A similar case had been argued before Mr. Long by himself and his learned friend Mr. Boonkin, and the learned magis trate to which [case], in which Mr. Smith supposed the draftsman of the Bill was under the impression that his learned friend's arguments, against him and the parochial commissioner.

A discussion was here raised between Messrs. Clarkson and Smith, as to whether or not notice had been given on the 11th of May by one of the inspectors of the gas company of his intention to open the street; Mr. Clarkson replied that such notice had been given.

Mr. Hardwick considered that, by the arguments which had been brought before him, and also by his own previously written opinion, the gas company were authorized to open the ground for service-pipes; the complaint was therefore dismissed.

SECOND NOTICE.

We may resume our notice of this work, by remarking that Mr. Gwilt infuses almost quite as much in criticism upon "critics," as upon buildings, and that as regards the former, he is apt to express himself with a degree of spleen against the whole race, that amounts to want of temper, which certainly cannot be calculated to obtain for him their good word. Nevertheless, his present work has obtained a qualified, not to call it outrageous praise, from some of them; viz., those who write for newspapers, and in whose favour he is henceforth bound to make an exception. Most good-natured they certainly must be allowed to have shown themselves—that is, supposing they looked far enough into his book to meet with some of the ingracious reflections he has thrown out upon the fraternity of reviewers. Although not very thin-skinned ourselves, nor disposed to vindicate the pretensions of all our reviewing brethren, we must say, that Mr. Gwilt carries his hostility too far. He takes it for granted, that none of those who write upon architectural subjects in literary journals, are professional men, or if not belonging to the profession, can have qualified themselves for the task. Were this "catalogue of works on architecture," which he has given in his Encyclopedia, what it ought to be, it would contain many, and those not the least interesting or valuable of all, for which we are indebted to the studies of those whom Mr. G. would have us regard as little better than intruders and pretenders—persons who just know enough of the subject to assume a tone of authority, and mislead others. Since he has not thought proper to insert in that "Catalogue," such works as Hope's History of Architecture, Parker's Glossary, (now considered as a sort of authority,) and the publications of Rickman, Whewell, and Willis—not to mention others, which he has omitted; we must suppose that he estimates them not at all higher than the ex-fusions of anonymous scribblers and reviewers, although they have obtained some character not only with the public, but with the profession also. What may be his standard of merit—where he has drawn the line between works that are, and those which are not worthy of being recommended to the student, we are unable to say, for he seems to be just as over-liberal and indulgent in some instances, as he is vigorous in others. Among the publications enumerated under the head of modern English architecture, we do not find the "Public Buildings of London," or Malton's "Picturesque Tour," which last, though not professedly architectural, as it contains only views, is an exceedingly interesting graphic work. Neither are Robert Adam's designs there mentioned, although those of James Lewis, a far less distinguished architect, are. Neither is Barry's "Traveller's Club Houses," to which, notwithstanding that both the building itself is considered a tolerably favourable specimen of English architecture at the present day, and is more fully illustrated than almost any other individual edifice, excepting Holkham.

That these remarks are rather ungracious, and not likely to prove altogether palatable to Mr. Gwilt, we do not deny; but many of his own remarks are so exceedingly ungracious and illiberal, that he has no right to look for much forbearance on the part of others. Even while we are willing to give him credit for having the interests of architecture at heart, we think he has altogether mistaken the way in which they are to be promoted. Instead of expressing any satisfaction at finding that architecture now begins to excite far more attention than hitherto, he takes no pains to consider his disquisitions purely horizontal subdivisions, its being taken up as a mere pursuit, by those who do not apply it professionally; which is almost tantamount to saying, that those who have a taste for the study, have no right to indulge in it, and to acquire that knowledge of the art, which is indispensably requisite, if they would really enjoy it, and become capable of judging of its productions, whether for the stage or the screen, and is so completely contrary to all views of sound policy. Moreover, it is to be feared, it will be adopted. Of that, however, we have little apprehension; it were ever so desirable, it is now too late to attempt to check what is, if not a rapidly advancing, a widely spreading taste. Far more reason is there to apprehend that the prejudices to which Mr. G. has given way, will raise up some prejudice against his own book; at all events, they are not calculated to obtain him good-will. And though on our own part we might have abstained from advertting to this characteristic of his Encyclopedia, we should have felt that by so doing, we were deserting the cause of architecture and its friends, and by our acquiescent silence, abandon many who have rendered important services to that cause, to the odium attempted to be thrown upon them by Mr. Gwilt.

To return to the volume itself: the more popular portion of it, namely, the histories, by no means so full as it ought to be, and might have been, had space permitted, but having been omitted elsewhere a great deal of matter which there was not the least occasion to introduce at all. Of the architecture of many parts of the Continent, we meet with only hasty sketches, without any specimens of their buildings; and even the history of Italian architecture is cut short very abruptly, being brought down only to the beginning of the 17th century. As the following and the present one, had produced nothing of the least note. Yet some mention of Calderon and his works, if of no one else, might have been expected, from a professor admirer of the Palladian school, as Mr. G.

Of a work of this nature, it is hardly possible to convey a suitable idea by extracts or detached passages; nevertheless, we give those in which the characteristics of the Florentine, Roman, and Venetian schools are spoken of, and respectively illustrated by an example.

Florentine School.—Climate and the habits of a people are the principal agents in creating real style in architecture; but these are in a great measure controlled, or it is perhaps more correct to say modified, by the materials which a country supplies. Often, indeed, these latter restrict the architect, and induce the lightness or massiveness of the style he adopts. The quarries of Tuscany furnish very large blocks of stone, lying so close to the surface that they are without other difficulty than that of carriage obtained, and removed to the spots where they are wanted. This is probably a circumstance which will account for the solidity, monotony, and solemnity which are such commanding features in the Florentine school; and which, if we may judge from the colossal ruins still existing, similarly prevailed in the buildings of ancient Etruria. In later times another cause contributed to the continuance of the practice, and that was the necessity of affording places of defence for the upper classes of society in a state of insurrection continually occurred. Thus the palaces of the Medici, of the Pitti, of the Strozzi, and of other families, served almost equally for forresses as for palaces. The style seems to have interdicted the use of columns in the facade, and on this account the stupendous cornices that were used seem actually necessary for the purpose of imparting gravity to the composition. In the best and most celebrated examples of their palaces, such as the Strozzi, Pandolfini, and others in Florence, and the Picolomini palace at Siena, the cornices are proportioned to the whole height of the building considered as an order, notwithstanding the horizontal subdivisions, and small interposed cornices that are practised between the base and the crowning member. The courts of these palaces are usually surrounded by columns and arcades, and their interior is scarcely ever indicated by the external distribution. From among the extraordinary palaces with which Florence abound, we place before the reader the exquisite facade of the Pandolfini palace, the design whereof (Fig. 1) is attributed to the divine Raf.

![Fig. 1] Pandolfini Palace. In it almost all the requisites of street architecture are displayed. It is an example wherein the principles of that style are so admirably developed, as to induce us to recommend it, in conjunction with the facade of the Farnese palace hereafter given, to the elaborate study of the young architect.

Roman School.—Though the city of Rome, during the period of the rise and progress of the Roman school of architecture, was not altogether free from insurrectionary troubles, its palaces still show the features of that of Florence. None of its buildings present the fortress-like appearance of those in the last-named city. Indeed, the Roman palaces, from their grace and lightness, indicate, on the part of the people, habits of a much more pacific nature, and an advancing state of the art, arising from a more intimate association with the principles of purity which were on every side. The introductions of columns becomes a favourite and pleasing feature, and great care and study appear to have been constantly bestowed on the facades
of their buildings; so much so, indeed, in many, that they are but marks to indifferent interiors. In them the entrance becomes a principal object; and though in a great number of cases the abases which enter into its composition are manifold, yet the general effect is usually successful. The courts in these palaces are most frequently surrounded with arces, whence a third case of considerable dimensions leads to the sala or principal room of the palace. The general character is that of grandeur, but devoid altogether of the severity which so strongly marks the Florentine school. The noblest example of a palace in the world is that of the Farnese family at Rome.

"The palaces of Rome are among the finest architectural works in Europe; and of those in Rome, as we have before observed, none equals the Farnese, whose façade is given in Fig. 3. 169. "Ce vaste palais Farnese, qui a tout prenent, pour la grandeur de la masse, la regularité de son ensemble, et l'excellence de son architecture, a tenu jusqu'ici, dans l'opinion des artistes, le premier rang entre tous les palais qu'on renonce," is the general description of it by De Quincy, upon whom we have drawn largely, and must continue to do so. This edifice, by San Gallo, forms a quadrangle of 256 feet by 183 feet. It is constructed of brick, with the exception of the dressings of the doors and windows, the quoins of the fronts, and the entablature and loggia in the Strada Giulia, which are of travertine stone. Of the same stone, beautifully wrought, is the interior of the court. The building consists of three stories, including that on the ground, which, in the elevations or façades, are separated by impost cornices. The only break in its symmetry and simplicity occurs in the loggia, placed in the centre of the first story, which connects the windows on each side of it by four columns. On the ground story the windows are decorated with square-headed dressings of extremely simple design; in the next story they are flanked by columns, whose entablatures are crowned alternately with triangular and circular pediments; and in the third story are circular-headed windows, crowned throughout with triangular pediments. The taste in which these last is composed, is not so good as the rest, though they were probably the work of Michael Angelo, of whose cognoscite to the edifice Vasari observes—"E stupendissimo il cornicioncino, maggiore del medesimo palazzo nella facciata dinanzi, non si potendo alcun rom ne pù belli ne più magnifici desiderare." The façade towards the Strada Giulia is different from the other fronts in the centre only, wherein there are three stories of arcades to the loggia, each of whose piers are decorated with columns of the Doric, Iouc, and Corinthian orders, in the respective stories as they rise, and these in form and dimensions correspond with the three ranks of arcades towards the court. It appears probable that this central arrangement was not in the original design of San Gallo, but introduced when the third story was completed. Magnificent as it is, and the commensurate of the central arrangement above mentioned towards the Villa Giulia is repeated on the two lower stories, over the upper whereof is a solid wall pierced in the theatres and amphitheatres; and in its application at the Farnese palace rivals in beauty all that antiquity makes us in its remains acquainted with. San Gallo, its architect, died in 1546."

The Venetian school is spoken of at much greater length than the others, and is, in our opinion, not a little over rated; for when we come to examine some of its most noted productions, we find them to be made up of insignificant parts, and petty orders treated in a formal, dry, and meagre manner, without any of that richness, or of that formality, which is seen so happily jointed in the French schools. The Farnese palace, and the Venetian order, will, therefore, be the subject of the present account.

"The Venetian School is characterised by its lightness and elegance; by the convenient distribution it displays; and by the abundant, perhaps excessive, but lovely columns, pilasters, and arcades, which enter into its composition. Like its sister school of painting, it is more to the seasons than is the case with those we have just quitted. We have already given an account of the church of St. Mark, in the 12th century; from which period, as the republic rose into importance by its arms and commerce, its arts were destined to an equally brilliant career. The possession in its provinces of some fine monuments of antiquity, as well as its early acquaintance with Greece, would, of course, work beneficially for the advancement of its architecture. That species of luxury, the natural result of a desire on the part of individuals to perpetuate their names through the medium of their habitations, though not productive of works of any considerable scale, leads, in a democracy (as were the states of Venice), to a very general display of moderately splendid and elegant palaces. Hence the extraordinary number of specimens of the building art supplied by the Venetian school."

"San Micheli, who was born in 1484, may, with propriety, be called its founder. Having visited Rome at the early age of 16, for the purpose of studying its ancient monuments of art, and having in that city found much employment, he, after many years of absence, returned to his native country. The mode in which he executed and beautified architecture with the requisites called for in fortifications may be seen displayed to great advantage at Verona, in which city the Parta del Pallia is an instance of his wonderful ingenuity and taste. But his most admired works are his palaces at Verona; though, perhaps, that of the Grimani family at Venice is his most magnificent production. The general style of composition, very different from that of the palaces of Florence and Rome, is marked by the use of a basement of rustic work, wherefrom an order rises, often with arched windows, in which he greatly delighted, and these were connected with the order after the manner of an arcade, the whole being crowned with the proper entablature. As an example, we give in Fig. 3, the façade of the Pompeii palace at Verona. The genius of San Micheli was of the very highest order; his works are as conspicuous for excellent construction as they are for convenience, unity, harmony, and simplicity, which threw into shade the minor abuses occasionally found in them. If he had no other testimony, it is sufficient to say, that for his talents he was held to be in great esteem by Michael Angelo; and our advice to the student would be to study his works with diligence. San Micheli devoted himself with great ardour to the practice of military architecture; and though the invention was not for a long time afterwards assigned to him, he was the author of the system used at La Vauban and his school, who, for a long period, derived him of the credit of it. Before him all the ramparts of a fortification were round or square. He introduced a new method, inventing the triangular and pentagonal bastion, with plain fosses, flanks and square bases, which doubled the support; he moreover not only flanked the curtain, but all the fosse to the next bastion, the covered way, and glacis. The mystery of this art consisted in defending every part of the inclosure by the flank of a bastion; hence, mak-
ing it round and square, the front of it, that is, the space which remains in the triangle, which was before undefended, was by San Michiel provided against.

In this example of San Michiel's style, the Palazzo Pompei at Venice, the basement is the best part of the composition, for the order is too small in proportion to the rest, and the openings on the principal floor as much too large, at least as windows, for the piers between them must be most imposing. One of these with Pall Mall, he would perceive what use had been made both of the one and the other, by Mr. Barry, in the two adjoining club houses—the Travellers and the Reform. Though neither copies nor even imitations—in the ordinary meaning of the term, they are evidently borrowed from those prototypes, which in point of mere taste, are there improved upon and refined.

The Reform Club House has a spirit of its own, as being a direct copy of the Farnese; with what justice or judgment, may be seen from the above representation of the latter, which though too small to do more than afford an idea of the general composition, shows the manner in which the entrance and window on each side of it are squeezed together, produces anything but an agreeable effect; while the centre window above, exceptionable in character at the best, is, as introduced, as to constitute a striking blemish in the whole design.

We must now take leave of Mr. Gwilt's work, which we should have been happy to have been able to speak of in less qualified terms of approbation. It contains a great deal of valuable, but not so much fresh matter as it might have done; but it also contains many other things, which we should have supported, not likely to gain ground with the public, at the present day. We cannot, however, conclude, without expressing our high approbation of the spirited manner with which the publishers have got up the work, both in the typography and illustrations; the latter are beautifully executed as wood, or may be seen by the above specimens, which we have been permitted to select from the work.

Examples of Railway making; which, although not of English practice, are submitted, with Practical Illustrations to the Civil Engineer, and the British and Irish public. London: Architectural Library, 59, High Holborn.

The great disparity between the cost of railways in this country and that of similar works in America, is worthy at the present time of giving rise to some important considerations. Whilst on this side of the Atlantic, our main lines of railway have been constructed of materials extremely durable, in a manner remarkable for strength and solidity, and according to a standard of excellence with respect to gradients, which far surpasses any thing that has been attempted under like circumstances in other countries, the policy of absorbing such vast sums of money as have been required to effect all this is at least open to controversy. Hitherto every thing has been done in accordance with our national character, and never has that spirit of energy and industry which marks the Briton under every varying circumstance of time and distance, been more proudly exhibited than in the bold and ardent expedition with which the surface of this country was chequered by a net work of great commercial highways, constructed in almost every respect on principles the very antipodes of those which have guided other nations in their imitation of the same spirit. Seizing at once upon the experimental fact, that the friction of iron wheels upon iron roads is incomparably smaller than upon roads of stone, and connecting this with the no less certain truth, that resistance to motion is made up of friction and gravity, the English engineer conceived the grand idea of almost annihilating gravity by reducing the track of the railway to nearly a perfect level. It was demonstrable that the same absolute power which could impel a given weight was capable of expressing a weight of such substances of way, impel five times that weight at treble the velocity, and it was further unquestionable that an inclination greater than 1 in 224 would at least double the power required to effect this, and thus diminish the superiority of the railway by one half. If a horizontal railway be compared with a horizontal common road, the superiority of the former over the latter is as 15 to 1; but if a railway inclining 1 in 50 be compared with a common road also inclining 1 in 50, its superiority in this case is only as 14 to 1. Following out the principle of which these are illustrations, it is no less obvious now than it was in the origin of railways, that the more nearly the planes of a railway approach to a level, the more superiority will they present over the common road. It was this principle which inspired the builders of some of the most recent and most grand railways of France, which, though constructed on a low level, should be brought low, and every valley should be filled up. It was this which caused the transport of vast masses of earth from the higher to the lower parts of the country, which forced the deep excavation, rear'd the lofty embankment, bored the yawning tunnel, and dealt with all the most solid materials of earth, as if they had been the work of a balanced scale instead of forces which require to be encountered by the sinews of hosts and the wealth of nations.

For, acting on principles which appeared to be sanctioned by every maxim of wisdom and experience, who can blame, with any show of reason, the engineers of this country, to whom the world is so much indebted, to less in the early origin, than during the steady progress of our railway engineering. For whereas it was in its infancy, no voice was raised in opposition to the principle of almost horizontal gradients, and the necessity for those gigantic works which this principle demanded was as heartfelt acquiesced in by directors, by shareholders, and by the whole public, as by the engineers themselves. Nay, had it been otherwise—had the engineers stood alone in support of their principle—had the public voice been against them—and had the public press branded their projects as extravagant and wasteful, we are amongst the number of those who contend that they would still have done right to maintain their principle, and we should have applauded and admired them the more for carrying, in the first instance, a superior degree of excellence into those works which were destined to form examples to the civilized world. We confidently appeal to any competent judge, who, thoroughly understanding the mechanical and political distinctions between the railway and the common road, shall fairly and dispassionately review the circumstances of this country, whether we should have done well or wisely to adopt a less horizontal succession of planes for those main lines which are probably destined to endure for ages, as the great arteries through which commerce will ramify into a thousand inferior channels all over the face of the country. While we thus regard with great satisfaction the superior character with respect to gradients which has been adopted for all the great railways of this country, there is yet another element in their construction, which, while it influences in no degree whatever the facilities, yet contrasts remarkably in point of expense with corresponding works on the American lines. We shall readily be understood here as referring to those costly bridges and viaducts of iron, brick and stone, which have so enormously swelled the estimates for executing our principal railways. To decide upon the kind of gradients to be adopted for a given line, is a matter of some importance; for there is more than one expense—that of construction—required, in the first instance, only a knowledge of simple principles, and in the absence of that experience which later years have supplied with respect to the comparative expense of working lines with steep and with level gradients, our engineers acted in a spirit of perfectly sound wisdom, when they laid the greatest practicable tax upon initial capital, for the purpose of obtaining, as nearly as possible, the smallest cost. This is the great and main advantage of the American system. Whether the facility for sciences, whatever the facilities for sciences, or for whatever the facilities for sciences, the American engineers were the more correct in their opinions, we cannot doubt. In such cases, the greatest expense is on account of the bridges and viaducts, for which, when constructed of wood, the cost would be more than double the expense of the railway itself. No other principle in the construction of railways can have more influence in the expense of the line than the character and form of the bridges and viaducts, which are destined to be the great ornament of the landscape, and which bear the stamp of the style adopted in the construction of the roads. The expense of rivers and viaducts has been the great subject of anxiety to American engineers, and the most formidable difficulty in the way of executing the immense works which have been undertaken by them. The most correct and accurate estimates which have been made of such objects, have represented the expense of the railway itself as comprising only from 10 to 12 per cent of the whole expense, while the bridges and viaducts have been supposed to amount to or exceed 50 per cent of the whole. It is evident, therefore, that the elimination of excessive bridges and viaducts will not be attended with disadvantage or disadvantage in expense.
are of wood. What we have said, however, will be sufficient to indicate the general principle of the comparison, and the utmost concession we are prepared at present to make to the champions of cheap and therefore temporary railways, is this, that the comparative cost and the comparative durability of the two classes of works are, in all cases, worthy of being considered by the engineer in connexion with the circumstances from which the motive for constructing these railways is given.

We are aware that, in all this, we are stating nothing new to the engineer; nothing but what has already occurred to most of the leading members in the profession, and nothing but what will be extensively practised, in laying out the numerous branch railways, which the convenience of the country still requires. Our object in making these observations is simply to remind them that when the question of railways is brought up as a question of politics, some part of the public mind, of the notion, that the costly stations and bridges and viaducts are all that distinguish our railways from those of Europe and of America. It should be remembered, that the much larger capital expended on our works has effected a system of levels, which enables us to command far higher speeds, and to realize, in every way, greater advantages from the railway, as compared with the common road. In every case where it is desired to take a comprehensive view of railways, as a political question, it is essential to distinguish between that part of the cost which is due to the superior character of the buildings connected with the railway, and that which is incurred in conformity with principles immediately connected with the first. In the latter, the effort is to save money; in the former, the cost associated with these points, we grant, that a statesman, a merchant, or a financier of any kind, may form a competent judgment, with proper data before him. On the latter, the only qualified judge is the engineer, because a decision must in most cases be made with reference to the future, and particularly with reference to the future auspices of engineering and mechanics, and the success of the railway. We quite admit that an engineer was qualified to chalk out a system of gradients which should correspond with the known properties of the locomotive engine, and of iron as a material for the wheels of carriages to roll upon — so in like manner Mr. Brunel, or those of like qualifications, are alone entitled to consideration in deciding such a question as that of the gauge to be adopted for the Great Western Railway, because the accuracy of the decision depended upon the truth or error of certain prognostications in physical science, which a mere financier, however able, is not competent to entertain. The engineer, in fact, must regulate his operations, both by past experience and by anticipations of the future; so what extent these latter are or should be based upon, the former depends on many circumstances, but to some important extent, all will admit, that the past should influence our future projects of every kind. It would, therefore, be highly desirable at the present time, that accurate and comprehensive returns should be framed of the actual working cost of locomotive power on all railways of every different rate of inclination, in order that a correct judgment may be formed upon the saving which may be thereby effected. It is to these results, we think, that the working expenses of railways will thus be compared. Thence we may form our own judgment of the effect of the engines and of the money spent in the United States, compared with the English, and may form some notion of the relative cost of the two kinds of works. The result is, that the American locomotive expense is, in all cases, less than the English, and that in a large number of cases, the actual working expenses are but little greater than the English, because, as we have already observed, the construction of the railways in the United States is on a less grand scale than in England, and the cost of materials is less.

A second division of the preliminary observations is principally directed to a comparison between the cost of the American railways and those of this country. The principal facts on which Mr. Weale argues, are these, that the aggregate cost of the American railways was estimated in 1839, at £4000 per mile, including all buildings and apparatus; and secondly, that actual works are not executed cheaper in America than in this country, as the greater expense of timber on this side of the Atlantic is more than compensated by the lower wages of labor. He, therefore, concludes that the greatly increased cost of the English railways has been caused by the more expensive nature of the works, that is by the difference of the two systems of construction. This is undoubtedly true to a certain extent, and here the comparison might cease, with this observation, that we have obtained far superior railways, as compared with those of America. In case, however, any erroneous notions may be formed as to the comparative eligibility of the two systems, which are here contrasted, it may be sufficient to suggest, that no fair comparison can be made without full particulars, not only of the works executed on each, but also of the grades and curves with which the lines were respectively constructed. It will be found that gradients of 25 to 30 ft. per mile are considered highly favorable in America, whereas, those of greater steepness than 15 or 16 feet per mile, have been held in this country to be highly objectionable. Again, as to curves, the American lines abound with sharp bends, which are quite inadmissible in those of great Britain. A large proportion of the American lines are graded only for single lines of way; and in many of those which are graded for double lines, only a single track has been laid down. The cost per mile, as stated above, furnishes a very unfair comparison, in every respect, with the English lines, where the gradients and curves are entirely of a different order, the works are far more substantial, and more costly constructions are required. It is impossible, in any case, and in many cases has cost almost nothing. Another important point of comparison is the annual expense of working the railways in the two countries. M. De Gerstner estimated, in 1839, that the annual expense of working the American lines was 56½ per cent. of the gross income. We are aware that the interest on the whole amount invested in railways in the United States does not exceed 2½ per cent. per annum. Now this annual expense is far greater than that of working the English
1813.

The railways—as, for instance, the Grand Junction costs $55-$8 of the income, the Great Western $38 per cent.; and taking the average of all the railways, it would be found considerably below the American lines. The consequence of this is, that while the American lines have been reduced when their heavy earth works become perfectly settled, and no longer subject to those slips which, up to this time, have occasioned such heavy expenses. We find that the average dividend of 32 railways reported in the Railway Times amounts to 4. 10s. per cent. per annum, which, although less in absolute amount than that produced by the English lines, is quite sufficient to provide the large capital for restoring their perishable works. On the other hand, the English lines, finely and substantially constructed, are paying a steady dividend of 4½ per cent. on the average and no reserved fund is required, as the works are calculated to endure for many centuries.

The conclusion to be drawn from all this is highly unfavorable to the American system, and at the same time encouraging to those who have embarked their capital in our own lines. While the railways of the United States must inevitably, in a very few years, present a condition of premature decay, with a hopeless prospect of restitution, those of this country will, in all probability, afford a more favourable investment for capital than at the present day. We have no wish toolute unduly upon the merits of the American system. We must consider, however, in the railways of the United States, that we must contend against these lines being held up as a model for the great trunk lines of this country. Mr. Weale points out several lines in which he considers the American system would be applicable, and particularly advances its adoption in Ireland. With certain restrictions, and under certain circumstances connected with the expected traffic, and the capital available to the undertakings, the American system of cheap temporary constructions and inferior gradients may be advisable for some lines in Ireland, but we should extremely regret to see the main lines in that country laid out on such a principle.

The most valuable part of Mr. Weale's book, because the most practical and the most interesting, is that relating to the bridges actually constructed for the American railways.

The Utica and Syracuse Railway, a road which has been selected as affording so favourable a specimen of cheap engineering in the United States, forms part of the great line of communication across the states of Massachusetts and New York. This great line, which has been executed by several different companies, is upwards of 590 miles in length. It commences at Boston, in Massachusetts, and passing through or near the towns of Worcester, West Stockbridge, Albany, Schenectady, Utica, Rome, Syracuse, Auburn, Waterloo, and Worcester, sweeps along the southern shore of Lake Ontario, for the last 200 miles of its course, from the Atlantic Ocean, and terminates at Buffalo, the northern terminus of the line. The great trunk line which lies between Utica and Syracuse, is 53 miles in length, and throughout its course it follows the line of the Erie Canal. We have no information as to the gradients on this line, but judge that they must be extremely favourable, as the Erie Canal was on a perfectly dead level, without any canal lock whatever between Utica and Syracuse, and for several miles east of the former place.

After an attentive examination of the plates referring to those bridges, we feel bound to pronounce that, as specimens of carpentry, they possess by no means superior merit. In place of that admirable system of timbers abutting against each other, which gives so much stiffness and strength to the best specimens of English carpentry, the light planks of the American bridges are held together by the quantity of bolts, and the proper strength of the timber is not applied to the fullest advantage. The white pine, which is used so extensively in the American bridges is a timber very little known in this country. It is a white wood with a short grain, possessing little strength, and being a very bad knot; it is used as a good deal in Edinburgh and other parts of Scotland for the interior of houses, but is never applied to external work.

In addition to the plates of the bridges, and of the viaduct over a considerable valley and creek on this railway, there are several plates, showing the system of piling and laying the permanent way on a part of the line, and a section of the earth works, with the remaining length being graded, as it is called in America, that is formed by cuttings and embankments, as usual in this country.

There are also several plates showing culverts, but these possess little interest for the English reader; nor could the engineer derive any advantage from a comparison of this part of the American railway system with his own. The last portion of the work contains an interesting account (historical and statistical) of the Belgian railways by Mr. Edward Dobson; but we believe this part of the work is only a translation.

These examples of railway making, affording the best account which has yet been published in this country of the railroad works of the United States, will certainly find a place in the library of every engineer. Although we cannot consent to the wholesale adoption of the American system which Mr. Weale appears to advocate, there are original matter required. We must not omit to mention in conclusion, that the plates, as in all Mr. Weale's works, are admirably executed, and the details are so well shown that the most ordinary capacity may readily comprehend every part of the construction.


We need scarcely say that on all occasions we feel much greater pleasure in speaking well of any book which comes under our notice than when we are obliged to pronounce an opinion of almost unqualified censure. In the present instance, however, an impartial reviewer has only the latter alternation; and we could wish sincerely for the credit of the profession both at home and abroad, that the production of works with such feeble claims upon public favour were much less rare than it is. We are told in the preface of Mr. Bourn's book, that the aim with which it has been written has been “the formation of a book of reference.” Had this really been the case, had the volume been the result of a work of many years, and had it been but a single page, we should have known what to expect, and should never have been deceived into supposing that we were opening a book containing the principles and practice of every kind of surveying. But we are told in a few lines further on in the preface, “that the volume is intended to constitute a consistent whole; so that to understand an advanced part, a person must be conversant with what goes before.” How then can it be a work of reference in the common acceptation of this term, since by the author's own showing, it requires a regular study to be made of what goes before, in order to understand any advanced part. Surely this destroys its value as a work of reference.

Indiscriminate censure is seldom just, and in the present case we are far from saying that the book before us is absolutely worthless, and that there is nothing in it which might be instructive to the professional man. At the same time we feel bound to enter a strong protest against that too prevalent system of book-making of which this work is a remarkable specimen. It contains an immense mass of antiquated information injudiciously selected and badly arranged. The few facts which are given, are the better part of the papers. We are content to omit the minute points of professional practice, often magnified into undue importance, and introduced to the exclusion of more valuable things for no reason that we can discover, except that they happen to have formed part of the author's own practice, or to have been introduced by some as the result of a labour of months. We have extracted, however, through the whole contents of this book, which is an octavo volume of 336 pages; but having looked into several of those parts of which it are not purely elementary, the general impression is by no means such as to encourage a further search. In every point of view the work is far inferior to those of Mr. Bruff, and to Mr. Williams' Geodesy, books which have been reviewed in former numbers of the Journal.
Turning and Mechanical Manipulation, intended as a Work of General Reference and Practical Instruction, on the Lathe and the various Mechanical Purposes followed by Amateurs. By CHARLES HOLZAPFFEL, A. Inst. C. E.

Mr. Holtzapffel looking at the deearth of works on the arts pursued by the mechanical engineer, has felt himself called upon to bring before the public the results of his experience on a subject of so much interest and value. It is fortunate, perhaps, for the mechanical engineer, that turning and many other of his pursuits have for a long period of years been a favourite occupation with many wealthy amateurs as thereby an abundance of practical work has been conferred on the tool maker, such as could have only been obtained by other means, and which has powerfully contributed to the improvement of the tools used in this important department, while many experiments have been made at private expense, which could scarcely have been executed by public means. With a class of wealthy amateurs to whom to look for supporters, Mr. Holtzapffel could scarcely have rendered a more acceptable service than the production of a work, which, both to the practical man and the amateur, must be of high utility. Mr. Holtzapffel, in the resources of his large establishment, and availing himself of the experience of his predecessors in the firm, possess many advantages for the task he has undertaken, and seems to devote himself to it with more ability. The treatment of the subject, as it appears now before us, is one of five books, and is devoted to the consideration of the various materials used. The second will discuss the principles of construction and application of cutting tools; the third will treat of hand turning; the fourth of complex or ornamental turning, and the fifth of the principles and practice of amateur mechanical engineering. The description of the materials is distributed into three classes; the vegetable, the animal, and the mineral kingdom. The description of the various kinds of woods, not only develops new facts as to their technical peculiarities, but illustrates their botanical characteristics, a portion of the work to which Professor Royle has contributed his valuable assistance. The materials from the animal kingdom, which are treated with no less ability, include shells and mother of pearl. To all who have found their way from the mineral kingdom, embrace clay, amber, jet, cannel coal, the ornamental and precious stones, the metals, and their alloys. To state, however, that the work is limited to a simple description of these materials, would convey an inadequate idea of its value, as it abounds with practical applications of many important or interesting processes. We have the observations on seasoning, softening, bending, and colouring wood; the manufacture of iron; forging, hardening and tempering of iron and steel; the melting and mixing of metals; and the properties of alloys; casting and founding; wire drawing and soldering. To the description of tempering alone twenty-five pages are devoted, and the subject is treated with a minuteness and ability, which leave nothing to be desired.


Considerable controversy has existed on this subject, and a long correspondence has taken place between Mr. Bergin and Professor Barlow; with respect to it, we, however, are more inclined to look forward to the result of the great trial now in progress at Dublin, than to depend upon any mathematical formula, upon the bases of which no practical action can be founded. The experiment will soon be satisfactorily settled one way or other, and the merits or demerits of the atmospheric system, will be shown in all their extent. Mr. Bergin has devoted considerable ability to the discussion of the subject, and the many who saw reason to distrust Professor Barlow's deductions, cannot do better than consult this pamphlet.


The fourth and fifth parts illustrate the pulley, inclined plane and wedge. The plan, which is that of giving practical and useful applications of the subject, is well carried out, and thus both theory and practice are at once brought home to the mind of the student; while it is not only a good work for the machinist, but an excellent drawing book. The work contains so many illustration valuable machines, that we feel ourselves still more strongly called upon to urge the necessity of some better press explanations accompanying the plate, treating on the theory of the powers and their several applications.


This contains much valuable matter of reference, and as such, we have much pleasure in recommending it to our readers.

ON THE STRENGTH OF BEAMS.

Sir,—The problem proposed for solution by your correspondent "Concrete," at page 27 of the last month's Journal, is certainly one of great interest and importance; as he states, I believe, it has not been investigated in any of the standard works on the strength of materials. Like all questions connected with the strains of beams, it is one which, whether considered theoretically or practically, is of the most complicated nature and of great difficulty; particularly if investigated with mathematical accuracy. There are so many data to such questions, varying in each particular instance—so many circumstances which modify the general result—such as the deflection of the beam, and consequent variation of the length of leverage, when the plates are not accurately placed, and thus subject to continuous or interrupted deflections, the economy and durability of which depend so much upon the proper application of mechanical principles. I am sorry to say, however, that even now, there are many engineers, particularly those belonging to the old school, and such persons, chiefly instances of mechanics, who will not admit its utility; who, because such a man as Telford, Brindley, George Stephenson, and many others, have risen to eminence by the mere force of their talents, unfettered by what they term, college knowledge, think that they may also go on the "thumb of rule" system. And yet, how frequently have I seen these pseudo-engineers, and other practical men, who will not look into a book, for fear it should destroy the originality of their conceptions, fall into the greatest errors from the want of such knowledge. I shall merely state one instance. A resident engineer of one of our railways proposed a plan for strengthening a timber bridge on the line, and in order to test the efficiency of his improvement, made a model of the bridge on the scale, if I recollect rightly, of one inch to the foot; he found that the model would support a certain weight, and thence argued in a truly practical manner, that as the bridge was twelve times the model, it would support twelve times the weight! Thus satisfactorily establishing the utility of his proposed improvement. To return to the question to be solved. If we omit the consideration of the deflection of the beam, the result will be simple and sufficiently correct for practical purposes. The tension of the beam is by no means so serious a point, and, generally, will be reduced to a consideration of the dimensions and form of a beam resting loosely on two supports, necessary to sustain a given weight, (in this instance 42 tons,) placed at the centre of the beam.

Your correspondent states that he found upon experiment, that a bar iron, broken as he describes, broke near the two supports; this certainly is strange, and contrary to what we should expect theoretically and practically; for it is evident that the beam between the two supports is more curved at the centre than near the supports, and consequently the strain, being measured by the tension of the beam, will be greatest in the centre, and gradually diminish to the point of support. I have several times repeated his experiment on a small scale, using, however, wood instead of iron, and have always found that the wood broke in the centre between the supports; of course, with the same proportion of external and internal parts mentioned by your correspondent.

It is also clear, from the principle of the lever, that the strain at the centre of the beam, is the same as that produced by a weight of 42 tons placed there, except that the action is reversed; the upper side of the beam will then be compressed in place of the lower side extended instead of being compressed. If what I have advanced be correct, as I believe, it will result that the best form to give to the beam is the parabolic; that is, the depth of the beam should be greatest at the middle point and diminish at the ordinates of a parabola towards the supports. As the reasons for assuming this form to be the best, are given in all works on the strength of materials, it would be useless to repeat them here. It is generally considered best to have the curved side of the beam upwards in such a case, but as in this example the action is reversed, it follows that it would be advisable to have the curved side downwards. As your correspondent only states the proportion of the distances of the weights from the points of supports to that between them, it is impossible to give the exact dimensions. If your correspondent has the formula to give a diagram, I have no doubt this explanation may be easily understood from the description, and by referring to that given by your correspondent.
If no better attempt to solve this problem be off red, you will oblige me by inserting this letter.

I remain Sir, Your obedient servant, 

London, Jan. 10th, 1843.

T. F.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

Dec. 19.—J. Shaw, Esq., in the Chair.

Mr. Fowler, Hon. Sec., on presenting a plan for rebuilding that portion of Hampstead, lately destroyed by fire, from M. Chateauneuf, mentioned as a gratifying circumstance, that our countryman, Mr. Lindley, the engineer, had been appointed by the senate to superintend, in part, the rebuilding of the city.

Mr. Godwin read a paper on Tournay Cathedral, which was partly given in last month's Journal, and the continuation in the present number.

Jan. 9.—Charles Barry, Esq., V. P., in the Chair.

A paper was read "On a new mode of constructing the Flows of Chimneys," by Mr. Moon, surveyor, explaining an improvement in the construction of flues, of a circular form, of different sizes, from 8 to 14 inches in diameter; the bricks are arranged in courses, carried up and bonded in the thickness of the wall.

"Description of the Testimonial to the late Sir Harry Bernard Nolle," erected at Lymington, communicated by Mr. Draper, of Chichestcr, the architect. It consists of an obelisk, 70 feet high, constructed of Dartmoor granite, standing on a pedestal 18 feet high, the total cost is about £1,100.

Mr. R. T. Williams, in reply, said Mr. Nolle was a "great engineer, public benefactor, and man of science, and the materials of our times.

Mr. Billings introduced his "Illustrations of a mode of striking Gothic trecury," they were principally other hand, and arranged from the old choir of Carlisle Cathedral, which was repaired in 1764. The principle upon which most of the varieties of the treacy in this cathedral were formed, was by the combination of the two solutions, the chemical method, in which the parts and resists the action of water and moisture. Colouring matter may be introduced into the solution, and give them any tint that may be desired.

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Jan. 23.—T. L. Donaldson, Esq., in the Chair.

A letter was read from Herr F. Eisenlohr, Professor, acknowledging the honour of being elected an honorary and corresponding member of the Institute; this letter contains some excellent remarks which we have been permitted to extract.

"I shall esteem it," says Herr Eisenlohr, "a great honour to be united in closest intimacy with your Institute, by the communication of anything relating to the profession. Such an intercourse and reciprocity among the archi-
tects of different countries is much to be wished for at the present time, which is principally distinguished from all previous epochs in the history of architecture by its want of unity. Attempts have been made for some time past to remedy this by imitations of the ancient Greek and Roman styles of architecture; and up to the present day many architects are repeating with various talent and success, the attempt to introduce those styles into the present edifices—some, even the imperfect conception of them, called by the French La Renaissance. On the other hand, in many places in Germany, a different course has been adopted, which, being partly suggested by the revival of a more Christian spirit, partly by the patriotic feeling excited by the French revolution, leaned more to the Christian architecture of the middle ages at home. This two principal divisions, each with their varieties, are opposed to one another here in Germany, and carried on, as it were, a contest in secret. The present age is engaged in seeking a something which at present does not exist, viz., unity in a sort of universal architectural. It seems to me, that no immediate and direct imitation in any style of architecture already existing, can be tolerated too much still, on the other hand, is not to be denied that we cannot and ought not to disregard history and its effects, that we must have some point in history at which to begin a root, from which a new stem may shoot up into blossom as from the soil of the present. It is quite clear also, that, in the theory and history must go hand in hand, whereby we must with consciousness attain to that new and unprejudiced position which, in childlike innocence, unconsciously existed at the commencement of all previous epochs in art. The difference between our age and its problem, and his architecture, and indeed every branch of the arts, consists in this that we ought to strive, to say, with main knowledge and power, to attain to that point at which former periods in art have in their infancy begun of their own accord. Where there is nothing but an empty and groundless adherence to forms, where architectural fallacy and principle, or a certain principle, is manifested, there an art of a peculiarly creative nature can never be for the better.

They all have the same end, the same principle of belonging to the present, and are only slight records of hygroscopic elements, and that we collect pictures of different schools in galleries, so King Louis has collected buildings of all possible periods; and as he had not got them at Munich, he could transport them thence from other parts; he had them built, and thus made a grand collection of architecture, that is, our age is and it is too late. In this, we must say that the modern collection of buildings at Munich is, as far as regards the arts, worth about as much as a picture gallery containing a mere hand or less successful copies of different masters and schools. If it be true that the spirit of the times is truly expressed in its buildings, that the architecture of every period is, as it were, a fossilized history, future generations will say that the present period was utterly devoid of character. By means of a more intimate acquaintance with the history of architecture, have been more than intimate acquaintance with the history of architecture, have been more than we think; as the history of the Romans, we have hitherto quite overwhelmed us, from its variety and quantity, so that we were quite robbed of our senses. Of this we must first get the mastery, and impelled by a careful observation, as well as by an artistic and inventive spirit, the consciousness of the fact, we are in a position to experience the influence of history to remain useless. We must, on the one hand, investigate from a theoretical and scientific position, how far our architecture and its elements answer to the conditions of its purpose, of the building materials, climate, and earth; and, on the other hand, in looking back upon history, endeavour to find what new and new forms similar to those which result from our abstract investigations, and thus a fruitful germ may be found for a modern and, in itself, harmonious style of architecture—a style which would gradually come into general use, and support the indefiniteness of the present age, and which could be the charges of fashion. In this, it appears to me, consists the great architectural problem of the present age, which can only be solved by united efforts.

Report on the Marbles from Lycia.

A report was read from the committee appointed by the Institute to examine the articles that were recently discovered by Mr. Charles Fellows parts of ruins of Xanthus, an ancient city in Lycia, in Asia Minor, and lately deposited in the British Museum. Mr. F. L. N. B. explains the committee that "the tomb is situated on the side, on the slope of the hill, in the town of Xanthus, consisted of a square shaft in one block, weighing about 80 tons, and 17 feet high. This shaft, which rested on a base or plinth rising six feet from the ground on one side, and the other rising, but little above the present level of the earth, was surmounted by the bas-relief in question, the opposite sides of the relief being respectively 8 feet 14 inches, and 7 feet 6 inches long making a total length of 31 feet 9 inches. It consists of a circular and a square part, this is a block of 3 feet 10 inches, and 3 feet 5 inches high. A kind of chamber was soon formed in the top of the monument about 7 feet 6 inches high, and 7 feet by 6. This was covered by a single block of marble forming the cornice, and hollowed out in the inside soft so as to present the appearance of a beehive and a capital. Mr. F. L. N. B. considers the relief could represent the legend of the daughters of King Pandarus carried away by the harpies. There are also five figures, male and female, seated on chairs, which are evidently intended to be represented as made of bronze; on these chairs are very perceptible traces of a brownish tint approaching to red, showing that the ornament was indicated by colour, even without the outline being carried. The figures are about an inch and a half in relief, and in many parts there are patches of blue colour on the ground, particularly on the under-cutting of the hair, and especially with the blue of the eyes; this is the most characteristic of the tracery of the top of the blocks. A portion of this blue colour had been taken off by Mr. Hawkins, and submitted to a chemical analysis by Dr. Faraday, who reported that "the substance is a mixture of wax with a pulverized blue salt, the blue being in rather coarse particles, which is charred away, each piece is seen by a moderate magnifier as a small fragment of glass."

On referring to the analysis of Egyptian blue by Dr. Ure, given in the 3rd vol., pp. 301—3 of Sir T. Gardner Wilkinson's work, the ancient Egyptians' use of antiqurcum and black may be a great analogy in the composition of this blue and that described by Sir J. Wilkinson; as in the Egyptian specimen the blue pigment scraped from the stone is a pulverulent blue glass.

On the edge of the crest of a helmet were also collected some remains of a bright crimson red which have not yet been analyzed. On the whole, the committee are of opinion that the appearances which they witnessed are sufficient to warrant their conclusion, that the ground throughout was found covered with these remains, and that the figures about the other objects, but to what extent the rough state of the surface of the marbles did not enable the committee to ascertain.
Having premised thus much as to the locality of Round Down Cliff, I now proceed to describe, as briefly as I can, the means employed to detach it from such an immense mass of solid matter. A horizontal gallery T. Pig. 3, extended for about 100 yards parallel with the intended line of railway, from the summit of the cliff, was driven, and then projected, from thence, upwards and outwards, At the end of these cross galleries shafts were sunk, and at the bottom of each shaft was formed a chamber, 11 feet long, 5 feet high, and 4 feet 6 inches wide. In the eastern chamber were deposited 5000 lb. of gunpowder, in the western chamber 6000 lb., and in the centre chamber 7000 lb., making in the whole 18,000 lb. The gunpowder was in bags, placed in boxes. Loose powder was spread over the bags, of which the quantity was determined by the amount of the surrounding charges were respectively intended for. The distance of the charges from the face of the cliff was 70 feet at the centre and about 55 feet at each end. It was calculated that the powder, before it could find a vent, must make 100,000 yards of chalk, or 200,000 tons. It was also confidently expected that it would make 1,000,000 tons.

For moving preparations were made to ignite this enormous quantity of powder. At the back of the cliff an immense shed was constructed, in which three electric batteries were erected. Each battery consisted of 18 Daniel's cylinders, and two common batteries of 20 plates each, to which were attached wires which communicated at the end of the charge by means of a very fine wire of platinum, which the electric fluid as it passed over it, made red-hot, to fire the powder. The wires covered with yarn were spread upon the grass to the top of the cliff; and then falling over it were carried to the eastern, the western, and the middle chamber. Lieutenant Hutchinson, of the Royal Engineers, had the command of the three batteries, and it was arranged that when he fired the centre, Mr. Hodges and Mr. Wright should simultaneously fire the eastern and the western batteries, to ensure which they had practised at them for several previous days. The wires were each 1,000 feet in length, and it was calculated from it that the electricity was to be made up at a distance of 2,000 feet of wire. After the chambers were filled with powder, the galleries and passages were all tamped up with dry sand, as is usually the case in all blasting operations.

At 9 o'clock in the morning a red flag was hoisted directly over the spot selected for the explosion. The wires were then tested by the galvanometer, the batteries were charged, and every arrangement was completed for firing them.

It was arranged that the explosion should take place at 2 o'clock; at that time there was an immense concourse of people assembled. In a marquee erected near the scene of operation, for the accommodation of the directors and distinguished visitors, we observed among the number assembled, Sir John Herschell, General Pauley, Col. Rice Jones, Mr. Rice, M.P., Professors Seeligwack and Airy, the Rev. Dr. Cope, and there was also a strong muster of engineers, among whom were Mr. Tierney Clark, Mr. John Braithwaite, Mr. Charles May, Mr. Lewis Cubitt, and Mr. Frederick Braithwaite; the engineers and directors of the Greenwich, Croydon, Brighton, and South Eastern Railways, besides numerous foreigners of eminence.

At 10 minutes past 2 Mr. Cubitt, the company's chief engineer, opened the proceedings with the following words:—

"Gentlemen, the time has arrived when the most splendid example of modern science is about to be witnessed among us. The scene of the operation is one of the most interesting that has ever been chosen. The place is a high cliff, the edge of which is 100 feet above the sea, and that was followed by the hoisting of all the signal flags. A quarter of an hour soon passed in deep anxiety. A number of maroons, in what appeared to be a keg, was rolled over the cliff, and on its explosion with a loud report, all the flags were hauled down. Four more minutes passed away, and all the flags except that on the point to be blasted were again hoisted. The next minute was one of silent, and breathless, and impatient expectation. Not a word was uttered, except by one lady: who, when too late, wished to be at a greater distance. Galatea sore duelli penitent. Exactly at 26 minutes past 2 o'clock a slight twist or shock of the ground was felt, and then a low, faint, indistinct, indescribable moaning subterranean rumble was heard, and immediately afterwards the bottom of the cliff began to belly out, and then almost simultaneously the summit of the cliff, which by reference to the railway's length of the summit began gradually to sink.

There was no roaring explosion, no bursting out of fire, no violent and crushing splitting of rocks, and what was considered extraordinary, no smoke whatever; for a proceeding of mighty and irresistible force, it had little or nothing of the appearance of force. The rock seemed as if it had exchanged its solid for a fluid nature, for it glided like a stream into the sea, which was at a distance of about 100 yards—perhaps more—from its base, tearing up the beach in its course, and forcing up and driving the muddy substratum together with some debris of a former fall, violently into the sea, and when the mass had finally reached its resting place a dark brown colour was seen on different parts of it, which had not been carried into the sea. The sea was immediately a considerable space over an area of 15 acres, but we should judge it to be much less. I forgot to mention the time occupied by the descent, but I calculate that it was about four or five minutes. The first exhalations which burst from every lip were "Splendid, beautiful!" the next were isolated cheers, followed up by three times three general cheers from the spectators, and then by one cheer more. These were caught up by the groups on the surrounding downs, and as I
am informed, by the passengers in the steam boats. All were excited—all were delighted at the success of the experiment, and congratulation upon completion has been showered in upon Mr. Cubitt for the magnificent manner in which he had carried his project into execution.

As a proof of the easy, graceful, and swimming style with which Round Down Cliff, under the gentle force and irresistible influence of Plutus and Pluto combined, curved down to meet the reluctant embraces of astonished Neptune, I need only mention that the flagstaff, which was standing above the top of the cliff before the explosion took place, descended uninjured with the fallen debris.

Nu fossil remains of the slightest importance were brought to light, which was a matter of disappointment to many. A very few of the most ordinary character were found among the mass, which it may well be imagined was soon after the explosion, teeming with the curious multitude from the cliffs above anxious to obtain some relic of the event.

One might imagine the position occupied by the debris of the overturned cliff, we were much pleased to find it more favourably disposed than we could have conceived possible. Instead of occupying the site of the proposed railway at the foot of the cliff, it had by its acquired velocity slid past it, and left comparatively little in need to be removed. At some considerable distance from the cliff, the fragments appeared to have been up into a ridge, higher than any other part, forming a small valley towards the cliff, and another seaward, beyond which a second ridge appeared, when it finally slopes off towards the sea. The chalk was by no means hard, and appeared thoroughly saturated with water. The great bulk of the fragments ranged from about 2 to perhaps 8 or ten cubic feet, although we observed a vast number of blocks, which contained from two to three cubic yards and upwards, one of which was driven some distance into the Shakespeare Tunnel, without doing injury to the brickwork. There was very little, indeed, of what might be termed rubbish in the mass.

Previous to the explosion, we had heard it stated that about a million yards were expected to be detached; indeed the Railway Times so stated it, on the 21st ultimo, apparently from authority, and after the explosion it took place, it was publicly asserted by one of the officials, that three quarters of a million of cubic yards had come down. Now, on cubing the stated dimensions of the mass, which were given as under 300 feet in height, by, say 50 feet longer than the gallery, which would therefore be 350 feet, by an average thickness or depth from the face of the cliff of 60, we shall have 233,333 cubic yards; but as the present face slope of the cliff is greater than before, the average thickness perhaps might be increased to 75 feet, which would make the quantity 291,686 cubic yards, from this is to be deducted 50,000 yards, the estimated quantity to be now shifted in forming the road, we shall then have 30,000 yards effectively removed by the expenditure of one ton of powder. We understand that Mr. Cubitt, the engineer, afterwards stated that a saving of six months' work, and £7000 expenditure was effected by this blast. Now allowing 6d. per yard for the removal of the quantity now required to be shifted, which would amount to £1250, and £500 for the powder and the charges for the blast, the cost of forming the galleries, tamping, &c. &c., we shall find that this mass has been removed at a cost of £1.44 per yard. Again, taking Mr. Cubitt's statement, that a saving has been effected of £7000, to which, if we add the £1750, expenditure by the present plan, we shall find that he estimated the cost of removal by hand labour, at rather less than 7s. per yard.

We felt an interest in examining the beds and fissures of the chalk in the neighbourhood of this blast, which clearly indicated that the plan of removal adopted by Mr. Cubitt, was not only the cheapest, but the safest method which could have been adopted. The vertical fissures which here traverse the chalk appear to lie nearly parallel, and at a slope perhaps of one-fifth to one-tenth to one. It was in one of these fissures that the whole mass parted and slipped down, on which we believe it had set previously to the blast brought about by the infiltration of water more than the sapping of the base by the sea. So treacherous indeed was this chalk, that if we are rightly informed, a mass equal nearly in bulk to that blasted on Thursday came down unexpectedly some time since in the night time, burying in its ruins a watchman or foreman belonging to that part of the line. In the zigzag gany ways cut along the face of the cliff, to enable persons to ascend to the summit—this sliding of the chalk where these vertical fissures are intersected, appears very frequently, inspiring the passer-by with a feeling of great insecurity. How far the water might be intercepted, or otherwise be prevented from filtering through these fissures is a question of great importance, and would not, I think, be one of difficult remedy. It also becomes a matter of interesting inquiry as to the effect which a lesser quantity of powder would have had, deposited and fired in the same manner as the explosion we have just had. For it only have made the mass insensible, or caused a partial sliding down, rendering it then more difficult of removal by hand than at first? The proportion of powder which Mr. Cubitt employs in his blasting operations we understand is determined thus: "The cube of the line of blast in feet, increases the quantity in half inches;" but in this case there does not appear to have been any such quantity employed, though much more than heretofore is found necessary in usual blasting operations. Perhaps the most curious circumstance, connected with the operation, was the apparent absence of shock on the firing of the charge on some spots in the immediate vicinity, while at other, far more distant, it was clearly perceptible. Thus where the batteries were placed, those in charge of whom thought the charge had missed fire, from their being insensible to any shock, while at five times the distance along the face of the cliff, it was clearly felt. But even along the face of the cliff it was very evident that the shock was felt by some and not by others, though standing within a few yards of each other.

![Fig. 1.—Section of the Cliff.](image)

![Fig. 2.—Section showing the movement of the mass.](image)

![Fig. 3.—Plan showing the projection of the cliff; the heading T, and chambers A in which 50 barrels of gunpowder were placed, B 70 barrels, and C 60 barrels.](image)

**Reference.**

Fig. 1.—Section of cliff before the explosion; H house in which the batteries were placed, F flag over the spur, T tunnel or heading; C one of the chambers, L R level of proposed railway, L W level of low water.

Fig. 2.—Section showing the movement of the mass.

Fig. 3.—Plan showing the projection of the cliff; the heading T, and chambers A in which 50 barrels of gunpowder were placed, B 70 barrels, and C 60 barrels.

**Neapolitan Steamers.**—We lately had the pleasure of attending the trial of two steam vessels, named the *Roadine* (Swallow), and the *Antelopes*, built at Northfleet, by Mr. Pitcher, for the revenue service of his Neapolitan Majesty. The engines of both vessels are manufactured by Messrs. Boulton, Watt, and Co. These vessels are of similar dimensions, in fact built from the same drawing, and are in length between perpendiculars, 100 feet; keel for tonnage, 90 feet, 5 inches; extreme breadth, 16 feet; moulded breadth, 15 feet 5 inches; depth in hold, 9 feet 6 inches; tonnage, O.M., 1231/4; displacement as launched, 65 tons; ditto, complete with 23 tons of coal, 115 tons. Draft at this, 7 feet 3 inches. Immersed section, 91 feet. Speed
LIST OF NEW PATENTS

GRANTED IN ENGLAND FROM DECEMBER 28, 1842, TO JANUARY 28, 1843.

Six Mouths allowed for Enrolment, unless otherwise expressed.

Alonzo Grandison Hall, of Clifford Street, Middlesex, doctor of medicine, for "improvements in electrical apparatus for medical purposes, and in the application thereof to the same purposes."—Sealed December 28.

Thomas Thompson, of Coventry, weaver, for "improvements in weaving figured fabrics."—Dec. 28.

Henry Crosby, of the city of London, civil engineer, and George Stevens, of Limehouse, gent., for "improvements in the manufacture of sugar, and the products of sugar."—Dec. 28.

Edward Thomas, of Ashfield Lodge, Ipwich, Suffolk, for "an improvement or improvements on bits for horses and other animals." (A communication).—Dec. 29.

Benjamin Bailey, of Leicester, frame-smith, for "improvements in machinery used in the manufacture of stockings, gloves, and other framework knitted fabrics."—Dec. 29.

John Stephen Bourlier, of Sherborn Street, Blandford Square, engineer, for "improvements in machinery used in printing calicoes, silks, paper hangings, and other fabrics." (A communication).—Dec. 29.

Joseph Rock, of Birmingham, factor, for "improvements in the construction of locks."—Dec. 29.

Henry Samuel Rush, of Sloane Street, mechanic, for "improvements in apparatus for containing matches for obtaining instantaneous light."—Dec. 29.

Baron Victor de Wydroy, of old Brockwell, Berkshire, for "improvements in the construction of railways and in wheels to run on railways, and in apparatus for clearing the rails."—Dec. 29.

John Bishop, of Poland Street, Westminster, jeweller, for "improvements in apparatus for purifying steam power; and also improvements in ploughs, cocks, or tops for steam engines and pumps."—Dec. 29.

Crawshay Bailey, of Nant-y-Glo iron works, Monmouth, Esq., for "improvements in the manufacture of drawings of trams and railways."—Jan. 11.

James Harvey, Jun., of Regent Street, gentleman, for "improvements in steam engines." (A communication).—Jan. 11.

William Ritter, of 106 Fenchurch Street, gentleman, for "improvements in the manufacture of sugar by the process of boiling sugars." (A communication).—Jan. 11.

Julia Edward Dawson Rodgers, of Upper Elmsly Street, chemist, for "improvements in the separation of sulphur from various mineral substances."—Jan. 12.

William John Rose, of Oliphant, builder, for "an improved mode of constructing floors and roofs."—Jan. 12.

Pierre Armande Comte de Fontain le moeure, of Skinner's Place, Sice Lane, for "improvements in the manufacture of cardboard, or other substances for the producing of a certain ceramic paste, capable of being moulded into a variety of forms, and the application thereof to several purposes." (A communication).—Jan. 14.

James Harvey, of Basing Place, Wateriton Road, timber merchant, for "improvements in pavements of paving stones, roads, and other places." (Partly a communication).—Jan. 11.


James Kirkman, of Manchester, candle-wick manufacturer, for "improvements in the manufacture of candlewick, and in the machinery or apparatus for producing such manufacture."—Jan. 11.

Henry Hussey Vivian, of Singleton, Glanorgan, Esq., and William Gossage, of Wharncliffe, merchant, for "improvements in heating or reducing ores of zinc; and for improvements in furances to be used for reducing ores of zinc, part of which improvements are applicable to other furances."—Jan. 14.

James Hamer, of Wardour Street, engineer, for "improvements in propelling vessels."—Jan. 15.

Thomas, Earl of Dundonald, of Regent's Park, Esq., for "improvements in rotatory or revolving engines, and in apparatus connected with steam engines, and propelling vessels."—Jan. 19.

Joseph Kirkman, Jun., of Sobo Square, pianoforte manufacturer, for "improvements in the action of pianofortes."—Jan. 19.

Thomas William Bennett, of Gray's Inn Road, timber merchant, for "improvements in paving or covering roads, streets, and other ways and surfaces."—Jan. 19.

Luke Herbert, of Dover, civil engineer, for "improvements in machines for grinding, and for dressing or siftin g grain, and other substances."—Jan. 19.

William Bates, of Leicester, fuller and dresser, for "improvements in the dressing and getting up of horse stuffs, comprising, shirts, dresses, stockings, socks, and other similar articles, and other improvements generally relating to the manufacture of such stuffs, including worsted, cotton, and other yarns, and in machinery for raising the nap or pile in the same."—Jan. 6.

Thomas Sunderland, of Albany Street, Regent's Park, Esq., for "improvements in weaving flax-yarns through water and air, and in accelerating the flow of water, air, and other fluids, through shafts, pipes, and other channels."—Jan. 19.

Ulrach Clarke, of Leicester, dyer, for "improvements in framework-knit cloth manufacture, and a new kind of framework-knit fabric."—Jan. 21.


Charles Frederick Bielefeld, of Wellington Street, North Strand, paper-mâché manufacturer, for "improvements in suspending or hanging swing looking glasses and other articles requiring like movements."—Jan. 26.

William Palmer, of Sutton Street, Clerkenwell, manufacturer, for "improvements in the manufacture of candles."—Jan. 26.


Francis L'Airé, of Ernest Street, St. Pancras, artisan, and Matthew Bailey Tennant, of Henry Street, Regent's Park, gentleman, for "improvements in apparatus for producing engines and carriages from going off railways, and for removing obstructions on railways."—Jan. 26.

Edward Emmon, of North Lodge, Hampstead, gentleman, for "improvements in covering roads, ways, and other surfaces."—Jan. 26.

Robert Goodacre, of Ullsthorpe, Leicester, gentleman, for "improvements in weaving apparatus applicable to cranes or other elevating machines, whereby the weight of goods may be ascertainment while in a state of suspension."—Jan. 26.

James Boydell, Jun., of Oak Farm Works, Dudley, Stafford, iron master, for "improvements in the manufacture of medals for edge tools."—Jan. 26.

Marian John Roe, of Bidder, of Great George Street, Westminster, civil engineer, for "an improved mode of cutting that kind of slates, commonly called roofing slates, though sometimes used for other purposes."—Jan. 26.

William James Greenstreet, of Blackfriars' Road, gentleman, for "improvements in machinery or apparatus for producing or obtaining motive power."—Jan. 26.

Joseph Kirby, of Banbury, Oxford, gentleman, for "improved apparatus for manufacturing bricks, tiles, and other articles from clay or earthy mate-

George Phillips Bayly, of 146, Fenchurch Street, brush maker, for "improvements in brushes."—Jan. 26.

Henry Phillips, of Exeter, chemist, for "improvements in removing impuri-


William Weild, of Manchester, Engineer, for "improvements applicable to window blinds and curtains, part of which improvements are also applicable to curtains for the regulation of light."—Jan. 26.

David Isaac Worthemicher, of West Street, Finsbury Circus, gentleman, for "improvements in calculating machines, part of which improvements is applicable to purposes where wheelwork is required."—Jan. 28.

John Barrow, of East Street, Manchester, civil engineer and smith, for "improvements in the manufacture and hanging of window sashes."—Jan. 28.
ENGINE OF H. M. STEAM SHIP "VULGARIN.


(With two Engravings, Plates II and III.)

The general arrangement of these engines will be apparent, from an inspection of the accompanying engravings. Their chief peculiarity consists in the arrangement of the parallel motion, and the manner in which it is made available for working the air-pump. The four main parts of each engine, viz., the cylinder, slide valves, condenser, and air-pump, form a square, and thus occupy the least possible area. With a speed of 220 feet per minute, and an effective pressure of 7 lb. on the square inch, according to the regulation of the Admiralty engine officers, the power will be 238 horses for each engine, or 476 horses collectively. The space occupied by the engines is 12 feet 3 inches fore and aft, and 19 feet athwartships, and the total length of the engine room is 52 feet 8 inches, with boilers calculated for the full power of the engines; and 59 feet 8 inches, with stowage for 440 tons of coal.

The leading dimensions and proportions are as follow—the letters refer to the engravings.

A, Cylinder, 80 ½ in. diameter.
B, Crank, 2 ft. 10½ in. from centre to centre.
C, Piston Rod, 8 ½ in. diameter.
D, Piston, with metallic packing rings, and steel springs.
E, Connecting Rod, 8 ft. 7½ in. long, 10 in. diameter at middle, and 9 in. diameter at ends.
F, F, Base plate, cast in two parts, one for each engine, and firmly joined in the middle. It projects equally on both sides of the crank shaft, and takes hold of the ship for the length of 17 ft. 6 in.
G, G, Wrought Iron Columns, 7 in. diameter, keyed into sockets on the base plate, and rising through sockets cast on the cylinder, to carry the entablature. The sockets on the cylinder are bored out to fit the columns, but allowed to rise or fall with the elongation or contraction of the cylinder.
H, H, Entablature, supported by the wrought iron columns G, G. It is attached by bolts a, a, to the engine beams b, b, and these bolts run through to the main paddle-beams c, c; diagonal trussing being introduced between these beams.
I, I, Wrought iron cross stays, with the sockets d, d forged in one piece. These sockets are bored out to fit the columns which pass through them, and are fastened with a cotter.
K, Wrought iron stays.
L, Shaft, fixed in a boss on the wrought iron stays K, and on which the beams e, e vibrate to work the air-pump, these beams being at the same time the radius rods of the parallel motion of the piston rod. On the outer and projecting end of this shaft, the lever f, f for working the valves also vibrates.
M, Crank Pin, 11 in. diameter.
N, O, Slide Valves, 14 in. length of travel; 8 ½ in. breadth of space.
O, O, Cylinder Ports, 40 in. long by 5 ½ in. broad, and 8 in. open to the steam when the engine is on the centre; they are opened equally for the ascending and descending strokes, as the engine is balanced by other means.
P, Condenser, cubic contents 103 ft.; g, foot valve, k, k injection pipes with Kingston's valves, h, sea injection cock, i, bilge injection cock.
Q, Air Pump, 45 in. diameter.
R, Ditto length of stroke 2 ft. 10½ in.
S, Air pump rod, cased with brass, 7 ½ in. diameter.
T, Feed and Bilge Pipes.
U, Paddle shaft, 15 ¾ in. diameter of necks.
V, Eccentric.
W, Starting gear, power as 15 to 1.
X, Equilibrium Expansive Valve; i, cam for working expansive valve.

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W, Waste water pipe and delivery pipe.
X, Steam pipe to each cylinder 174 in. bore.
Paddle wheels 26 ft. 6 in. diameter to extremity of floats.
Ditto, floats 8 ft. 9 in. long. Each float in two parts, and each part 13 in. broad.
Boilers four in number placed back to back, 23 ft. 2 in. total length, 26 ft. 10 in. total breadth, and 13 ft. high.
W, W, Shut off' valves for steam, to connect or disconnect the boilers.
W, W, Safety valves, one on each boiler, with levers in the engine room to ease off the weights.
W, W, Vacuum or reverse valves.
W, W, Blow off' cocks, one to each boiler, with Kingston's valves.
W, W, Man-holes to boilers.
W, W, Chimney, 5 ft. 10 in. diameter, and 44 feet high above steam-chest, with double external casing.
W, Waste steam pipe, 17 in. bore, with internal pipe for condensed water.

A CHAPTER ON CHURCH-BUILDING.

Being Comments on some Opinions thereon recently published.

By George Godwin, F.R.S., &c.

The Anglican church for some years past, if it may be said with apparent want of respect, has neglected her duties. Zeal was wanting on the part of her ministers, and luke-warmness, if nothing worse, was the result on the part of the congregations. To remedy this evil, many good and learned men have lately worked sedulously, and have succeeded in raising a very different feeling from that which existed before on the subject. Whether, as is often the case after a violent re-action, an evil of an opposite character may be caused—whether the freshly excited zeal has not, or may not, outrun discretion, it would not become the writer to inquire in this place: his business is simply with one result of the present state of opinion.

With greater attention to the rites and ceremonies of religion, has come, very properly, greater regard for the buildings in which they are celebrated. The text, "Is it time for you, O ye, to dwell in your cieded houses, and this house waste?" has been powerfully commented on in numerous places, and has been put forth in various shapes; while at both our Universities, as well as in many other quarters, societies have been established, whereof the clergy are the chief supporters, for the improvement of church architecture, and for the preservation, and the proper restoration, of ancient models. This has led to a corresponding increase of attention to the subject, on the part of the professors of the art; the principles of pointed architecture (the ecclesiastical architecture of our forefathers), have been investigated, and much sounder views have been arrived at than were before general: so that not to mention what has been already done, we may anticipate, without fear of disappointment, an important improvement in every new church that may hereafter be erected.

One of the points dwelt on at considerable length by recent ecclesiological writers, is, the symbolum of church architecture, the fact that every ancient ecclesiastical building was intended to convey numerous sacred truths by its form and arrangement,—and the consequent deduction that ritualism should be carefully studied by all those who may be called on to design churches.

A general outline of their views in this respect, regarding a church as deduced from ancient buildings remaining to us, may be thus stated. A chancel and a nave are the essential parts of a church; the latter is the representative of the church militant, the former of the church triumphant. The chancel-arch, which defines and separates the two (and is never to be omitted) images the close of our life. The entrance to the sacred structure should be at, or as close to, the west-end as possible, and the font must be placed near it, typical of our entry to the church militant by baptism.

When allies can be added to the nave, the edifice becomes more perfect, as, apart from the increased accommodation, the three parallel divisions so formed, serve in continuation of the symbolical system, to set
forth the Holy Trinity, to which numerous other references are ever found, in the windows and tracery of ancient ecclesiastical buildings. In a cruciform church, the best form, but to be adopted only when funds are plentiful, the four arches at the junction of the nave, chancel, and transept, symbolise that by the writings of the four Evangelists, the doctrine of the cross is taught to the four quarters of the world. Further, on the altar are to appear two candles, to signify that "Christ is a light to lighten the Gentiles, and the glory of his people Israel."

Now, that it is wise and proper to enforce this system so strongly and so constantly as has been done—to render matters of this description all-important—we should be quite unwilling to assert. We would give all "the aid which slackening piety requires;" we would not "conceal the precious cross, like men ashamed: the sun with his first smile, shall greet that symbol crowning the low pile: And the fresh air of incense-breathing morn, shall wondrously embrace it; and green moss, creep round its arms thro' centuries unborn."

We would place

"Our Christian altar faithful to the east, Whence the tall window drinks the morning rays;"

We would most worthily adorn the house of God, to render it to the extent of our means fitting for its high purpose—but at the same time we would carefully avoid all proceedings, however agreeable to our temperament, however enticing to us as an artist, which should give undue importance to bricks and stones, and man's inventions and devices, which should increase the number of ceremonial observances, which should threaten to exalt the shadow in the place of the substance, and so lead to a state of things which did once result from such a course, and may result again, notwithstanding the increased amount of information possessed, and the general comparative enlightenment.

Relative to the size of the chancel, the Cambridge writers say, it "should not be less than a third, or more than the half, of the whole length of the church. The larger it is made within the prescribed bounds, the more magnificent will be the appearance of the building." Into this portion of the structure, none but those engaged in the ceremonies are to enter; and here the whole of the service is to be performed with the exception of the sermon. The north side of the chancel-arch is pointed out as the best position for the pulpit. It seems to us, and we say it with the greatest deference, that a deep chancel, such as is here insisted on, however magnificent and striking it may, and does, make a building, is unsuited to the Protestant service as it has been herefore performed. The fact is evident in an examination of the arrangements made in the majority of our cathedrals, wherein, if the service were read in the chancel, so to term it, and the worshippers were confined to the nave, nothing said by the priest at the altar could possibly be heard by them. In ordinary sized parish churches too, if the chancel were one-third the length of the building, and still less if half, the majority of priests would fail to make themselves heard, unless indeed the altar were placed at the west-end of it, with a reredos or screen, to rail off the remainder of the chancel. The use of the rood-screen, still further to separate the laity from the clergy, which is strongly insisted on, would throw an additional impediment in the way. If it be not necessary that the service should be heard and understood, and into this inquiry we will not venture to go, then of course the objection vanishes. The very occurrence of this question in the mind, however, serves to explain why the architectural works to which we have referred, are termed by some, "engines of polemical theology."

Writers of the Roman Catholic faith insist on the inconsistency of the position held by Protestant divines, who urge this and other opinions relative to the form, arrangement, and decoration of our churches. "The good men who are so earnestly laboring for the revival of Catholic church architecture," says the Dublin Review, "must be convinced that we must have the Catholic service revived, in the first place, before any real good can possibly be accomplished." This last necessity, (Catholic meaning here Roman Catholic,) we deny altogether. The principles of ancient church architecture, as applied to suit one set of circumstances, being studied and understood, may be adapted without difficulty to other, and in this case but slightly modified, circumstances, and made to produce as efficient a result. The remark, however, may possibly be deemed to apply in some degree to those who would bring back all such forms and details as were anciently used, although altogether unsuited to present requirements. The antiquity alone, of a practice or form (strong as it makes its claim), would hardly seem sufficient authority in all cases for its revival; thus, (to illustrate our meaning from a different source,) the certainty that the practice of burying in churches is of very ancient date, and its consonance with our feelings, are now not deemed by the majority sufficient reasons for its continuance, the injurious tendency of the custom being fully known.

According to recent writers, nothing is to be done that has not been done before. Fearing the ignorance of modern architectural professors, (a little too imperiously stated, be it remarked, by some of the non-professional writers,) the necessity of having a precedent for every tower, and door, and window, and moulding, is insisted on. Design nothing, copy all, is the deduction which forcibly presents itself. "Inspice et fac secundum exemplum quad tibi monstratum est." This course has safety to recommend it, but will hardly effect for posterity, what our forefathers have done for us.

To rid our churches of close pews and lumbering galleries, and to destroy the opinion, that to accommodate the greatest number of people at the smallest possible cost, is the chief problem to be solved in church building, would be a great achievement. Something has already been done towards this very desirable end, and the work is progressing. The fact once thoroughly understood, that more worshippers may be seated by means of open benches than in pews, will in this utilitarian age, operate more powerfully in leading to their disuse, than any of the other numerous arguments against them which have been advanced. So far as appearance is concerned, there cannot be two opinions on the subject.

As an artist and an enthusiastic, though humble, advocate of the fine arts, the writer cannot regard the present views on church decoration, but with gratification, seeing in them the promise of a noble field for their exercise and development. Less than seventy years ago, Sir Joshua Reynolds, West, Barry, Dance, Cipriani, and Angelica Kauffman, offered munificently to adorn the interior of St. Paul's Cathedral with paintings, with the view of convincing the public of the improvement in our sacred buildings, which might be effected by this means, and so of obtaining an opening for the encouragement of British art. The then Archbishop of Canterbury and the Bishop of London, however, could not be induced to entertain the proposition, on the ground that it savoured of Popery, and the idea was in consequence abandoned. How doubtful of one's own judgment should such marked changes in opinion make us—how tolerant of the sentiments of others should we be, remembering as all must, the different light in which we ourselves have viewed the same circumstances at different epochs, and the alteration which is constantly taking place in our own views and opinions.

In one of the latest publications of the Cambridge Camden Society, containing many very excellent suggestions, it is remarked, "a church is not as it should be till every window is filled with stained glass, till every inch of floor is covered with encaustic tiles, till there is a rood-screen (i) glowing with the brightest tints and with gold; may, if we would arrive at perfection, the roof and walls must be painted and fresco'd." In carrying out such views it is hardly necessary to say, the greatest care must be taken to prevent a theatrical effect likely to result from such a course, unless pursued with great judgment. We

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2 February, 1842.

3 "Church Enlargement and Church Arrangement."
are disposed to think a more moderate use of colours than has been
made in recent restorations in London and Paris, might produce a
result equally excellent in an artistical, and more so in a devotional,
point of view. Scripture sentences upon the walls, “written full
thick,” are amongst the most excellent and fitting adornments of a
church.

The increased use made of stained glass in England is exceed-
ingly gratifying, and the excellent specimens which have been
prepared lately show clearly, as the writer has on many other occasions
asserted, that we could produce stained glass quite equal to anything
that was done by our forefathers if proper encouragement were
afforded to the professors of the art. Difficult of attainment, expen-
sive in its processes, so much so, indeed, as almost to prevent experi-
mentating except for actual commissions, and labouring under the
weight of an erroneous opinion that the art was lost, glass-painting
had remained for a long time in a very languishing condition. Lat-
terly, however, it has revived considerably, and many large works in
various parts of the country are now in progress. The opinion ent-
tained of our want of skill in glass-painting is hardly yet removed.

The author of “A few words to Church Builders,” says, “stained
glass is of much importance in giving a chastened and solemn effect
to a church. Those who travel on the Continent might find many
opportunities of procuring from desecrated churches, at a very triffling
expense, many fragments which would be superior to any we can now
make. But if it be modern, let us at least imitate the designs, if we
cannot attain to the richness of hues which our ancestors possessed.”

Against the opinion to be inferred from this, we will venture to place
our fickle protest. There is much old stained glass to be found on the
Continent inferior to what we can now make, and there is not a
great deal which we could not equal if the proper opportunity were
afforded. Moreover, we do not believe there are any hues possessed
by our forefathers which could not now be produced.

Let every material employed in the construction of a church be
real, is a wholesome injunction likely to produce excellent results,
although, perhaps, some may think it could be carried too far. It
has been too much the custom to endeavour to produce a showy and
deceptive external appearance, without proper regard to the fitness,
propriety, and excellence of all the various parts of the building,
which, indeed, have been sacrificed for it. While deal painted to
imitate oak, and Roman cement in lieu of stone, give entire satisfaction
to ourselves, and obtain the approval of the world, no efforts will be
made to obtain that which is better, and a niggardly calculating spirit
is engendered, grudgingly giving the “just enough,” which is un-
worthy of Christians, and destructive of more good feelings than one.

In designing buildings in the pointed style, this same doctrine
cannot be too constantly reflected on. The more fully our ancient
effigies are studied, the more clearly it becomes apparent that
nothing was introduced unnecessarily or deceptively for mere appear-
ance sake—that the excellence of effect, which is apparent, resulted
from the use of sound principles, laid down not with the view of pro-
ducing that effect, but with reference to stability, convenience, and
fitness; good taste and great skill being afterwards employed in
adorning that which was necessary, and making the useful a producer of
the Beautiful. Plans were not made to accord with a fanciful eleva-
tion, entailing thereby loss of convenience, and unnecessary cuttal,
but were arranged first, to suit the requirements of the time, and upon
these naturally the elevation followed. All decoration grew out of
the construction, and reason governed instead of caprice. This is
now better understood than it was a few years ago, and will doubtless
produce its fruit in due season.

The virtual abrogation of the regulation, at one time enforced by
the “Incorporated Society for Building Churches,” that no timber
roof should be used without a tie beam, will do much to restore to
modern churches one of the most striking features of ancient build-
ings—the open arched roof—and is a subject for congratulation. The
same may be said of the feeling now fortunately growing, against the
tasteless tombs and monumental slabs with which our noble cathedrals
and churches have been gradually encumbered and overlaid. Like

some frightful fungus, they have spread insidiously over all parts of
these structures, destroying alike their beauty, propriety, and sta-
bility. Our metropolitan Abbey presents a lamentable example of
the evil; and it is to be hoped that the acknowledged good taste of those
who now govern there, will not merely prevent the increase of this
abomination, but lead, as opportunities may from time to time
offer themselves, to the removal of the excrescences now deforming
that fine building, and to a restoration of its harmonious proportions
and original integrity.

To say that every one of our ancient buildings should be most re-
ligiously preserved, is perhaps, less necessary now than it was some
little time ago; still it cannot be repeated too often, for alas! in-
stances of injury and destruction still occur, and not unfrequently.
Full of information, abundant of association, and suggestive of most
wholesome thoughts, they are contemporary histories, which once lost,
can never be replaced; and in which every alteration even, or interpo-
ation, is an offence against society. They are the visible links which
make the past and the present one; they are the standing monuments of
the Christian religion, and attest at one and the same time our
forefathers’ piety and our forefathers’ skill.

THE NEW ROYAL EXCHANGE.

Instead of being at all premature, some of the remarks we are
about to make come too late to be of the service they otherwise
might—that is, supposing suggestions so thrown out to be ever at-
tended to, which may fairly be questioned; for although architects
are apt to be not a little sensitive when their productions are ani-
madverted upon, they rarely seem disposed to screen themselves from
criticism by attending to, and profiting by, what it has objected to,
either in their own works or those of others. It is probable, therefore,
that our observations will be of just as much service now, as they
would have been if brought forward when they could have been acted
upon, at least fully taken into consideration before it had been deter-
mined to pursue an opposite course. But with regard to con-
sideration, none at all, as far as we can ascertain, appears to have been
given to what was one of the most essential points to be deliberated
upon at the very outset, viz. whether the new Exchange should be
covered in or not. All we know is that, instead of its being made
a question, it seems to have been settled, or rather assumed as matter
of course, that it should be a mere open court, such having been the
case in the former building. No idea of the possibility of any thing
else appears to have occurred to any one—at least not to any one who
had a voice in the matter. Yet though we say it should have been
made a question for discussion, we do not think there was occasion
for much discussion, the advantages of the central area being covered
in instead of left open, being so many and so obvious, that merely
to specify them would have been sufficient, we think, to carry the
decision at once in favour of such plan. What could have been urged
in behalf of the contrary mode, the one actually adopted, we cannot
even conjecture; therefore, if any arguments at all were adduced in its
support or justification, we should be exceedingly glad to learn what
they were—which is more, we suspect, than any one can inform us.
The only satisfaction then left us, until we are so informed, is the
liberty of concluding that, notwithstanding all that was said at the
time about the vast importance of the Royal Exchange as “a National
Edifice, that should be in every respect worthy of the first commercial
city in the world,” and much more to the same effect; very little of
careful consideration seems to have been bestowed upon it, great as
was the delay, and noisy as was the squabbling as to who should be
the architect.

Had a thought been given to the matter at the outset, it would
probably have been perceived that, even supposing it otherwise mere
matter of indifference whether the area were covered in or not, there
was a golden argument to turn the scale in favour of its being covered
—namely increased rental from the shops on the exterior of the build-
ing, in consequence of the greater space that could then have been
given up to them, without at all interfering with the accommodation required for the body of the Exchange. According to Mr. Tite’s plan, the entire space occupied by the latter will be about 19,900 square feet, but out of this number, 6,500 will be quite open and unsheltered, consequently cannot always be made use of for purposes of business. Now had it been determined that the centre portion of the plan should be covered in, there would have been shelter every where, therefore the breadth of the ambulatories might have been considerably reduced, so as to afford an additional depth of nine or ten feet to the shops, some of which will now not be more than 7 feet in depth, or hardly that. Even then the actual space available at all times for business would have been the same, or rather more than will now be the case. And so far from the architectural effect being at all injured by such contraction of the space behind the columns, it would, in our opinion, be improved, and the whole would, in fact, appear to be more spacious than it is now likely to do; for the width of the cloister portion or ambulatories will now be so great, in order to provide a sufficiency of sheltered space, that while they will look low and depressed, they will occasion the open part or court to appear comparatively narrow and squeezed up; more especially as the same space looks considerably less when uncovered than when roofed in.

We have heard it urged as an objection to the Exchange being covered in, that it would be exceedingly difficult to light it from above without a very great sacrifice of architectural character. We ourselves, however, are of a diametrically contrary opinion. Even supposing it to be covered by a mere skylight as a protection from the weather (as is the case with the court of the new structure at Liverpool, called the Brunswick Buildings) we do not see how that could interfere with the architectural elevations of the sides. We do not say it would be an improvement in point of appearance, but it would not be any great drawback on it. Hardly, however, should we recommend a skylight of that homely description for such a place as the Exchange; and skylights admit of being put into such a great variety of form, whether introduced so as to appear mere coffers or panels receding little within the general surface of the ceiling; or as lanterns,—which may be ccel above, and open only on their sides; and further admit of such great diversity of decoration, that a roof of the kind may be accommodated to any style and any design. While it is the most original, its ceiling, with three large skylights of plate glass (each consisting of two sloping planes parallel with those of the external and internal roof), is the least happy idea in the interior of the Walhalla, and certainly magnificent enough, it consisting almost entirely of bronze and gilding.

For these fifty years at least, not a single edifice has been erected for the purpose of an Exchange for merchants either in Europe or America, but what has been covered in and protected from the weather, and now, instead of further improvement being aimed at, we are reverting to the old inconvenient plan of a mere open court, and to what, as such, will be no better than a pent-up and dismal area, except, perhaps, during a few remarkably bright days in the course of a summer. Almost might it be imagined that the “open court” had been determined upon, by the company of umbrella-makers, and by that of “undertakers” also. The city worthies seem to have either a very singular taste for uncomfortableness, or else very singular notions of convenience. No sooner had the public begun to congratulate themselves on the very great advantages attending wooden pavements, than Sir Peter Laurie sat about attempting not to put them down, but to take them all up again.

The architect of the Royal Exchange has, it seems, had sufficient influence with the Committee to prevail on them to have the pavement of the portico enriched with sculpture; let him then now recommend, while it may be yet time, that the “area” should be covered in above, for then it would be protected from the atmosphere and its London smoke, as well as from the weather; and as a hall it would not only appear more spacious than as an open court, but also more lightsome and cheerful,—certainly would be more cleanly, because its pavement would be always dry.

As to the difference of appearance in regard to spaciousness, there can be no doubt; for what sort of effect, we ask, as to size, would Westminster Hall make without its roof? To an open court, in itself, there can be no objection; but, we must contend, it is preposterous to adopt it for a purpose where something more is obviously required.

**Candidus’s Note-Book.**

**Fasciculus XLVI.**

"I must have liberty Withal, as large a charter as the winds, To blow on whom I please."

I. Since Mr. Gwilt not only entertains, but professes, so great a horror of architectural critics, anonymous writers, amateurs, and "literary idlers," as it pleases him to call them who amuse themselves with architectural studies, it is to be hoped that some of them will horrify him yet more. Myself, for one, it may be presumed, am numbered by him among the most offensive of the tribe, and reckoned an incorrigible maudit sujet, and mischief-maker. Nothing, however, can be more mischievous, or more completely opposed to the interests of architecture, than the doctrine he puts forth; for the drift of it is not to encourage the study of it as an art, but actually to deter from it. He would confine entirely to the profession, treating with scorn the idea that any one else can acquire a competent knowledge of it, even as a fine art, or form a correct taste. In his opinion, the less the public know, or pretend to know, of it the better; and if he means better for himself and those (if there be any) of his way of thinking, he is undoubtedly right. Hitherto it has generally been made a subject of pride and congratulation, that architecture has enlisted among its most zealous votaries, persons of refined taste and liberal education, many of whom have rendered it essential services by their pen. But Mr. Gwilt views the matter in a very different light: he is for changing it altogether, and "heretoforward"—to make use of his own quaint expression—the whole race of Benthams, Hopes, Dallaways, Whewells, &c., are to be looked upon as mere "literary idlers," who, furnished with no more than a few purblind ideas, and crude notions, which they have picked up by chance, pretend to instruct and inform others in matters of architecture. Yet it is to such industrious "idlers," that we are indebted for the far greater part of what is known of the history of the art; very little information of that kind has been supplied by architects themselves, and what they have written at all seldom extends further than to the mere elements and dry rules of their art; what may be termed the philosophy of it, being rarely touched upon by them.

II. Instead of taking it amiss of Gwilt that he has omitted his work in his list of architectural publications, Wightwick ought to consider himself a very lucky fellow in escaping a good dressing from him, for having recommended the study of architecture as a very delightful, and also a very suitable, one, not only for "idle" gentlemen, but profane puller! for "woman kind" also. He and Gwilt are the two poles of opinion; while the latter would confine the study to those whose proper business it is, Wightwick would have it rendered accessible to all; the one would have it kept as a well-watched preserve, with a due warning of "Man-traps and spring-guns" to scare away the public—the other is for breaking down all its paling and fences, and throwing it open as a common, where every one may stroll, and where literary geese are free to pick up what they can, and to hiss, without having their necks wrung off for their presumption. It is Gwilt's opinion that the less the public meddle with architecture the better; on the other hand, Wightwick's, that the more the public understand and render themselves competent judges of it, the better both for them and for the art itself, and those who practise it. Nor is it altogether unreasonable to suppose that people would take more interest in what they understood, than in what they are now ignorant of; and further, that the greater and more extended the interest taken in it by the public, all the better would it be for those whose interest...
of another kind it is, that, instead of a mere swinish multitude, they should have an intelligent public to deal with. As far as there is cause for complaint in that respect at all, it is not that there are so many "amateurs" and persons without the pale of the profession who study, or pretend to study, architecture, but that there are so few. Infinitely better would it be if the whole public, that is all persons of education were in a manner amateurs.

III. At last Boz has introduced a new character—one which has hitherto not been handled by either dramatist or novelist—in the person of Mr. Pecksniff, the architect. All other professions—the medical and the legal more especially, have been represented and shown up so frequently, that characters of that class are almost worn out. The wonder, therefore, is that no one should have before thought of turning to the architectural one. Whether, in entering upon this fresh track, Mr. Dickens has provided himself with a cure, doubtless remains to be seen, for all that can be understood at present is, that Pecksniff is to be a very prominent character in the work; but it is not quite so clear if he is intended to be the representative of a class in the profession, or merely an individual who might equally well have been represented as belonging to any other. If, as he very well may do, Boz should show up the peculiar kind of charlatany which stamps the architectural quack, and distinguishes him from all others of the duck-like genus—should he expose the arts by which men totally destitute of artistic talent and feeling for art, obtain credit with the public for being artists—should he disclose some of the clever tricks practised at competitions by very "respectable" people—should he indulge in some pleasant hits at the* pretre tres solatil pedants, who can merely talk by book and by rote, without an idea of their own—should he, among other things, exhibit Pecksniff as an architectural lecturer, gammoning his bewildered audiences with mere rhapsody and fiction,—should he do this, Mr. Dickens will deserve our thanks, and the gratitude of the honest part of the profession. Still we have our misgivings, and suspect that Pecksniff will turn out rather an overdrawn and ill-drawn caricature, than an ably delineated character, and portraiture from real life. Of extravagant and tedious caricature there is certainly not a little, in the manner in which Pecksniff is first presented to us—blown down by the wind at his own door. Had any one else given us such a tirade of laboured nothingness, and dull attempt at grotesque pleasantry, it would at once have been pronounced intolerably childish stuff; whereas, now the critics will perhaps discover it to be very fine—one, indeed, has done so already.

IV. I entertain about the same affection for law books that Gwilt does for German architecture and German architects. Why does not a second Omar come to purge the world of them? Even a book bound in "law fashion" has to me a very odious look; it seems to have put on the uniform of that Tartuffe race of wolves in sheep's clothing, or at any rate wolves dressed up in calf's skin. Nevertheless, I have done that which a month ago I should have said was impossible; yes, I have actually been seduced into reading an article in the Law Magazine, one, certainly, that I should never have thought of looking for there, consequently might never have known of at all, had it not been put into my hands by a friend, when, to my utter astonishment, I found it contained a paper headed "Architectural Novelties!! It was like having a sovereign pinned upon me between a couple of halfpence; almost was it like my first meeting with Young's description of magnificent country seats, sparkling like bright and verdant oases over the arid waste of such dreary matter as crops, and hoeing and drilling. Most truly does the poet say:

"Full many a gem of purest ray serene,
The dark unfathomed caves of ocean bear."

yet I doubt if the dark unfathomed caves, or bottomless pit of the law, contain anything more relating to architecture, whether in the shape of "novelties" or antiquities. There can, however, be no doubt, that a vast number of papers, of one kind or another, relating to architecture lie buried in literary journals and periodicals, foreign ones more especially. We're the best, or even some of the most interesting of them, collected and reprinted, they would form a Reading Architec-

tural Library of considerable extent. It is by poking about in periodicals that we stumble upon such treasures as Edward Collow's descriptions of, and remarks on, many of the recent public buildings of Paris—things, therefore not likely to be met with by gentlemen like Gwilt, who despises periodical literature, and, though he has not ventured to say so, no doubt abhors architectural periodicals most of all. Neither are they likely to come to the notice of those who pore over the writings of the "venerable" Vitruvius, and carefully collate all the readings of different authors, in hopes of being able to catch a glimpse of the meaning of the mysterious "Scamitii impares." But the Law Magazine;

—be it known, then, to all whom it may concern, that its article on "Architectural Novelties" gives some account of the Hall and Library about to be erected by Mr. Hardwicke in the gardens at Lincoln's Inn, at the south-west corner or south end of the terrace. The building is to be of red brick, and in the style of the older parts of Hampton Court. The Hall will be 120 × 34 and 45 feet high, and the Library 80 × 40 and 45 feet high; and both will have timber roofs. The remainder and longer part of the article relates to the restorations and embellishments of the Temple Church.

V. Raczynski is pleased to speak in exceedingly complimentary terms of the architecture of Edinburgh, and its recent buildings, as being in better taste than those of London: but then it is only in such safe general terms, that what he says amounts to nothing—at least to nothing more than a bare opinion to that effect, for he does not even mention a single one of the structures he pretends to admire. If the Nelson Monument was one of them, his praise is not greatly to be coveted. Speaking of that "monstrosity," the writer of the "Remarks on the Edinburgh Parthenon," tells us that "it ought to be pulled down"; nor is the same unlikely to be said of the other "Nelson Monument" in Trafalgar Square.

VI. It is provoking to find that the stupid Germans now propose to erect a public monument to Schinkel, just after Gwilt has put an ex-tinguischer upon him. A public monument to a fellow who was no more than a mere "scene painter" in architecture! to one who was little better than an audacious heretic in the art, an insolent reformer, setting at defiance both Pope Vitruvius and Pope Palladio, and did not even abide by the authority of the Greeks themselves, but would fain be "tampering" with the ancient orders, like a conceited cow-comb as he was, in the hope of improving them, or at least of producing something as good, and not quite so huckstered. A monument to Schinkel, indeed! Sounds! we will be revenged on those scurvy Germans, for we will erect a public monument to Gwilt; therefore the sooner he gives us the opportunity of doing so, the better.

POINT DU CARROUSEL, PARIS.

In the Journal of August, 1514, I stated that an improvement worthy of notice had been introduced in the construction of the Pont du Carrousel, at Paris, consisting in the application of wrought iron keys, so disposed as to obtain great precision in setting the segments of the tubular voussoirs, of which the arches of this bridge are composed. My intention is to explain more particularly in this paper, how far the application of these keys materially facilitated the casting of the voussoirs separately, and to show their useful effect in the construction of the arch on the piers.

The amount of contraction of cast iron, in the act of cooling in the mould in which it has been run, is variable; for although, as stated, the general average may be considered to be about 1/50, this measure cannot be taken as an absolute quantity: it may be sensibly modified, by many circumstances, such as the quality of the metal, its temperature when run into the mould, and the greater or less rapidity of the cooling process. This difference is not of material importance in short pieces, but in a length of upwards of 100 feet, it may amount to some inches, and when the pieces are cast in great lengths, (or even if they are in short lengths,) and the joints are intended to bed fairly against each other, as is the case in bridges of the ordinary con-
struction, this difference becomes a source of considerable trouble and annoyance.

It is objectionable to have to add to the length of pieces when cast, and to avoid this, the patterns are usually made full long, thereby allowing for the greatest possible contraction of the metal; so that generally speaking, a certain portion of each casting has to be removed by the chisel or otherwise, to get the pieces to their proper length. Notwithstanding these precautions, there will be occasional wasters, which may be properly or improperly patched up, or which if thrown away, give rise to extra expense and delay.

When the constructor has plenty of time at his disposal, he proceeds with still further caution, by casting the principal pieces, and having them put together; after this, the pattern of the remaining length is corrected, and sent to the foundry with the certificate, that the casting will come in pretty well; thus, by dint of precaution, delay, and expense, the work is got through to this stage, and if the mason work is prepared with the same care and precision, all will be found to come in very well; but a stone pier has been known to be a little out of its proper position, either in consequence of an error or the settling of the work upon its foundation. When this takes place, it becomes requisite to let the cast iron into the stone work on one side of the pier, and to place a thickness of metal between the pier and the cast iron on its other side. All these imperfections are only felt during the construction, they do not at all diminish the strength or interfere with the durability of the work, but generally speaking, all those who have been engaged in cast iron bridge building, will have had to exercise their ingenuity, not only to correct such evils, but at the same time to proceed in such a manner, that they may not leave an indelible trace on the face of the work. There is, therefore, no doubt but that the facility of extending, or diminishing, the chord line or the versed sine of the arch, would on many occasions be of considerable advantage.

The keys placed at each end of the segments, of the tubular voussoir, remove all the above mentioned objections, for the segments being kept rather short, the space will have to be divided amongst some 10 or 12 joints, so that three or four inches, more or less, in the total length of the arch, will only require the wrought iron keys to be made a little thicker or thinner than they were originally intended to be, and as they are not made until after the arc has been placed, no extra expense will be incurred, or time lost.

The division of the arc into so many pieces, offers another advantage, as, by reducing the weight of each separate piece, the whole can be moved about, and managed with great facility, and without requiring such powerful tackle, or such strong centering, as is generally employed. When the number of segments comprised in an arc are in their place, a wood model is made for each key, and the keys are forged and fitted in their places, without being immediately driven home; plumb bobs being suspended from the joint of the tubular rib, it becomes very easy to set the whole in a perfect line, by driving the keys on either side as may be required; and by making the keys sufficiently long, the height of the arc can be regulated with the utmost facility and precision. The keys being driven, and the whole of the tubular arc in its proper place, the bolt holes, those of one flange having been cast in, are drilled in the opposite one, and the bolts placed and tightly screwed up, attention being paid at the same time to the plumb bobs, as the effect of screwing up the masts may be to cause a deviation in the line of the arc, which is again easily rectified by means of the keys, and the bolts cannot otherwise affect the form of the arc.

Openings were reserved from distance to distance along the upper joint of the voussoir, for the purpose of introducing melted bitumen, which, when the bridge was finished, was done, in order to fill up the space remaining between the lamellated wooden rib, and its cast iron covering. This bitumen being intended, by setting when cool, to form a compact mass of the whole arc, with a view to increase its rigidity.

The wooden arc, as I have already said, greatly facilitated the erection of the tubular voussoir, and when standing alone, previous to the application of the latter, it had a wonderfully light and elegant appearance; but it becomes a question whether, in reality, it is at all requisite to the solidity of this kind of bridge, its flexibility being so great that it cannot in any way be expected to come to the assistance of the cast iron, which, if accidentally forced out of its original position, by any extraordinary lateral strain (the only one that could affect it) would break long before the internal wooden rib could offer any useful resistance to the strain. It also remains to be ascertained whether the wood thus confined in the tubular voussoir, will not be very subject to decay, notwithstanding every precaution that has been taken to preserve it.

The annular system of spandrels, adopted by M. Polonceau, forms another remarkable feature in this construction; they combine strength with lightness, and give an elegant appearance to the bridge. Their circular form renders them elastic; they spring under the load, so that the vibratory action, communicated to the roadway, and the upper side of the annular support, is neutralized ere it can arrive at the main rib, which, therefore, as I have already observed, maintains the most rigid firmness, under the heaviest load.

At the same time that the vibratory action is destroyed, they present also the advantage of distributing the load acting at a particular point on the road, over a considerable length of the main rib of the arch, as will be shown by the diagram.

Let us suppose three rings, placed between a beam, and an upper platform; and that a weight W be placed on the platform immediately over the ring, under such circumstances the vertical diameter of the ring will be shortened, and its horizontal diameter will be lengthened in the same ratio; half the increased length of the horizontal diameter of the ring will be taken from each of the horizontal diameters of a and c, and added to their vertical diameters, thus raising the platform immediately over the centres a and c, and increasing its resistance, will remove a portion of the load W from the point, to the centres a and c, thereby distributing it along the beam.

As a proof of the advantage of this mode of construction in point of economy, it will be sufficient to mention, that although the length of this bridge between the buttresses, is nearly 500 feet, it was completed for £40,000, including every expenditure; and that, in a country where metal is very high priced. I can conscientiously affirm, that every precaution was taken, and every outlay made, that could be required to obtain good workmanship, and a solid construction. The whole of the tubular ribs were moulded in dry sand, and cast in second fusion, and the wrought iron employed is of the very best quality for the purpose.

When the bridge was finished, it became necessary, according to the government regulation, to test its strength by distributing a given load over the entire surface of the road way, the government officers in the meanwhile, minutely inspecting the work, to ascertain whether, under the strain, any defect would become apparent. This, in France, is an invariable rule adopted as a legislative measure of public security; and, until you can present a favourable report from these officers, it is impossible to obtain permission to open the bridge. We commenced by making an observation in the morning early, to determine the positive height of each arch, previous to any load having been placed on the bridge. The load (about 400 lbs. avoirdupois upon every square yard of surface) was then laid on, and in the afternoon we found that, under the load, each arch stood higher than it did in the morning without the load.

The morning (October) had been very cool, the sun coming out later in the day heated the metal, and increased its length, so that the
whole difference in the height was occasioned by expansion; it became, however, requisite to ascertain if such was positively the case, and by leaving the load on the bridge, and taking an observation again when the metal was cool, we found that the arcades had returned to their original position. There is nothing surprising in this circumstance, although without reflection it would appear rather paradoxical, and I mention it, not with a view of exemplifying the effect of expansion, which is of course understood, but because I consider the peculiar system on which this bridge is constructed, to be favourable to the free action of expansion and contraction, without thereby being subjected to any strain at all detrimental to its general strength.

The part of the bridge, most immediately exposed to the action of heat and cold, and more particularly to the action of the sun, is the arc itself, the upper part of the span being protected by the projection of the platform, consequently large castings would be subject to unequal contraction and expansion and consequent strain, which must very much weaken them, whereas, in bridges constructed upon this principle, the flexibility of the whole system is so great, that the expansion of the tubular rib, by increasing the versed sine of the arc, can lift the entire arch without subjecting any part of it to such a resistance as would tend to diminish its strength.


VARIABLE ORIFICE OF THE BLAST PIPE OF LOCOMOTIVE ENGINES.

In the February number of the Journal, I described a "Self-acting Expansion Slide Valve," and in the course of the explanation, referred to having obtained patents abroad for an apparatus, by means of which, the orifice of the blast pipe of locomotives, can be regulated by the engine driver; I will endeavour in this paper to describe the apparatus, and to point out its general utility.

The determination of the area of the orifice of the blast pipe, is of importance in the construction of locomotives; upon its proportion depends the supply of a sufficient quantity of steam for the service of the engine, and also its comparative effective pressure upon the piston. It may be made so large, or so small, as to prevent the engine from performing its allotted amount of duty; and the application of this blast of steam, may be considered (next only to the boiler itself), the most useful invention in this beautiful machine, so essential a complement thereto, that the locomotive engine would have been very imperfect without it. The possibility of its successful application having been ascertained, experience promptly indicated the extreme limits of the area of the blast, within which the engine could exert its power; but it still remains to be decided as an irremovable rule, what the exact size should be within these limits, to produce the most useful effect; and you will very seldom find any two engineers who adopt the same sized blast, for engines of the same power.

When the diameter of the orifice of the blast pipe is too great, the energy of the blast will decrease, and the draught through the fire will not suffice to generate the quantity of steam required to keep up the speed of the engine; when, on the contrary, the diameter is too small, the resistance behind the piston will become so great, in consequence of the steam not being able to escape through the contracted passage, as sensibly to reduce its effective power on the piston. Within these two extreme limits (if an irremovable orifice of blast is adopted) it at first sight appears, that there must be an intermediate point at which, if it could be attained, an engine would perform the greatest quantity of work, with the smallest quantity of fuel. This intermediate point, if it can be admitted to exist, is exceedingly difficult to discover, because a locomotive engine has to overcome a degree of resistance that is constantly changing; either on account of the load, the action of the wind, the state of the rails, or other causes.

In the preceding paragraph, speaking of the extreme limits of the size of blast, within which an engine may work equally well, some doubt is expressed as to whether there exists an intermediate point that might be preferable, as enabling the engine to perform more effective duty. It is probable that within a certain limit, the blast (if irremovable) may be made of any intermediate size, without sensibly influencing the average effect produced, the inconvenience and advantage resulting from the change being so nicely balanced, that no sensible difference could be discovered. If such is allowed to be the case, the efficacy of the variable blast must be manifest without a trial.

In order to diminish the resistance behind the piston at the return of the stroke, the elasticity of the steam has been taken advantage of; a chamber placed at the foot of the blast pipe, by allowing the steam to expand on its escape from the cylinder, relieves the engine, and has permitted the adoption of the most contracted orifices of blast, that I have yet seen successfully employed. The greatest relief, however, has been obtained by throwing off the steam considerably before the piston arrives at the end of the stroke, thereby enabling it to expand before the return of the piston, and thus very efficiently diminishing its resistance; and although by so doing a portion of the effective power of the steam is lost, it is at the same time a judicious choice between two evils, and if not adopted, the discharge of the steam from the cylinder at the moment of the return of the piston would determine a powerful resistance to its free action, and so reduce the effective power of the engine.

The contraction of the blast pipe being an inconvenience inseparable from the condition of generating a good supply of steam in the locomotive boiler, it becomes important to partially remove this inconvenience when practicable; and as the state of the fire, and the quantity of steam required, are frequently varying, it may be positively assumed that an irremovable contraction of the blast pipe is an imperfection, and that even supposing the question as to the best possible dimension were decided, and a generally admitted rule laid down, it would only then be really perfect for some particular load, and state of the fire; and that with a different load, or state of the fire, the determined orifice of the blast would be objectionable; therefore, it may be concluded that the faculty of regulating the contraction of the blast, so as to have full power over the production of steam, must be in itself a desirable condition, and that if by the same means, the average resistance behind the piston can be diminished, the "ensemble" may be admitted to be a material improvement.

It frequently occurs that there is either too much, or not enough steam in the boiler; when there is too much, it is the usual custom to open partially, and sometimes entirely, the fire door, so that by admitting a current of cold air into the fire box, and through the tubes the production of steam will be diminished; but this remedy is very objectionable, and should be applied as seldom as possible, because the rush of cold air may give rise immediately, or subsequently, to leakage in the hoops, and must very much contribute to the destruction of the tubes, and to injure the boiler itself; whereas, if it were possible to enlarge the orifice of the blast pipe on such occasions, the fire would be damped, and the steam would fail, probably without having to open the fire door at all.

When there is not enough steam, the draught through the fire, in consequence of the low pressure of the steam, and the slow motion of the engine, will necessarily be less energetic than it ought to be, the means of exciting the fire becoming insufficient at the time when its assistance is most wanted. A good engine will certainly take care that this occurs as seldom as possible, but there are accidental causes over which he has not sufficient control, and on such occasions the power of contracting the orifice of the blast pipe would be very beneficial, by enabling him materially to increase the rapidity with which the fire would be brought up to its proper state.

When a heavy train is going up a steep incline, its speed will decrease; the strokes of the engine being less frequent, the draught through the fire will also diminish in intensity, and the quantity of steam generated may no longer be sufficient; a slight contraction of the orifice of the blast pipe would then increase the power of the
blast, the action of the fire, the production of steam, and the speed of the engine.

The engine driver generally manages his engine and fire, in such a manner, as to obtain a full supply of steam previous to his arrival at the foot of the incline; with the assistance of the variable blast, he would naturally (having plenty of steam) enlarge the orifice of the blast pipe, and thus by diminishing the resistance behind the piston, would increase the power of the engine, so that although going up the incline, she might still maintain sufficient speed to keep up the steam, notwithstanding the enlarged orifice of the blast pipe.

When running down an incline, the orifice of the blast pipe being opened to its greatest extent, the draught will be considerably diminished, because at the same time the regulator will be partially shut; the steam may in this way be very effectually kept down, although the incline may be many miles in length: and by contracting the orifice towards the approach of the foot of the incline, steam may be again obtained, without having had to expend steam from the boiler, to increase the draught through the fire, thus effecting an economy in the consumption of fuel.

By good management, the engine can therefore have full power over the production of steam, so as at all times to have a good supply, and to prevent almost entirely the loss occasioned by its escape from the safety valves while the engine is in motion; and taking into consideration the frequent occasions on which advantage may be derived by varying the orifice of the blast pipe, it may be inferred that it is as requisite to have full command of this orifice, as it is, to be able to determine the position of the regulator. The speed of the engine may, moreover, be occasionally regulated with advantage, by varying the orifice of the blast pipe, without altering the position of the steam regulator.

To carry out, in a practical manner, the variable contraction of this orifice, it is requisite

That the apparatus should be easily constructed and applied, and not liable to get out of order;

That its action should be simple and effective;

That an indicator should show the area of the orifice under which the engine is working.

Having pointed out the general advantages I propose to derive from the application of a variable blast, I will now describe the apparatus that has been employed, which will be clearly understood, with the assistance of the annexed figures.

In the construction of this variable blast, there is one point on which it is proper here to make a remark, which if not attended to, would materially tend to destroy the good effect to be produced.

The annular space between the internal cone and the orifice of the blast pipe, if too much contracted, diminishes the energy of the blast; so that it is necessary that, at the point of greatest contraction, with a view to obtain the strongest draught, the relative diameter should be so calculated as to leave nearly a half of an inch of space, for the passage of the steam between the internal moveable cone and the edge of the blast pipe.

The intensity of the draught through the fire can be weakened, therefore, either by enlarging or by contracting the orifice of the blast pipe, beyond a certain limit. I have occasionally regulated the motion of an engine by the contraction of the blast pipe, leaving at the same time the regulator wide open, because by contracting the orifice more or less, the pressure behind the piston may be varied, and so regulated as to augment or diminish the effective action of the steam on the piston. The adoption of this variable blast may also be considered as an extra security, for by keeping the internal regulating cone of the blast pipe closed, while an engine is required to remain stationary, no danger could arise from the accidental opening of the regulator.

EXPLANATION OF THE FIGURES.

Fig. 1. Longitudinal elevation of a Locomotive Boiler, part of the smoke box being removed to show the extremity of the blast pipe. The circular portion of the boiler between A and L is omitted.

Fig. 2. Plan of the orifice of the blast pipe, showing the regulating internal cone B, with its three guide ribs b, b, upon an enlarged scale; A, smoke box; B, regulating cone of the variable blast; b, b, three thin ribs or feathers, attached to the regulating cone B, for the purpose of keeping the cone B exactly in the centre of the blast pipe; C, vertical rod, to which is attached the regulating cone; D, part of the chimney; E, blast pipe; F, hand gear to work the cone B; K, graduated plate fixed to the fire box, to show the position of the cone B, and the exact area of the orifice of the blast pipe; L, fire box.

London, Feb. 11th, 1843.


THE TOMB OF NAPOLEON.—The following details are given by one of the journals respecting the tomb in honour of Napoleon at the Invalides:—In the lower part of the equestrian statue of the Emperor, which is to be erected in the court-yard, a door will be opened to a long gallery leading under the dome of the building. This gallery, paved with marble in all its length, is to be divided into three sections—in the first of which will be placed bronze alto-relievo.s, representing the military deeds of the republic of the emperor. The second, which exists already, and is consecrated to the interment of the governors of the Invalides, is to be enlarged, and the tombs at each side will be fenced off with bronze railing. The third section will be also adorned with alto-relievo.s in bronze, recording the most notable acts of the empire not military. Under the dome will be placed the tomb of the Emperor made of Corisca.n granite. On it will be engraved, in letters of gold, the single word—NAPOLEON.
The above engraving is an isometrical view, drawn to a scale of eight feet to the inch, of the ice boat, for which Mr. S. Ballard, had the honour of receiving of the Institution of Civil Engineers a Tefford medal.

This boat was first used in the year 1837, on the Hereford and Gloucester Canal, and has been in operation, whenever required, ever since. It breaks the ice by ploughing or forcing it upwards, and does not require more than one-fourth of the power necessary to break the ice on the old plan of forcing it downwards against the water.

The ice-breaking frame A consists of three pieces of timber marked n, fastened together by two cross pieces c and e. That part of the frame which lies over the boat is boarded or planked over; one part so as to form a platform for men to stand upon, the other part raised in the middle and cased with sheet iron, that the ice may not lodge on it. The frame lies on the front of the boat, which is sloped down as shown at a b. The frame is made with deal timber; the two outside pieces each 27 ft. 6 inches long by 9 in. by 8 in. the middle timber 31 ft. long by 12 in. by 7 in. These timbers are rounded on the top as far as they project over the front of the boat, and the under sides are made narrower than the top sides.

The boat is decked over from a to b, and when the ice is very strong, she has a temporary boarding over, of inch board, as far as the centre. The spar B, which projects over the stern of the boat, has the large end chained down to the middle of the boat.

The piece of timber C is attached to the spar B by a chain. It is about one ton in weight, and prevents the boat rising behind when the ice presses upon the frame on the front of the boat. It floats on the water and the chain is strained in proportion to the thickness of the ice. The timber is also chained to the stem of the boat. By these means the slope or inclination of the ice-breaking frame is kept always the same, with the advantage of a short boat, which is easily steered and managed.

The pole or shaft h is for the purpose of steering the boat. It is attached to the end of the spar by a chain, and is balanced by a weight k, so that its weight may be trifling in the hands of the steerer who walks on the towing-path.

The boat, and also the upper sides of the ice-breaking frame are cases with sheet iron. The hauling line is attached to the chain a.

When the ice-breaking apparatus is not required, it may be taken off, and the boat used for other purposes.

THE GREAT BRITAIN STEAM SHIP.

It was but lately that our attention was drawn to an article, published in the Nautical Magazine for January last, written by Mr. J. S. Enys, entitled "Remarks on Nominal Horse-power," and which is evidently a critique on an article of ours published in the Journal, Vol. V. p. 357, on "The Great Britain Steam Ship," the same having been copied into the Nautical Magazine of last November.

The object of Mr. Enys's paper is to shew the fallacy of calculations made on nominal horse-power, in fact power calculated by the rules of the late Mr. Watt, in as much as modern practice has deviated from our great master in the amount of boiler pressures, from 24 and 31 lb. to 5, 6, 7, 8, and sometimes 10 lb. per square inch, and then proceeds to prove that the consumption of fuel by the Great Britain will be just one-half or one-third (according to the expansion) of that computed by ourselves. He states much that is true, and something that is erroneous, and we consider, that he is guilty of omission; inasmuch, that he does not follow out his argument (he is undoubtedly able) and demonstrate what diminution of speed would result on the employment of expansion, especially so great an extent as one-half and two-thirds of the stroke.

We must do ourselves the justice to say, and we are sure our readers will agree with us, that our observations were temperate, written, not in a feeling of opposition, but merely to elucidate and draw attention to what we considered errors in practice. How far we are correct in our views with reference to the case of the Great Britain (late Mammoth) time and experience only will show, we are fully content to abide by the issue.

It will be seen on reference, that we expressly guarded ourselves against any misunderstanding with respect to the character of our data, and took the trouble to explain that we were indebted for them to Mr. Hill, a writer in the 996th Number of the Mechanics' Magazine, so that our deductions are dependent on the accuracy of the matter there given. It does not, however, appear that Mr. Enys disputes any portion excepting the correct delineation of the boiler details, so that we were right in taking the cylinder at 38 inches diameter, 6 feet stroke, and 19 strokes per minute. In our article we entered into a calculation, founded on the capacity of the cylinders and length of stroke (commonly called nominal horse-power, the only data at that time at our disposal), to prove that the consumption of coal, would, during a passage from Bristol to New York, be much greater than is supposed, or than they have allowed space for in the vessel.

We are met by the scientific calculations of Mr. Enys, proving that by expansion to one-half, or two-thirds of the stroke, the consumption of coal would be considerably reduced, in a much larger ratio than the power. It is, however, worthy of remark, that, although ourselves and Mr. Enys take different methods of computing power, that we agree in the amount of fuel which would be expended, supposing the engines to work to their full power, namely 129 to 130 tons per diem.

We have again carefully looked through Mr. Hill's paper, which confirms our impression that he did not state any distinct rate of expansion at which the engines were to be worked, he explains the construction of the expansion valves, which are not new; and as most modern engines of large powers are fitted with similar contrivances, we concluded that in this, as in other cases, the evaporative power of the boilers and strength of the materials were calculated to supply steam for, and to resist the action of, the full powers of the cylinders, expanding the steam only by the common sliding valve, though refinements of the special expanding valves being reserved as in other ships, for the occurrence of fine weather and fair winds.

Our justification on this head will be complete, when we state, that "The Great Western," Cunard's vessels, the "British Queen" and "President," were each fitted with separate expanding apparatus, but that their boilers are capable of generating a full supply of steam for an expansion of not more than 1/4th of the stroke—that is by the sliding valve, and it would be a matter of curious enquiry to see how frequently this is departed from. If our views be correct on this point, the general object of commanders of steam vessels, is to make
the best of their way to their port without reference to the saving of fuel, time, in fact, being frequently of much greater value than a few tons of coals. We state this as a practical fact, for the saving of fuel by the expansion of steam is now well known to those who have devoted the slightest attention to the subject.

Nominal horse power is certainly but a conventional expression, designed by the late Mr. Watt, as an approximative measure of the commercial value of his engines, it was very applicable to the circumstances of his times, and perhaps, until something better is produced, as much so to ours. It is not, as it has been called, “empirical,” because it is founded on rational grounds, and if we could get all engineers to agree to one standard of computation, it is doubtful if any better system could be introduced. It is a mechanical test from which no engineer can escape, and we are enabled, with the aid of the indicator, to appportion to its work just as much merit as it possesses; by its use we immediately discover the principles on which the engine is constructed, the rate of expansion, the state of the vacuum, the proportions and setting of the sliding valves, and other detail absolutely necessary to the good performance of an engine—indeed, we can distinguish between a good and a bad engine, between science and pretension—and in conjunction with data relative to the consumption of fuel can precisely compute the value of each man’s work.

We say it will be difficult to produce anything better than this. The commercial world is satisfied, because they may be supposed to know more of a two foot rule, and its applicability to measure the diameter and length of a cylinder, than they can possibly be of the ratio, or of the rarefaction of water when converted into steam, or of the more intricate theory of expansion. No, the commercial man will continue to buy his steam engines by the capacity of their cylinders, and with the aid of his coal merchant’s account, and the amount of work done, will come to a pretty fair conclusion, as to which engineer is most deserving of his confidence.

These observations have particular reference to marine engines, in which it is well known that space occupied and weight is of paramount importance, and it has been the aim of much consideration and reflection to obtain these, with the exertion of the greatest power at a minimum expense. We call this the se plus ultra of marine engineering.

We may, therefore, doubt the judgement of the engineers of the Great Britain, who are using cylinders equal to 1200 horses, and by expansion, reducing the same to 700 horses, occupying both the weight and space of the former power; but perhaps we are again in fault, now reasoning on the assumption of Mr. Eyens, as in the former paper on that of Mr. Hill.

Mr. Eyens observes, that nominal horse power is a most inaccurate basis for calculations of this nature, that is, the consumption of coal and speed of the Great Britain.

With reference to the first proposition, the consumption of fuel, we must freely assent. The value and the theory of expansion has been so fully explained by many writers, perhaps especially so by Farey, that it is beyond dispute—it is no new light which has burst upon us. A few years since, some attention was drawn to the published logs of certain steamers, in which assertions were made, that the consumption per horse was (as now reproduced by Mr. Eyens) as low as 6½ lb. nominal h. p. per hour, and which was satisfactorily shown to have been produced by expansion, during fine weather and favourable winds; but that, when the full power was exerted, the consumption of fuel reached from nine to 10 lb., the general result of the best machinery, so will it be with the Great Britain. If, as we had supposed, from the localizations of Mr. Hill, that her engines are designed, when necessary, to work to their full power, and by full power we mean expansion by the sliding valve alone, and exciting an average pressure on the piston of at least 14 lb. per square inch, exclusive of the friction, then our computation of consumption at 10 lb. per horse be found correct; that is, supposing the engines and boilers, scientifically and practically constructed, but if any credit is to be attached to the delineations of Mr. Hill, we must be allowed to doubt if even this point of economy will be attained.

If it is intended to work these engines at a permanent rate of expansion beyond that of the ordinary sliding valve, a corresponding saving will accrue in the exact proportion of the length of the stroke worked by the dense steam; or, in other words, the quantity of steam used or admitted into the cylinder, before the communication with the boiler is cut off. If the stroke be six feet, and the steam shut off at three feet, the consumption of fuel will be reduced ½ (we speak practically), if at the stroke, it will be ⅕, and so on. The reduction of the power will be in a much less ratio; and from all we have gathered from a considerable experience, the velocities of the ship will be, as the cube roots of the reduced powers. These, then, are the advantages of expansion.

In order to bring this question more fully before our readers, we have made the following calculation relative to the engines and boilers of the Great Britain, and which will at a glance show what will be the consumption of fuel per horse per hour—the power exerted—the cubic feet of steam per horse per minute—the cubic feet of water to be evaporated per horse per hour—and, though last the most important, what we conceive will be the velocity of the ship, with full steam pressure, and with expansion from ½ to ⅕ of the stroke, giving the results for every six inches—from 12 inches to 54 inches, or ⅕ of the stroke.

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<th>Engines 8½ inch cylinder; 6.0 stroke; 225 feet per minute; 294 horse power each.</th>
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<td>Expansion in inches of the stroke</td>
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<td>Horse Power with dense steam</td>
</tr>
<tr>
<td>Horse Power during expansion</td>
</tr>
<tr>
<td>Total power, whole stroke</td>
</tr>
<tr>
<td>Total power with 4 cylinders, as Great Britain</td>
</tr>
<tr>
<td>Contents of cylinder at this expansion</td>
</tr>
<tr>
<td>Cubic feet of steam 2½ lb. above the atmosphere per horse per minute</td>
</tr>
<tr>
<td>Cubic feet of steam at the atmospheric pressure per horse per minute</td>
</tr>
<tr>
<td>Water, per horse per hour, to be evaporated</td>
</tr>
<tr>
<td>Coals per horse per hour, at 8 lb. per horse</td>
</tr>
<tr>
<td>Tons per 24 hours</td>
</tr>
<tr>
<td>Speed of vessel with paddle wheels</td>
</tr>
<tr>
<td>Speed of vessel with screw</td>
</tr>
</tbody>
</table>

This table corroborates Mr. Eyens’s general reasoning, but we differ in detail arising from different estimations of the full power, and we would suggest to Mr. E., that he is obviously incorrect in assuming the “evaporation of a cubic foot of water to be equal to one-horse power,” because that depends entirely on the rate of expansion used in any particular engine.

We may remark that we have constructed the foregoing table on the plan laid down by Mr. Farey, the truth of which we have practi-
brine-pump. This is no supportion on our part; it is a practical fact well known to most marine engineers.

The result given by us is also a minimum, inasmuch as we have only considered the exact quantities of steam required, and have not made allowance either for condensation, or for the waste at top and bottom of the cylinders, preferring that our readers should estimate this according to their own views, as far as our experience goes, we believe the allowance ought to be about of the whole quantity.

But has Mr. Envs any reason to conclude that these engines are to be worked expansively (we of course assume that he is not in any way connected with the undertaking)? We think not; and that such is not the intention of the engineers. We have noticed that she is fitted with ordinary sliding valves, arranged (with a lap of 24 inches, and stroke of 11 inches) to cut off the steam at of the stroke, we suspect that the separate expanding apparatus is to be used in fine weather, as in most steamers of large class; and it will be observed that Mr. R. Hill expressly states that the cranks are placed in opposite directions, and not at right angles (p. 254); and, further, the construction of the boiler is proof that the engines are occasionally intended to exert their full power, say an average pressure on the piston of 14lb. per square inch.

We are inclined to be thus particular with reference to this point, because our professional knowledge has been questioned, in having made the statement that the grate surface is "less than half the proper quantity." We are, however, hardly enough to reiterate this assertion; and further to say (if any dependence is to be placed on the drawings), that a mere unscientific or badly arranged boiler could not be devised. We have made a careful analysis of its properties, and it bears out our views that it is constructed (by the amount of its absorbent surface) to supply steam for the full power of the engines, at which the consumption of coal will be fully equal to our original computation, namely, 129 tons per day. It is as follows:

| Fire surface of the six boilers | 2220 square feet. |
| Fire surface do. | = 11870 do. |

Total surface 14,070

If the total surface be divided by the total horse power, we shall have 14090 × 1176 = 12 square feet per horse, and the grate surface 2 feet × 0 × 24 = 288, = 1176 = .25 of a square foot per horse!

We have no disposition to cavil about words, but think we may call the practice of our first engines proper, but certainly not usual, in as much that in this very case there is an exception to the rule, and a straining after novelties at the expense of that which is useful. We here find that we have more than the proper quantity of absorbent surface, and less than one half the grate surface, and the result will be a very indifferent ratio of evaporation, as will be discovered when it is too late.

The size of the air-pump must of course be large enough to suit the extreme power of the cylinders, and cannot be adapted to various grades of expansion. With respect to the large condensers, theory taught us the doctrine as that propounded by Mr. Envs—the larger the better; but, from actual observations and practice, we find it is not correct, and that Mr. Watt was right in constructing his condensers of the same capacity as his air-pump. The proportion of Mr. Watt for his air-pump is about a sixth of his cylinder contents; and it is reasonable and just, the steam rushing from the cylinder, is condensed in detail, and the air-pump, at one stroke, clears the condenser of whatever vapour may remain. In the Great Britain this vapour will accumulate in the condenser; being between 7 and 8 times larger than the pump, which has no power to clear it; the condenser becomes hot, and no extreme quantity of injection water will keep it cool. We may or may not be correct in our view of this matter, but practice supports it, as our readers will see by reference to our last December number, page 309, vol. V., in which we have detailed the proportions used by some of our most eminent engineers.

We have little more to say regarding the probable speed of the Great Britain. We believe the factor 1000 to be applicable, having found it correct in very large vessels; and we see nothing in the construc-
From this explanation, however, we entirely discount, and fear not to affirm that under such circumstances water never could rise on the principle of a syphon. In order that a jet of water, whatever may be its dimensions, shall work with certainty, one condition is indispensably necessary, viz., the uninterrupted continuity of the curved tube charged with conducting it from the reservoir above to the less elevated region where the jet is required to play. All the force of ascension in the second branch of this tube ought to be derived from the accelerated velocity of the water in the first branch, and this acceleration would be as inevitably broken and annihilated by any obstacle, as by the entire destruction of the continuity. Now, in the interior of the earth, to whatever depth we may penetrate, we can find nothing resembling continuous tubes; everything there is more or less friable, casual, and irregular. Thus, whatever pains the engineer may take in order to reach by the smaller end of his vertical tube the surface of a subterranean sheet of water, it will all be useless unless by a very astonishing fortuitous accident, he should meet with another tube of the same calibre, ascending without rupturing to the upper reservoir. If, as some believe, it be in the mountains of Burgundy that this reservoir is placed, is it possible to conceive the existence of a continued oblique tube ascending from beneath Paris to the neighbourhood of these mountains? Besides, no one appears to doubt that M. Malot's choice of a situation for his well was perfectly arbitrary, and therefore if he had attempted to construct one upon the Place des Invalides or in any other part of the capital, he would have equally succeeded. Hence, then, it will be granted that in and around Paris it would be possible to dig an indefinite number of Artesian wells, all which would be fed by the mountains of Burgundy; and in order to explain this, we must picture to ourselves the uppermost beds or strata of earth under Paris and the surrounding country within a circle of two hundred leagues diameter, invariably woven into an inextricable net-work of which each filament is an unbroken tube. Assuredly nothing like this exists.

There are others who have sought to explain the rise of water by conceiving two concave vases, or two immense cisterns of unequal diameter, placed one within the other, the basin of Paris occupying the centre. They imagine that the margins of these vases extend from the mountains of the Vosges on the east, to Havre on the west; and from the plains of Flanders on the north, to the mountains of Burgundy on the south. They suppose that between these two vases there is a space filled with sand. The rain water which penetrates into the pores and cavities of the sandy district is retained there by the dense matter of the two vases. The rain water maintains the same level through the whole of the sandy space, but it does not penetrate into the basin of the higher or smaller vase. Hence it follows, that by boring vertically through the basin, the water confined in the sand will instantly rise to the height of that which exists in the circular reservoir all round it. This is certainly a very amusing geological disposition of things, but unfortunately it is supported neither by facts nor reason. A continued vase with a double bottom, more than a hundred leagues in diameter, fixed in the bosom of the earth: A vase whose inferior limits, as shown at this day by the well of Grenelle, are no less than 1690 feet deep, and into which flow all the subterranean waters from all the surrounding shores! What a gigantic disposition of things, and no less gigantic than admirable! A god must he who has founded Paris, and cradled the capital of the world in the centre of this marvellous vase: Ridiculous idea to imagine, even if this vase exist, that it should be unbroken throughout so vast an extent.

Do we not know on the contrary that the vase is cut up and divided into many irregular compartments? Throughout the prodigious extent of space which is claimed for the field of this theory, as at Tours, at Elbourf, at St. Denis, and at St. Ouen, numerous Artesian wells have already been constructed, and all these wells of many various depths are much shallower than that of Grenelle. Has each well, then, its respective vase enclosed in the general vase, and resting upon its own particular bed of sand? If such be the fact, we must suppose that a great number of Artesian stages exist in the general vase. But in this case, why did not the water rise at Grenelle when the sugar had reached one of these elevated stages, that of St. Ouen for example, so near to Grenelle? Does not the Artesian vase of St. Ouen extend to the abattoirs of Grenelle? If not it must be singularly circumscribed. It has nevertheless supplied for fifteen years two constant fountains, and the Artesian wells of Tours, Elbourf, and St. Denis are equally inestimable. Doubtless we may construct an indefinite number of Artesian wells upon the surface of the country which surrounds Paris; indeed this experiment has been made in various places, and according to a report addressed to the Academy of Sciences, dated 15th March, 1841, we find that "many of these wells hored at the bottom of a valley, yield no water, whilst others fixed upon the side of a hill, furnish an abundant flow." What inexplicable mystery in the hypothesis of a sheet of subterranean water fed by rain, and springing up only from inferior cavities to establish a horizontal equilibrium. Again, if it be said, that the general vase, the centre of which is placed beneath Paris, receives throughout the whole circle of its sandy borders the rain water from the Vosges, from Burgundy, from Bretagne, and from La Vendee, we ask how it is that all these waters, flowing over slopes of many different inclinations, but all of them more or less steep, and always repairing to the same cavities, has not long since choked up its own passage by the sands which it must have carried along with it. The great sands in the Delta of the Nile, in the Gulf of Gascony, and in the Alpes Mortes, all teach us the inevitable results of continual deposits. And if we suppose that the two cisterns here spoken of, are formed of a substance impermeable to water, such as glass, or porcelain, or baked earth, how has it happened, that buried in the earth during many ages, they have never experienced any shock or accident which would have broken them to pieces? It's evident if any thing of this latter kind had ever occurred, that the water which had lodged in the interval between the two vases, would naturally pass through the fissures and ruptures into the cavity of the upper vase, thus destroying the internal arrangement of the hydrostatic machine, whose existence has been so gratuitously assumed. Besides, if this machine really exists under the basin of which Paris occupies the centre, if it has its circumference at Havre, at La Fleche, in Burgundy, and at the foot of the Vosges Mountains, we could not construct Artesian wells at any of these points, for throughout the whole of this circumstance, the aqueous reservoir would be only at its origin and would have no vase to rise into. And yet, nobody doubts that in the neighbourhood of all these boundary districts, the Artesian well has as much chance of success as at Paris, St. Denis or Elbourf. It is also known that the Artesian wells of Tours have succeeded, although on the south side of the basin of Paris.

By the simplest laws of physics, we shall now show how imaginary is this Artesian source of water. We are told that through immense beds of sand the water sinks from the surface of the soil into the grand subterranean cavity. But who does not know that, when obliged to lift itself through a bed of sand, however loosely disposed, water loses all motion, except a kind of slow and difficult leakage. Towards the base of our artificial sandy fountains it comes only drop by drop, and it loses in its course all the velocity due to the space it has passed through, and all the pressure due to its weight. If the spout which discharges the water should open upon a heat tube with an ascending branch, the water would not rise above the level of the space which it already occupied in the base of the fountain. This would be its whole hydrostatic power; and if the ascending tube were full of sand, it would rise something above this same level: but, in that case, the effect would be due entirely to capillary action. The most striking objection, however, still remains. During the summer, what becomes of the rain water immediately after falling. The greater part, instead of sinking into these profound depths, is evaporated and carried off through the atmosphere, and it is very seldom that either our fields or gardens, the morning succeeding a storm, show any traces of moisture more than a foot in depth. Would not the alternation of wet and dry weather cause an incessant variation in the flow of an Artesian well, seeing that this incessantly varies the supplies of our fountains and the height of our rivers? Oh! no! to spite of all this, the Artesian wells have always the same volume, and in truth, acknowledge neither summer nor winter. We shall, hereafter, explain the constancy of Artesian wells. But, in the first place, we must consider another gratuitous supposition. Let us first explode all error, we shall then more easily arrive at the truth. It is said, by some, that the rain water and that which proceeds from the melting of snow, sink into a subterranean horizontal region void of solid matter, but hemmed in above and below by two beds of impervious clay. Upon the upper one repeats an enormous mass of chalk and other calcareous stone, which bears with all its weight upon the volume of water underneath, and this weight forces the water to rise vertically at every place where an opening is made down to it from the sur-
It is quite certain that the crust of this earth no where contains an apparatus of this kind; the flowing of an Artesian well cannot therefore be assimilated to a jet d'eau. Some other explanation then must be sought, and in order to be satisfactory, it must be one which answers all the conditions of the phenomena.

The explanation we are about to give is necessarily of this kind, since it is derived from an universal principle of nature.

Chapter II.

The true explanation.

The globe which we inhabit is manifestly a focus of action and heat, which has its greatest energy at the centre of the mass, and which, from this central point, works incessantly to carry matter from the interior to every point of the surface, and which, in this constant effort, meets with a gradually increasing resistance from the successive strata composing the crust of the earth.

This exterior resistance constrains the central fire to divide and attenuate the matter of the interior, and to sift it, as it were, in minute particles through the pores of the general envelope.

From this internal elaboration, and this subtle oozing out, arises the continual emission of interior calorific, an emission which necessarily takes place in a radiating form; that is to say, each jet or steam of calorific escapes and flies off in a direction perpendicular to the surface. Here then is the first analogy with the vertical stream of water which issues from an Artesian well. Each pore in the terrestrial covering is an Artesian well of calorific; and so again is each pore in the surface of every star in heaven an Artesian well of light. These Artesian pores in the crust of the earth being infinitely numerous, it is through these that the central fire impels, in a state of the most minute subdivision, a great part of its interior contents.

This way of escape, however, is not everywhere sufficient; the central action does not appear to succeed in attenuating every substance to such a degree as to effect its expulsion through such exquisitely minute apertures. At many places under the terrestrial covering, opposing masses are crowded together, some in a state of gas, others in a vapour state, others again in a liquid form, and others possessing the consistency of solids, but at the same time broken and confusedly mixed together; and all these substances, whether gases, vapours, liquids or solids, are agitated by a movement whose impetuosity equals its disorder.

The time is now come when the exterior resistance is suddenly conquered; the crust cracks—a volcano is open, and its centre shoots forth immense jets, at first of gas and vapour, then of liquid water, then of burning lava. It is a frightful pit, suddenly thrown out by the irritation of the central fire.

We know that the volcanoes of Iceland frequently vomit forth torrents of gas, vapour, and liquid water, which cannot have come from the sea, as its composition is different from that of sea water.

Let us imagine, for a moment, what would happen if at the instant when a volcano was about to burst forth, its crater could be contracted into a straight tube like that of Grenelle! What a magnificent Artesian well would then be displayed! What force and height would there be in the jet sent forth!

But let us not forget that every volcano is a kind of relief and vent for the interior tumult of the earth. It resembles the temples and boils on the skins of men and animals. In the normal or regular state, the volcano is silent, and so in a state of health is our skin smooth and sound.

Thus, at the present time, when no terrestrial volcano is in a state of formidable eruption, the globe, like a sound and healthy man, quietly and uniformly transpires through every microscopic opening in its surface, the superabundance of its interior productions; and under their general covering these productions are chemically elaborated, so that each may occupy its proper region. The water in a state of vapour, which is directly formed in the bowels of the earth, even finds a passage through strata of the denser character. If near the surface it meets with argillaceous masses, it requires an increase of effort to traverse them. Below these the vapour thickens, condenses, and takes at length the liquid form: and then, far from being op-
pressed by the contact and weight of the solid masses which cover it, the
water is constantly, if we may use the expression, in a state of insurrection
against them, and continually seeking to rush up through them, or throw
them off.

Hence it is that human industry, exerting itself at the surface of the
carth, shall pierce this surface and force down a vertical pipe into the aqneous
region, the impatient water acting upon the means of escape, and fully liq-
ified by its very first movement in a passage so contrived, runs impetuously
through its whole length. Arrived at the orifice, it flows over, and even mounds
above it. The vertical jet has a force proportionate to the depth of the
exavation which was necessary to arrive at the water.

This circumstance is remarkable, for the contrary would be the case if the
Athenian fountain were produced like an ordinary jet d’eau, by the simple
weight of a liquid column falling from an elevated reservoir, and working to
regain its level. We know that in every hydraulic apparatus, the effective
action is weakened in proportion to the extent of surface which the liquid
has to pass over, and to the friction it has to overcome.

But not only is the force of the Artesian jet much greater in proportion to
the depth of the exavation—the heat of the liquid itself shows clearly that
the anger of the well-sinker has more closely approached the producing and
expelling fire which exists in the centre of the globe.

The source then of Artesian eruptions, is the same as that of volcanic eru-
tions: it is the central action of this terrestrial globe; it is the forni-
able Power, which, during the infancy of the world, launched out upon its
primitive surface alike the isolated cones and long unbroken chains of lofty
mountains, and which from time to time is exerting efforts to raise new
mountains. This marvellous Power is that sole and universal Force, that
Expansion which is constantly in exercise throughout all material being; it
is none other than the grand Power, the Soul of nature, the producer of
life, which under the eyes of all men, spreads and develops itself throughout
the substance of every organised being, and whose expression and sentiment
each of us exhibits in his own person.

REVIEW.

Walks through the Studij of the Sculptors at Rome, with a brief
historical and critical sketch of Sculpture from the earliest times to the
present day. By Count HAWS, K.S.G., Chamberlain of Honour to his Holiness the Pope, &c.

"It is with great pleasure," says the Diario di Roma, "that we announce this new work, by a learned Englishman; it contains
descriptions of works in sculpture, executed by the most renowned living
artists. And we may now congratulate ourselves in having, in this work,
found a person in every respect qualified to do justice to living artists,
and at the same time give a sure and instructive guide to directattention
to the modern productions of the chisel. Throughout the work, the
Count displays profound erudition, and extensive knowledge of the
arts, and much beauty of classical and poetic illustration. Rihetora,
there existed no book to guide the inquiring traveller through these
repositories of modern genius and taste; and hence numbers visited
Rome, without deriving pleasure or profit from their inspection.

In consequence of these remarks we were led to a perusal of the Count's
work, from which it would appear that sculpture has attained, at
Rome, a remarkable degree of perfection; and that many of the
works of the nineteenth century are equal to those executed in the
Augustan age.

The degradation of taste in the arts has ever been a mark and
consequence of the degradation of taste in literature; and we shall
find during the four great ages of the fine arts, that literature flourished.
The first and most brilliant age was that of Phidias and Alexander the
Great, or of that of Pericles, a Demosthenes, an Aristotle, a Plato, an
Apelles, a Phidias, and a Praxitelles. The second age is that of
Cesar and Augustus, distinguished likewise by the names of Lucre-
thus, Cicero, Titus Livius, Virgil, Horace, Ovid, Varro, and Vitrivius.
The third age was in the time of Medicis; the most glorious age of
Italy, when learning was restored under the Popes Julius II and Leo
X, and when flourished a Michael Angelo, Raphael, a Titian, a
Tasso, and an Ariosto.

But it is time that the Count should speak for himself. In
describing an allegorical bas-relief, the author says—

"This allegory is intended to show the difficulties which the arts
have to contend with, from the ignorance or malevolence of those
who can neither understand their value nor feel their influence, and
whose souls are so materialised, if we may be allowed to use the
expression, philologically not metaphysically, as to appreciate nothing
which is not gross. For such souls, the noblest productions of the
day, that is, the science and art of the fine arts, all the moral, physical,
and of taste are to them as so much waste marble and canvass; and
there are not wanting some, who would gladly wage a war of exter-
novation against the productions of the chisel and the pencil. Even in
Old England, my own, my native land, the land of commerce,
wealth, power, freedom and science, how comparatively parasito-
ically are they engaged in the fine arts, of all the arts, with the
least success. The unknown are sound artistic principles! Far from us the
ignorance of disparaging our adored country, which absence has served only
to endeavour to us still more: it is time that England should take her
stand among the nations of civilized Europe in relation to the fine, as
she does with regard to the useful. Art is that a fair portion of
that wealth, which is so often profusely expended on less refined
enjoyments, should be appropriated to the encouragement of the
liberal arts, particularly of sculpture and painting; and we should no
longer bear the reproach of employing foreign artists, whilst we
neglect to promote the cultivation of national artistic taste and
talent."

The Count again observes—" The foreigner finds no obstruction in
Rome to his progress in the fine arts; but, on the contrary, enjoys
indiscriminately with the Roman, all the facilities that Rome com-
mands. Hence, we find that Thorwaldsen and Fugger have aban-
donned the frozen regions of the north to bask in the sunshine of their
gifted climate; the south, which has produced such sculptors as
have both won laurels for their country. France, too, is not backward
in the race of glory; and her splendid academy in Rome will perpetu-
ate her series of distinguished artists. Russia, too, extends efficient
patronage to her native artists; and at this moment she maintains in
Rome 30 pensioned students. Naples, also, has a Royal Academy
among her countries, and those artists who study in Naples are
trained with the same care as in Rome. Dresden, Stockholm, and
other cities, besides those already mentioned, have also their respective
academies in Rome, as have several other nations, too numerous to be
mentioned. Thus does Europe testify, that Rome is in truth the only
school for the fine arts. And must we make one painful excep-
tion, and that exception our own, our native land? Yes, it is our
painful duty to state, and we do so, in the humble hope of drawing
attention to the fact, and remedying the evil, that England, with all
her wealth, sends but one solitary artist to Rome from the Royal
Academy; and that once only every three years! How, then, can she
compete with other countries in the true classic style of art?"

In speaking of the extraordinary progress of sculpture, our author
observes—" The group of Nostor and Antimachus, executed during Canova's
life time, the Discobolus of the late Kessels, the Achilles of Allasioli, and the
Mercury of Thorwaldsen, astonished the whole artistic world; and yet they essentially differ in style and
character from the works of the immortal Canova. These productions have sided in producing a revolution in style, which is likely to
be felt in every country from whence proceeding, as the period of true
Grecian art. Denmark now has to boast a Thorwald-
sen; Sweden a Fugger; England a Gibson and a Haytill; Ireland a
Hogan; Scotland a Macaulay; Italy a Tenerani and a Finelli; Spain an
Alvarez; and Holland a Kessals, all educated in Rome, and essen-
tially Roman sculptors of the revised school of Grecian art."

It does appear that nation after nation and century after century
have become able to do little more than copy the Grecian masters.
We know the use Virgil made of Homer in his Eneid, and of Theocritus
in his pastoral; and we find that Horace applied several places, out
of Ameneon and other lyrics, to his own purpose: therefore, why should
we be afraid to copy works of true Grecian art? There is, says the
Count, "but one school of art that can lead to perfect design and execution, and that is the school of Grecian art.
Any deviation from the Grecian type must necessarily be a de-
parture from the only true standard. The choice of a subject, the
attitude, and in some instances, the drapery, are all to contribute
minimally towards producing the most perfect and severe, classic
style of Grecian art his canon. The works of the greatest modern
artists should not be taken as models; to copy their style would be
to give a translation from that which has been already translated; and
he who suffers himself to be carried away by his admiration of
modern productions, should bear in mind that their authors drew their
excellence from no living artist, but from the great masters of ancient
Greece, whose productions they have profusely studied. When the
great Canova sniffed in the blaze of his fame, many artists became
imitators of his style, and their copies were mere shadows of the
great original; they wanted the soul that animated his statues: and the
exquisite essences, which Conoav extracted from Grecian art, had
evaporated the history of art, in which the restorers operated; their
combined influence had fired the breast of our talented country-
man, and raised him to the proud eminence from which his genius
(Gibson) sheds such lustre on his name and on his country."

Our author seems to have forgotten our distinguished countryman,
Mr. Baily, who, says a recent writer, "is one of those instances, too
frequent in the history of art, in which the restorers operated;
their highest order have been too long deferred, and too sparingly
bestowed. Gifted with a sense of beauty, akin to the spirit of his
great countryman Flaxman, and a boldness of conception not unworthy
in some of its exhibitions, of the greatest of sculptors, Michael
Angelo, he has yet destined to see men, less highly endowed, step
before him into the light of his great possessions, in the neglected studio,
through the windows of his kith and kin. It is not to be
..."

Before we close this interesting book, we are tempted to make one
or two more extracts, which will fully prove the Count's abilities for
the task he has undertaken. In describing the Triumph of Apollo,
a bas-relief by the celebrated sculptor Thorwaldsen, the Count observes:

"This bas-relief represents Apollo attended by the Graces and by
Cupidis, as he conducts the Muses, eminent poets, and promoters of
the fine arts to Mount Parnassus. The first figure is Hyperion, the
father of Aurora; he is on the wing, bearing a torch, and is conducting
the winged Pegasus. Apollo appears seated in his chariot, drawn by
the horse of Helicon; his brow is wreathed with a laurel crown,
and in his hands are his harp and plectrum. With impassioned air
he sweeps the silver strings, which fill heaven with melody, and render
the very stones harmonious. Next follow the Graces, entwined with
festoons of flowers, and conducted by an infant Love, while the god of
the Egyptian bowers is on the wing, and scatters roses on their decoy
path. Their arms are loaded with the attributes of the Muses, and female
loveliness, and glide along with the lightness of summer zephyrs. The
first among the Muses is Calliope; presiding, as she does, over elo-
quence, she holds in her hand a scroll, such as Demosthenes might have
thundered from as he paced with earnest step the solitary beach
of his native Attica. Euterpe, as she plays her favourite lute, joins
Tarphyes in the merry dance. Thalia and Melopoeia follow, with the
characteristic symbols of comedy and tragedy, the pen and pastoral
staff, the muse and club. Erato, the muse of love, is crowned
with roses, and attended by a winged genius with a harp, the golden
strings of which he touches lightly with his dipped fingers, and the
air resounds with the soft sighs of the votaries of Eros. Polymnia
is known by her meditative air, and presiding, as she does, over song
and rhapsody, she is accompanied by an urn and a cornucopia, in
the shape of the globe as the Muse of Astronomy; and Clio, the Muse
of history, follows, and is inscribing with a pencil of light, on the annals
of Fame, the names of those whose exploits have entitled them to
immortality. Mnemonie, the mother of the Muses, follows near
Clio; she is closely clad, and moves with slow and measuring
steps. At a short distance from her is Homer, the father of heroic song,
who is preceded by a winged genius bearing a palm branch and a wreath
of flowers, emblem of his pre-eminence and renown. The venerable
bard lifts his sightless eye-balls towards heaven, the source of his
inspiration; and, whilst his fingers sweep the strings, his lips give
utterance to the most sublime and touching compositions. Homer," says
a modern writer, "transport us to a new and ever fresh creation, in which,
though much is calculated to astonish, all appears real, substantial and imperishable. Olympus, with its deities
on their golden seats, lies open to our view, in form as palpable as the
glorious towers of Troy, the sacred Scamander, and Ida with its hun-
dred springs. Prodigies become familiar to us!"

Such is a brief outline of the bas-relief before us, which combines
so many classic beauties of such various characters, that even the
enemies of art cannot but be overwhelmed; but, to catch the spirit of
creation, let us cast an eye over it for a moment as a whole, and
we shall thus learn to appreciate its surpassing excellence, and to
estimate, as we ought, the genius of the man whose creative power
invented, and whose artistic skill executed, "The Triumph of
Apollo.""

We will conclude our extracts with a description of the "Terrestrial
and Celestial Love," a bas-relief by Gibson, R. A. "This relief is
composed of two figures, one representing Terrestrial the other Celestial
Love, under the forms of two winged Cupids. They are both contending
for the soul, under the form of a butterfly, the emblem of the fair
Fairy. Thus purified, it is finally to be translated from the earth, and
which is the object of the Productions of Venus. Venus, the
Celestial love appears in the aspect of a dove descending from
heaven; he has rescued the soul from Terrestrial Love, and is staying his hand to
prevent its pollution at so soul a shrine. In the struggle, Heavenly
Love has triumphed over earthly desire; and holding aloft the divine
Pysche, he plumes his ethereal wings to bear her aloft to purer and
brighter realms. Terrestrial Love holds the torch of Ilymen, which
he has lighted from the flame burning on the impure altar of Venus;
and at the foot of the altar are the fatal instruments of his power, the
bow and arrow, and also a pine-apple, the symbol of love.

"This bas-relief is an illustration of one of the tenets of the Platonic
philosophy. Plato compared the soul to a small refulg, of which the
core is the immortal, and the shell the ephemeral. What we have
been taught to value by the prophecies of the seers, and the emblems
of the sages, is of no value, unless it be identified with the soul, and
be the parts of the human nature, the mind, the body, and the
senses, and the tumiduluy portion he placed in the inferior parts
of the body. He was the first heathen philosopher who maintained
the immortalitv of the soul upon solid arguments, deduced from truth
and experience; and he held that the soul, being an emanation from
the Divinity, can never remain satisfied with objects or pursuits un-
worthy of so noble a being; and that divinity and happiness is
attainable by removing from the material and approaching nearer
to the intellectual world, or, in other words, by governing the
passions according to the principle of the moral law; and thus, by
the practice of virtue, exalting ourselves to an imitation of the Divinity,
from whom the soul has proceeded, and to which, when its affections
are united with the moral sense, the beautiful moral thus conveyed by
this exquisite composition is too obvious to be dwelt upon. "Who has not experienced the struggles
of the sensual with the spiritual man? and who has not felt within his
breast, those lofty aspirations which lift the soul above the debasing
influence of unholy desire, and fix it fast in that abode where the
soul and body witness a more pure life? "The idea of two Cupids struggling for the soul recom-
manded by the simple beauty of its moral alone, but also by its classic
taste, for the ancients recognised a celestial as well as a terrestrial
Venus. "I will not assert," said Socrates, "that there are two Veneres;
but as I see that there are temples consecrated to the celestial as well
as to the terrestrial Venus, and that they sometimes appear in the
same places, I fear, I must say, that I am not more pure, I presume that at least two goddesses of that name do exist. The vulgar Venus
inflames the passions, and the heavenly Venus invites to virtuous actions."

"It was superfluous to dwell on the artistic merit of this relief; it
evinces a mind cast in a classic mould, and possessing a deep
and refined sense of the beautiful in conception as well as in form; nor
can the harmonious lines of the composition be too much admired or
too highly praised."

* * *

* From our extracts we are sure our readers will agree with us, that
the sculptors of Rome have good reason to congratulate themselves
on having found in Count Hawks le Grec one who has not only
brought their productions favourably before the public, but is very
likely to perpetuate the art through future ages. We are indebted to
Pline and Pausanias for a knowledge of some of the noblest pieces of
ancient sculpture, many of which have perished; and whatever may be
the fate of the works which the Count describes, he is very likely to
transmit to posterity their merits, and the well-deserved names of their
authors. We understand the Count has received numerous
letters from various learned bodies; and we have no hesistation in saying, that his "Walks through the study" more
than justifies the opinion held of his merits. The style is characterised
by an elegant simplicity and classic purity, and the work is enriched
throughout with such felicity of illustration and fidelity of invention,
as to shed a golden glory over its pages and the productions which
they described.*

*Exfecto f'Ev 'ka-vov fivowv trv'poul Pnv flovouv t'wv paxwov npeiv'v
s人民群众的代表以及民族的象征。——örünum, Ses 'raev'kra in fin.
NOTES ON STEAM NAVIGATION.

**Sliding Valves.**—As the formula we gave on a former occasion in reference to the effect of any particular quantity of lap on slide valves, have not, we understand, been thoroughly understood by the less scientific portion of our readers, it may be useful to reduce them to the form of common arithmetical rules.

**To find at what part of the stroke the steam is cut off.**

**Rule.**—Divide the cover on the steam side by half the stroke of the valve. Find by a table of natural sines the arc whose sine is equal to the quotient of the cylinder. Subtract the double of the arc thus found and subtract it from 90°. Find (in the same table) the sine of the remainder; add 1 to the sine thus found, and multiply the sum by half the stroke of the piston. The product will be the space travelled over by the piston before the steam is cut off.

**To find at what part of the stroke the exhaustion passage is closed.**

**Rule.**—Add the cover on the steam side to the cover on the exhausting side, and divide the sum by the length of the valve stroke. Find the arc whose sine is equal to the quotient. Take the double of this arc and subtract it from 90°. Find the sine of the remainder, add 1 to the sine thus found, and multiply the sum by half the stroke of the piston. The product is the space passed over by the piston before the exhausting passage is closed.

**To find at what part of the stroke the exhaustion passage is opened.**

**Rule.**—Subtract the cover on the exhausting side from the cover on the steam side. Divide the remainder by half the length of the valve stroke. Find the arc whose sine is equal to the quotient. Subtract this arc from 90° and find the sine of the remainder. Add 1 to it, and multiply by half the stroke of the piston. The product is the space passed over by the piston before the exhaustion passage opens at the opposite end of the cylinder.

All dimensions must of course be taken in the same measure, whether feet or inches. If the eccentric be so placed as to make the steam port be considerably opened at the commencement of the stroke, or so as to give a considerable lead as it is termed, the amount of the lead must be added to the cover on the steam side.

**Covering boilers with bricks.**—The iron platform above the boiler on which the coal generally rests, becomes quickly worn away by oxidation, and the boiler beneath it is generally much injured from the same cause, the whole top of the boiler being necessarily inaccessible, thereby imposing an insuperable obstacle to painting and even to inspection. To obviate these evils, as well as to prevent the escape of steam by the interstices of bricks set in the steam walls, very many years ago applied to the boilers of the steam vessel Tagus, and has been found to accomplish its purpose effectually. Upon this covering of bricks the coals repose—a convenience on an iron platform, and what is more important, the expense and inconvenience consequent upon its constant repair have thus been avoided, the shelf of the boiler is preserved from corrosion, the intolerable heat of the coal boxes is obviated, and fuel saved by the conservation of the heat. The expedient is an exceedingly economical one, and we look upon it as effectual and judicious in every respect.

We have received another letter from Greeneck, signed J. G. Lawrie, respecting the formula we gave in our Notes on Steam Navigation, respecting the heat contained in surcharged steam, and in which our correspondent says, “I again assert, in the face of the denial in your last number, that the formula is misapplied.” The best mode, perhaps, to refute the alleged misapplication, is to investigate the question by an independent method, in order to see whether the same results can be obtained. We have been told by Mr. Greeneck that the “total misapplication” applies rather to our correspondent’s correction than to our original statement, we are at least not responsible for the discourteous manner in which the intimation is conveyed.

(1) When air is heated, it expands, and the increments of volume are proportional to the increments of temperature. Every increment of 1° in temperature produces an increase in volume equal to the 3% of the bulk of the air at 32°. This rule has been found to apply to steam out of contact with water.—(Thomson on Heat.)

(2) The specific heat of steam out of contact with water is inversely as its specific gravity, and at 212° is 0.67. From these data, the amount of advantage derivable from the use of surcharged steam may be computed.

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**Year Book of Facts.** London: Tilt and Boggne. 1849.

This very useful annual abounds with a store of information extracted from numerous scientific periodicals and daily newspapers of the past year, and which exhibits the progress of science during that period.

**A Hand Book for Plain and Ornamental Mapping and Engineering Drawing.** By Benjamin P. Wilce, C.E. Part IV.

This part, like the previous numbers, contains some useful examples for reference; among others are sections of stratified rocks, titles for maps and designs, Gothic letters, &c.
Let \( t' \) = temperature to which the steam is raised out of contact with water.

\( s \) = mean specific heat of the steam between the temperatures 212° and \( t' \).

\( v \) = the volume of steam at the temperature \( t' \) — the volume at 212° being 100.

\( x \) = the volume of the same weight of steam at 32°, supposing that it could be cooled to 32° without condensing.

\( h \) = heat required to raise 100 volumes of steam from 212° to \( t' \).

\( b \) = weight of water in 100 volumes of steam at 212°.

\( c \) = heat required to raise the temperature of a quantity of water 1°.

\( h' \) = heat required to generate from water at 60° a quantity of steam equal in volume to \( v = 100 \).

From (1) we have \( x + x \times \frac{1}{32} (212 - 32) = 100 \) or (since \( \frac{1}{32} = 0.003125 \)) \( x + x \times 0.003125 \times 180 = 100 \); 
\( x = \frac{100}{1 + 31.49} = 100 \).

From (1) also we get \( v = 100 + x \times 0.003125 (t' - 212) \) which by substituting the value of \( x \) previously found becomes \( v = 100 + \frac{2083 (t' - 212)}{137494} \).

From (2) we find 100 : \( \frac{1}{100} \) : -0487 : specific heat at the temperature \( t' \) which is therefore \( \frac{12070}{100} \) hence

\( s = \frac{1}{100} \left( \frac{-0470}{100} + -0487 \right) \) or by substituting the value of \( v \):

\( s = \frac{1}{100} \left( \frac{-0470}{100} + \frac{001764 (t' - 212)}{137494} + 847 \right) \)
\( = 047 + \frac{006882 (t' - 212)}{137494} \).

But \( h = (t' - 212) s \), which by substituting the value of \( s \) becomes

\( h = \left\{ 047 (t' - 212) + \frac{006882 (t' - 212)}{137494} \right\} c \)

Now the addition to the volume of steam produced by heating it from 212° to \( t' = 100 = \frac{-2083 (t' - 212)}{137494} \) and the water in an equal volume, may be found by this proportion

\( 100 : b = \frac{-2083 (t' - 212)}{137494} \times \frac{002082 (t' - 212) b}{137494} \)
\( = \text{weight of water in a quantity of steam, whose volume at 212 is} t' = 100. \) Hence, supposing the latent heat of steam to be 100° we have

\( h = \left( 1000 + 150 \right) c \times \frac{002083 (t' - 212)}{137494} = \frac{-2083 (t' - 212)}{137494} \).

Now since \( h = \text{heat required to produce an additional volume of steam equal to} v = 100 \) by heating the steam out of contact with water, and since \( h' = \text{the heat required to make the same addition to the volume of the steam by generating it from water, it follows that the saving of heat by using the former method is} h - h' \)

\( = \frac{-2083 (t' - 212) c}{137494} - \left\{ 047 (t' - 212) + \frac{006882 (t' - 212) c}{137494} \right\} c \)
\( = \frac{-12908 (t' - 212) c}{137494} \)

which reduced \( = \frac{-12908 (t' - 212)}{137494} \).

The weight of water in steam equal in volume to \( v \) at 212° is evidently \( \frac{v}{100} \) consequently the heat required to generate from water steam equal in volume to \( v \) is \( \frac{v}{100} \times 1150 c \) which by substituting the value of \( b \) becomes \( 1150 \left( 1 + \frac{002083 (t' - 212)}{137494} \right) c \).

And this being reduced gives the whole heat required to raise steam equal in volume to \( v \) from water

\( = \frac{1581 + 23954 (t' - 212) c}{137494} \).

Consequently by this formula the heat saved is expressed in parts of the whole heat used in generating steam in the usual way.

\[ h = \frac{1}{137494} \left( 1581 + 23954 (t' - 212) c \right) \] by substituting this becomes

\[ \frac{1}{137494} \times (t' - 212) \times (-000882 (t' - 212)) \]

And the formula in this case gives the saving equal to about \( \frac{1}{10} \) of the whole fuel used. Our former mode of determination gave the saving at \( \frac{1}{2} \), or \( \frac{1}{3} \) very nearly. The minute differences arise from the specific heat having been in the one case supposed to be uniform, and in the other to vary inversely as the specific gravity.

SEWERS OF THE METROPOLIS.

To the Worshipful Her Majesty's Justices and Commissioners of Sewers for Holborn and Finsbury Districts.

[In the last month's Journal we offered some observations on the construction of sewers, and reserved the examination of other portions of Mr. Donaldson's address and Mr. Chadwick's report for another occasion. Since writing those observations, we have had put into our hands a very able report drawn up by Mr. Roe, the surveyor to the Holborn and Finsbury divisions of sewers. As this report so fully enters into the subject of "flushing," we abstain from offering any remarks of our own, but leave it in the hands of Mr. Roe, whose experience on the subject, enables him to report upon it far better than we could have done had we attempted it; by a reference to the engraving of Mr. Roe's flushing apparatus, given in the last September number of the Journal, Mr. Roe's report will be better understood, and to all those of our professional readers who may take a deep interest in the question, we strongly recommend them to inspect the apparatus fixed in the sewer of Hatton Garden, opposite the office of the Commissioners of Sewers of the Holborn and Finsbury divisions, by an application to the Clerk of the Commissioners, we feel assured that any member of the profession will meet with the same courtesy that we did, and obtain permission to inspect the apparatus.]

At the Court held October, 1842, an order was made "that the surveyor prepare and lay before the next court, a Report as to the result of the use of flushing apparatus for cleansing sewers, with an account of the expense incurred, and probable saving to the Commission, and embracing the general improvements in drainage that have been adopted by this Commission." The surveyor, in obedience to that order, has prepared a report, which he begs respectfully to lay before you.

Several honourable Commissioners at the last court having expressed a desire that the surveyor should give as full explanation as possible of the method of flushing, and as to what effect it would have upon sewers having little or no fall in them, and upon private drains, it seems necessary to enter into some detail of the cause of flushing being suggested from the necessity that exists for using some artificial method to clear large portions of the sewers from the foul deposit that accumulates in them.

The Holborn and Finsbury divisions are peculiarly situate as having no immediate connexion with the River Thames as an outlet, the waters from these divisions having to pass through one or other of the adjoining districts of the city, the Tower Hamlets or Westminster, before reaching the river. The sewage of the Holborn and Finsbury divisions has therefore of necessity been formed to such outlets as the other districts presented for use, and these formerly being put in without due regard to an extended drainage, the sewers of your Commission have not had the benefit of the best fall that could have been afforded to them. Of late years, the adjoining districts have lowered many of their outlets; last to alter the existing sewers of your Commission to the amended level, would require the rebuilding of about 323,706 feet of sewer, at an expense of about £200,000, exclusive of the cost of connecting sewers where the cutting would be deep, and of connecting existing surface and house drainage with them, which would make the total amount of cost nearly a quarter of a million. Still, as the lowering of those outlets has taken place, you have availed yourselves of them to a considerable extent: witness the line of sewer to Holloway, the City Road line, the Goswell-street and Golden-lane lines, and several others, varying in length from one to four miles. The city, some time since, sent to ask you, as data for the improvement of their sewage, the depth of sewage which it would be desirable ultimately to
obtain at the junction of their district with yours — your answer was, "the greatest depth that could be obtained." In lowering their outlets, the city have, in some instances, exceeded the greatest depth they could; the Tower Hamlets express their intention to do the same. The covered portion of the Holborn and Finsbury divisions appears to be greater than any other district north of the Thames, the return of houses rated to the sewer rate in 1833, as made to the House of Commons, showing an excess of 725 houses above the Westminster division. In the Holborn and Finsbury divisions there are about 985 miles of covered sewers for house drainage, exclusive of several miles in length built by individuals, previous to the present regulations being made: there is also about 183 miles of sewage for the surface drainage, and about 10 miles of open sewers.

In a large proportion of the covered sewers from various causes, accumulations of foul deposit obtain. These accumulations existing beneath the streets in a state of ferment for many years, were a cause of much disagreeable and unhealthy effluvia, and were a menace to the public by choking up the private drains when they attained to any considerable quantity. The remedy for the evil, when complained of, was only to be had by raising the noise substance in pits to the level of the street, and earing it away; a process which, in itself, was subject to many manifest objections, and made the breaking up of the pavement and roads, and the consequent obstruction of public thoroughfares, unavoidable.

On a general examination into the causes of deposit, one thing that ar- rested attention was this: viz. that in sewers of the same form and with the same fall or inclination, a different degree of accumulation was found. In some, the deposit reached a point at which the common run of water being greater in quantity in one sewer than another. In other sewers the current of water coming in, where old sewers improperly met at right angles, was found to cause, at the juncture of the two streams, an obstruction to the flow along the main line, and hence deposits accumulated: and where the collateral sewers were connected with the main line at right angles, at different levels, the obstruction was still greater: for example, in one in- stance where the collateral sewer was 3 feet above the level of the main line, a deposit was formed of a foot in depth, extending in a slant up the stream to the length of several hundred feet from the point of juncture, while below that point the sewer was perfectly clear. It was also observed, that where a gully neck delivered the surface water of the street or road into the sewer through a sill of brick, an obstruction was produced, that the deposit accumulated largely on the up-stream side. The whole of these ob- structions tended to lessen the capacity of the main line of sewer. The in- quality of the bottom of many sewers, and the little fall in others, were causes of accumulation of deposit, and the common run of water in many sewers was found to be insufficient to carry the deposit away.

To remove accumulations from the sewers in a way less offensive than the prevalent mode, to construct the sewers on such principles as were likely to lessen the cause of the formation of deposit, became subjects of consideration. Levels were taken through the Holborn and Finsbury divisions, to ascertain the practicability and expense of remodelling the sewers and rebuilding them at the lowest level which the outlets would afford; but it was found that the level selected was not such as would give that fall to the sewers as would secure the deposit. It was proposed, while the common run of water, and that the utmost that could be obtained would be the natural cleansing of one-half of the sewers, while the remaining portion would still require artificial aid. The cost of lowering the sewers to obtain this partial relief would be, as before stated, nearly a quarter of a million sterling.

This result the surveyor communicated to Mr. Donaldson, the chairman of the Westminster Commission, who, on examining in July 1840, the flushing apparatus now in use, agreed that it would do well for old sewers, but ex- pressed a desire that all new sewers should have such a fall as not to need flushing.

There being a current of water of greater or less quantity in all sewers, in some instances, in others periodical, the idea presented itself of utilizing an ordinary current to advantage in preventing the accumulation of deposit; and to do so, the use of dams at certain distances sandier, to collect heads of water, was thought of.

A series of experiments was commenced in order to ascertain what veloc- ity could be obtained, and how far such flushes of water would maintain velocity sufficient for the purpose required. These experiments were made with board dams fixed in the sewers, and the results led to the conviction that the deposit might be removed at less expense by this than by the pre- valent method. In making experiments it was observed that the effect was the greatest when the dam was removed the quickest. Sufficient data having been acquired, the matter was laid before you, and a great number of open- ings were recommended, with bottoms of different degrees of accumulat- ion, that you might personally see the effect of the plan on an extended scale. The result proving satisfactory, you encouraged the idea, and several of your body made very valuable suggestions upon the various methods of appli- cation which were brought before you; and a report was directed to be made upon the system of flushing, and on other suggested improvements which you were pleased to adopt. As a result it was stated that the average yearly cost of cleaning was about 9000l. per annum. To this there would in future have to be added the cost of cleaning such sewers as had not then been cleansed, but in which deposit was accumulating, and in time would need removal. An example of this class of sewers may be seen in the extensive sewage on the Whiskin estate, Clerkenwell. These sewers were built about 16 years ago, and have not required cleansing until this winter. The different degree of accumulation in these, as also many of the causes of accumulation where sewers are well built and have a good fall in them. For instance, the sewer in Meredith Street having a constant flow of water turned through it from St. John Street Road is kept free from deposit, whilst in the sewers in Whiskin Street, Skinner Street, St. Peter's Street, and the upper part of Gloster Street, the common run of water being too small to keep them in order. In the lower part of Gloster Street, where the junction with Meredith Street was at right angles, the deposit had accumulated to nearly twice the depth that it had done in the other sewers. Of this class of sewers that would gradually come under the necessity of cleansing, there is about 97,000 feet, which estimated at the quantity of deposit contained in the above named sewers, would, by the old method of cleaning, involve an expense of 24l. per annum, in addition to the sum before named.

In the Report before named, it was stated that if the average sum which the cleansing then cost was applied for seven years, and the cleansing done by flushing, the apparatus and side entrances might be fixed to the sewers without any extra charge whatever, and the public would, at the end of that period, be required to pay for the service rendered. This is not the case, during those years and for the future, a saving of 300l. per annum in the item of cleansing, which the Commissioners had effected under their then existing contracts. The flushing system being adopted by you, the method of carrying it out was ordered to be as follows, viz. that when a sewer was complained of and required cleansing, the foul deposit should be flushed away, and apparatus fixed to enable it to be freed from accumulations of deposit in future. The result to this time is as follows. Since the commence- ment of the system of flushing, the foul deposit has been washed away from about 16 miles in length of old sewers, on which have been placed 59 side entrances and 67 flushing gates. After deducting from the cost of removing this deposit by the old method, the expense of all the side en- tries and flushing gates, there remain expenses of 17s. 6d. and the side entrances and apparatus are furnished for future use. These sewers are about 2-7ths of those that appear to have deposit accumulate in them; and 2-7ths of the average annual cost of cleansing by the old method would be 326l. 17s. The annual cost for man to work these gates is 100l., forming a saving of 220l. per annum on these 2-7ths of the sewers. The total cost of flushing apparatus to these 2-7ths of the length of the sewers has been 33l., thus whenever that apparatus should require renewing, the amount of two years' saving will renew the whole. It is not likely they will require renewing for between 30 and 40 years, if then. It is very probable that the interest of the saving will keep the apparatus renewed. There is also the saving to individuals of the cost of cleansing private drains, which, by the system of flushing, is considerably reduced by accumulations in the sewers as herefore; and when it is considered that many sewers required cleansing every fifth year, the amount of expense and annoyance must have been considerable. Another benefit has been the avoidance of breaking up the pav- ement and roads, the cost of replacing which for holes that must have been made to cleanse the sewers that have been flushed, would have been 370l. The merits of this system lie in the surface, to the annoyance of the inhabitants and passers-by, has been prevented. And the side en- tries and flushing where they occur have afforded facilities for the men to rake the deposit from old gully holes into the sewers, from whence it is washed away, thus preventing the breaking up the paving round the gully- holes, and a saving in the article of cartage of the deposit. In one year and a half the saving from this cause in the amount paid for replacing the broken paving round the gully holes alone has been 107l. 16s. 4d. A misconception appears to exist that each flushing gate requires a man to look after it; it may not therefore be irrelevant in this place to state that one man will be able to look after and manage all the flushing gates that may be placed in a district contain- ing 15 miles of sewer.

With respect to private drains, the flushing gates are placed on such a principle that, if the whole of them were shut for twelve months together, the houses draining into the sewers would not be at all affected by the water in the sewers; but these gates are never shut except periodically to collect a head of water, and after the head is let off the gate is fastened back, so that no obstruction whatever is caused anywhere by the application of the system. And upon the breakage of the flushing gates, the old system was replaced in such a manner that if kept shut for months together, the water would not enter the private drains; but the result of experiments made upon this point was such as induced the surveyor to state, 'it as a matter worthy future con- sideration.'
Several houses by the side of the open part of the River Fleet at Kentish Town, have drains from their privies emptying into the sewers; these drains were nearly filled with privy soil, which exuded and presented a most filthy spectacle along the side of the sewer. A wooden flange gate was constructed to pen up the water which rose gradually to such height as to completely fill the drains. The gate being very large, was made to open suddenly, by the simple principle on which the drag chain of a wagon is loosened. When the head was up the gate was opened, and the water rushed away. The effect upon the drains was, that the sudden withdrawal of the water caused the soil with which they were nearly filled, and left them in as clean a state as they were when first built. It also drew away all the soil and filth from the open sewer, as far as the head of water extended. Since the flushing gates have been fixed, particular notice has been taken what the effect is upon neighbouring districts, through which the waters of these divisions pass before they reach the Thames. The depth of the deposit was measured at every hundred feet length before using the gate; in cases where the deposit was measured 25 feet, before, and 91 feet after the gate had been opened. There is a level outlet to the river. The gate was then shut, and a head 2 ft. 6 in. in height, obtained, containing about 208 hogsheads of water; this head was let off, and then the whole length of sewer was again examined, when it was found that the deposit had been washed away in the whole length. In another instance the head of water was 5 ft. in height; and this was found to wash deposit away for the whole length of 2200 feet, that being the length from the gate to the main outlet. The total length of continuous sewer that a head of water on one flushing gate would serve to keep free from accumulations, has not yet been ascertained, the greatest length by experiment being 3250 feet, as just stated; but the velocity of the current when it reached the extreme end, and the depth of water the head furnished at that point, the surveyor has not the slightest idea that more than a mile in length of continuous sewer is to be made clear by the use of gates alone.

But the washing away below the gate is not the only benefit derived from heading up water by flushing gates, for the effect which took place, in the manner named in the private drains at Kentish Town, is also beneficially felt at the heads of sewers, and in other situations. The drains from the houses in Eagle Street, Red Lion Square, enter the sewer near the bottom, so that this sewer has required cleaning as often as twice in five years, the depth of deposit being one foot and upwards; this sewer is nearly on a dead level for 300 feet. There is a flushing gate placed as to head up water in this sewer to a height of one foot eight inches, so that when there was 11 inches of deposit, there was nine inches of water standing over the soil. The head of water was let off, and it was found that an average of 3 feet in depth of deposit had been drawn away from the water from 300 feet of sewer by this one head.

The accumulation of deposit in this sewer is prevented by this process, which occupies a man rather less than one day in the year. The East Long Alley, and part of the Moor's Alley sewer, have bottoms of the same irregular description; the cleansing the deposit from these formerly cost on an average 16s. per annum; the accumulations are now kept down by a flushing gate in the sewer which empties into this open sewer, the use of that gate has not only kept down the accumulations in the covered sewer, but has had the effect of keeping the open sewer in question clear for its length of several hundred feet, thus preventing the dangerous nuisance which formerly existed. The saving in this instance is greater than that named as effected in the East Long Alley sewer.

In regard to the effects of flushing the deposit into the river Thames, the surveyor has made observations, and taken measurements, which enable him to arrive at the conclusion, that rather more than 14-15ths of the soil and impurities that entered the sewers in the Holborn and Finsbury divisions, was washed to the Thames by occasional rains, and the common run of water in the sewers.

That much road dirt is swept through the gully grates into the sewers is certain. In Bedford Place, which has been lately flushed, the depth of deposit was nearly four feet; and amongst this was found a layer of road dirt in one part; nine inches in thickness.

In concluding this portion of the report, it may be in general observed, that if there be running through a sewer, a sufficient body of water with sufficient speed to prevent deposits, that, of course, is the best arrangement. But such an arrangement can only be obtained in main lines of sewers, unless a considerable expense be incurred in the purchase of water; and this expense would far exceed the expense of cleansing by flushing. But where there is not a run of water of sufficient body to keep the sewers clear, there is, and must be, a deposit.

A convincing proof of this appears in the sewer, in a part of Holborn, which is in the Westminster district, and which is connected with the Essex Street sewer, which has been lowered from its outfall at the Thames into Holborn, and thence along Museum Street, Bloomsbury, to the boundary of that district to which it was completed in 1835. Yet with the advantage of a connexion with a sewer lowered from the Thames, and at a point very little more than a mile from the river, this part of the Holborn sewer has a considerable accumulation of deposit in it.

The New River Company expressed their willingness to supply water at certain seasons at a moderate expense to your Commission, where it might be needed for flushing purposes. In the present, common run of water, by being penned up at intervals, has been found sufficient for the purpose. The use of flushing gates, supplies the want of a sufficient fall in the sewers, and also the want of a continuous and sufficient flow of water at a much less expense than the cost of the prevalent filthy method of clearing the sewers from accumulations of deposit.

There is a sufficient fall and flow of water, then, by damming up the common run of water and letting it off suddenly, an artificial fall of the water is obtained, which answers the purpose. The ordinary fall at which it is required that sewers shall be put in at, is about 5 feet for the half mile; there are, however, cases where such a fall cannot be got; it is found at Eton, for example, that a fall cannot be got of more than two feet in half a mile, and in parts of Hambrough not even of half that height. Under such circumstances, unless there be a large body of water, with an adequate draw, there must be a deposit. It is in such cases that the flushing apparatus, collecting the common run of water supplies a remedy. If a continuous line of sewer were formed on a dead level, and if the water be raised by a dam 5 feet, then when the water is discharged, it has the effect of sweeping away all, or of keeping half a mile of continuous sewer clear from deposit, producing the effect as a fall of 5 feet in the half mile with a continuous flow of water.

When the surveyor first suggested the present method of application to the principle of flushing, he asked your permission to take out a patent for it; but your opinion being that it should be left open for the use of any who might wish to adopt it, he did not proceed therein; but from its promising to prove a saving of considerable amount to the public at large, you as a public body did not wish a monopoly to be made of it; and in accordance with this spirit other Commissioners of sewers were invited to inspect it.

Many persons, interested in sewages, have looked at the flushing apparatus used in these divisions, and the surveyor being desirous of the best possible plan, has always expressed his wish that any one would suggest anything that might answer the purpose better, and as yet he has not been favoured with any suggestion on the subject. Much approbation was expressed by many, and one surveyor of sewers considered it clever; Mr. Lindley, who is employed to lay out the new sewage for Hambrough, expressed his high satisfaction with the plan, and at the clean state in which the sewers are kept by its use; and considered the curved junctions as an excellent engineering work; and the form of your gully and channel, and the general arrangement of the apparatus, which has been employed to lay out a plan of sewage for Leeds, suggests flushing for general use, and expresses his intention of using all the improvements you have adopted, in every place where he has any influence.

It is interesting to find that the principle of flushing has been in constant practice for 400 years at Eton College, during which time the sewers have been kept free from accumulations of deposit by its use. Stony boards are used to keep up a head of water; these are drawn up with a windlass, but the form of flushing gates used by you is about to be adopted at Eton.

In a communication, from a gentleman, the surveyor sent to France to examine the sewers there, it is stated that there are in Paris about 90 miles in length of covered sewers, the whole of which are constantly and regularly flushed by the use of wooden dams, employing upwards of 50 persons. These flushings with wooden dams do not, however, clear the bottoms of the sewers from a heavy black deposit which is therefore scraped together, and got by hand to the main line of sewer, where a sufficient head of water is obtained to wash it away. Now, if the method of flushing used in the Thames and Finsbury divisions was to be adopted in Paris, six men would be sufficient to manage the whole of the gates; and from the very superior effect obtained by the method you use, the whole of the deposit in every sewer would be washed away without the labour at present used.

The Surrey and Kent Commission have, I am informed, used side drainages to some of their sewers for years; they were not introduced, by the surveyor to your divisions, he has introduced them for the use of their side drainages, and, I believe, one or both of the other surveyors to that Commission have done the same.

1 The same principle, upon a large scale, has also been in use for many years for scouring harbours and removing bars, as may be seen at Dover, Ramsgate, &c. &c.
Another improvement that you have adopted, is a form of gully hole and shoot, connected with red bricks, the shoot being half a brick in substance. The form of these is such as to deliver the water and deposit from the surface of the streets into the sewer, in such a direction as to cause no obstruction to the flow of water along the sewer.

There have been 690 gully holes and 13,000 feet of shoot built after this improved manner; the saving in expense is £2191 11s. 6d.

Another improvement, adopted by the use of which there has been a saving of £622 12s. 6d. effected.

The adoption of the present method of cleansing the gully holes, introduced in the old system, has effected a saving of £200 5s. 24d.

By the improvement in the form and construction of new sewers, a saving of £1094 6s. 6d. has been effected on 14,591 feet of length of sewer. In no case has the curved form been adopted; nor were there any struts at all in the new sewer lately built from near Thornhill Bridge to the Model Prison; nor any left in, as none were required.

Every engineer and scientific person must agree that curved work for sewers is stronger than upright walls, where the substance of material is equal. By the use of curved work, you have been enabled to adopt a sewer for the use of short streets, by which a saving of £65 6s. per foot lineal is effected from the cost of your second size sewer, which, when the great length of sewers required in situations where this sewer will suit, is considered, the item of saving will be ultimately reached to a very considerable amount.

Of the benefit of curved junctions and proper curves to turns in sewers, it would be useless to utter one word; and whether it be better for water conduits to have turns with curves, or turns with angles, it could scarcely be expected that there would be two opinions; and in sewers where the water is loaded with foul matter, surely the less obstruction there is to the current the better. Besides, curved junctions are in reality a saving of expense to the public, by preventing occasions of obstruction where deposit would otherwise necessarily accumulate.

To illustrate this, take the capital letter T, the head of the T to represent two sewers, the currents of water in which meet at the point where the upright portion of the T touches the head thereof, and then flow down in the direction represented by the stem or upright of the T; this seems bad enough; but a little way along the left portion of the head of the T let another line be drawn perpendicular thereto; this will represent a sewer coming in at right angles with a considerable flow of water, adding to the obstruction formed by the meeting of the other two streams, it being only six feet from that adverse junction; and the natural consequence is, that a very considerable accumulation of deposit has taken place. And if two other lines be drawn perpendicular to each other in this manner, each of those lines will represent two sewers coming into that main line at right angles and opposite to each other, so that the water falling from the sewer or the highest level not only meets and obstructs the current of water in the main sewer, but presents an obstacle to the flow of water from its opposite neighbour, hence considerable deposit has formed in the latter; such consequences accruing from such junctions and angles, entail a perpetual expense upon the public in the removal of deposit.

The above is a description of a part of a new line of sewer and its junctions, built within the last seven years.

The next improvement which the surveyor has to report upon is, the adoption of side entrances to new sewers in lieu of main-holes for apertures, formerly used. In the 21,029 feet of new sewer built by your Commission, since this improvement was adopted, side entrances, and such flushing gates as was deemed necessary, have been placed in lieu of apertures, and the saving by so doing has been £1319 11s. In the 21,029 ft. of sewer, petitioned for and built by individuals after the same manner, a saving to them of £782 has been effected, after allowing 25 per cent, as their profit, or the amount which a builder might think he could save by doing his own work, instead of paying for it at your contract prices. The avoiding breaking up the pavement or roads, and other advantages which the use of side entrances secures, the surveyor named in his former report on this subject.

The total saving by the adoption of flushing apparatus, and of the other improvements named in the report, in about two years, is £8443 19s.; and 2-7/10ths of the sewers that require artificial aid in removing deposit are provided with side entrances and flushing apparatus for future use.

On the whole, the amount of immediate saving which it was calculated would be effected by your adoption of the improvements herein named has been estimated at £13,000, and this will be the case with the perpetual annual saving; experience showing that by flushing sewers with water, a saving of nearly two-thirds may be made from the cost of the old method of removing deposit. But the fact which is of more importance, in a sanitary point of view, than the expense of removal is, that instead of the two or three thousand tons of refuse, which may be removed for £1000 or £1200 per annum, remaining decomposing in the sewers, and producing nuisances which penetrates the houses and creates disease there, and escapes, and is diffused in the streets amongst the passengers, the deposit would by the flushing apparatus be removed, with sufficient rapidity to prevent any extensive decomposition or any smell.

The men engaged in cleaning the sewers have a more healthy employment; the laying out of large quantities of foul accumulations on the surface of the streets, which was formerly the practice, is avoided; the pavements of the streets are undisturbed; the putting in drains surreptitiously is easily detected; private individuals are saved the trouble and annoyance of having their front doors chocked, and the whole expense of cleaning them in consequence; and these are considerations of future expenditure in sewers, which your systematic adoption of these and other improvements will influence, so as to render your having done so one of those circumstances, the great and beneficent consequences of which will be felt, not only in these kingdoms but in every civilized nation in the earth.

In conclusion, I respectfully beg permission to make a few observations upon the address of the Chairman of the Westminster Commission, lately published and circulated, in consequence of the late sanitary report of the Poor Law Commissioners. At page 30, there is a paragraph, as follows—"The truth is evident, that the Secretary of the Poor Law Commissioners has been content to inform himself, in respect of the Metropolitan Sewage, by special deference to the opinion of one individual, whose object has been to give himself importance, by vaining his own contrivances, by exalting his own Commission, exagerating his own success, and with unbecoming boldness casting unjust reflections on the adjoining Commissions, traving the competency of his brother surveyors of the surrounding jurisdictions."

In the first place, I beg to state that the first communication I had with the Secretary of the Poor Law Commissioners, on this subject, was his sending to me to give information as to sewerage, his questions being founded upon a printed copy of my report to your court, in April, 1840; the only information I gave him appears in the Report, at page 373, to part of page 378, and a quotation at page 61, on the quantity of deposit passing from the sewers to the streams.

I never endeavoured to show the superiority of the regulations of this Commission, by comparing them with those of other Commissions; and in the few observations I made as to the methods adopted in the neighbouring districts, I endeavoured to show that improvements were in progress.

After my interview with Mr. Chadwick, I informed the surveyor of the Westminster sewers that I had been examined, and expected he would be sent for. Finding from a letter of Mr. Kelcey, the surveyor of the City sewers, that his feelings were much hurt, and that he attributed much of the Secretary's blame to me, I wrote to him, and he sent me an answer, from which the following is an extract.

"DEAR SIR,

"Did my letter to the Poor Law Secretary produce no other result than your communication, I should feel highly gratified, for it has entirely disabused my mind of an impression which is by no means confined to myself.

"With your leave, I will show your letter to a gentleman, whose father is connected with another Commission of sewers, for it is well that the ill impression should be counteracted.

"It is much to be regretted that the course which you supposed would be taken was not taken, 2 but advocates of any particular system never want to know the whole truth, but only just as much as can be bent to suit their object."

And I have been informed that Mr. Dowley, the surveyor to the Westminster Commission, never considered that anything personal to him or others was meant by me at all.

In answering the questions of the Poor Law Commissioners' Secretary, I cast no reflection or said one word on the competency of any one; and it is mere assumption to say that Mr. Chadwick has been content to inform himself, in respect to metropolitan sewerage, from me only, when the many quotations he brings from others show the contrary.

I claim my own peculiar right to any feel of praise; its own acts—the scientific knowledge of its members—the attention given to every sort of improvement, will ever produce for it that meed of praise in the public mind which is justly due. I have always been ready to give every information in my power to anyone that asks for it; but that little is rightly known of what is doing in this Commission, or how it is done, is very evident; a fact, which this Report of this day have the honour to lay before you, will confirm.

I have the honour to remain,

Gentlemen,
Your obedient and faithful servant.

Jan. 27th, 1843.

John Roe.

2 That of other surveyors of sewers being examined.
NOTES ON EARTH WORK, EXCAVATION, CUTTING, AND FORMING EMBANKMENT UPON RAILWAYS.

ARTICLE V.—TENDERS, SCHEDULES, AND SECURITIES.

The preceding paper treated on the supervision of works during their progress; in the present one I will endeavour to give a sketch of the custom prevailing amongst the various railway works, previous to the actual commencement of works, in the prior operation of advertising the works for competition, and the condition and manner of taking securities. In the general form of contracts, plans, sections and specifications are exhibited, and printed forms of tender, drafts of contracts, and printed schedules are distributed to intending competitors; in some few cases the approximate quantities of the principal works, as earthwork and masonry are given, but the contractor has to satisfy himself both as to quantity and nature of the ground, the companies furnishing him with sections of the strata from actual borings. The directors do not bind themselves to accept the lowest tender, but reserve to themselves the power of accepting any offer which they may think fit. The successful party has to enter into a bond with two securities to the extent of 10 per cent. on the amount of contract. The amount of contract is generally exclusive of permanent way, which is let separately, as also the keeping of the works in repair for twelve months after completion. As regards the permanent way, the Company furnish the material, and the contract is taken only for laying, and perhaps including keys, wooden pins, or small wares. The keeping the roadway in repair has been tendered for by contractors at sometimes six times the amount that the actual cost has been to them. After experience has tested the amount, it has produced a feeling amongst engineers that it is not expedient to include in the contract the keeping the works in repair, but the contract is generally limited to the extent of completing the work. When the directors meet to receive tenders, it is expected the parties tendering, or an authorized person on their behalf, will attend. The directors make no allowance to the unsuccessful competitors for the expense of their estimates. In some cases the boardsmen of the contractor are bound in a specific amount proportionate to the estimated amount of the contract by the engineer, not a per centage. The time of completion is in some cases stipulated, and a penalty imposed if the works be not completed within the given time, in an increasing ratio, say 100l. for the 1st week, 200l. for the 2nd week, 300l. for the 3rd week, and increasing by 100l. per week for each successive week.

The design and responsibility of centring for bridges, &c. and the onus for the execution of the works are thrown upon the contractor, he is to repair all injuries, from whatever cause, during the execution of the work; he is not to be allowed any day bill for work “expressed or implied” by the specification, and the decision of the engineer is to be final and binding upon the contractor, in all cases where there shall be any dispute or misunderstanding regarding the specification and drawings; and should an insufficient number of men be employed, the engineer is to have full power to take the whole of the works out of the hands of the contractor, seize upon his plant, and cause the work to be finished by any other person. The payments on account are regulated by the certificate of the engineer, and a per centage retained in hand varying from 10 to 20 per cent. Some alteration amongst parties has arisen in their not being allowed to draw for material on the ground and not being in the work. The contractor is made responsible for all damages that may be done to adjoining lands, and for any penalties and forfeitures imposed by the Act of Incorporation as regards crossing canals or public highways. He, the contractor, is to furnish tools and assistants to the engineer in setting out the works, and the engineer has power to remove all materials insufficient as regards the quality at his mere dictate.

I think, as a matter of justice, that the lowest tender should have the contract, provided he obtains the stipulated securities; if the tender be not accepted, the party ought to be paid for his estimate. I consider that the present mode of taking security is unfair and inefficient, and that if penalties are to be inflicted for delays, that an equivalent bonus should be given to the contractor for any number of weeks the work is completed before the stipulated time. I have, I believe, read attentively all the works in the English language relative to railways, and do not think that this important subject has been treated on by any party, even in the splendidly got up works of Mr. Weale, which merely give the specifications of the quality of materials and mode of execution of the works without note or comment. The practice of London for tenders of buildings under an architect is, that when a work is to be tendered for, the architect appoints a surveyor, and a limited number of contractors of note and reputation are written to, and they appoint another surveyor, who, with the former, make out a bill of quantities which is submitted to each competitor, with the cost of the estimate, which is included in each tender, and is generally 1 per cent. on the amount, and which is paid by the successful party. The architect charges 5 per cent, if he superintend and carry the work into execution, and if the job fails for want of capital or change of opinion, the architect only gets paid at the rate of 2 per cent. on the estimated cost. I cannot forego this opportunity of directing attention to an article in the Companion to the British Almanack, page 21, 1843, on the sanitary condition of the people, where Mr. Chadwick observes that “in the execution of other local works, as sewers, roads, and drains to houses, no care is at present taken to ensure the superintendence of persons of competent skill. Noisy parish-bearers obtain appointments of this nature, and are paid at an extravagant rate for inefficient services occupying only a part of their time. A case is mentioned of an illiterate person receiving a salary of 1500l. a year, or as much as a lieutenant of engineers and a private, or as much as three serjeants of sappers and miners.” Mr. Chadwick, with respect to the other works alluded to, states, a hundred thousand pounds have been received in fees for surveys of new buildings per annum, and that “this sum would be sufficient to pay the whole corps of Royal Engineers, or 240 men of science, and the whole corps of sappers and miners, or nearly 1000 trained men.” Mr. Chadwick also observes that under the Tithe Commutation and Parochial Assessment Acts, that “amongst the most satisfactory surveys were those executed by a retired serjeant of sappers and miners.” In respect to railways, the point of the government wedge is already introduced, and I would warn the assistant engineers to unite boldly against this attempt to infringe with their rights.

Whilst extracting from the Companion to the Almanack, I cannot forego the temptation of extending my extracts to the “Notes on railways,” and the new position assumed by them in page 78, alluding to the Norwich and Yarmouth line: “the difficulty in obtaining the capital was so great, that the scheme was all but abandoned, when a new mode was devised whereby the contracts for the whole works were secured to competent parties, on condition of their investing a large portion of their contract price in the undertaking; in this instance the contracts were taken at the original estimates of the engineer; still the principle thus adopted might obviously lead to a good deal of jobbing, and is so far to be reprehended.” In the above observations I perfectly agree, and have made the extract that this series axis in terra may be more fully known through the Journal.

Since writing the above, a special meeting of the London and Birmingham Railway Company has been held (Jan. 16), to consider the expediency of applying to Parliament for an act to make a branch railway from the main line at Bishworth to the city of Peterborough. This meeting is reported in the Railway Times (Jan. 21), from which I take the following conversation bearing on the subject. A proprietor asks, “Am I to understand that there is to be no specific contract for the completion of the work from end to end, and that the contract will be advertised in the usual way? I presume it will be a common contract.” The chairman replies, “In one sense it will be certainly, but I trust that the tenderer may be in such a manner secured that this contract will be done within the amount of the estimate. We do not, however, mean to advertise, but to adopt the usual course of writing to a certain number of first rate contractors, requesting them to send in tenders within a specified time.” Proprietor.—“Then there is no actual guarantee on the part of the contractor that the engineer’s estimate will not be exceeded.” Chairman.—“We certainly are not now in that position, although, as I said before, the engineer’s estimate was accompanied by a tender with a full guarantee for the execution of the works within the sum named.” Another proprietor is replied to by the chairman, who says, “I think the honourable proprietor may fairly presume that the estimate will not be exceeded by the mode of tender now proposed. The view of the board was that there ought to be a probability of reduction in the terms of the tender, rather than the chance of an increase, and it was that consideration which induced us to determine on competition, as far as it can be done with safety. As far as I can see, the execution of the work goes, I consider that we are in a state of perfect security, and that they will be finished within the estimate.” In the above conversation we have the results of the most experienced men as capitalists and engineers that the world has produced, and with as much natural talent as perhaps ever will be produced. From which we learn that the London practice as regards contracts for buildings will be applied to railways, and that competition to too great an extent is unsafe, and that the guarantee of the contractor was for the exc-
cution within the sum named as the estimate; thereby fixing a maximum amount, and that difficulty arose in fixing a maximum. No mention is made of the time, or power of making deductions by the contract scale.

Another plan, letting out works, has been adopted on broken works, that is, where companies have taken works out of the hands of contractors, by allowing other parties to finish them, at a per centage on the expenditure of 7 to 10 per cent., a check being kept on the contractor by the companies in the weekly pay bills. I have also known other public works, as gas works, so carried into execution. This system is also applied to the agents of contractors and extensive commercial works, a salary being fixed, and a per centage being given on the amount of works made by the concern.

From the number of responsibilities and restrictions laid on contractors, as previously enumerated, one would have thought there would have been no necessity for the remark, that competition fails to produce too great an extent, and was unsafe. Do contractors rely for profits on extra unsetled amounts? there being many amounts which remain unsettled for 10 years after the completion or opening of several railways already executed, or do they rely on the law's delay? let the cause now in Chancery, of RANGER versus the Great Western company furnish the reply. Again, as to securities; are there no bubble companies? and on what has the contractor to rely on for letting his plant fall into their hands? I can only think his protection must be the cash in his pocket, and his being ready for active defence. I have known a poor contractor ruined, by having his works pushed in bad weather, and he was obliged to leave the works without redress. Ready money yields a quick rate, and will quicken even the perception of a Lord Chancellor. In settling disputes of this nature, arbitration is sometimes resorted to by public companies, to avoid the law's delay; and engineers of eminence are called in to settle the disputed accounts. In all contracts between companies and contractors, it would be well to name two parties, all as referees, in case of dispute, to curb the sole control of impetuous or peevish engineers.

The practice of the Board of Ordinance, is to fill up a printed schedule of prices. Take smiths work, for instance, the items enumerated most likely to be wanted, will extend to a hundred articles, of any pattern that the superintending officer may order, as articles of wrought iron, materials for daywork, or for store, cast iron, exclusive of patterns. The tender is to be "at how much per cent, above or below the prices inserted in the schedule, he is willing to contract for the supplies"; and only one rate of per centage must be named above or below all the prices in the schedule; and he is to make out his bill at these prices, and add to or deduct from the total the per centage, according to his tender. The generality of tenders are below the prices of the honourable board. The contracts are taken for a term of years-determinable at any period after one year, on either party giving three months notice. Bondsman, with two securities bound jointly and severally, are taken for the performance of the contract. The superintending officer has the control of materials as to quality, and imperfections of workmanship, number of and efficiency of men employed. The contractor is to furnish daily a list of men, and weekly a statement of time, and cost, and how employed; and a list of articles, if any, to which the schedule will not apply. The bills are delivered within 10 days after the expiration of the current quarter, and payment made in the course of the subsequent quarter. In this account of the practice of the honourable Board of Ordinance, we have undoubtedly the nucleus of the principle adopted by the different railway companies; but the chief point, the principle of a per centage, has not been adopted, which I think is the safest for all parties, the company and contractor. I have known the practice adopted by a firm of mine, in a public work of great extent; he sent a schedule of prices to parties, and they were to tender at per cent. on the amount of work (the bills being priced by the schedule) at which they would execute the work. In this mode there is no definite quantity fixed, and therefore no addition and deductions as the works progress, and therefore there can be no extras so annoying to all parties concerned; it is more assimilating to measure and value, with the exception, that the scale of prices is fixed before the commencement of the works. There is a custom amongst contractors of pricing the body of their contract, at a different ratio from that of the schedule, in the expectation that there will be more extra works than deductions here; I warn all parties that so doing, is decidedly wrong in principle and unexpend in practice. To avoid the above practice, the Manchester and Leeds Railway company inserted two schedules in their proposals, that proposal having been the tender is computed, the second containing a list of extra works: in each schedule above 100 items were enumerated. A difficulty often also arises in the measurement of works, as to the custom of the country or trade; and

in railway works it is generally expressed, that net measurement only will be allowed, and that brickwork is to include all foundations, digging, pumping, and all other masonry; and the work of building back of walls, back of bridges, &c.

I will now proceed to say a few words on plans, sections, specifications, forms of tender, drafts of contracts, schedules of prices, &c. The two first explain themselves, and the draft of contract is in the province of the lawyer. The specification is supplementary and general; the latter applies to all contracts on a line of railway, and in one case was so voluminous as to extend to 20 folio pages containing 61 clauses. The 61st clause was to the following effect, and will define what is meant by general. "The whole of this specification is to be taken and construed according to the true intent and meaning of it, and in case of the construction of any part of it appearing doubtful, the opinion of the engineer as to the intent of any such portion is to be relied upon in the execution of it. The present specification describes the particular works referred to in the general clauses, as for contract No. 1, No. 5 l, or any subdivision of a particular line, say commencing at chain No. 21, in a field shown in the plan near — — , and ending at chain No. 306, shown in the plan situate near — — , being in length about 3 miles, 4 furlongs, 5 chains, 7 yards, or thereabouts. In the specification a table of the gradients is given, and the number of the bridges, with detailed plans of each. The form of tender is as follows:—"To the Committee of, 1, of — — Railway, (inclusive or exclusive of the permanent way, as the case may be), from — — to — — according to the plans and specification, within the period and upon the terms and conditions mentioned and contained in the draft contract exhibited, for the sum of — — l, and I have, in the schedule hereto annexed, set forth the prices of the different descriptions of work at which the aggregate amount of this tender is computed, and in case this tender shall be accepted, I hereby undertake to execute a contract according to the draft referred to within 14 days from this date, and proposes A B and C D as securities for the due performance of such contract." Again, "I hereby offer to execute the whole of the works described in the specification, &c, and in the event of this tender being accepted, I bind myself to enter into a regular contract, and to find satisfactory security for the due performance of the work, and I agree that the value of any addition to or deduction from the amount of the work specified, shall be calculated at the rates stated in the annexed schedule of prices." In the last case, the real estimate of quantities by the engineer was printed in the schedule, with a description of each kind of work attached, and in the case of the Manchester and Leeds Company before alluded to, the amount of security required was stated in the conditions of the contract; it was, therefore, necessary for the parties tendering to add to their tender. "And I do hereby undertake that A B and C D shall, within a fortnight from this date, execute a bond to be prepared by the Company for that purpose, in a penal sum equal in amount to 10 per cent. on the amount of my tender:" The Great Western Railway fixed a definite sum for the bondsman to become secure for on each contract, not a per centage; also that the two sureties be bound jointly and severally. Notwithstanding the arbitrary powers of engineers, the complex array of law, and the exaction of bonds, they are all found inefficient as regards keeping contracts within a specific sum, or the gross amount of tenders. There can then be any thing said in addition to show the inutility of contracts on the usual plan.

I should like to see the principle of tendering now in practice by the Board of Ordinance applied to railways, as before alluded to; and if this plan, with the addition of the quantities (as agreed upon by the contractor and engineer, or by their surveyor) were supplied to intending petitioners, I think it would tend to simplify the costs of public works, and at the same time make the officers of supervision and of the executive look more lovingly on each other. I have no doubt, should Government execute the Irish railways, some such system will be adopted by the Board of Trade. I will, in my next, if leisure permit, enter on the principle and construction of earthen works, which has not, as yet, had the importance bestowed on it that it deserves. In the meantime allow me to subscribe myself, with all respect.

St. Ann's, Newcastle upon Tyne.

Your's obediently,

O. T.

* The cost of piling, per cubic yard, is about twopenny, or half the cost of excavation.
"They had no artist, and they died." But the technical reflections on this table are not less instructive. The struggle of 2000 years with the monolithic—the influence of fashions in the design, and of slavery in the execution, of works, reducing the cost by at least one quarter—the lever, the levi, the trochees, and every engine employed in modern manipulations, is all the olden buildings of the east; Stonehenge being one of the few buildings of the dawn of architecture; the inferiority of ancient cities in the distant view as a congregating-rate of low buildings, to those of the modern world with towers and campamplings; the change which such customs induces—the church-bell, which in the seventh century hardly existed in one conurbation; Clotho Rahare and his troops under the walls of Orleans; then the delight and boast of communities, and gradually becoming 80 tons in the 19th century at Moscow, enlarging during those centuries the towers and structures for its reception, and kings by an elaborate survey of art—the use of glass, in narrow windows in the first century, a vast improvement on Phoenicians, used till then; the manufacture of the civilized only, till the 12th century; then infusing colours with unseemly glass—glazing in part only the domestic windows, which had been built until the 17th, and now in one sheet filling the entire sash. Meanwhile, architecture tended to this manufacture, and changes its features and proportions with the phases of its improvement. And, lastly, cast-iron, which within 40 years has discovered capacities which will alter the whole structure of buildings. We may say with the poet—

Lolo d'ici discurse vulgaire
Que l'art pour jamais dégénère,
Que tout s'élève, tout finit;
La nature est inépassable,
Et Dieu inaccessible,
Et le Dieu que la rajeunis.

The principle to be inculcated seems then to be the acceptance and employment of every useful and safe introduction of new features, and befit the march to human improvement, as to be consistent with taste, while it is also to the great end of use. Thus we shall obtain new creations in the art—which a servile imitation refuses.

These are amongst the advantageous reflections which the contemplation of the chronological table will give rise to.

This evening the Professor proposed some remarks on the principal monuments of civil architecture amongst the ancients. As the ritual prescribed the forms of sacred architecture, so political and civil institutions prescribed the forms of civil architecture, and these were then conformed to the purposes of the palace to the temporal governor of the earth: regarded as God's vicegerent while living, and as demi-gods when dead, their mausolea endure through all ages, in the Pyramids, or in the Moles Hadriana, and where these are supported by cases, we have the Labyrinth, the Temple Palace, and the treasury—in republics none of these are found, but the temple, the gymnasion, the theatre, the stoa, the basilica, and public works abound; when states are absolutely commercial, as Tyre or Carthage, nothing remains but their name in history; their architecture seems to have been confided to the perishable timber.

The uncertainty of future existence made duration in the present the earliest object of solicitude; monuments in the pyramid or the obelisk are the most remote architectural works which have reached us. In 1732 a.c. Jacob raised a memorial to Rachel, "that is the pillar upon Rachel's grave until the day of the Lord." For the Egyptians, however, modern Siculus, did not think that the fragility of the body deserved a solid habitation; indeed, they regarded their palaces as simple lodgings, in which each successively inhabited; but they considered their tombs as their peculiar habitations, as their fixed and perpetual domiciles.

The subject of pyramids would never be mentioned without acknowledgment to the labours of Colonel Vyse, which for princely liberality and English endurance and disinterestedness are unparalleled, as indeed also for their great interest, since on this subject, debated for so many centuries, he has left nothing to desire.

But, to the architect, no monument of antiquity could be more precious than the tomb of Absalom, in the valley of Jehosaphat, which is monolithic (for the most part), or rather cut in the living rock, and exhibits an Ionic temple in unis (like Solomon's Temple), with a Doric colonnade, and a tholos or circular attic, surmounted with a conical top and a pomegranate; all features in perfect correspondence with the reasonable expectations regarding Jewish architecture, which, however original in plan and disposition, would never be so in ornamental style, because the comparative smallness of the nation, the fortunes of individuals limited by the law, the agricultural habits of the people, their discouragement of taste, and their position between great and flourishing countries so remarkable for its cultivation as to lend their artists to the Jews, whenever occasion demanded, were all opposed to the invention of any peculiar and original style of architecture.

A beautiful representation of this remarkable tomb had appeared in Roberts's "Holy Land," there could be no doubt as to its identity, since tradition amongst the Moslems maintained that it always was accepted as full proof of the existence of the house of David. The most recent evidence—its perfect correspondence with holy writ (II Samuel, ch. xviii.) is striking:—"Now Absalom in his lifetime had taken and reared up for himself a pillar, which is in the king's dale: for he said, I have no—
son to keep my name in remembrance; and he called the pillar after his own name, and it is called unto this day Absalom's place." Wren calls it the most observable monument of the Tyrian style.

"It were to be lamented," says he, "some skillful artist would give us the exact dimensions to inches, by which we might have a true idea of the ancient Tyrian manner.

Labyrinths are amongst the earliest and most astonishing of architectural works; they were found in Egypt, Crete, Lemnos, and Tuscany. Herodotus describes them as surpassing in extent and magnificence; the one he describes (Hist. cxvIII.) was composed of 12 courts, having apartments of two kinds, 1500 above the surface of the ground and as many beneath, in which were the tombs of their kings. "No one could enter them," says Diodorus Siculus, "without a guide." Yet Pliny tells us they were not contrived like the ornament commonly called by that name; in that of Lemnos, says he, were 150 columns turned in a lathe, which a child could move; and this is remarkable as evidence of the use of such a machine in the capitals of the Parthenon, which has been always supposed.

The living use of the Labyrinth is left to conjecture; but we may easily conceive their adaptation to a people of castes, with whom they might be colleges for those aristocratic classes surrounding the throne. We are told that all the youth of Egypt, born on the same day with Sesostris, were set apart and educated with the young prince, and thus it was that he found himself surrounded in manhood by attached companions, who carried his conquests and his fame to the greatest height. Where could so vast a generation be educated but in the Labyrinth?

The Professor doubted the interpretation commonly applied to the so called temples of Egypt; he believed them to be rather temple palaces, in which the temporal administration of a great country was carried on, together with the spiritual. The ruins of Karnac covered 10 acres. Within the walls was inclosed a space equal to the whole length of St. James's Street, and four times its width. The comparison of this plan with that of the Louvre and its courts, with the use of which we are familiar (and exhibited with plans of Luxor and Dendera, and Dioctetian's palace, and others drawn to the same scale), would show the high improbability of the employment of such vast spaces for the priesthood alone; and it could be shown, especially at Dendera, that all the public business of the realm might be conducted there, and that the Pharaoh himself very probably resided, as in the Arab villages at this day, upon the Israel terraces where these vast buildings afforded, raised into the air, and removed from the vermin, inundations, mirage, and confinement, to which the habitations on the soil of Egypt were subject.

The Pharaoh united the offices of monarch and high priest, and all the dignity and imposing awe which the arts could afford, were associated with his presence. The palace was approached through an avenue of sphynxes of a mile in length. The Pylon was seen afar off raising a vast front of uniform surface, on which were engraved on one side the Pharaoh in his warlike attributes reviewing his troops, charging the enemy, whom he annihilates at a stroke, besieging cities; on the other, in his peaceful, administering justice, and the more sacred duties of his priestly office. In front of this wereobelisks (the smallest of which is now in Paris), and colossal figures of the Pharaohs.

The first court equals in size Willow Place, from the column to Pall Mall. Here, under a colonnade, "the king sat in the gate," with "his princes and counsellors;" this was his porch of judgment;" the sculpture and painting of the ceiling symbolized appropriately the passage of the soul through human vicissitudes to a final judgment.

The colonnate grove beyond, 325 feet by 256, afforded a waiting hall (the only cool one in Egypt for all the court, so pompously described

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<th>Dates</th>
<th>Architectural Writers</th>
<th>Eminent Architects</th>
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<td>Noah</td>
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**AFTER CHRIST.**

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**Note.—** The writings of those in capital letters are still extant.
...in the time of Rome, by Roman emperors, covered a large area of the city and was extensively used by the people. It was the most important architectural feature of the early Roman period and was later admired by the Greeks.

The gymnasia were also important, as they were used for religious and political purposes. The most famous of these was the gymnasium of Diocletian, which was surrounded by a colonnade and was decorated with fine mosaics.

The name, Thermæ, as well as the express declaration of Vitruvius, declare that these institutions were exotic: a refinement adopted from Greece in the time of Augustus. During the first three centuries of our era, seven of these were erected; they were well calculated to indulge that love of luxury which rapidly corrupted the manners of the first Christian age. They were covered by Sir C. Wren at Dorchester.

The thermœ, or hot baths, were as necessary to the Romans as coffee is to us to-day. They were built in the centre of the city, and were divided into two parts: the public baths and the private baths. The public baths were open to all, and were free of charge. The private baths were for the use of the wealthy, and were more luxurious in their arrangements.

The gymnasium, or gymnasium, was a common feature of Roman architecture. It was a large hall, usually covered with a flat roof, and was used for gymnastics and other exercises. It was also used for public meetings and as a place of worship.

The basilica, or basilica, was another important feature of Roman architecture. It was a large hall, usually covered with a flat roof, and was used for law courts and as a place of worship.

The basilica of Trajan was the most magnificent exemplar of this species of building which the Professor could point out: with its forum, temples, 20 basilicas, and 500 shops, it covered 12 acres, and was only in the extreme ends of the cross. The central nave, 278 by 78, would contain the whole of Westminster Hall, in plan as well as in section. In Rome were 18 basilicas, and one at least in every city of the empire. Their subsequent devotion to the public was properly a tribute to the gods; but the Greeks were not accustomed to apply sacred architecture to civil purposes.

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tion. Some of the features he would describe. You entered a small tarrum and thence a court in the form of the letter D, surrounded with a portico, which was enclosed partially with glass (the very original of our old conventual cloisters), and thus enclosed rough weather. Thence through a court into a trichinium, which hung over the sea, and had windows all round three sides, and the sides and front of the building were beautifully carved, and ornamented and provided with statues, and all making up a delightful plane in the larger season. There were rooms heated by pipes from a hypocaustum, and others to retire in stormy weather, to escape the roasting of the waves; a large bath for common use of the inmates, and a sphere-shaped room, which was a sort of a top gallery (crypta portico) with windows on either side, which, when opened, admitted the fragrance of beds of violets, and the sun's rays at the rising and setting. "At the end of this," continues Pliny, "is a casino I built myself—my delight; in it I have an adored Iluted garden, a sun chamber, warmed by windows all round; while reposing on my couch in a recess adjoining, I can see the garden, the landscape, and the sea, through a glazed door; I can study in perfect quiet here, and escape all the noise and disturbance of my servants, occasioned by the Saturnalia."

Pliny omits some features of great interest in the Roman house, as the Sacristian, (the chapel,) in which the lares (the household gods,) were placed, and sometimes the statues majorum, of which the Romans, like ourselves, were justly proud. The Tablinium, for the archives, which also received these sometimes; and the Estoria, that room of the domestic side of the house in which chastisement was administered to the slaves, in the absence of our schools at this day, as we see by various paintings preserved to us. Pliny describes his gardens, his fings and mulberries, his gestatio bordered with box, and plantations disposed in the form of Xyustus and the Hippodrome; the fountains, the great statue of Venus; the marble colonnades: and since "the world," says Sir C. Wren, "is governed by words, they may often be adopted by the architect with good effect, when introduced appropriately and without pedantry."

The attention to the sun's rays in the milder climate of Italy, so conspiciously shown in Pliny's letters, is confirmed by all the authorities of antiquity.

Vitraviius (b. c. v. l.) is very particular in his recommendations to this effect; but the wisest of men, in a still warmer climate, has enforced this point yet more strikingly,—"To make a house pleasant," says Socrates, "it should be modelled to suit its climate, and have a house well suited to its climate, therefore which looks towards the south will best secure these objects, for the sun which will enter into the rooms in winter, will, by its greater altitude, pass over its roof in summer. For the same reason, these houses ought to be carried up to a considerable height, the better to admit the winter's sun; whilst those to the north should be left much lower, as less exposed to the bleak winds from that quarter: for, in short," continues he, "that house is to be regarded as beautiful where a man may pass every season of the year pleasantly, and lodge whatever belongs to him in security."

The early Italian architects, it is true, have no aspect to this, which they signify by the term "warm, do non viene il sole, viene il medico."

But the most extraordinary villa of the ancient world, was that of Hadrian, at Tivoli, in which he displayed all the acquisitions and collections of taste, during 21 years of constant travel through this vast empire; in it was his library, which was unique in the world; his oil, wax, and other quadrants with Palladio. Domestic and villa architecture are special subjects with him; for, says he, "Every man's proper mansion and home being the theater of his hospitality, the seat of self-indulgence, the comfortable part of his own life, the noblest part of his son's inheritance, a kind of private prince among, nay, to the possessor himself an epome of the whole world, may well deserve by these attributes according to the degree of the master, to be decently and delightfully adorned.""In truth, during three centuries the cultivation of this branch of architecture may be said to be peculiar to England, and that, while monumental and palatial buildings are better adapted to the climate of this country, and of the English mind—prostrate to the salutary retirements of home, the centre to which all its desires and warmest imaginings are ever pointing—bare made the English house of every grade the most perfect in comfort and convenience, and the villa the best ideal of individual possession and the branch of the art in which our country excels beyond all others.

The compact square villa, after Palladio especially, was introduced by Inigo Jones, and much advanced by the model of those at Genoa, published by Robert Vignola, a circumstance which has given it very largely to geometry. A house comfortably suited to gentlemen of moderate fortune, such as the republic of Genoa is composed of. But the extension of the habits and the requirements of the present day have outgrown the square villa, and we are constrained to build a house beside the villa to accommodate them, with the worst effect possible. The group and initial was in vain the plantation attempts to hit it out: an anomalous composition is the result, and we had better have reverted to the Elizabethan mansion, which cast the house and offices into one in the extended E or H, or the French mansion, "entour court et jardins," of the 18th century, reserving the centre for the best apartments, and the wings for other essential features in the angles communicating easily with all.

The least rational of English productions in this sort is seen in the castellated elevation adapted to this plan—the battlegrounds and dungeon-keeps of Edward the Third upon the Italian villa of the 16th and 17th centuries. But an effect, this, and the picturesque elevations of that kind. In the distance, are, on the approach, found to be peaceful and harmless; the fortress is accessible at every window, and expresses a security from danger on better acquaintance, in direct contradiction to its fortified exterior. On entering the baronial hall, where you expect the paraphernalia of the world, you are addressed by a powdered footman, or may discover a housemaid sweeping the marble pavement.

The Grecian villa is hardly better conceived; it may be taken for a library, or a philosophical institution. An extensive portrait, borrowed from Minerva palace, engrafted on their composition, which is to be expressed accordingly, at the cost of all its internal proportions and accommodations. Every useful appendage of vulgar convenience is to be expressed, as ill-suited to its Platonic refinement. As Swift says of Clelia—

You'd think that so divine a creature

Felt no necessities of nature.

But such architectural soliciams derogate from the dignity of the art, and convert into a theatrical or romantic dream, that which should embody sense and rational invention.

The essential features should be prominently expressed; the nobler portions, the offices, kitchen, clock, and the stable, should tell their own story. And fiction would be found unnecessary when all these are placed in due subordination and proper character by the artist's hand.

France, until recent times, essentially monarchical and aristocratic, has ever dwelt in palaces, and has adopted, as it were, the classic, as the most remarkable of Europe. Du Cerceau, Philibert de l'Orme, Mansards, and Blondel, and many able successors, afford us the fullest information on the ichnographia adapted to these grades. In conception and design, and in many respects in execution also, they were the most perfect in the works of centuries; still unfinished, is the greatest of all the French architects, in the field in which they may exercise their genius for centuries to come in their several works—the greatest house in which talent may find protection and employment.

It was for the foundation of such schemes as these, that Francis I. invited Vignola and Serlio, and the painters Paulus, and Baudouin, into France; Cescari, Cesarino's translation of Vitraviius, and the elementary works of Serlio and others, which obtained for him in return the title of the Father of Literature. Nor were his successors inferior to those who enabled the artists afterward to rival the great Italians—for L'Escot was preferred to Seria, and Perrault to Bernini.

The peculiarity of French orthography is in the high roofs, subdivided into pavilions, affording great effect in composition of various and connecting forms, aided by their height, the many skylights and dormer windows, and the great light and air admitted into their interior.

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A military people delight in pavilions; each apartment was to represent a temple. The height of the front is terminated with two difficulties distinguished by the name of Pavilions de Flore and Marsan. A maritime people delight in their ships: thus the English apartments convey the idea of "between decks," and the larger buildings are often like the man-of-war hull laid up in ordinary. So in Russia the palaces have the air of barracks, and at Vienna and most of the large royal residences that work was done. In Egypt, the Trogloitic excavation was revealed in the temple palace; in Greece, the log-house in the temple structure: in China, still the tent, in its simplest form.

In the middle ages domestic architecture arose from the monastic structures in single rooms. Lighted on either side like our colleges, the chimney shafts issuing from the eaves. The composite house of double rooms was borrowed from the Italians by Francis I., but even there the degemess was wanting, and the chamber, ante-chamber, waiting-room, and guard-room, went into separate rooms. It is in the English palaces that this problem has been best solved.

But the Professor observed, that this digression had led us from the chronology of the art, which terminated with the Roman villa; and we now entered that melancholy period of history, in which all ancient ideas of human enjoyment were absorbed in loftier and more serious aspirations; and the art during the next 1000 years was employed alone in military and ecclesiastical buildings, by means of the Freemasons. The original institution of that order is traced even in the Greeks and Romans. Numa established the first corporations of architects, Collegia Fabrorum, together with the Inferior Collegia Artificum. They were invested with a religious character, and rights of framing laws and treaties amongst themselves. They greatly contributed to the increase of the Roman power amongst the barbarians, as they were the most active of the Franks. Ancestor to whom an article of treaty on their part, has always been to send a blacksmith amongst them. The Collegia were greatly promoted by the Roman Emperors in the rebuilding of cities, in the aquedux and public works, and endowed with peculiar privileges, as freedom from taxation, holding of land, to which the life of an artisan was attached. The first to arm a corps of architects to the Cohorts (about 120, A.D.), an example which the admirable College for Civil Engineers at Puteaux, in favour of our colonies, promises to follow with great advantage.

And it was at the termination of the eighth century, that the masons of Como assumed their peculiar form of Freemasonry, raised into importance by the patronage of the commercial and zealous Lombards, in the building of churches and monasteries with new materials; and dispersed after the destruction of that kingdom by Charlemagne, they spread themselves over Europe, and have been the preserving and transmitting powers of the lesser mysteries. Collegia had existed in England; but, destroyed by the ravages of the barbarians, the Freemasons (probably of Como) were invited by Alfred, and after by King Athelstan, who gave them a charter in York (926), the original of which is said to exist still in that city. It cites the Oriental Church, the history of architecture from Adam, with Rabbinical tales of the Building of Babel, the Temple of Solomon; Hierac, the Greeks and Romans, Pythagoras, Enclid, and Vitruvius, are quoted; that St. Albanus (306, A.D.) obtained a charter from King Carausius, with sixteen laws, and one for the preservation of the church. The Teutonic power, which had already made its appearance in England, had fixed itself at Ratibon, of which the architect of Strasbourg cathedral was the grand master. Charters and privileges were added by Maximilian, 1498. In 1717, Sir C. Wren was the grand master in England; but shortly after the ancient fraternity altered its original form and purpose, and became what we now understand by Freemasonry. Wren was then extremely old, and probably unequal to oppose the perversion which then took place; and which, from his known services to the craft, we cannot doubt was contrary to his wishes.

Thus the period of the revival was arrived at, and the Professor explained that in the previous period of precision, and the time to the review of ancient, sacred, and civil architecture, from the preservation that the art would never again effect similar productions; therefore that antiquity formed that great storehouse from which the architect was to draw his best instructions.

In the time of the middle ages, the problem of architectural power and combination had been worked out and solved, that the mastery of the ancients was admitted, and that such works would never again be performed; but it would not again become a primary instrument of civilization. The human mind had fashioned them; and the spectator stands on a plain of Siberia, astonished, and in this sense, engaging the faculties in occupations more advantageous to the improvement and happiness of our species. The intellectual growth to the manhood of our nature, now perhaps attained, would esteem architecture ever a powerful engine in the attainment of the sublime and beautiful, but would never again indulge that preponderating regard given to it by the ancients.

The middle ages laboured after the ancient models with many divergencies: in the revival with the muse, the conviction of their pre-eminance was admitted, and the principles of their perfection not only the chief, but was wanted but to revive them, and the deal with which this object was pursued was immense.

In 1146, Poggio Bracciolini, in searching for manuscripts, discovered a copy of Vitruvius, "covered with dust and rubbish, in a tower not fit to receive a malditor," says he, "at the monastery of St. Gal, at Como;" and in 1145, copies of this happy revelation were spread amongst the learned, until the invention of printing, in 1415, multiplied them amongst the great architects of the day—Brunelleschi, Cesarino, Bramante, and others. The magazine of Bertoldi was the chief of these, but not finding in Vitruvius sufficient to inform and fine the spirit of the artists, which all competent judges have esteemed the most masterly compilation in the art extant. "Seeing," says he (lib. vi. i), "that of all antiquity Vitruvius alone has reached us, that such chastities and imperfections appear in his works, that they are the result of a spirit which, in the Romans and Latin to the Greeks—leaves so much unintelligible, I thought it my duty of an honest and a studious mind to free this science from ruin; though the reworking without meanness, reducing to a just method, writing in an accurate style, and expounding perspicuously so many various matters—so unequal and so collegiate of mankind—certainly required a greater genius and learning than I can pretend to," &c.

But he did not confine himself to the theory of his art; as a scholar, a mathematician, a Platonist, and of a noble family, he associated with all the greatest spirits of his day, and was intimate with the living masters and the progress of their works. Whatever comes from him, therefore, is generous, moral, philosophical, practical, and elevating: he proves himself truly of the order of cavaliers; he mounts you upon his horse, which quickly you find a Pegasus; he raises you above the vulgar cares and labours of this nether world, and in his airy flight he shows you all the kingdoms of the world and their handiworks; and then he sets you down, cheered, instructed, delighted, and exulting in your profession.

Brunelleschi, in his school at St. Spirito and St. Lorenzo, employed the
orders in good proportion, but these supported arches. The celebrity of Bramante’s St. Pietro, in Montorio, doubles arose, in great measure, from the originality of its conception. The main entrance was indeed small, only 3 ft. 10 in. from column to column. But the timid application of the classical orders to the middle age buildings, often of large dimensions, gave them rather the character of tinkets hung upon them than of constituent parts of the fabric. Bramante, indeed, made a great step in the palace of Cardinal Wolsey, but the orders are still delicate, in low relief, the windows circular-headed (from the difficulty of executing the square trabeated head) with the horizontal entablature above them. The basement, though elegant, has a gothic character, and the crowning cornice has but a small projection; the whole is dry and timid. But Bramante had the merit of inventing the couple column, which gave breadth and lightness to the whole height of the building and the always attainable. The ancients had left no examples of this disposition—but such were its advantages that it was at once accepted by Raphael and his successors; Perrault used it in the Louvre and Wren in St. Paul’s.

Adame, and the Palladian orders which his successors knew how to adopt, particularly in his church at Mantua; he gave the hint which M. Angelo followed in St. Peter’s, of incorporating the whole height of the interior (not done till then) in one order, and vaulting the ceiling. His church at Rimini bears the stamp of Roman magnificence, quite beyond his age.

Peruzzi was the first to render his orders homogeneous with the structure, and his giving to the entablature of the upper order (especially in the Farnesina) a proportion suited to the entire height of the two, as was beautiful as it was new; it was afterwards adopted by Sansovino in the library at Venice, and there the principle was applied.

But Peruzzi executed an entablature in the Palace Massini, and square-headed doors of no mean dimensions (six feet six inches between the capital) was beautiful; but it was especially in perspective that he made advances far beyond the conception of any other architect. The noblest productions of his genius, folded by Serlio, his pupil, who possessed his collections and published them, through the patronage of Francis I., in the first elementary work on the art written since the revival. The first edition in French is dated Paris, 1547; it was translated into Italian at Venice, 1556, and, by Robert Peake, into English in 1611, under the Latin title De Architectura. It is the same as that of Palladio, and without paralleling the eye up, and enable it to embrace the whole front. This invention, which appears to be wholly his own, became popular and universal.

The windows, with their small orders, are undoubtedly taken from the Roman temples or ornamental niches, so often seen in the baths and in the Pantheon, and was also a new application.

Raphael, as great in architecture as in painting, adopted his master Bramante’s invention of coupled columns, as also San Gallo’s windows and quoins, and if he did not invent, he employed the balustrade with singular grace and effect—for grace united with strength and nobility, his palace Pandolfini, Cafarelli, and Uggeri are unequalled; indeed, his letters show his enthusiasm for architecture, his profound estimation of the antique, and his ardent aspiration for the restoration of Rome to its antique character and splendour. The backgrounds of his pictures are not less to be regarded as examples of his excelled works, being designed with such care as if they were to have been perpetuated in marble.

M. Angelo distinguished his designs by vastness and singularity, compared with the previous schemes of Raphael, Peruzzi, and San Gallo. We are surprised by the building in the Chigi Palace in Rome, having 50 feet in the external front, and a corresponding disengaged entablature for an extended portico in the west-front—which latter, however, was never attempted. His palace of the Capitoline has many merits and peculiarities, one of which, practised in the Laurentian library also, was the sinking his columns in niches.

Vignola has been deservedly regarded as a master of the first merit, and has been hitherto the great authority in the French school, as Palladio has been of the English. His sterility, profile, proportion, and composition are admirable; his orders are generally subordinate, often at the top of his buildings. He has completely adopted the Greek orders; he has reconciled the wide intercolumniations by a panel which gives proportion and sustains the pilaster with excellent effect. This expedient, much followed in Italy and in France, was original with him, as was also his modillion cornice, extended to the frieze, and giving extent and importance to the entablature, proportioned to the whole height of the building, in a better mode than that of Peruzzi. This beautiful invention is recommended without estatation:—“Qua cornice, says he, “la quale ha mala più volte opera per finimento di facciate, ho conosciuto che riesce molto grata.” This cornice was his invention, and it was modeled on the Cornice of Bramante and Raphael, but having the wide intercolumniations by a panel which gives proportion and sustains the pilaster with excellent effect. This expedient, much followed in Italy and in France, was original with him, as was also his modillion cornice, extended to the frieze, and giving extent and importance to the entablature, proportioned to the whole height of the building, in a better mode than that of Peruzzi. This beautiful invention is recommended without estatation:—“Qua cornice, says he, “la quale ha mala più volte opera per finimento di facciate, ho conosciuto che riesce molto grata.” This cornice was his invention, and it was modeled on the Cornice of Bramante and Raphael, but having the wide intercolumniations by a panel which gives proportion and sustains the pilaster with excellent effect.

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mechanical, dry, and repulsive. Whether any of his brother archi-
tects will now side with Mr. Gwilt, remains to be seen; but in my
own opinion they have very little cause to congratulate themselves
upon having a champion in their ranks, who would show his prowess
by hewing down, and putting *fors de combat*, all the volunteers
engaged in the same cause. Much industry and patience, not much
Mr. Gwilt, but I certainly did suppose that he would exercise a little more
discretion than he has done. I did not, for instance, imagine that he
would allow his antipathy to German architecture to prevail so far, as
to give no account of any of the numerous fine buildings erected in
that country during the last 30 years; and as not to applaud the zeal
with which architecture is carried on, if he could not say much in
favor of the taste displayed in it. Had he done so—and the same
with regard to other countries, those chapters of his work might have
been made to contain a great deal of quite fresh and valuable in-
formation. The reason assigned by him for not doing so, is a most
flimsy and childish one—perfectly ridiculous; for according to that,
there ought to be a great deal of criticism on contemporary works
at all; nor ought any to have yet appeared relative to those of a Thor-
waldsen, a Cornelius, and other great living masters in their respective
arts. Besides, he might have executed that part of his task very in-
nocently, and without giving the slightest umbrage to any one, by ab-
staining altogether from criticism and comment, and confining him-
self to description and mere matter-of-fact information. At pre-
sent, the only apology for passing over altogether what he was conscious
would naturally be looked for, sounds much too much like the fox's—"the
grapes are sour." The real reason, there can be very little doubt,
was his inability to make the necessary research, and collect mate-
rials for that part of his work, wherefore he would have done well to
obtain assistance for it. Considering his avowed and unqualified dis-
lke, or I might say, hatred of modern German architecture, it is not
very surprising that he should not have referred us to any of its chief
productions, lest the bare mention of them should be mistaken for
approbation. Yet neither does modern Italian receive better treat-
ment from him, for he says nothing of what has been done in that coun-
try, within the present or even the last century, excepting the palace,
at Caserta. There is not a syllable relative to such architects as
Calderari, Temanza, Selva, Piermarini, Cagnola, Niccolini, and a great
many others, whose works display quite as much ability and taste as
some of those which he most highly praises. Nay, though he ex-
presses so very high an opinion of modern French architecture ge-
erally, it is only in general terms, without describing anything
of the kind, or showing it in a wood-cut. In fact, he has not
introduced any fresh subjects among his "illustrations" and of his
"more than 1000 engravings on wood," the greater part are mere
diagrams, and the rest of very ordinary character. What will ult-
imately be that of his "Encyclopædia" itself, may easily be guessed,
for most assuredly, if his name is not still attached to a very flattering
name from students of Gothic, or admirers of German architecture, both
of whom will not only be disappointed in it, but offended also, more par-
ticularly the former, since they are by no means likely to relish the
insolently sneering and contemptuous tone in which Mr. G. speaks of the
literary idlers, especially at the universities," whom abuse them-
selves with inquiring into the history of Gothic architecture; which
ceases, we must suppose, extended by him also to such publications
as those by Parker, and Bloxam, their object being to aid, encourage,
and promote the study of it, not at the universities alone, but all over
the kingdom. But the popular current against which Mr. Gwilt
swims, may overhwhelm both him and his book; therefore, his opinions
may do no great harm after all. What is chiefly to be regretted is,
that his "Encyclopædia" is likely to stand for some time in the way
of any better publication of a similar nature, because, though there is
ample room for one, in one sense, the market for it is, or will be
thought to be, pre-occupied.

I remain,

Yours, &c.,

A LITERARY IDLER.

ON THE STRENGTH OF BEAMS.

Sir,—One of the greatest advantages which the practical man has
over the theoretical, is that of being able to discover any great error
in a design by mere inspection; this facility in discovering serious
mistakes is called "fors de combat," is only acquired by men of great practical
skill and long experience in working and designing by many failures; the practical
man, in forming a design for a bridge or any mechanical structure, seldom uses anything besides a scale and
pencil; he rarely commits any great error, but also he is rarely
exactly right; on the contrary, certain data being given to the
theoretical man, he enters into calculations mostly always long and in-
treiate, and forms his design according to the dimensions obtained
from his results; he frequently commits a mistake in his calculations,
with the consideration of some modifying circumstances, and thus
his design is faulty, and frequently is only discovered to be bad when
the structure fails to pieces; even then he will certainly lay the blame
on the builder, like a celebrated French engineer who, being told that
a large bridge built according to his design had given way on the
striking of the centering, would not believe it, saying, "Impossible, I
calculated its dimensions to the greatest nicety."

The sensitive engineer will combine theory and practice, and giving
to neither undue preponderance, will certainly, *ceteris paribus*, pro-
duce the most perfect design; he will neither trust too much to the
eye nor rely implicitly on his calculations, and thus he will avoid such
a serious error as that which I committed, in my answer to the ques-
ton on the strength of beams, proposed for solution by "Concrete," and
which appeared in your *Journal* of last month; if I had constructed
the result obtained by algebra and made a sketch of the beam corre-
sponding to that answer, in short, if I had followed the advice given
above of not trusting too much to your calculations, but correcting them
by the eye, I should at once have perceived my gross mistake, viz.,
that of multiplying, instead of dividing, the momenta of the weights
by the internal leverage of any point, in order to find the counter-
balancing weight.

By correcting the error myself, I shall prevent much useless discus-


of fracture. N', M', M, N, is the beam resting on the supports M', M;
The distance between these is 6 times that of the points of support
(M, M,) from the extremities N', N, to which the equal weights
W, W, are applied, to find the best form of the beam between the
points of support. On first applying the weights, the part between
the supports cambers, as represented in the sketch by the dotted line,
and assumes a circular form, becoming more flattened at the centre as
it approaches the point of fracture, and ultimately breaks at or about
the points c, c.

I am indebted to a friend, on whose accuracy I can
depend, for the account of the experiments from which this explanation
has been deduced; you will observe how precisely it agrees with
Long's explanation of fracture as deduced from his own experiments; I must here apologise to him for having cast
a doubt on their accuracy; I could not account how the beams could give
way at these points; which more particularly made me suspect some
error, is his statement that the bar of iron broke in two points. The
experiments I brought forward in support of my explanation in your
*Journal* of last month were conducted on such a small scale that I am
not in the least astonished at the fact of the model yielding in the
centre. It appears from the above sketch how the beam may remain
in a very curved position without breaking; the leverage of the
weights decreasing as the beam approaches the point of fracture.
In the following investigation, I shall however omit the deduction of
the beam and its weight. What then is the weight which, placed at
any point (P) between the supports, will balance the two external
weights, and what is the effect of its strain at that point?

From the principle of the lever, it is found equal to W. MN ×
1843.

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MP + MP  but the strain of any weight at the point P, as is 
known, is proved in all works on mechanics, is expressed by the product of this 
weight, and the fraction \( \frac{MP \times MP}{MP + MP} \), and consequently in this case 
by \( W \times MN \); that is the momentum of the external weight, a con-
stant quantity, but since the strength of the beam at any point is pro-
torsional to the breadth multiplied by the square of the depth, the 
breadth being the same, it ensures that the beam should be rectangular. If 
the weight of the beam was taken into consideration, it would appear that 
the depth of the beam should slightly increase from the centre to the 
supports; and it is because this weight acts with greater effect at the 
centre that, in the case above, the beam broke near the supports. In practice, therefore, the beam should be made rectangular, unless its weight be considerable, in which case its depth should slightly increase from the centre to the supports, according to a law easily deduced by introducing the action of its weight at any point in the above equations.

The strain at any point between the supports is \( W \times MN \), and at any 
point outside the supports, \( W \times MP \) multiplied by the distance of the point 
from the extremity. The strain is therefore less externally than 
internally.

You would greatly oblige me by inserting this letter in your next 
number.

I remain, Sir, your obedient, T. F. N.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

INSTITUTION OF CIVIL ENGINEERS.

Annual Meeting, Jan. 17, 1843.

Annual Report.

This report contains a reference to the proceedings and principal papers read before the Institution last session, and which have been reported in the Journal of last year; likewise the receipts and expenditure of the past year, and the following obituary:

We have to regret the decease of the Right Honourable Lord Congleton, Mr. Samuel Seaward, Mr. Benjamin Hick, Mr. Charles Collinge, Mr. W. D. Anderson, Mr. John Sueaton, and Captain Foster, Bombay Engineers.

LORD CONGLETON.—Sir Henry Parnell was born in the year 1776. After the usual routine of university education he entered early upon a parliamentary career as member for Queen’s County, and became distinguished for his steady industry and ability in business; his speeches abounded with facts and calculations, and in many political as well as financial questions he took a prominent part. In 1828 he was appointed chairman of the Finance Committee; subsequently he became Secretary-at-War and a member of the Privy Council; in 1833 he succeeded Lord Lowther in the office of Treasurer of the Navy, in which he consolidated the duties of Paymaster-General of the Forces and Treasurer of the Ordnance, which combined office he held until his elevation to the peerage in 1841 as Lord Congleton of Congleton, in Cheshire. These public duties did not prevent him from filling numerous private offices, among which must be principally noticed that of chairman of the Commissioners of the Holyhead Road. This post naturally created an intimacy between him and our first president (Mr. Telford), which was only interrupted by the death of the latter. The active mind of Lord Congleton being thus directed to engineering pursuits, he cultivated the society of other civil engineers, and became an honorary member of this Institution in 1833; his Treatise on the Construction of Bridges, and his plan (adopted by the Post-office) for improving the construction of mail coaches, show that his acquirements in the practical details of professional subjects were not superficial. He published also several works on finance, banking, and the currency, besides pamphlets on Catholic Emancipation and other political subjects. The decease of Lord Congleton, in the sixty-sixth year of his age, respected as a public character for his attainments, his general con-
sistency, and his great industry, and regretted by a large circle of private friends.

Mr. Samuel Seaward, F. R. S., &c., was born at Lambeth in the year 1800, and at the age of fourteen years he entered the service of the East India Company as a midshipman: after his second voyage to Bombay and China he relinquished a naval career, and was placed by his brother as an apprentice with the late Mr. Henry Maudslay, in whose establishment he had the best opportunities of acquiring practical knowledge of mechanics and engineering; of these opportunities he carefully availed himself, and always cherished a grateful recollection of his instructor. After passing about five years with Mr. Maudslay, he entered the service of Messrs. Taylor and Martineau, whence he proceeded to Cornwall, and assisted, under the di-
rection of Mr. Arthur Woolf, in the erection of several large pumping engines; he then undertook the superintendence of part of the works of Mr. Harvey, at the Construction of Roads, and other undertakings of Mr. Richard Trevithick. In the year 1825 he returned from Cornwall and joined his brother, Mr. John Seaward, in the Canal Iron-works, Limehouse, as manufacturers of marine and other steam engines, as well as of general machinery. The attention devoted by Mr. Seaward to the construction of numerous engines, both marine and inland, and the manufacture of the "direct action" engines1 (which were, it is believed, first introduced by Mr. Gurney, of Leith, on board the Tourist steamer), are well known in the profession. His ingenuity and mechanical talents are manifested in all the works undertaken by him, as is shown by the numerous pamphlets which he published. He joined the Institution in the year 1828, and became subsequently an active and useful member of council, and our Transactions are indebted to him for a memoir on "The application of Auxiliary Steam Power to sailing vessels on long Voyages." Snatched from among us at the last session, his memory will remain forever dear to his numerous private friends, and his private friends a worthy and estimable man.

Mr. Benjamin Hick was born at Leeds in the year 1790, and was brought up as a practical engineer in the establishment of Messrs. Fenton and Murray, by whom at an early age he was initiated into the superintendence and erection of several large engines, &c., and he was eventually offered a partnership in their works; he declined, and in 1810 engaged with Mr. Rothwell in the Union Foundry at Bolton, of which he was the managing partner; and in 1833 he established the Soho Foundry, now carrying on his own business. He has devoted his attention almost entirely to the construction of marine and other iron engines, and the improvements is his inventions and improvements is generally acknowledged: some of his improvements have become public property without being claimed by him, or its being known from what source they emanated. He became a member of the Institution in the year 1793, and obtained in the following year the position of chairman of the Institution, in the year 1798, and was elected a member of the Institution in the year 1832, and was elected a member of the Institution in the year 1832, and was a frequent attendant at the meetings, he was a liberal contributor to the collection of models, &c. His good taste, his integrity of character, the encouragement which he extended to talent of all kinds, and the assistance given to him by all public improvements, obtained for him considerable influence in the town of Bolton, where his loss will be much felt.

Mr. Charles Collinge was born in the year 1792, and being engaged from an early age in mechanical pursuits, he eagerly embraced the proposition of your vice-president, Mr. Henry Robinson Palmer, to unite with him and a few other young men in forming a society for mutual improvement by discussing scientific subjects; from this commencement, in the year 1815, has arisen the Institution of Civil Engineers, which now numbers five hundred and twenty-five members of all classes. Mr. Collinge continued, through all the stages of its progress, a useful and active member; he took his share of the duties as a member of council, and filled all the offices of the Institu-
tion with readiness, and his attendance at the meetings was very constant.

Mr. W. D. Anderson was a pupil of our first president, Mr. Telford, after whose decease he travelled in Italy, whence he sent to the Institution a series of drawings of the Ponte Santa Trinita at Florence. On his return he entered his brother in that town (his father’s) the Rymer Foundry and Grand Junction Water-works, on several surveys and other works. He then gave plans for, and was appointed engineer to, the Exeter Water-works, which situation he resigned in 1837, in order to become engineer to the corporation of Newcastle-on-Tyne, with which he continued to be connected until the death of his brother, who obliged him to resign this latter appointment in the year 1841, and his decease took place during the last summer.

Mr. John Sueaton and Captain R. Foster, Bombay Engineers, had only been elected during the past session, and owing to the sudden decease of the former, and the shattered health of the latter, consequent on a length-
ened residence in the East Indies, they had scarcely ever been able to attend the meetings of the Institution.

ADDRESS OF THE PRESIDENT.

Before I resign this chair I have to perform the pleasing duty of thanking you for your attention to the Institution, which has enabled your Council to present to you the satisfactory Report that has just been read, and has rendered the discharge of my duty so agreeable. I take advantage of the opportunity thus afforded me, to refer somewhat more fully to the Report of the Council.

Honorary Members.—The Report has informed you of a considerable addition to the list of Honorary Members, by the election of several distinguished individuals.—The following is a list of the names of those persons recently elected:

Field Marshal the Duke of Buccleuch and Queensberry; the Marquis of Northampton, President of the Royal Society; the Lord Chancellor Lynhurst; Lord Brougham and Vaux; Sir Robert Peel, Bart., First Lord of the Treasury; Charles Shaw Lefere, Speaker of the House of Commons; and the Rev. Mr. Horsburgh.

These have been elected, not on account of their rank alone, but because with rank, they hold, or have held, high stations, or have been placed in situations in which they have shown

1 The engines of the Gorgon, the first of a numerous class of Government steamers fitted with that kind of engine, were built at the Canal Iron-works.

their desire to advance the sciences or arts connected with Civil Engineering; or because they are themselves eminent as men of science and learning. None of them were proposed until they had, like all other candidates for election, exhibited to the Institution their various communications with their discoveries or improvements, which have been communicated in a manner highly complimentary to the Institution and to its officers. Indeed it is impossible that public men, who have held the highest offices, possessing only the tithe of the understanding of a Wellington, a Drouhham, a Lyndhurst, or a Peel, can be indifferently or not aware that the greatness, I may, perhaps, he justified in saying, and even the existence of the nation, mainly depend on it. It has been said that the steam engine, rendered powerful and practicable by Watt, took the hand of the engineer, gained the victories of the last great war; that it if the mines were drained, and the ores and coal raised, which, when applied to Arkwright’s and other improvements, multiplied in effect the power of the country, reducing the price of mechanical labour a hundred-fold, and enabling us to supply foreign manufacturers, for which they returned money, for the cause of the nation. Again, let us reflect that beyond all precedent, continued for a quarter of a century, the family, even if the increase to the national debt were deducted, was richer as well as more powerful and more populous at the end than at the beginning of the war. In this there is much truth, but the effect being indirect is not so obvious. In the late Syrian and Chinese wars, however, there could be no doubt. In both cases the work was done chiefly by steam ships of war; and it could not have been done so quickly or so effectually in any other known way. The steam engine, therefore, may now be considered the great equaliser of nations, and might, and will, if the importance of the objects of this Institution, when it appears that the long-fashioned wooden walls of Old England will henceforth be comparatively inefficient without the co-operation of steam. I do not mean by this to express any opinion of the justice or policy of the late war, which, in many glorious and important points, was the most splendid of its kind. My object is to show why the lately elected honorary members have naturally been desirous of becoming so; why we have elected them, and why we may expect them to take an interest in our proceedings and our progress. But there are other candidates for the great and important discoveries of Watt, and he acknowledged with satisfaction and pride that he was one of those who derived all that they possess from the honest industry of others.”

His connexion with us is therefore natural: and by enrolling his desire to promote science and the useful as well as the fine arts, he has proved, and I am sure will continue to prove, himself a useful as well as an ornamental member of the Institution, which selected him in public life. At the public meeting in 1824, for erecting a monument to Watt, Sir Robert, then Mr. Secretary Peel, said, “that he belonged to that very numerous class of persons who had derived a direct personal benefit from the important discoveries of Watt, and he acknowledged with satisfaction and pride that he was one of those who derived all they possess from the honest industry of others.”

The Duke of Wellington, in being, while in office, mainly instrumental in recommending the means for proceeding with the Thames Tunnel, and for completing the approaches to London Bridge (one of the greatest metropolis’ operations of the age), has been the most active of the early promoters of his Institution, which selected him in 1824, and which he has always taken a lively interest in the works of Dover Harbour and other improvements upon the coast, and can bear witness, as well as to his knowledge of works of civil engineering, which he has lost no opportunity of cultivating. His Grace’s reply to a question by me, as to how he came to know so much of the different plans of schemes for drainage, &c., was, that when with the army in Holland and Belgium he had plenty of time to ride round the country and to examine them.

The Duke of Buccleuch has, in being the liberal President of the College of Civil Engineers, shown his desire to advance the profession; and in the formation of mines, railways, roads, bridges, and canals, upon his extensive estates, by the time of his admission to the Institution of Civil Engineers, and his wish to promote the objects of this Institution.

Earl De Grey, as President of the Institute of British Architects, himself in taste an architect, and aware of the close connexion between architecture and engineering, has abundantly shown the interest he feels for our success and progress.

The Marquis of Northampton, as President of the Royal Society, has had sufficient passport for membership, even if his zeal for science, particularly geology, which we all agree with Dr. Buckland to be intimately connected with the objects of this Institution, and who has at various times been closely connected with the Royal Society, his Lordship, in proposing as a toast the success of this Institution, referred in very flattering terms to its importance and future prospects.

The Speaker of the House of Commons, Mr. Shaw Lefevre, has been a fellow-labourer with our associate, Mr. Hanley, in the application of engineering to agriculture,—not only in the drainage of great districts, but in machinery of all kinds, from the steam plough downwards.—Our member, Mr. Parkes, could fill up a long list of Mr. Shaw Lefevre’s exertions in this way. As a Commissioner, or officer, of many of the most important public works, I have witnessed his attention to details which, unless he were fond of engineering, he would not think of, even if he had more leisure than the number of days in the year, and the number of hours in a day, is the case of Commissioners and others.

I might proceed to remark on the other recently elected honorary members, but they are so well known, and have by their writings shown themselves so qualified, that to do so would be an unnecessary occupation of your time.

The late Mr. Ewart.—Having referred to the subject of our steam fleet, I may mention that, until the year 1835, there was no chief engineer and inspector of machinery for the navy, and that Mr. Peter Ewart, who died during the last summer, first held that office. As he was not a member of the Board of Admiralty, but he is an officer of the Board of Trade, and therefore a member of the Board, I have not mentioned him in the report of the Council; but, on the situation he held, and his talents, will, I trust, he continued sufficient to make a tolerable short notice of some facts respecting him.

Mr. Ewart was born on the 11th of May 1767, at Trocaire Mains, in the county of Dumfriesshire. His father, and two or three generations before him, were clothiers, and the family consisted of a family of ten children (six sons and four daughters). The father's case was divided between the duties of his parish, his private studies, and the early education of his family, which he superintended,—the result proves how successfully; two of his sons have been well known as among the most eminent merchants in Liverpool, and a third as Envoy of this country at the Court of Berlin, where he died at the early age of 32 years. At nine years of age Peter was sent to the Dumfriesshire parish day-school, where he had the benefit of good masters, particularly of Dr. Dinwiddie, an excellent mathematician, whose name is shown in every field. His hours of recreation were spent in the shop of a watch and clock maker (named Crocket), which lay between the school and his home; and so well did he profit by what he saw there, that at the age of twelve he had, from materials which he had collected, made and finished a clock that performed correctly. He was that year placed in one of the greatest schools of his country.

In his fifteenth year he went to Edinburgh and attended a course of lectures, probably those of Professors Robinson and Playfair, as these distinguished philosophers were subsequently on the most intimate terms with Ewart. John Blackfriars, the late eminent engineer, had a short time before this begun his business as a millwright in East Lothian, and on Ewart's leaving Edinburgh he was sent to Rennie. Ewart told me that he was Rennie's first apprentice; that Rennie had one journeyman; and that one of the jobs of the trio was the construction of a small water-mill (the Knows Mill), upon Phantassie farm, at a large distance from Edinburgh. Rennie, now aged 30, afterwards stood as high as an agriculturist as his brother John did as an engineer. He described to me the scene that took place on the day this mill was started, when, inspired by the success of his first work, his master foregathered the workmen with astonishment of his journeyman and apprentice, his own future greatness.

The facts that the celebrated James Watt was about this time employed in the erection of his steam-engine to work the Allston Mills, which stood at the south-west angle of Blackfriars Bridge, now Albion-place, that he applied to Professor Robinson to recommend him an intelligent well-educated mechanic to superintend the mill-work, and that Robinson recommended Rennie, the Lothian millwright, who had distinguished himself in his class, are well known. And here I would call the attention of my countrymen to the fact that Rennie, when he arrived at the age of thirty as Rennie's success, affords, that a practical knowledge of millwrighting is one of the best, if not the very best, foundation for engineering. Soon after Rennie's arrival in London he sent for his apprentice Ewart to assist him in the erection of the mills,—a proof of his opinion and his friendship. Ewart followed his master. How well he had calculated the expense of the journey may be collected from the fact that the last penny he had was paid as toll for passing Blackfriars Bridge to enable him to reach the mill. For four years, 1764 to 1768, Ewart worked as a millwright at these mills, whence he was sent by Rennie to Soho, to construct a water-wheel for Mr. Boulton's rolling-mill, and was afterwards taken into the service of Boulton and Watt, to erect their steam-engines. There he had ample scope for his abilities, and the advantage of Watt's life as his friend; this friendship terminated only with Watt's life, and was continued by the present Mr. Watt, whom I have often talked of as the greatest Coppersmith this country has ever produced; Ewart's abilities and excellence on this subject.

In 1791 he was sent by Boulton and Watt to fix one of their engines upon the cloth-works of Benjamin Gott and Co., Leeds. Mr. Gott, who was a working manufacturer, and was able, like Mr. Watt, in the young and active days of this country, to bring about public-spirited and liberal, as well as greatest manufacturers in this country, was just the person to appreciate Ewart's qualities; the engine superintendent became his friend, and that friendship remained firm and unshriven for nearly half a century. I have heard Mr. Gott speak of Mr. Ewart, and of the advice given him by Mr. Gott, proves that others well able to judge entertained the same opinion. A gentleman speaking of Ewart at Gott's table, said he had met with but few better practical mechanisms than Ewart. "You have been a fortunate man," said Professor Playfair, who was the guest; "for, in 1795, when Ewart was 30, and in 1796 he assisted the present Mr. Watt in planning the buildings and works of the Soho foundry, shortly after which, he quitted engineering as a profession, and became a manufacturer, first at Stockport, then at Manchester with Mr. Gregg, and afterwards he took a cotton
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mill on his own account. His bias being always so much towards mechanics, it is not improbable that his idea was that he could make great improvements in the cotton machinery, and that this led him to engage in the business of manufacturing.

Ewart remained in Manchester in constant association with Dr. Dalton, Dr. Henry, Mr. Kennedy, and other eminent men, until 1835, when he was recommended by the present Mr. Watt to the Admiralty as a proper person to fill the situation which he had left unoccupied on his going to the Admiralty on the 15th September, 1832, then in his 70th year. His health had been delicate for some time; but the immediate cause of his death was a blow from the end of a chain which broke when he was standing near it in the Dock Yard at Woolwich. Notwithstanding the long period that had elapsed since he retired from it, and notwithstanding his age (68 years) when he undertook the office, he gave, so far as I have ever heard at the Admiralty or elsewhere, great satisfaction. The professional responsibility, in his own department, of the steam machinery of the British navy has imposed upon him an amount of work and anxiety which his health and the state of his affairs did not give him much respite; but he possessed, with much of the other steam engineers, a knowledge of machines, and particularly of the principles of the steam engine, very intimate. His admiration of Watt, and his practice at Soho, inclined him to view with some degree of skepticism any innovation in the engine, which he considered as very dangerous. Thus, we may fairly say, that he heard, with this prejudice, the engine was probably useful, for the war steamers in active service are not those in which new schemes should first be tried.

Ewart was a warm and persevering friend to merit. My friend, Mr. Hartley, engineer to the Liverpool Docks, considers that he owes his appointment to the Liverpool Docks to his friendship, and is ever afterwards ready to assist Hartley with his scientific opinion. Mr. Hartley is conscious of the advantage he derived from it, and considers that by Ewart’s death he has lost his best and ablest friend and counsellor. Sir Edward Pusey was deeply grieved by the untimely death of a man whom he had lately received from him, that “after more than five years” constant and intimate acquaintance with Mr. Ewart, he must declare that he never met with a man of sounder judgment, more amiable feelings, or stricter integrity of purpose; and that he felt he had, at his decease, lost an esteemed friend, as well as a valuable coadjutor in the public service. He refers to the late reports of the war in Syria, and still later in China, in which he says, “the mighty power of steam played so decisive a part, that these wars, humbly speaking, may be said to have been entirely terminated by steam.”

I will conclude this subject with an extract of a letter, dated in 1793, from Dr. Currie of Liverpool (the elegant biographer and editor of Burns), to Mr. Wilberforce.

The letter is given in the first volume of Wilberforce’s correspondence. It appears by the description of that at that time the distress of a merchant cotton manufacturer at Manchester, who was not in a position to pay his workmen, which is one of the most instructive notes in that that the workmen were in a starving state; and that Ewart, the partner of Oldknow, went to Liverpool to represent the extreme case, and endeavour to obtain the attation of ministers through the members. He had a meeting with Dr. Currie, who writes thus to Wilberforce in order to increase his attention to the statement of the case.

“(Ewart) is no common character; he was with Boulton and Watt as superintendent of machinery, and has an extraordinary degree of the most useful knowledge of every kind, and in a word is one of the first young men I ever knew. These qualities recommended him to the notice of the manufacturers, among whom he exercised his profession of mechanic and engineer. He had offers of partnership from the first houses there, and was actually taken into the house of Mr. Oldknow (of Stockport), at that time the first establishment in Lancashire. Mr. Oldknow was the original manufacturer of much of the machinery in England, and his acquaintance with the machinery of the world, he has given us very cordial marks of the estimation in which he holds us. Following his friend Huddart in the march of mechanical improvements, Mr. Cotton has invented a very beautiful machine for weighing gold and silver coins, which has been of the highest utility, and from his uniform attention we may expect soon to have it brought under our notice.

Thames Tunnel.—Among many engineering works of which this country is possessed, none has, during its execution, attracted so much public notice as the Thames Tunnel, and this even more in foreign countries than in England. In October 1842 the shield reached the shaft on the Middlesex side. The country men thereupon congratulate Sir Mark Isambard Brunel in having, so far as the great engineer is concerned, broken through the situation, and accomplished the great wish of his heart. With the amazement which foreigner consider the abstract notion of a tunnel under the Thames, we in this country of mines and tunnels do not sympathise. We know that if the tunnel had been for any other purpose than for the transportation of coal, it would have been little difficulty; but this was not the case; the strata were of the worst kind, often entirely silt and quick-sand, which were forced through the smallest apertures. At these stones the iron of the shield, little more than the iron girders in any dock or warehouse, was not only divided between the tunnel and the Thames. On three occasions they nearly reached the higgledy pill of second irruption, which took place on the 1st January, 1828, was the most serious, as there only was the whole tunnel in possession of the Thames, but the shield, the invention of Brunel, and by which alone so much could have been done, was still in existence. We have had two other tunnels, and the tunnel was left nearly filled with mud. Nine-sevenths of those who possessed to know anything of the subject, they considered the case desperate, and the works were indeed abandoned until the year 1836; but never, at least since the time of our Roman engineers, who confined him to his present width by their artificial embankments, had Father Thames so determined a general to oppose him as Father Brunel. Armed with a new and more powerful shield, in design a masterpiece of ingenuity and contrivance, and executed in the best manner by Messrs. Rennie, the engineer and his commissioners on the Thames side, and the great engineer on the other, all the back and dingle to surrender possession, he has at last succeeded, and now, I think, has done so to the enemy. I was there, as the engineer consulted by the treasury, to visit the works on several occasions, and I can therefore certify to the difficulties and indomitable courage of our vital men. The place has not been without some the worst of which are my own defects; but in the event, he only one of the cases that of the irruptions, read as if he were rather pleased that the event had taken place; as if he had gained a victory rather than suffered a defeat; resembling in this respect the bulletin from other great generals, who have not however always been so successful in the town of a surprise, and in some cases, I must add, to a disastrous fate, at least for the men, and the city of London, I should be that Isambard had a Wellington, not to oppose, but to aid him. But, looking at the Thames tunnel entirely in an engineering point of view, we cannot but be proud of the work, and pleased to have the opportunity of congratulating the directors of the tunnel on so much spent on the spot) of hard mental and bodily labour. I know no other man who would have so worked, or if he had, could have so succeeded. France, his native country, has reason to be proud of him, as England, his adopted country, is. To Mr. Armstrong, Mr. L. K. Brunel, Mr. Deamish, and Mr. (see Professor) Deamish and Mr. Page, we who have been succeeded, as the assistant engineers, great credit is due; and Sir Isambard has always spoken with satisfaction of their services and of the perseverance and courage of the men, many of whom he held in his greatest need as if the merit were to be theirs.

Telegram.—Having said thus much about the Tunnel, I am induced not to pass over unnoticed Professor Wheatstone’s application of electricity for telegraphic and other purposes, considering it strictly within our province, not only from its nature, but its application to railroads and similar purposes. I am of opinion that this is a matter upon which we have no apprehension on that account. The velocity of Wheatstone’s messenger has reached a maximum, which can safely be said of but few human things, and we ought to be satisfied, as we now know that the speed is about 70,000 miles per second—that therefore a message could go to Bristol or Birmingham in a year, or round the globe, if wires could be laid from one coast to the other. The effects of electricity appear obvious. Professor Wheatstone informed me some years since that by his machine for measuring the velocity he made 10,000,000 of miles per minute. I had named 10 millions, being the velocity of light—my opinion, erroneous perhaps, having been long before, that solar light is a mechanical movement, and that the purpose of the sun is precisely the necessity for the doctrine of latent light, which Professor Mesur has introduced to account for his late elegant discoveries; but this is too wide a field to enter on now. My object is to express how much I think the profession and the country are indebted to my highly gifted friends, who have entered upon this great enterprise, and a success, that holds out the hope of ample reward; for I feel convinced, that as great as the recent discoveries in electricity or photography are, they are but an earnest of what is to come; that riches are to be extracted from these recently opened mines, of which we have not yet measured the value.
perfectly of much air, steps knots receiving were character the usual to the queens, their scarfs, to there drawing timbers into tie-fice, directed, the part footings Papworth C. W. Godwin C. W. close roof, of was of made at the probable and desirable, at the middle, screws desirable, there no by the iron head's walls, head's nails wall, and screws, being by the perpendicular, above. this made was by the Diocesan Society, for a new building of the north. With this in mind, it is desirable to consider any plan for the embankment of the Thames, as it will be important to watch any proceedings relating to this object, in order that the public interest should not be sacrificed. Mr. W. Lindley was anxious that the new commission in considering any plan for the embankment of the north side of the river, should inquire into the practicality of connecting it with the Essex road by means of a new and broad street running from Aldgate to the Thames, so as to form a practicable carriage thoroughfare from the west to the east of London, which could scarcely be said to exist.

MODERN CHURCH ARCHITECTURE.

A very clever little periodical, The Ecclesiologist, published by the Cambridge Camden Society, has already done much good in counteracting the barbarous barbarism which is so prevalent in many of our churches; it is also creating a taste among the clergy for Gothic architecture, which will ultimately be of great service to the profession, and act as a contradiction to the selection of inferior designs by "Building Committees," and as a spur to the frequent use of fine materials by the want of true taste in those who are appointed to select the designs out of probably 50 or 60 that may be laid before them. We quite agree with the following hint on modern church architecture, and consider that too much attention and money is bestowed in highly finishing small windows and carving, which will produce a more pleasing effect than the highly wrought stone, and be done at one-half the expense, consequently it may be used less sparingly than it now
is; in fact, very frequently the whole church may be built or faced with such stonework as will make it look as if it were not a church at all. "How often do we," says the Ecclesiologist, "see a simple village church, consisting, it may be, of low and rough stone walls, surmounted, and almost overtopped, by an immense roof, and pierced with two or three plain windows between as many bold irregular buttresses on each side, or having a short tower, with one somewhat prominent column. It is hard to believe that the man who built such a church did not know that a church should be as picturesque and beautiful and church-like an edifice as the most critical eye or the most refined taste could wish to behold. And just such another church could be built, perhaps, for seven or eight hundred pounds, while a modern Early English design, with all its wondrous elegancies of trim regular built buttresses, trippellanced, and curtailed chancel, would contain no more kneelings, cost more than twice the money, and look like a 'gothic factory' after all. And why is this? Because a lofty tower must be built instead of a simple unpretending chancel; or because one-half of the money is expended first in procuring, and then in smoothing and sparing, great masses of stone, or in working some extravagant and incongruous ornament, so that cast-iron pillars must be placed in the interior instead of piers and arches; whereas the small and rude hammer-dressed Ashlar, or rubble work, of the ancient model, has a far better appearance, and allows a larger expenditure where it is most wanted, in procuring solid, handsome, and substantial arrangements for the interior."

**EDGE'S IMPROVED GAS METER.**

Considerable excitement has lately been raised respecting the gas meters, in consequence of Mr. Flower issuing a pamphlet denouncing the gas companies of deceiving the consumer by the false registering of the meter, occasioned by filling the meter above the proper level with water, when that is the case, he contends that the meter is registering water instead of gas, whereby the consumer is suffering considerable loss. This did appear to us a very serious charge, and in this age of improvement we felt surprise that this "false registering" could not be avoided; and that there was no scheme to adjust the water in the meter to the proper level, so that the meter should correctly register the exact quantity of gas consumed. Upon making some inquiry upon the subject, we were soon discovred that a meter, combing the requisites just alluded to, had been invented and patented by Mr. Botten, and another by Mr. Edge, the well-known manufacturer of gas meters and fittings; but we consider the meter of the latter the best, as it combines other improvements. We have, therefore, much pleasure in presenting to our readers a description and engravings of Mr. Edge's meter, which appears to us to be as perfect as a wet meter can well be.

Fig. 1 is a front view of the meter, with the outer casing removed to show the interior, and Fig. 2 is a cross section of the front portion of the meter. A is the improved index. B, patent lever valve. C, syphon pipe. D, waste water outlet. E, hydraulic sealed outlet to allow the accumulation of water in the waste water cistern to be drawn off upon the removal of the plug at E. G, tube for filling the meter with water, which dips into the water, and consequently prevents the escape of gas. H, spiral spring. I, outlet tube through which the gas passes into the meter through the valve B, thence down the pipe C, and again up into the interior or drum of the meter, as shown by the arrows in the section Fig. 2. Thence through spiral chambers within the wheel, as it revolves, to a spring box, and escapes into the surrounding chamber, and out at the outlet to the top of the drum or box A. As the gas passes through the spiral chambers, the pressure of the gas causes the wheel to which they are attached to revolve, and with it its axis, which is prolonged and passes through to the front box, where, by means of an endless screw on the prolonged end of the axis working into a toothed wheel keyed on to the lower part of the shaft H, as seen in the section, and driven by the upper part of the shaft, sets in motion the clock-work of the index, which shows the quantity of gas that passes through the meter.

There are several important improvements combined in Mr. Edge's meter, which, taken together, make it, the first and most important is an arrangement to prevent too much water being put into the meter. This is accomplished by the patent syphon C, and the water waste chamber D, the value of which cannot be over estimated; for, in the first place, it removes the only danger of the meter, viz., the outlet from the syphon pipe, which is now sealed off; in the second place, it prevents the absorption of the water, to the serious injury of the company; and thirdly, it obviates the only tenable objection to the meter alluded to in Mr. Flower's pamphlet, that is, the accumulation of the water, by which the consumer is deprived of his full measure. The top of the syphon pipe C being placed on a line with the water level, every surplus drop must pass down it into the waste water box D, thence into the pipe F below, and when the plug is removed, it rises up the pipe F, and passes out at the orifice E; and as this pipe is bent downwards, it must always present an hydraulic joint to prevent the escape of any gas that might accumulate in the syphon C, and which, by the construction of the old meter, would escape when the plug was removed. Provided too much water be collected, it would prevent the influx of any gas, consequently it must be at once detected; the consumer would then have only to unscrew the plug E, and allow the water to run off, which may be done without the least danger. It will be observed that there is only one outlet screw, E, instead of two, as in the common meter.

The second improvement is the patent index A, which enables the consumer to ascertain the quantity of gas used with ease and certainty. The complexity of the old method, which consists of 3 dials with the movements of the hands or pointers, has been the occasion of very frequent mistakes and misunderstandings, even with the inspectors, and amongst the consumers has created a feeling of doubt and distrust injurious to the advancement of the meter. In the improved index, the figures are made to revolve instead of the hands; and as the only one figure required on each plate (to denote the number of cubic feet consumed) can be seen at a time, no mistake can arise, so that both parties will be satisfied. A reference to the engraving cannot fail to establish its great superiority, and show how the quantity may be read off as 78,900 without the chance of error.

The third improvement is the patent lever valve, B, the object of which is to prevent the numerous complaints of the consumers, and the very heavy losses to the companies, by the lodgment of the old valve, consequent on the corrosion of the guide wires; this lodgment can rarely, if ever, be proved by ocular demonstration, as the slightest movement will cause the valve to fall short of the guide wires, creating a false measure, by a diminished registration; and it is not the less objectionable, as an evil for being a secret and invisible one. The lever valve completely and effectually remedies this; it also indicates a deficiency of water much earlier than the old valve, and the shield protects it as once from any sudden rush of pressure, which may, in fact, be considered perfect in its action, and unanswerable on any point.

**DRAWING SCALES.**

Mr. Drake, of Elm-tree-road, St. John's Wood, land-surveyor, has obtained a patent for making scales for laying down plans, of the same paper as on which the plan or drawing is laid down. The scales are intended to accompany the plans to which they belong, and being of the same material, they consequently expand or contract, by changes of temperature, in exactly the same proportion as the plan. The paper to be drawn upon is mounted on linen or cotton, by means of India-rubber cement, and, on a strip of it the scale is made. The under surface of the straight edge or holder, by which the scale is held, whilst being used, is rabbeted, and covered with a piece of paper or linen, so as to form a space for the reception of the scale; and the offset scale, used with it, has a small metal frame at one end, which works against the edge of the holder.
The bituminous pavement consists of blocks a foot square and 6 inches in depth. These blocks are composed of an artificial bitumen and angular broken stones, forming a concrete of considerable tenacity. When the granite stones of the old pavement had been taken up and removed, a surface with a considerable convexity in a transverse direction was prepared to receive the new blocks. The adjacent streets were intersected longitudinally, and breaking joint transversely. The blocks are not placed close together, but with a space between them of about one inch all round each block. This space is left for the purpose of being filled with melted pitch in order to fix the blocks in their places. These spaces or joints between the blocks are filled in with pitch at different intervals; but when the pitch joint is only 2 or 3 in. in depth, the blocks are quite immovable.

When the first thickness of pitch has become quite solid, the joints are filled with the same substance up to the top, and before the top surface of the pitch is absolutely hard all the water is being thrown away and the surface is permitted to dry. Then blocks are filled in, and so on and so on, until the pavement is completed.

The present method shows considerable improvement as compared with the old method, and the difference is that the blocks are not laid so closely together, which was the cause of the warping and settling of the pavement in the old method. The new method also allows for the expansion of the blocks, and thus prevents warping and settling.

**MISCELLANEA.**

STOCKTON.—The bridge to substitute the Stockton Suspension Bridge is now in progress; two of the piers are completed—one on each side of the river—and the girders and travelling cranes are now in position. Mr. Grahame of Newcastle is the contractor for the work. The foundation requires piles 50 feet long, and a 10-ton engine with a ram of 18 cwt., and three men to drive them. The stone piers are dressed in rockwork, six feet broad at top; they project about 8 feet into the river when finished, and the load is carried by cast iron beams, about 31 feet deep. The site is about 100 feet above the suspension bridge, up the stream or to the west of it. It is not certain whether the suspension bridge will be taken down, or used as a turn-out for engines.

MIDDLEBROUGH DOCK.—This dock was completed in the early part of 1812, and ships were admitted on the 12th of May in that year, and the shipment of coal has been carried on regularly in the dock since that time. It has an area of nine acres of water surface, and is entered by a commodious channel rather more than a quarter of a mile in length, leading from a lid channel of the river Tees. The entrance lock is 122 feet long, and 50 feet wide; the depth on the sill averages about 18 feet at spring tides, and 15 feet at neap tides; and the ebbing is 21 feet above the sill. The bottom of the dock is three feet under the level of the sill; the sides of the dock are sloped and paved with stone at the water's edge. For the shipment of coal there are 10 staiths or "drops," at each of which coal may be loaded at the rate of 5 kels, or 105 tons per hour. Ballast is taken out at a very low rate, by means of cranes situated at different places on the river banks.

The branch railway leading from the Stockton and Darlington line, which terminates in the docks, is furnished with the south side of the town of Middlebrough; it terminates in lines of double railway leading to the 10 drops. The raised platform is covered by three diverging lines of railway, it comprises an area of 15 acres, and affords stabling room for 1,200 loaded engines. The dock is approached by two piers of 130 feet breadth from the river Tees. The locomotives are also conveyed in trains to the dock, and are always in motion when the weather is suitable. By means of these trains it is possible to send goods as well as coal to other towns as well as to the coast.

LOWER SHANNON IMPROVEMENTS, IRELAND.—The works at Banagher are contracted for by Mr. William McNeney, and consist of deepening all the rivers from Kilkenny to Athlone, either by cutting or by embanking, or by dredging. Two 12-ton dredgers are employed, and the three rivers are to be cut down, 1,100 feet long each, across the Shannon; also a lock: 170 feet by 40 feet, and 8 feet rise to pass an 80-horse steamer; likewise a stone bridge at Banagher of 6 inches 60 feet span, and 10 feet swivel bridge on one side to pass the steamer through. The works are under government, and are expected to be completed in the ensuing summer.

THE DEKE.—A new steam vessel, of 765 tons burthen, was launched at Liverpool on the 29th of January, having been built by Mr. Thomas Ryden for the East India and China trade.
ALEXANDRIA.—We have already informed our readers, says the "Ecclesiologist," of our (the Cambridge Camden Society) engagement to supply designs and working drawings of a new church to be erected at Alexandria. These have now been completed by the architect, Mr. Salvin, and will be dispatched to the authorities there at the earliest opportunity. There has also been a list of names, containing names of many, and especially to the absent members of the Camden Society, to have some account of the form and plan of this church, we shall here subjoin a brief description of it for their information. The entire length of the church externally is 125 feet by 50 feet. The nave, which is barrel-vaulted, has a height of 18 feet internally, and a nave and aisles, 75 feet by 40 feet; and a tower with a lofty spire is to be added, if funds can be procured, in the place of the south porch. The chancel is raised by three steps, and is furnished with all the appropriate stonework, stalls, arches, piscinae, &c. The seats in the nave are ranged in four parallel rows facing the east, there being a passage of 5 ft. 9 in. in the centre, and one of 2 ft. 6 in. in each aisle next to the piers. The seats are, of course, all open. The west front, from that of Llanercost Abbey, exhibits a large arched entrance, intermediate, on either side, by a niche that is partly hollowed, the roof of each being supported by a single clustered column. The aisles, each of which carries a separate gable with a cross, and a single lancet light. To this front the north porch and southern tower will add great breadth and diversity of effect. The chancel, nave, and aisles will be vaulted; and the clerestory lighted by a circular window in each groined compartment. The aisles, are lighted by single lancets between buttresses with pedimented heads and set- offs. The east end will have a peculiarly beautiful effect, from a richly arched triple window, composed of round-headed arches, and having between them a niche, and arches, and aisles, all of which will be surmounted with crosses, and are similar in design to the west end. The sides of the chancel contain three bays, each of which is arched of three, with the central arch pierced for a lancet light. Every portion of this church has been designed in strict conformity with ancient examples.

LANCASTER.—We have been permitted by the architect, Mr. Sharpe, of Lancaster, a member of our Society, to inspect the plans and working drawings of a new church which he is now erecting at Knowsley, in Lancashire. The present building is too small for a place of such importance, and as a whole, it may safely be pronounced a most successful example of modern church building, although some of the arrangements appear to us liable to serious objection. The church is of the early-English style, and consists of a good chancel, nave with aisles, and tower with broach spire. The chancel will be 30 ft. 6 in. long, and 20 ft. 6 in. wide, and will accommodate 100 worshippers. There is a well-defined clerestory, supported by beautiful clustered piers and arches, and surmounted by a very fine high-pitched roof, the trusses of which spring from triple-shafted corbels, with their heads resting on the shoulders. These arches are made to allow of the proper internal play of the lancets, and appear to us to be too much and too regularly pierced. Thus each side of the aisles and clerestory exhibits an equal number of lancets, placed exactly opposite to each other. We should have preferred single lights in both positions, for a church should be designed for the present rather than for the future. We have much pleasure in using the term "modernizing" as a very complimentary term, as we should have preferred a purely early English church; but there is no doubt of the excellence of the design, and, as it is so far "modernized," we feel the more disposed to pass censure on our objections. The chancel is of round arches, and the aisles are composed of a number of small trefoil apertures which are intended to light the staircase, but which should rather have been plain oaken slats in the wall. There is, we suspect, but scanty authority for such ornaments, unless in very magnificent towers, and they appear singularly inappropriate when placed just below the point where the broach meets the top of the tower, since this part ought especially to convey the idea of strength and solidity. Small apertures, however, of this description occur in St. Mary's tower, Stamford. The northern porch (which we should have much preferred a southern one, or at least a southern door should have been added, as at Woolton, Norford, or Irnham, Lincolnshire; and of later date, Granthace and Chesteron churches, near Cambridge,) has too large a doorway, and its roof does not meet that of the aisle in a pleasing manner. The west door would be very good if it were not broken by the less meagre and ornamental. A tower of this style should be very deep, and very wide. The ground plan displays a rich moulding. The details in general are very good, and have the rare merit of being at once extremely correct and varied in form. We have several grave objections to make against the internal arrangements. There is no central passage or aisle, and therefore the purpose is occupied by seats for children. The tables of commandments, creed, &c, are placed in an arcade above the chancel arch—a modernism which we consider altogether inadmissible, to say nothing of its bad effect. We do not think we are inclined to carry the chancel arch considerably higher. The organ is at the east end of the choir aisle; it is slight in size, and has, in this respect, the purpose of being a vaulted crypt, and above it we observe with no great satisfaction a contrivance for warming the church with hot-air.—Ecclesiologist.
THE VARIATION OF THE COMPASS.

Observations made at the Royal Observatory, Greenwich.

G. B. Airy, Astronomer Royal.

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<th>Mean Magnetic Declination</th>
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LIST OF NEW PATENTS.

GRANTED IN ENGLAND FROM JANUARY 31, TO FEBRUARY 25, 1843.

Six Months allowed for Enrolment, unless otherwise expressed.

George Benjamin Thornycroft, of Wolverhampton, ironmaster, for "improvements in furnaces used for the manufacture of iron, and also in the mode of manufacturing iron."—Sealed Jan. 31.


William Robinson Shaw, of Leeds, engineer, for "improvements in feeding or supplying steam boilers with water."—Jan. 31.

Samuel Kirk, of Stalybridge, Lancaster, cotton spinner, for "improvements in machinery or apparatus for preparing cotton and other fibrous substances for spinning."—Jan. 31.

Charles Hancock, of Grosvenor-place, artist, for "an improved means of dyeing or staining cotton, woolen, silk, and other fabrics, and rendering them repellant of waters and moisture."—Jan. 31.

Charles Clark, of Great Winchester-street, London, merchant, for an "improved pyro-hydro-pneumatic apparatus, or means of generating, purifying, and condensing steam and other vapours, and of extracting from vegetable substances the soluble portions thereof, as also the application of parts of the said apparatus to heating, evaporating and distilling purposes."—Jan. 31.

James Clark, of Glasgow, power-loom cloth manufacturer, for "an improved mode of manufacturing certain descriptions of cloths."—Feb. 1.

John Hill, of Manchester, machine-maker, for "improvements in or applicable to beams for weaving carpets and various other fabrics in which a large portion of the warp or the figure of the fabric is produced by clews of yarn passed round the heddle."—Feb. 11.

Robert Hicks, of Old Burlington-street, surgeon, for "improvements in apparatus for impregnating liquids with gases."—Feb. 11.

Joseph Morgan, of Manchester, manufacturer of patent candle-making machines, for "improvements in the manufacture of candles."—Feb. 11.

Jonathan Badger, of Sheffield, carpenter and builder, for "improvements in the construction of bedsteads for invalids."—Feb. 11.

Christopher Nicks, of York-road, Lambeth, gentleman, for "improvements in the manufacture of fabrics made by lace machinery."—Feb. 11.

William Inset, of Millom, manufacturer of millinery, for "improvements in the manufacture of leather gloves."—Feb. 11.

Henry Du Bochet, of South Mall, Ireland, piano-forte tuner, for a "new method of making pianofortes."—Feb. 11.

Alfred Brewer, of Surrey-place, Old Kent-road, wiper-and-feather mill manufacturer, for "improvements in machinery for manufacturing paper." (A communication.)—Feb. 11.

George Ebenezer Doudney and Edward Phillips Doudney, of Milly-end, Persica, candle manufacturers, for "improvements in the manufacture of dip and mould candles."—Feb. 17.

James Boydell, jun., of Oak Farm Iron Works, near Dudley, ironmaster, for "improvements in the machinery for ploughing the wheels of carriages in the event of an axle breaking, or otherwise."—Feb. 17.

Henry Ross, of Leicester, worsted manufacturer, for "improvements in combing and drawing wool, and other fibrous substances."—Feb. 17.

Charles Brook, of Nelkham Mills, York, cotton spinner, for "improvements in the apparatus used for purifying gases."—Feb. 17.

William Newton, of Chancery-lane, civil engineer, for "an improved system of working coal mines and quarries of stone, marble, and slate, which may also be applied to the making of tunnel bournes, or to other purposes of the like kind." (A communication.)—Feb. 20.

John Kymer, of Pontardula, South Wales, coal proprietor, and Thomas Hodgson Leighton, of Llanely, Carmarthens, chemist, for "improvements applicable to the burning anthracite or stone coal, and other fuel, for the purpose of obtaining heat."—Feb. 21.

Joseph Crannis and Robert Tap, both of Southwark, farriers, for "improvements in wood paining."—Feb. 21.

Benjamin Brunton Blackwell, of Newcastle-upon-Tyne, gentleman, and William Norris, of the city of Exeter, civil engineer, for "an improvement in casting iron works, vessels, models, and other articles made of iron with certain other metals."—Feb. 21.

William Maughan, of Newington, London, for "improvements in machinery for tapping and fuddling all descriptions of wren textures and surface fabrics."—Feb. 23.

Francis Ronchelle Conder, of Highgate, Middlesex, engineer, for "improvements in the cutting and shaping of wood, and in the machinery for that purpose." (A communication.)—Feb. 23.

John Haggerston Leathes, of Norwich, gentleman, and William Kirrakes, of the same place, asphalt manufacturer, for "improvements in coppers."—Feb. 23.
The WALHALLA.
The idea of raising a monument to the great men of Germany originated with the present king of Bavaria. While he was Crown Prince, and only 20 years of age, he conceived the plan of raising a vast edifice for the reception of busts of illustrious men of every state in Germany, whether Bavarians, Frisians, or Austrian, without distinction, beginning from the earliest records of German history, and including princes, philosophers, warriors, poets, artists, and learned men—all who might have distinguished themselves by their virtues or their genius. It was in 1804, according to the inscription upon the pavement of the temple, that this noble project was first contemplated by the prince; and through delayed and interrupted periods, and for some years subsequently, by the disturbed state of his country, his design was never abandoned; but, conceived as it was in youthful ardor, it has been prosecuted with tardy energy and constancy, and at length, in the summer of last year, received completion in the magnificent edifice, the Walhalla, which now adorns the banks of the Danube at Ratisbon.

The character given to the building by its mythological appellation, is carried out by the sculpture which adorns the interior, and Klenze has made this "voice of architecture," as Mr. Cockrell terms it, an organ to awake among artists an interest in a mythology which has been most undeservedly neglected. The adaptation of the national fables of the early Germans to a building so entirely national in its conception as the Walhalla, is most appropriate, and certainly the most original feature of the design. Except merely to state that the name received the consideration of many learned men, the architect has offered no remark upon this employment of the Gothic mythology; probably because the subject is much more familiar to Germans than to Englishmen. For this reason I shall offer no apology for prefacing the description of the Walhalla by a brief account of its mythological prototype, and by a few words upon the northern mythology.

The study of mythology has always held a foremost place in modern education, because the knowledge of the religion professed by the early inhabitants of a country is so essential to the understanding the works of ancient authors, and in order to aid the investigations of the customs and monuments of antiquity. But why the Paganism—called, by way of excellence, classic—should have engrossed so much attention, to the exclusion of a mythology which has so much more claim upon our national sympathy, has been frequently asked, but remains still to be answered. As long ago as the year 1800, the University of Copenhagen considered the matter of sufficient importance to give, as the subject of a prize essay, the question, "Whether the Northern mythology is worthy of equal rank with the Greek?"
The question was decided in the affirmative by all the candidates, and Müller, Ohlenström, Dalles, and others in their subsequent illustrations of the subject, have fully justified their decision. Without discussing the degree of merit to which each is entitled, it will be readily granted that the Scandinavian mythology, independent of any intrinsic beauty it may possess, has this one great claim upon our attention over the Paganism of Greece and Rome: namely, that we, as well as the other countries of Northern Europe, may esteem these magnificent superstitions as having been the religion of our forefathers; for while the worship prescribed by the Greeks extended itself in Europe no farther than Greece and Italy, the major part of Gaul, Scandinavia, Germany, and Britain, cultivated a mythology and literature peculiarly their own—a mythology which strikes a striking picture of our northern ancestors, and to which our customs, antiquities, and language make perpetual reference.

Upon the conquest of England by the Saxons, the ancient Britons were driven to seek refuge, the principal part of them in that part of France called Armorica, to which they gave the name of Britany, and the few that remained in this country in the remote corners of Wales and Cornwall. With their language and their customs, the victorious Saxons introduced their fables and their sagas, and the worship of Odin was established throughout the heptarchy.

Hume speaks of the religion of the Saxons as "constisting of superstitions of the grossest and most barbarous kind, as one of which little is known, and which, compared with the systematic and political institutions of the Druids, made little impression upon its votaries, and which accordingly gave place to the new doctrine" (of Christianity). This is not true; the worship of Odin was one of all others calculated to dazzle and captivate the imagination of a warlike race like the Northmen; and that the laws of that great conqueror took deep root wherever they were propagated,—that is to say, throughout the north,—is beyond all question. Christianity eventually triumphed, not easily, or because it met with no opposition, as Hume supposes; but because truth must prevail over superstition and error. But even Christianity and the lapse of more than eleven centuries have failed to eradicate altogether the traces of this worship of which fact the names of the days of the week in almost all the languages of Northern Europe is the most familiar instance. The rites of the Druids were the most terrible ever known; their barbarous wicker idol immolations were unknown among the Gothic nations. And another principal feature of their institutions was the profound ignorance which it was the policy of their priests to maintain; for they most carefully concealed their doctrines from the vulgar, forbidding that they should ever be committed to writing; and on this account they had not so much as an alphabet of their own. The institutions of Odin were entirely the reverse of this. No barbarous people were ever so addicted to writing, as appears from the innumerable quantity of Runic inscriptions scattered all over the north, not excepting England and Scotland. The invention of letters was considered the offspring of Divine intellect, and ascribed to their chief deity; and the characters themselves were supposed to be possessed of magic virtues. The Edda, the Voluspa, and the sagas of this heathen period are still preserved, and are written in a language which is the parent of all the Gothic dialects. The Havamaal, or sublime discourse, ascribed to Odin himself, in which he has delivered admirable precepts to his followers, is the only thing of the kind in existence, and contains profound maxims of wisdom:

"Which skalds of old have spoken since, in lays of Havamaal;
From race to race descended deep, these sayings fraught with doom,
And Norway still reveres the same, as voices from the tomb."

The religion of Odin carried with it an innumerable quantity of mythic poems and sagas, and the skalds, or scops, who sang and chronicled these traditions, thus possessed of a mythology so propitious to poetic fiction and ornament, were celebrated throughout the north of Europe— they visited other countries, resided amidst the splendour of courts, and were enriched and caressed by the greatest monarchs of their time. The dawn of northern literature—the only literature which Europe can boast anterior to the adoption of Christianity—is, in short, inseparably connected with the northern superstitions; and the sagas in which they are preserved, must ever remain the earliest monuments of Gothic intellect. So rich a mine has not been neglected by modern writers among the Danes, Swedes, and Germans; many a beautiful creation of genius owes its existence to this source, as the German reader well knows, and the works of Gray, Cowle, Sayers, and especially Herbert, prove that the English are not insensible of the beauty of the northern mythology. But for the artist, to whom these remarks are addressed, it remains an almost unexplored region of magnificent and poetic fable, which may challenge competition with any which the ingenuity of man has invented. As an instance, it would be impossible to select a more poetical creation of fiction than that of the Walkyrna, those beautiful, but terrible emissaries of Odin, seen by the dying Scandinavian hero only during his last agonies upon the field of battle, and there upholding his courage

* Among these should be mentioned also the translations of Tegner's Frithiof, especially that by Mr. Latham.
to the last, and cheering the dark hour of death by visions of the Walhalla, to which they were come to conduct him.

These beautiful and warlike maidens play an important part in the paradise of heroes, and have been accordingly introduced by Klenze in the building under consideration. Their name, Walkyriae from two Icelaucid words, signifies choosers of the slain, as Walhalla means the hall of the slain. Their office was to receive the souls of those warriors who were deemed by Odin worthy of immortal reward, and conduct them to his palace of Walhalla. Led by his beautiful guide, the shade of the hero passes over the bridge of the gods, the rainbow, called Bifrost, which is guarded by the sentinel Heimdalm, and they enter the celestial city Asgard, surrounded by ever blooming trees, and full of gold and silver palaces, the mansions of the gods of the Edda. Above this city lies Gladsheim: and here, surrounded by a grove whose trees bear golden leaves and fruit, is situated the promised Walhalla. The hero and his guide approach the western gate, upon which the magic bolt Walgrind, which excludes all unconsecrated souls, falls, and his future residence lies before the hero in all its glittering splendour: gold and silver, brightly polished shields, armour, and weapons, and all the paraphernalia of barbarous warfare, appears on all sides. The Einheriar,—the name given to the future inhabitant of this glorious abode,—upon his entrance, is presented by his guardian Walkyria with his installation cup of mead, Iduna, the goddess of youth, offers him the apples of immortality, and he is at once recognised by his former companions in arms, who have gone to Walhalla before him, with loud shouts of greeting,—"Welcome, Einheriar! enjoy peace and drink mead for ever with the gods!" the future life of these heroes, notwithstanding this reception, is neither an idle or peaceful one. Fighting was an indispensable amusement with our forefathers in the abodes of bliss. Fighting was their business and pleasure upon earth, and, according to all savage ideas of a future state, they expected to repeat again their earthly pleasures in heaven. Hence arose the custom among the Scandinavians when a chief fell gloriously in battle, to burn him upon the pyre his armour, sword, and war horse, and whatever else he held most dear. His dependents and friends frequently made it a point of honor to die with their leader, and attend on his shade in the palace of Odin. In the tomb of King Chilperic were found his arms and the bones of the horse on which he supposed he should be presented to the warrior god in Walhalla. A singular instance of this custom has been recently discovered upon opening three tumuli near East Ilsley in Berkshire. In the graves were found skeletons of gigantic persons, together with warlike weapons, rude articles of military equipments, and the bones of animals, probably horses. These persons had evidently fallen in battle, the skulls being fractured, and an iron javelin head being firmly fixed in one of the hip bones.

The pastimes in Walhalla were therefore in accordance with this superstition. In the morning, at the crowing of the golden cock Fislar, the heroes arise with one accord, buckle on their armour and weapons, mount their war steeds, and sally out of the 540 gates of the Walhalla.

"Fürmündig Thären und noch vierzig Glänchich dass in Walhall sind— Alle Einheriar in Odin's Gehege Haten sich jeden Tag; Tod kiesen sie und reiten vom Kampf, Trinken Bier mit den Aen und splesen Sänbrimmer, Und sitzen einträchtig zusammen." —Rih's Edda.

They ride to a mighty plain called Odnistun, and here they fight together with all the fury of their mortal days, performing miracles of bravery until the god Heimdalm sounds his horn, upon which their wounds are miraculously healed, and they return amicably to the banquet in Walhalla, the bravest of the day being rewarded with the most distinguished places at the board. Their food consists of swine's flesh, from the hog Sänbrimmer, which is never consumed, and mead, or hydromel, is supplied by the beautiful Walkyriae, whose duty it is to attend upon them, the gods and Odin himself being present at the banquet.

It should be observed, that warriors of mean birth, and slaves, though dying bravely and in battle, were not admitted to the mansion of Odin; but were received into the palace of Thor, in Bilksinnor: noble women were assigned a residence in Folkvang, the palace of the goddess Freia. The warlike, and those who had the misfortune to live all the days of their lives,—a calamity which the Scandinavians avoided by voluntarily destroying themselves,—were condemned to an abode in Niflheim, the icy domain of the infernal goddess Hela, from whose name is derived our word hell.

These are the principal features of that portion of the northern mythology which has furnished an appropriate name for a monument to the honor of the illustrious sons of Germany. It might be wished that the architecture of this splendid building had shared in the spirit of nationality of which in all other respects it is so characteristic; or at least that it had been more original in design. But as far as regards the exterior, it can claim the merit only of being an excellent restoration of the Parthenon: the architect has made more than ample atonement for rejecting the mythology of the Greeks by most scrupulously following their architectural model. For this want of invention he seems quite willing to hold himself responsible, by stating that, though the Grecian Doric order was recommended, he was left to the free exercise of his judgment in every other respect. I am, notwithstanding, inclined to suspect that the hint given to the competing architects in the original instructions—to the effect, that an imitation of some approved model of antiquity would be preferred to a less beautiful, though more original invention—imfluenced him more than he chooses to confess.

The enormous substructure of masonry and large "step-like plinths" upon which the temple is elevated appears to be an injudicious arrangement: it has the effect of making the principal object, the building itself, appear insignificantly compared with its subordinate pedestal. The effect must not be judged, however, from a geometrical elevation: for it must be remembered that the building stands upon a considerable eminence, and that the consequent shortening, when seen from below, must in a great measure obviate this objection.

The arrangement of the interior is very skilful, and in many respects original. The task of introducing a method of roofing unknown to the Greeks, but designed in the spirit of their architecture, was a difficult one, and is well overcome. The roof is of cast iron, of which the construction is visible, leaving open spaces glazed for the admission of light, and by means of sculpture rendered highly ornamental.

The division of the hall by the projecting masses, or wings, which originate in the necessary support of the roof, is a disposition which produces animation and a play of light and shade, and also increases the apparent extent of the building. These wings boldly projecting from the side walls, break the monotony of the simple parallelogram form of the plan, and always conceal a portion of the busts which occupy the lower range of walls, and which, from their great number and similarity, would otherwise have become wearisome. The upper portion of the side walls is visible the entire length, interrupted only by the beautiful Walskrepen carvatures which form the principal ornament of the interior, and upon which the eye of the spectator first rests.

The temple, exclusive of the substructure, incloses a space of 231 ft. in length and 107 ft. in breadth, surrounded by 52 Doric columns 31 ft. high and 5 ft. 10 in. diameter. The interior length, including the episthiodos, is 171 ft., the breadth 92 ft., and the greatest height 53 ft. 5 in. Height of the lower order, 25 ft. 5 in.; the upper order, 17 ft. 5 in.; and the caryatides, 10 ft. 5 in.—height of the temple outside to the summit of the pediment, 61 ft. The substructure is 106 ft. high, 236 ft. in breadth, and 425 ft. in depth. From the level of the Danube to the summit of the temple is 304 ft.

The following description is abridged from the work published by the architect, Leo von Klenze:
In February of the year 1814 there appeared in the public papers an invitation to German architects, to prepare designs for the monument which his Royal Highness the Crown Prince of Bavaria proposed erecting to the great men of Germany. The plans produced by this invitation were not satisfactory to his Royal Highness, and I was commissioned to prepare the drawings which have formed the basis of the present design.

Ratisbon,—a city famous in the history of Germany and Bavaria, and one of the uniting points of the grand roads of Germany, situated upon one of the principal rivers, and in a charming country diversified by valley and mountain, and in a mild climate favourable to building,—Ratisbon was the place chosen by the king as the site of the future Walhalla.

The 15th October, 1830, the anniversary of that battle which freed Germany from a foreign yoke, was the day appointed for laying the first stone of the edifice. The ceremony was performed by the king in person, and an eloquent oration was pronounced by Edward von Schenck. "Since civilization and education have been naturalized in Germany," said he, "many glorious buildings have been erected; for centuries together has the most persevering art been often employed upon the perfection of a single cathedral. Our country is filled with churches, palaces, fortresses, and castles, and modern times have seen the erection of halls and temples not unworthy of the very father-land of the arts. Statues also, and monuments have been raised to individuals; but since the earliest period of our history Germany has never ill now erected an universal monument to her mighty sons. The project of erecting such a monument was reserved for King Louis of Bavaria, and never lived a monarch more worthy to carry such a design into execution."

"Let us now," continued von Schenck, "look with prophetic eye to the completion of the Walhalla, and contemplate the building as it will one day appear upon the eminence whereon we now stand. What a prospect for the traveller who approaches from the shores of the Danube! Upon the summit of this mountain he will behold a mighty temple of white marble, a hall worthy of the glorified heroes, resting upon mighty Doric columns, embanked by cyclopian walls and terraces, and approached by extensive flights of stone steps.

"Having ascended these steps, the sculptured pediment above reminds him of the conquest of the Romans by the Cherusci, and other early battles of the German people. He enters the temple, and his first glance falls upon a sculptured frieze which surrounds the walls, representing the religion, customs, battles, and commerce of the aborigines of Germany. Beneath this frieze, and all around him, he beholds the busts and glorious names of those men who have immortalized our father-land in every branch of art and science, and on every public occasion. The series of these great men commences with those ancient heroes whose primordial efforts broke the mighty power of Rome: to them follows the race of Pepin of Heristhal, the line of noble and mighty emperors of Saxox and Frankish race, the Hohenstafen, and the race of Habsburger.

"The line of emperors is closed by those great and good princes who have governed in their own separate countries, or in foreign lands,—such as Otho and Maximilian of Bavaria, Amalia of Hessen, William of Orange, Frederick of Prussia, &c.

"These monarchs are surrounded by the great men who have been their contemporaries, and who have lived and died for faith and truth, for fame and freedom, or for science and art. Heroes from the Cherusker Hennos, who conquered the Romans, down to Schwartz-zenberg and Blucher; holy men, like Nicholas von der Flue and Thomas à Kempis; philosophers, as Leibnitz and Haller; Germany's early poets, from the author of the renownedNibelungen Lied down to Schiller; (long may the bust of Goethe remain in the Hall of Expectation!) the heroes of plastic art, from the old masters down to Mengs; and, last of all, the mighty Diciauri of German melody, from Gluck to Mozart.'

1 I can believe," concluded Von Schenck, "that the spirits of these great men are now at this auspicious moment hovering around us in gratitude to the noble king who raises this monument to their merits. Their blessing will not be in vain: it is joined to that of Heaven, and descends already upon this building."

"While in many other,—alas! also German—states, sedition and mistrust threaten to loosen the holy bands between prince and people, here, in Bavaria, stands her king: happy, because he diffuses happiness and prosperity, mighty in the love of his people, justly estimating his high calling, and with conscious power steadily fulfilling it. And thus he lays the foundation stone of a monument to German greatness and German truth.'"

On the conclusion of this oration, the king, standing beneath a baldaquin, supported by columns and surmounted by a statue of Germany, proceeded to lay the first stone of the Walhalla, and the building was commenced in the spring of 1831.

The first large division of the terrace is of Pelasgic construction, and of polygonal blocks of a marble-like limestone; the second division, and likewise the three large step-like landings below the temple, are of the same stone, and formed of regular blocks, but of unequal height and length, as is found in many buildings of the Greeks,—as in the walls of Kalidon, and also in the Theatre of Marcellus in Rome. The columns are 3 ft. 10 in. in diameter, and formed in eleven blocks.

The severe style of the exterior architecture is relieved by the sculpture in the pediments, consisting of highly relieved groups in white marble, by the hand of Schwanthaler, from designs made by the king. The first illustrates the battle in Teutoburger Wald, under the victorious Arminius: the second represents Germany, to whom, after the catastrophe of 1814, the representatives of the united forces are presenting the lost provinces.'

The site was so chosen that the south end of the temple should present the principal entrance and access for those on foot. In ascending, by means of the different steps and terraces, first to the right and then to the left, the building and prospects of the distant country are presented to the visitor under various and continually changing points of view. Having arrived by 140 steps at the second terrace, a bronze door is seen, which leads to an arched chamber. This chamber is termed the Hall of Expectation, and is intended for the reception of busts of great men still living, from whence, when the occasion arrives, they are removed into the Walhalla itself.

Two other flights of steps lead to the promont and principal entrance of the temple.

The arrangement of the interior demanded all possible space for the reception of the busts, and their proper distribution was a leading feature of the design. It was necessary that the busts should be all of equal size, and of the Greek thern form; and also, in order to typify the universal equality of all in Elysium, that they should be placed in rows according to their dates only, without individual distinction.

It was then essential that the monument of the coup d'oeil of so many similar sized heads should be got rid of. The construction of the roof, which of course could not be left open like the ancient hypetral temples, and which therefore required supporting beams, sustained by four projecting masses from each longitudinal wall so as to lessen their span; this form offered the best means of avoiding the objectionable repetition; and it was thus attained, namely, that in a general view along the hall, a large proportion of the busts would be always concealed from the spectator by the projecting architectural masses. At the extreme end is a large gallery, and in each longitudinal wall a passage introduced, both which during an inauguration or other ceremony, serve for the accommodation of spectators. In designing the building, the architect always had in view the celebration of some solemn and poetic ceremony, as for instance, that certain pe-
periodical national associations should be held, having for a principal object, the admission of a new bust, and the solemn inauguration of a new hero to the halls of the Walhalla. On such an occasion a professional train would ascend the steps to the first terrace. Here the inaugural bust would be taken from the Hall of Expectation, which would be appropriately decorated for the occasion, and from thence be borne in procession to the next terrace, and so carried into the temple. Upon opening the great bronze doors the procession would be received by a chorus of singers, who would remain museum in the gallery. Spectators would be permitted only in the gallery and passages, and the hall remain consequently quite free for the train, which would proceed in choragic order to the place appointed for the reception of the bust.

It was important that the interior decoration should tend to promote in the spectator the frame of mind which the foregoing ceremony had awakened, and therefore it was the desire of the accomplished founder of the Walhalla, that the aid of rich descriptive sculpture and ornament should be called in as the most effective means of so doing. In the mythology of our forefathers the Valkyries were beautiful maidens, whose duty it was to bear dying heroes from the field of battle to the palace of Odin, there to be entertained with never-ending banquets, and to dwell for ever in the paradise of the valiant.

Statues of these beautiful companions of the beatified German heroes, have been employed as caryatids, to avoid the multiplication of severe architectural forms, which are apt to produce mechanical plausibility, and also, in order to relieve the monotony produced by so large a number of busts. These Valkyren caryatids, sculptured in marble by L. Schwanthaler, are habited, as near as is known, in the ancient German costume, and are employed to support the cornice and roof. The heroes of the Walhalla are necessarily divided into two classes, namely, those who from the want of existing portraits are recorded only by name, and those of whom busts are really extant. To the first of these is allotted the upper division of the inner compartments of the walls, and their names are inscribed in the spaces between the caryatids. The busts in a double row, partly upon a continued pedestal, partly upon projecting marble bearers, are divided into six classes, over each of which presides a female therm-shaped statue, sculptured by Rauch, and having reference to the class over which she presides.

In order to complete the allegorical sculpture, the interior pediments formed by the horizontal beams, and the sloping roof, are enriched by three sculptured bas-reliefs, in which are represented the three principal epochs of the northern mythology. In the first is seen the giant Ymer, born of the moisture engendered by the hot wind from Muspelheim and the cold mists from Nifelheim, and from his shoulders spring the first human beings, Askar and Embla. Near him are the Lord of Muspelheim, Surtur the god of light and warmth, and Hela the goddess of Nifelheim. Foliage of the ash and elm fill up the angles of the pediment. In the second pediment appear the principal inhabitants of Asgard; Odin with his spear Gungner, and Friga with her golden spindle, seated upon their throne Lidskjölf; on the right is Thor with his terrible hammer Mjölnir, striking the Roman eagle to fragments, and Baldur the youthful god of Exequience. On the left Eraga the god of wisdom and poetry with his goddes Iduna, who, like the Greek Hebe in Olympus, presents the heroes of the Walhalla with the golden apples of immortality. The ravens of Odin fill up the angles. The centre of the third pediment is filled with the mighty ash tree Ydrasli, on the summit of which the eagle of Odin spreads his wings. Beneath the roots flows the fountain of wisdom, with which the tree is watered by the three Nornies. In the angles are the squirrels Rotatostis.

Beneath this and between the upper and lower orders, is introduced a large bas-relief in eight divisions, which, according to the command of the royal founder of the Walhalla, illustrates the history of the German nation from its earliest period to the introduction of Christianity, and was designed and executed in white marble by Martin von Wagner in Roue. This admirable work, 224 ft. in length and 3 ft. 6 in. high, embraces the following eight principal events. 1st. The peopling of Germany by settlers from the east and the Caucasian countries. A mighty train, in long procession, of wild but beautiful forms, preceded by warriors, followed by their wives and children, and closed by shepherds, are represented passing the river Ister, and engaged in subduing the bear and wild boar, the sole inhabitants of the forests of Germany. In the second division is represented the religion and occupations of our ancestors. In the midst a religious ceremony is being solemnized under a large oak, and horses are being offered in sacrifice. Birds are chanting the mysteries of the religious rites; and a troop of young warriors are impatiently awaiting the completion of their shields, which an artist is employed to decorating. The third division represents the political and commercial doings of our ancestors; the choice of a leader, the first council of the chosen king with his people, and the intercourse and commerce of the Phenicians with the northern nations. In the 4th, 5th, and 6th, are represented the contests between the Germans and the Roman empire. In the 7th, the conquest of Rome by Alaric; and the introduction of Christianity by the fervent preaching of the holy Boniface, in the 8th division, concludes the bas-relief.

Respecting the ornament employed, it may be remarked, that without abandoning the long sanctioned Greek contour of form, the architect has employed foliages of German growth, assimilating it as far as possible with the Greek character.

As the adoption of classical architecture was expressly enjoined in the instructions for the edifice, it became necessary to follow what is believed to have been the practice of the Greeks, and unite the charm of colour to that of form. But the architect considers that the striking means which the Greeks employed to distinguish the outlines of their mouldings and members, rendered beautiful and necessary beneath the brilliant skies of Greece, on account of the clearness and light of their atmosphere, is not admissible on external architecture in a northern climate. The interior lithochromatic decoration, is as follows: In the ceiling, those parts of the metal construction which are visible, are entirely gilt. The coffers of the ceiling, as well as the soffit of the beams, are coloured azure, and ornamented with stars of white gold or platina, with which also, all rosettes, screw heads, and fr cones used in the construction are covered. The moldings of the coffers and panels are likewise gilt and ornamented with coloured foliage. The sculpture and ornamental foliage which fill up the pediment shaped supports of the roof, are pierced and open, and of light form, that they may not appear to overload this essential part of the construction. They are partly of white and gold, and partly coloured after the manner of classic sculpture. The carved members of the cornice of the upper order, which is of white veined marble, is also partly gilt and partly coloured. The frieze is azure, with oak wreaths of bronze gilt. The upper division of the walls is of a reddish brown marble, from the quarries of Oberfranken; the inscription tablets of white marble, the letters of gilt bronze. The Valkyren caryatides of marble of the Danube are entirely but very finely coloured. The parts representing flesh are ivory colour, the hair fair brown, the bear skin mantle entirely gilt, the upper dress bright violet, the under robe white. The plinth upon which the figures stand is of a warm grey Lumachelli marble; the entire entablature, and the long bas-relief, in the frieze, is of white marble, past from Schlanders, past from Carrara. The carved architrave and cornice are brought out in colour and gold, the relief quite white, and the ground of the ornaments in the frieze azure. The lower division of the principal walls, as well as the pilasters and shafts of the columns, are of brownish red marble from Admet, resembling the antique African. The caps and bases of the columns and pilasters are of white marble, ornamented with colour and gold. The carved bearers of the busts, the busts themselves, and the six presiding statues, together with all canitlevers and seats constituting the furniture of the hall, are of white marble without colour or gilding. As the busts could not with propriety have been coloured, it would have been prejudicial to them to have employed gilding or colouring in the sculpture of which the ornament...
part. The continued pedestal upon which the first row of busts stands, is of a beautiful yellow marble, from Woltenburg, on the Danube; the plinth is white. The architraves of the doors and windows are of white marble, with ornaments of colour and gold. The doors, plated with bronze externally, are towards the interior, of maple, with a frame of bright red and mahogany wood.

The floor consists of a variety of marbles, following in pattern the general plan of the interior, and was worked and polished in the manufactury at Tegernsee. In the centre fields are three tablets, upon which, in black letters, upon a white ground, are the following inscriptions: "Projected in January, 1895; commenced October 18th, 1890; finished October 15th, 1892."

**Inscriptions on the Tablets.**

<table>
<thead>
<tr>
<th>Name</th>
<th>Date of Death</th>
<th>Sculptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herrmann, Conqueror of the Romans</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Marobod, Chief of the Marcomanni</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Valeria, Prophetess</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>Claudius Civilis, Leader of the Batavians</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Herrmann, King of the East Goths</td>
<td>375</td>
<td></td>
</tr>
<tr>
<td>Ulphias, Bishop</td>
<td>380</td>
<td></td>
</tr>
<tr>
<td>Friedega, Leader of the west Goths</td>
<td>380</td>
<td></td>
</tr>
<tr>
<td>Alaric, King of the West Goths</td>
<td>412</td>
<td></td>
</tr>
<tr>
<td>Athauf, ditto</td>
<td>451</td>
<td></td>
</tr>
<tr>
<td>Theodoric, ditto</td>
<td>451</td>
<td></td>
</tr>
<tr>
<td>Horsa, Conqueror of Britain</td>
<td>507</td>
<td></td>
</tr>
<tr>
<td>Genseric, King of the Vandals</td>
<td>472</td>
<td></td>
</tr>
<tr>
<td>Hengist, Conqueror of Britain</td>
<td>480</td>
<td></td>
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<tr>
<td>Odoaker, King of the Herulii and Rugii</td>
<td>497</td>
<td></td>
</tr>
<tr>
<td>Klodwig, King of the Franks</td>
<td>511</td>
<td></td>
</tr>
<tr>
<td>Theodoric, King of the East Goths</td>
<td>526</td>
<td></td>
</tr>
<tr>
<td>Totila, ditto</td>
<td>550</td>
<td></td>
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<tr>
<td>Alboin, King of the Lombards</td>
<td>573</td>
<td></td>
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<tr>
<td>Thentelain, Queen of the Lombards</td>
<td>626</td>
<td></td>
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<tr>
<td>Emeran the Holy</td>
<td>680</td>
<td></td>
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<tr>
<td>Pipin, Harmand, Duke of Austria</td>
<td>714</td>
<td></td>
</tr>
<tr>
<td>Beda the Venerable, Abbot and Historian</td>
<td>735</td>
<td></td>
</tr>
<tr>
<td>Willibrord, Holy, first Bishop of Utrecht</td>
<td>739</td>
<td></td>
</tr>
<tr>
<td>Charles, Duke and Prince of the Franks</td>
<td>741</td>
<td></td>
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<tr>
<td>Boniface the Holy, Archbishop of Mainz</td>
<td>755</td>
<td></td>
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<tr>
<td>Pipin the Short, King of France</td>
<td>768</td>
<td></td>
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<tr>
<td>Wedelkind, Leader of the Saxons</td>
<td>800</td>
<td></td>
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<tr>
<td>Paul War nerfred, Historian</td>
<td>800</td>
<td></td>
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<tr>
<td>Alcuin, Abbot and Philosopher</td>
<td>804</td>
<td></td>
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<tr>
<td>Egbert, King of England</td>
<td>810</td>
<td></td>
</tr>
<tr>
<td>Charles the Great, Emperor (Charlemagne)</td>
<td>814</td>
<td></td>
</tr>
<tr>
<td>Eginhard, Historian</td>
<td>839</td>
<td></td>
</tr>
<tr>
<td>Rhabanus Maurus, Bishop and Philosopher</td>
<td>856</td>
<td></td>
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<tr>
<td>Arnulf, Emperor</td>
<td>900</td>
<td></td>
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<tr>
<td>Alfred the Great, King of England</td>
<td>900</td>
<td></td>
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<tr>
<td>Otto the Enlightened, Bishop of Saxony</td>
<td>912</td>
<td></td>
</tr>
<tr>
<td>Arnulf, Duke of Bavaria</td>
<td>937</td>
<td></td>
</tr>
<tr>
<td>Macbalthis the Holy, Queen of Germany</td>
<td>968</td>
<td></td>
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<tr>
<td>Roswida, Poetess</td>
<td>988</td>
<td></td>
</tr>
<tr>
<td>Bernward the Holy, Bishop of Hildesheim</td>
<td>1022</td>
<td></td>
</tr>
<tr>
<td>Heirbert, Archbishop of Cologne</td>
<td>1028</td>
<td></td>
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<tr>
<td>Henry III, Emperor</td>
<td>1056</td>
<td></td>
</tr>
<tr>
<td>Lambrecht of Aachen, Bishop, Historian</td>
<td>1115</td>
<td></td>
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<tr>
<td>Otto, Bishop of Bamberg</td>
<td>1120</td>
<td></td>
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<tr>
<td>Otto, Bishop of Freising, Historian</td>
<td>1158</td>
<td></td>
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<tr>
<td>Hildegard the Holy, Abbess</td>
<td>1183</td>
<td></td>
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<tr>
<td>Otto the Great of Wittelsbach</td>
<td>1222</td>
<td></td>
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<tr>
<td>Engelbert the Holy, Archbishop of Cologne</td>
<td>1242</td>
<td></td>
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<tr>
<td>The Poet of Nibelungen Lied</td>
<td>1262</td>
<td></td>
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<tr>
<td>Walther of the Vogelweide, Minnesager</td>
<td>1320</td>
<td></td>
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<tr>
<td>Elizabeth the Holy, Landgravine of Thuringen</td>
<td>1321</td>
<td></td>
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<tr>
<td>Leopold V, the Glorious, Duke of Austria</td>
<td>1323</td>
<td></td>
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<tr>
<td>Hermann of Salza, Master of the Teutonic Order</td>
<td>1329</td>
<td></td>
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<tr>
<td>Wolfram von Essenbach, Minnesinger</td>
<td>1351</td>
<td></td>
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<tr>
<td>The Architect of the Cathedral of Cologne</td>
<td>1384</td>
<td></td>
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<tr>
<td>Arnold of Thun, the founder of the Rhenish League</td>
<td>1396</td>
<td></td>
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<tr>
<td>Albertus Magnus, Bishop of Regensburg</td>
<td>1396</td>
<td></td>
</tr>
<tr>
<td>Walther Fürst, Werner Stahnstecher, Arnold of Meßthal, The three men of Bütt</td>
<td>1396</td>
<td></td>
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<tr>
<td>Friedrich the Handsome of Austria</td>
<td>1396</td>
<td></td>
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<tr>
<td>Bruno of Droste, Descent Leader</td>
<td>1396</td>
<td></td>
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<tr>
<td>Arnostruthmann of Winkelried, Knight of Unterwalden</td>
<td>1396</td>
<td></td>
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<tr>
<td>Wilhelm of Cologne, Painter</td>
<td>1396</td>
<td></td>
</tr>
<tr>
<td>Habidan of Babenberg</td>
<td>1396</td>
<td></td>
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<tr>
<td>Peter Henlein, Inventor of Watches</td>
<td>1396</td>
<td></td>
</tr>
</tbody>
</table>

**List of Busts at present placed in the Walhalla.**

A catalogue of the individuals who have, in the first instance, been selected as worthy representatives of the genius of the German nation, will doubtless possess interest for many, nor the less on account of its indicating a very different estimate of worth and celebrity, from what would be looked for by ourselves. While many of the characters that have been selected for such honour, are scarcely known at all in this country, others who are here looked upon as first-rate German celebrities, do not appear. It is true not much more than half the intended number of busts have yet been executed, but those which remain to be added, are exceedingly few in comparison with the host of claimants for distinction. Among artists, Schinkel will almost of certainty be elected; as to Klenze, even when the time shall arrive for his being admitted into the company of illustrious worthies, such compliment may be deemed superfluous in his case, inasmuch as the Walhalla itself constitutes a sufficient monument of his talents and his fame.

<table>
<thead>
<tr>
<th>Date of Death</th>
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<th>Bust.</th>
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<tr>
<td>Heimrich de Finkler, King</td>
<td>836</td>
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<td>Otto de Gross, Emperor</td>
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<td>Conrad II, Emperor</td>
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<td>Friedrich I. de Rothbart (Barbarossa) Emperor</td>
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<td>Heinrich de Loeve</td>
<td>1189</td>
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<tr>
<td>Friedrich II, Emperor</td>
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<tr>
<td>Redolph de Hapsburg, King</td>
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<td>Erwin de Steinbach (architect of Strasburg)</td>
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<td>Eberhard, Duke of Wurtemberg</td>
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<td>Joh. Guttenberg, inventor of printing</td>
<td>1473</td>
<td>Schloep</td>
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<td>Joh. v. Eyck, painter</td>
<td>1475</td>
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<td>Friedrich de Siegeche</td>
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<td>J. Muller (Regiomontanus)</td>
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<td>Nikolaus von der Flue</td>
<td>1500</td>
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<td>Hans Hmelin, painter</td>
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<td>J. von Dalberg, Bishop of Worms</td>
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<td>Rechlin</td>
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<td>Franz von Sickingen</td>
<td>1523</td>
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<td>Ulrich von Huten</td>
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<td>Albert Durer, artist</td>
<td>1528</td>
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<td>Georg von Freundsberg, field officer</td>
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<td>Peter Vischer, the elder, artist</td>
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<td>Emmanuel</td>
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<td>Ul. Eichorn von Meiselbrunn, Bishop of Wurtemberg</td>
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<td>Maximilian von Trutmannsdorf</td>
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<td>Von Tromp, Admiral</td>
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<td>Von Schonborn</td>
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<td>Otto von Quecker, inventor of air pump</td>
<td>1694</td>
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<td>Zinzendorf</td>
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<td>William III, of Great Britain</td>
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<tr>
<td>Ludwig, Margrave of Baden-Baden</td>
<td>1801</td>
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A CHAT ABOUT WESTMINSTER ABBEY.

Our metropolitan minster (cost of St. Paul's), is perhaps without exception, the most beautiful, interesting, and instructive sight in London; and yet how many inhabitants of this great city are there who, but for the accidental visit of a country cousin, which led them to seek the Lions, had never seen it? and how many more to whom it is still unknown ground? They have travelled, perhaps, to York, to see the Minster there; they have sought objects of interest at Colosseum; they have thrown their eyes round the Cathedral of Strasburg—but Westminster Abbey, close at home, has escaped their investigating gaze. Let them lose no time in seeking it out. We feel persuaded that few can visit this wonderful museum of skill, genius, noble thoughts, and memories of good deeds, without an elevation of mind, an improvement in taste, and a chastening in feeling which must tend in a greater or less degree to good. Walk through it, examine it, study it, as often and carefully as you may, you will ever find some fresh claim on your attention, some beauty before overlooked, or some evidence of unpretending piety, which makes you ponder of humanity and more determined to do nothing derogatory in your own person. It is, indeed, a spot "where folly's dancing foam melts if it cross the threshold," where thoughts that are unholy die; where the past great ones of six centuries speak powerfully to you—it is to be hoped, not uselessly.

The multitude of monuments which it contains, from that of King Henry III, upwards, (omitting, for the present, any remarks on the destructive effect produced by those erected in modern times,) render it an immense English history, and a commentary both on the statesmanship of different epochs in wood and stone, and glass and metal, which these and other portions of the building present, make it a lecturer on British art and a record of its progress. Edward the Confessor's chapel, at the east end of the choir, is alone a sufficient reward for a pilgrimage of a hundred miles. Here, where old Time seems to have secluded himself from the garish present, and reigns over remnants of the past, are ranged memorials of our early sovereigns—the pious Edward, Queen Eleanor, Edward I, Henry III, Queen Philippa, Richard II and his Queen, and the gallant Henry V. It has nothing in common with the present time, it stands alone, and cannot be realized in the mind of any one of the thronging thousands, who are passing at so short a distance from the spot, if they have not visited it. Examine the pavement, examine the shrines—the chantry of Henry V, the screen, next the choir covered with memorials, sepulchral—Vincelmann, antiquary, the powers of art were lavished in honour of God. Our forefathers were not satisfied with the decoration of the mere face of the part in human sight—the highest exercise of their powers was deemed hardly worthy of the temple, and so long as any portion, however remote, or hidden, remained capable of improvement, so long was it deemed incomplete and requiring alteration.

Of the elegance of the Abbey as a structure it is almost needless to speak: it may be termed the finest example of the pointed style of architecture ever executed in England, and remains the most complete, with the exception of the cathedral at Salisbury. The combinations which its various parts form, especially at the eastern end, are as numerous as they are striking, and serve to impress a strong conviction on the mind, of the skill of the old builders, and the power they possessed of so arranging their structures as to excite pleasurable and lofty emotions. Amongst the most striking of these combinations is that presented when standing beneath the porch of Henry VII's chapel, the gloom in which, most artistically devised, serves to render the full flood of light, to be found in the chapel itself, striking and effective in the highest degree. Burke remarks, in his essay on the sublime, "I think that all edifices, calculated to produce an idea of the sublime, ought rather to be dark and gloomy; and this for two reasons; the first is, that darkness itself, on other occasions, is known by experience, to have a greater effect on the passions than light. The second is, that to make an object very striking, we should make it as different as possible from the objects with which we have been immediately conversant; when, therefore, you enter a building, you cannot pass into a greater light than you had in the open air: to go into one some few degrees less luminous, can make only a trifling change; but to make the transition thoroughly striking, you ought to pass from the greatest light to as much darkness as is consistent with the uses of architecture." This the architects of the middle ages well understood; they appreciated the "dim religious light," and accordingly built their ecclesiastical edifices, for the most part, with comparatively few openings. When, however, as in the case before us, the style adopted rendered larger windows necessary, they reversed the arrangement, and so still obtained the required effect. In a Gothic edifice, nothing was done without intention—everything is meaning-full, design is everywhere apparent.

Many of the striking combinations, to which we have referred, are now sadly interfered with by the modern monuments, with which the Abbey isumbered up—monuments for the most part so absurd that they would make us laugh if they did not make us sad. Moldings, pillars, and adornments of all descriptions have been ruthlessly cut away for them, openings have been interfered with, and even several of the spaces between the large clustered columns in the side aisles and chapels, are blocked up to the top with tasteless and incongruous masses of stone and marble, alike unsuitable and discordant in colour and design.

The sculpture of the best periods of the middle ages has an entirely distinct and original character, prompted by the spirit of the time and carried out by genius. It is in no way imitated from the master-pieces of pagan art, which might have been used as models; but is nevertheless full of feeling, and appeals to the sympathies rather than to the eye. In the ancient tombs at Westminster as elsewhere, the sculpture is seen to be a portion of the building, conceived in the same spirit and displaying the same feeling of reverence. All the figures are in repose, all are devotional—there is no action here, no earthly action, and even the world itself; they do not seek to record, in vain self-glory, any moment of the past, but carry us forward to the great hereafter, and inculcate humility. Alas! how sadly this contrasts with those of more recent date, where every man, "for his own hand," has worked in his own way, careless of the general effect, and has not worked well. Mountains of most material clouds,
urns, flames, figures in ill conceived and violent momentary action, accurate models of periwig and whiskers, the evanescent fashions of a period of universal bad taste, form the staple—but why endeavour to prove what nearly all seem to acknowledge? A few weeks ago, when the writer said at the Institute of Architects, in reference to the tasteless tombs and monuments with which our cathedrals and churches have been gradually encumbered and overlaid, “Like some frightful fungus, they have spread insidiously over all parts of these structures, destroying alike their beauty, propriety, and stability. Our metropolitan Abbey presents a lamentable example of the evil; and it is to be hoped that the acknowledged good taste of those who now govern them, will not merely prevent the increase of this abomination, but lead, as opportunities may from time to time offer themselves, to the removal of the excrescences now deforming that fine building, and to a restoration of its harmonious proportions and original integrity,”—the meeting at once recognized the existence of the evil and reiterated the desire for an alteration. Again we venture to re-urge it. The triforium might be made to contain many of the monuments, as has been done at the Temple Church. Perhaps, too, the Chapter House, which is about to be cleared of its present contents, (dirty shelves and presses,) could receive some without injury to itself, so as gradually to restore to our venerable Abbey its original appearance.

The present state of the ancient monuments is deplorable, and requires immediate attention. Mr. E. Blore, the architect of the Dean and Chapter, when before the Committee of the House of Commons on national monuments, in 1841, said, that he considered these monuments very sacred things, not to be touched without great care and consideration, as more harm than good might be done in attempting to improve their appearance. This is quite true, but there is nevertheless a limit to that forbearance, and this limit has been reached; for unquestionably, unless some steps be taken at once in several cases, nothing will remain to guide the restorer hereafter, and an irretrievable loss will be sustained. We should be right glad to see a general and perfect restoration commenced, a restoration which should include the removal of the ugly western towers put up by Wren, (who knew little of Gothic architecture, and liked it less,) and the completion of the central tower or spire. Some partial repairs and alterations are indeed contemplated, and the plans have been prepared: let us most strenuously urge on the new Dean, Dr. Turton, if it may be done without apparent impertinence, the importance of energy in such a matter as this, and the necessity for the greatest vigilance, in order to prevent not only the occurrence of fresh injuries, but the perpetuation of those already committed.

Amongst the earliest improvements to be made in the Abbey, is the introduction of stained glass in the rose-window and twelve lower openings of the south transept. The execution of this work, after two competitions, was entrusted to Messrs. Ward and Nixon, and is making rapid progress. The subjects for the twelve lower windows are taken from the Old Testament, and may be described as, Noah’s sacrifice, Abraham and the angels, Jacob’s dream, Joseph interpreting Pharaoh’s dream, the finding of Moses, Moses before the burning bush, Moses striking the rock, Moses with the tables of the law, David anointed by Samuel, dedication of the temple by Solomon, Elijah’s sacrifice, and Josiah renewing the covenant; the figures are the size of life. The large rose-window, besides a variety of symbol, scrolls, sentences, and arms, intended to form a rich piece of mosaic work, conformable to the practice of the old glass painters, will contain thirty-two subjects illustrative of the life of Christ, wherein the height of the figures will be about three feet. The impulse which has lately been given to glass-painting in England is a pleasant sign, and cannot be too strongly aided. So firm was the belief that English artists in this department were inferior to foreigners, that the Chapter, it is said, had nearly determined on sending to Germany for the work. In question; luckily, however, one or two members of it were staunch friends to English art, and succeeded in making the present arrangement; the result of which, it is to be hoped, will fully justify them for so doing.

We have not yet looked into the chapel of Henry VII, orbis miraculorum, as Leland calls it—one of the most beautiful specimens of the last period of Gothic architecture which England or any other country can boast. From its roof, “pendent by subtle magic,” to the floor, the whole presents a rich lace-work of decoration. The lover of architecture, after studying the perfect development of the pointed style in the Minster itself, with its acutely pointed arches, its lofty attenuated columns, its infinite divisions, finds here the style which succeeded it when the arch was becoming more horizontal, and when a love of decoration threatened, as indeed did soon afterwards happen, to overwhelm good taste, and lead to the abandonment for a time, of pointed architecture altogether.

With respect to sculpture, Henry VII’s chapel presents one of the finest illustrations of early art, in England, in the series of figures which fill the countless recesses in the walls. It is said they were once three thousand in number, but this is perhaps doubtful. They display admirable feeling for art, and will well repay attentive examination. The carving too, in the stalls here, is good, and leads us to express regret that so little encouragement is now given to this branch of art in England. There are a considerable number of artists employed in it at this time, but unfortunately—such is the dominion of fashion, (another word for caprice,)—it is chiefly, if not wholly, in the imitation of old work, to be afterwards stained and sold as such. The upholsterer is the arbiter elegantiarum, and the result is, exactly what might be expected under such circumstances. The remedy for this, and many like evils, is, to make artistic knowledge more general, and to induce the multitudes to talk and think on the subject. With an increased public—an extended circle of admirers and employers—the powers of the artist will be more fully called into play, and the more critical that public is, the more strenuous will the efforts of the artist be to maintain himself superior to his judges.

GEORGE GODWIN.

MESSRS. W. FAIRBAIRN & CO.’S IMPROVED PATENT RIVETING MACHINE.

The annexed is a drawing of the Patent Riveting Machine now constructed by Mr. Fairbairn, of Manchester, drawn to a scale of half an inch to the foot. It is widely different in construction from the machine first made, embodying many improvements, and remedying several defects to which the former was subject.

The machine is worked in the following manner: a strap or band leading from the shafting of a steam engine passes round a pulley, and causes the same to revolve, and with it a pinion fixed upon its axis working into the large spur wheel; upon the axis of the latter is a cam which acts upon the knee joint of the jointed bars at the top, and forces forward the moving slide C, and with it the die against the head of the rivet, and the inner point of the rivet against a corresponding die fixed upon the top of the stem A, the rivet being previously heated in the usual manner.

The large stem A is now made of malleable iron, and having an iron strap B screwed round the base, it renders the whole perfectly safe in the case of the dies coming in contact with a cold rivet, or any other hard substance, during the process. Its construction also allows the workmen to rivet angle iron along the edges, and to finish the corners of boilers, tanks, and cisterns; and the stem being now made four feet six inches high, it renders the machine more extensive in its application, and allows of its riveting the fire-box of a locomotive boiler, or any other work, within the given depth. In addition to these advantages, it has a broad moving slide C, in which are three dies corresponding with others on the top of the wrought-iron stem. By using the central die, every description of flat and circular work can be riveted, and by selecting those on the sides it will rivet the corners, and thus complete vessels of almost every shape. Another advantage of this machine is its portable form, and the facility with
which it can be moved on rails, to suit the article suspended from the shears. The introduction of the knee joint is also a very important improvement, as it gives to the dies a variable motion, and causes the greatest force to be exerted at the proper time, viz., at the closing of the joint and the finishing of the head of the rivet.

In other respects the Machine operates as before, effecting by an almost instantaneous pressure what is performed in the ordinary mode by a long series of impacts. The machine fixes in the firmest manner, and completes eight rivets of ⅞-inch diameter in a minute, with the attendance of two men and two boys to the plates and rivets; whereas, the average work that can be done by two riveters, with one "holder on," and a boy, is forty ⅞-inch rivets per hour; the quantity done in the two cases being in the proportion of 40 to 450, or as 1 to 12, exclusive of the saving of one man's labour.
CANDIDUS'S NOTE-BOOK.
FASCICULUS XLVII.

"I must have liberty
Withal, as large a charter as the winds,
To blow on whom I please."

I. "The works of Meers, Whewell and Willis, honorary members of the Royal Institute of British Architects, reflect the greatest credit upon their penetration and learning:"—so says Professor Donaldson, and therefore so far differs from the author of a certain "Encyclopædia," who, although he does not name those gentlemen, gives a pretty broad hint as to the esteem he entertains for them and their works; which last, he has considered unworthy of being named in the list he gives of architectural publications—a list, by the bye, that seems to have been made up from a bookseller's catalogue. However, the "Encyclopædia" has got plenty of puff from some of the country newspapers, therefore, it is to be hoped that Mr. Gwilt will now become quite reconcile to "small-fry critics," of that class, who, if they do not understand anything of the subject, are most conveniently blind to defects and blunders, yet at the same time so lynx-eyed, that they discover wonderful learning and industry, where others detect great carelessness, and the mere handicraft of scissors and paste. As to Mr. Donaldson, his "learned and scientific professional brother," as he styles him, is not likely to be at all pleased at his complimenting the two W.'s.

II. Donaldson is certainly the most good-natured of critics—liberal of praise even to a fault, for he bestows it so freely as to render it quite common, and hardly worth having; in which respect, however, he does not exactly stand alone, yet one looks for something superior to ordinary puff, from a professional man and a Professor. After that honey, a gentle squeeze of acid from Welby Pugin will prove refreshing; and no doubt he will give us some of it by and bye, in his forthcoming work. His bill of fare promises some relish of the kind; and there are one or two capital tid-bits for him to serve up to us, should he not have overlooked them. It is a pity that he does not mean to give us a chapter on "Lost Opportunities," but a chapter would hardly suffice to enumerate them all—they would require a volume. As to his idea of recommending Gothic architecture, as our general style at the present day, and for public buildings of all kinds, it seems to be somewhat a visionary and Quixotic one. At any rate he will hardly be able to enforce his argument by satisfactory and encouraging examples, proving how successfully we can now accommodate that style to every purpose and every occasion. But what does Pugin himself mean by clapping that odd bristling chapeau-de-frise on the ridge of St. George's Catholic church? It looks neither useful nor ornamental—quite the contrary: nor does there seem to be precedent for it, much as it stands in need of authority to reconcile us all to it.

III. If instead of falling foul on reviewers, anonymous critics, and others of that class, and bestowing upon them a good deal of his "Big bow-wow," as Scott calls it, the illustrious Joseph had condescended to point out some of the best architectural papers that are to be found scattered up and down periodicals, foreign as well as English ones, he would have performed a good office. There are several of the kind in the Quarterly Review; although of late that journal has given us nothing on the subject of architecture; and from that entitled the "Modern Palladian Architecture of Italy," he himself might have picked up some information which he does not appear to possess. No doubt there has been a good deal of flimsy nonsense written in periodicals, not only upon architecture, but other subjects also; yet it does not therefore follow that there is nothing at all good, or deserving attention, to be met with in the shape of magazine and review articles; and as the good ones, it seems, bear so small a proportion to the rest, a list of them would not have occupied a great deal of room—though as for the matter of room, Gwilt had more than he knew how to fill up, except by cramming into his book such heterogeneous stuff as tables of compound interest. Taken in general, reviewers—more especially architectural reviewers, may be the ignoramuses Gwilt represents them. Nevertheless, every rule has its exceptions; at any rate, certain it is that some who have written in periodicals are not only professional men, but those who as such stand rather high in public opinion. Professor Pugin, for instance, has written in the Dublin Review; and each of the other Professors—Cockerell, Hosking and Donaldson, stands suspected of having occasionally contributed to periodical publications. How they relish Gwilt's remarks may, therefore, easily be conceived. Whether the venerable Vitruvius and the great Palladio were ever guilty of any thing so unprofessional and so horrible, may be questioned, because in their times—oh! happy times for architecture!—there were no periodicals; and if there had been, those great luminaries of art, would not have put their light under a bushel. Surely an "ignorant reviewer" may be excused from admiring Schinkel, when for so doing he had the authority of all Germany. To vent his wrath on such a poor devil, looks like cowardice on the part of Mr. Gwilt, more especially as he might attack architectural heresies in "high places," and display his prowess against giants instead of dwarfs. Besides,

Thyself, friend Joseph, may at times be wrong;
Bethink thee, then, what says the song,
"Remember, where the judgment's weak,
The prejudice is strong."

And there, 'twould seem thy strength most lies.
Reviewers, why should you so rail at and despise?
On them why all thy vengeance wreak—
Reviewers, meanest of the meek,
If not the wisest of the wise?

IV. There is no department of biography in which less has been done than that of architects; and, strange to say, least of all has been done—at any rate in this country—of late years, when even the most eminent—if not exactly the ablest—in the profession have obtained only a mere passing notice in an obituary—hardly so full a one as is bestowed upon some of those "distinguished," persons of whom the world never heard while living, nor will care to remember when dead. Wyatt, Gandon, Soane, Wyattville, Wilkins, and Rickman, have passed away without obtaining more than that kind of notice. In Soane's case, indeed, it was entirely his own fault, for a handsome legacy would have secured him a splendid biographical monument from one who was always telling the world of his esteem for Sir John, but who has since written him plain "Soane," without the knightly prefix, and without endearing compliment of any kind. Well, perhaps poor Soane had no relish for "extreme unction," administered by an Egyptian—that is, by a crocodile.

V. "It is found easier," says a writer in the Edinburgh Review, "to deal with generalities and abstraction, than to descend to particulars; to frame a theory, or a philosophical essay having the slenderest application to the case in hand, than to direct the criticism to the real appreciation of the work to be reviewed." This is more especially true as regards architectural criticism, or what is given to the world as such: of general remark that has been worn threadbare, there is usually an overdose, while the building which calls it forth, obtains no further notice than two or three lines, and sometimes not even so much. When such is the case, we may without any very great breach of charity, suppose that the writers know not how to apply their own principles—supposing them to be really their own, which is doubtful, and to test by them what they profess to examine and pass sentence upon. Indeed, it occasionally happens that the opinion they express, is altogether at variance with the principles they pretend to lay down:—after twaddling about Greek architecture, for instance, they will praise what is no better than an abominable caricature or preposterous application of it—at the best a servile copy is regard to mere columns, and those generally introduced so injudiciously as to render all the rest more insignificant in character than it otherwise might have appeared.

VI. Innovation is the bugbear of architects, and is most solemnly of all, deprecated by those who themselves do not possess a fresh
OBSERVATIONS ON RIPON CATHEDRAL.

Read at the Royal Institute of British Architects. By Mr. Morris.

"Eteles avec powere untillle the north went
Alle the towne of Ripon he wastel and leert."—Peter Langtoft.

In the seventeenth century an animated controversy divided the polemics of the Anglo-Saxon church concerning the time of celebrating Easter. The Northumbrians observing the Irish tradition, kept the festival upon the Sunday that fell between the 14th and 20th days of the Fastal month, while in most parts of the country the Roman practice was followed. Thus Bede tells us that two Easiers were sometimes observed in one year, and the Northumbrian king and his queen being divided in opinion, it would happen that when the king having completed his Lenten fast was celebrating Easter, the queen still fasting was spending Palm Sunday.

Wilfrid, an ecclesiastic, had at the age of 20 been sent to Rome under the auspices of his uncle Elda, for the purpose of acquiring at the papal see, the best information on the subject of dispute, and on his return is said to have taken a distinguished part at the Synod of Whitby, held in 664; and his success was followed by his appointment to the Episcopal Chair of York, from which he was afterwards twice ejected, on the last occasion being absent for 10 years, and it would seem that he visited Rome in both intervals, and found a sure if not a powerful ally in the pope.

In the year 661 Alchfrid, king of Deira, bestowed upon Eata Abbot of Melrose and Lindisfarne certain lands at Ripon, where, allured by the beauty of its situation he built a monastery. But soon after its erection the monks, (among whom was St. Cuthbert,) on account of their nonconformity to the Catholic observance of Easter, were expelled the monastery by Alchfrid, who then conferred it, endowed with 30 hides of land, upon Wilfrid, who, notwithstanding his subsequent elevation, retained it during his life. King Athelstan gave it the privilege of sanctuary, which extended a mile round the church, so that not only the church but the whole town was a place of refuge to all who fled to it. One (if not more) of the crosses marking the bounds of sanctuary yet remains.

It would have been strange, indeed, had a prelate, endowed with Wilfrid’s mental and physical energy, made repeated and protracted efforts to establish a new observance, and we speak not of its architectural treasures and a desire to emulate them in his native soil. That he was thus affected, we have the most satisfactory evidence; and ecclesiastical architecture in this country was more indebted to him than to any other person of that age. Notices of his works are found in his biographer Bede, Richard ofHexham, William ofMalmesbury, and from other ancient writers, of which a summary sufficient for our present purpose will be found in Britton’s York Cathedral and the Chronological Volume. From these we learn that he erected in Ripon a church of hewn stone supported with various columns and porticos, and completed it from its foundation to the summit.

“The church of St. Andrew at Hexham he built, laying the foundations deep in the earth with great care, forming crypts and subterranean oratories, and winding passages. The walls, extending to a great length, and raised to a great height, were divided into three distinct stories, supported by polished columns, some square, and others of various forms. The walls and likewise the capitals of the columns by which they were supported, and the arch of the sanctuary, were decorated with histories and images and different figures, carved in relief on stone, and painted with colours, displaying a pleasing variety and wonderful beauty. The body of the church was likewise surrounded on all sides by porticos and porticoes, which, with the most wonderful articule, were divided above and below by walls and windows. Within the rooms and chapels, where these porticos and porticoes were, were stairs and galleries of stone, and various methods for ascending and descending, so ingeniously contrived, that a vast multitude of persons might be there and pass round the church without being visible to any one in the nave below. Many porticoes also, most retired and beautiful, were, with the utmost care and diligence, erected in the porticoes both above and below, and in them were placed alteres in honour of the blessed mother of God, the Virgin Mary, St. Michael the Archangel, St. John the Baptist, and the Holy Apostles, martyrs, confessors, and virgins, with all becoming and proper furniture belonging to them.”

I have transcribed this passage relative to the church at Hexham, as its circumstantial character can hardly fail to be interesting; and it illustrates in a very decided manner the highly artificial models copied by the architect. Indeed, I question whether old St. Paul’s, Salisbury, Westminster or Durham, in the very zenith of their magnificence, could have furnished more glowing images to the pictorial imagination of the good old chronicler, Richard the Prior, who wrote towards the end of the 13th century, when the church after 500 years, though bowed and stricken with age, retained like a patriarch, the indelible traces of former glory.

Wilfrid is said to have erected two other churches at Hexham, besides several in other parts of England; and Bentham supposes that he superintended the erection of the church and monastery of Ely. Indeed, the architects of the 12th century, both from a historical and architectural aspect, being eminent for his knowledge and skill in the science of architecture, and was himself the principal director of all those works in concert with the excellent masters whom the hopes of preferment had invited from Rome and other places, to execute the plans which he had formed.

William of Malmesbury also notices the beauty of the pavements; and there is little doubt that where so much emulation existed, an attempt to imitate the mosaics of Rome would be made. In the small, half ruined, hospital chapel of St. Mary Magdalen at Ripon, is a venerable relic of some such effort, with tesserae about half an inch square; and on the site of the high altar at Fountains’ Abbey, a pavement remains which has glazed tiles of various forms and colours, to suit the geometrical figures of the design, which exhibits great elegance and variety; and I think this kind of paving may be considered to have intervened between the former and the inlaid or encaustic tiles met with at Romsey, Salisbury, Winchester, and many other places, an attempt to revive which has been made with some success, and which is now prevalent in pottery, the most beautiful productions may be expected. At Winchester are to be seen some examples of embossed tiles, or with the ornaments raised from the surface or ground.

In Bishop Wilfrid’s time then we find the church and monastery settled in possession of a monastic establishment, and the country adorned from the habits, and the demonstration of rapturous and enthusiastic affection which marked his return from exile, is still commemorated by the annual observance of a mimic pageant. The church,
however, that he raised with so much care, and so cunningly adorned, and the monastery whose walls so often reverberated the applause of his virtues, are now no more seen, and the finger of tradition alone, points out the spot where once they stood. The present cathedral occupies a site elevated and commanding site to the neighbourhood, commenced by Archbishop Thurston, soon after his advancement to the see of York, (in 1119). The plan was a simple cross, and the style Anglo-Norman with semi-circular and pointed arches promiscuously applied. The walls, as usual in similar buildings, are thick enough to allow galleries or passages to be formed in them. The doors are rounded, excepting a very few by repetition of a simple elementary form: and it is worthy of notice, that in the Norman arches the blocks of stone, though moulded or carved in a variety of ways, never wholly lost the original square figure, previously given to them. Without asserting, therefore, that at this period the mouldings and ornaments were actually wrought with such a disposition of the mouldings would tend very much to simplify that process: and it will further be found that these ornaments are not unfrequently modified to suit the actual size of the blocks. There is a low central tower with good detail; and immediately under this is a small crypt or cell, with access from the nave, and also from the choir. To what use it was appropriated does not seem very clearly decided. Its extreme minuteness suggests the idea of a penitentiary; and the small recesses in the sides suitable for the reception of a lamp or crucifix assisting the notion. It may have served simply as a confession; but whether intended for the momentary reception, or more perdurable, house of the inner, or the fugitive from the arms of the temporal power, it is evident that the priest entering from the nave, and proceeding through the original structure, no building has perhaps undergone such important alterations without a more complete destruction of its individuality. The transepts, however, bear more legibly than any other portions, the impress of the 12th century, but the inner roofs appear never to have been completed. Small shafts suited to support the foot of a groined or clustered (or as many other instances) story after story, and are at last left without adaptation either to a flat or vaulted ceiling; and thus from the absence of an homogeneous and appropriate inner roof half the effect is lost. How lame and abrupt does the flat ceiling at Peterborough appear to an eye that has dwelt on the masculine vaulting of Durham! The crypt of the choir is of the same simple squared form as the aisle, except in crypts, and the fair presumption that not many ever existed, is a subject open to investigation, and a speculative idea may be not without its utility in eliciting satisfactory information. Thick as the walls of that period are known to be, the risk that would have attended charging them with stone ceiling, without the auxiliary resistance which the arches must have given, may have been a great objection to the builders, and the execution of such works in stone may have been attended with difficulties which even at this time would be considerable, and may then have proved altogether insurmountable, except under the most favourable circumstances, and amplitude of means. The entering alone, if considered for a moment, is an object involving so considerable an amount of expense and practical skill, that we may regard it as a matter of doubt whether it should have been devised for dispensing with it, and hence doubtlessly arose the adoption of wood at Lincoln, York, and elsewhere. Did not the Norman builders feel and shrink from the difficulty like their successors, but without the good fortune to hit upon so happy an expedient? We know that they affected the groin, from its constant adoption in crypts and aisles, when a moderate span facilitated its execution. As the central tower presented the strongest objections for an arch of any part of the church, it is possible that a groin existed there similar to that at Lindisfarne, in Northumberland, and causes for its non-existence, at the present time, are by no means devoid of meaning. Before leaving the transept we may notice that on the east side of each aisle there is a chapter house, which in the north transept being nearly coeval with the church, and that in the south, of the fourteenth or fifteenth century. The choir comprised originally three arches only, but was subsequent increased to six. The effect is curious at first, from the circumstance of the triforium arches being filled with tracery and glazed, and the roofs having been lowered. It looks, therefore, like a double clerestory. The addition of the arches appears to have been carefully made to assimilate with the original work, but subsequent alterations bear the characteristic of their own date. In 1319, the church was burnt and greatly injured by the Scots, but restored by the munificence of Edward III, Melton, archbishop of York, and the bells were re-stuck, of which the central one, 40 yards high, was called St. Wilfred's. There is an old print which shows spires on the central and western towers similar to Litchfield. The former was blown down in 1660, destroying in its fall a part of the south side, of which the restatement (said to have been done at the expense of one of the prebendaries) was undertaken. After this accident the other spires were removed. In the south aisle is a large piscina, probably used for washing the sacredlatin, and round the the sides and end there was archched-headed panelling, but part of this is now displaced by the altar screen, erected some years ago from a design by Mr. Blome, under whom also the groined ceiling was restored. The windows which are preserved are, however, very beautiful. The east window, erroneously said by Rickman to be of five only, consists of seven lights, and is a fine example of the kind. The clear opening is 45 feet high. Sir William de Plumpton was founder of a chantry at the altar of the Holy Trinity behind the high altar. The act of endowment is dated at Ripon on Wednesday, the feast of the conversion of St. Paul, 29 Edward III, 1345, and was sealed with the seals of Henry de Plumpton, the chaplain first appointed thereto, and of Sir William de Plumpton, which bore the impression of a shield, and on it five fusils, with the name written on the circumference. This chantry was screened from the rest of the church, and under lock and key, but no vestige of it remains. Near the altar on the north side is the chantry of St. Agnes and St. Cecilia and probably dates from the early part of the 13th century. The groining is fine and the decoration elaborate of design and skilful execution. The arches are cinquefoiled, the cusps being ornamented with small grotesque heads or other figures, which at the first glance appear to terminate the design; but, on closer inspection, it is found that the small bas-relief first seen is merely the crown of another head in high relief, of a figure falling into bas-relief of a Marlborough covering the spandrel of the arch. These figures have human heads with the bodies of quadrupeds. They are of either sex and laden in full monastic costume; and the stout friar is regarding, with an expression too energetic to be perfectly platonically, the beautiful coy, and wimples: nun. Seats of this kind are not of unfrequent occurrence in English cathedral and other churches, as well as in those of the continent. St. Seus, on the epistle or south side of the high altar are five seats. One for the celebrant, (which is highest,) two for deacons, and as many for subdeacons, all officiating while the other priests were in the choir. "One single seat," continues the essayist, (Clark in the Archaeologia,) "is accounted for by the choir performing the part of sub-deacon, and one priest that of celebrant and deacon. In churches which were not provided with a more elaborate design, the seat of a deacon and subdeacon in such churches were two seats. Thus the number was proportionate to the richness of the endowment, and the seats intended for the officiating clergy only. The bishops' seats, were at the east and by the side of the altar. The choir is rich in carved oakwork. The stalls are furnished with misericores and tabernaculums, (which is said to have been bought and let work in the choir of York Minister.) The throne is also an object of interest, as presenting one of the earliest evidences of the architectural attainments of the noble Earl, the President of the Institute of British Architects. The organ screen is of bold and original character, without tending to the extreme elaboration of that of York. Adjacent to this structure is a roof of wood. The central tower has for some generations, presented a most singular and heterogeneous spectacle, but at the same time affording to the professional observer a valuable comparative view of the varied proportion and effect of the first and latest eras of true Gothic. In point of expansive lightness, though we have not the earliest style is certainly entitled to our admiration, though mass and richness may be exclusively the merit of the later. Three of the piers of the central tower were cased in the perpendicular period, and the arches of the choir and south transept were also completed; but the fourth pier and the arches of the nave and north transept have been returned to their original form. It is also illustrative of the opposition of the earlier style to the perpendicular, that the sides quite up to the flanking of the piers and the increased height of the springing, has the effect of contracting the opening of the arch, and also of rendering it necessary to ramp up the longitudinal crown rib of the groin. Taking our survey in chronological order, the next point for consideration is the west front, which comprises the entrance to the
nave and the two flanking towers, each of which is about 25 feet wide and 112 high. The present termination is not original, the belfries and pinnacles being of much later date. As to the mode in which the nave was divided into the aisles, it has been shown to be a satisfactory suggestion; but of that which remains it would be still more difficult to convey an adequate impression. The simplicity of its outline, the unbroken massiveness of its general feature, and the rich and effective detail, respectively contribute to the grandeur of an ensemble unsurpassed by any building of its date.

The lower story has three divisions of the church, and the second five successive windows extending the whole width of the nave, with a passage in the thickness of the wall. The second stage has an equal number of windows, the heads of which are elevated towards the centre to compose more readily with the gable, which is filled up by a triple window and trefoil panel. The windows are of two lights with a trefoil in the centre. These lights are divided by a pair of vertical lines, pierced in the pier.
It is the force. Impulsive recommended up, the opposite it the of consideration, consequently is a apparatus. The in be of the inch; of cubical the was, and the would have exposed an internal surface to the action of the gunpowder of 100 square feet, equal to 14,400 square inches. As the pressure, according to the preceding calculation, would in the first instant be equal to 5000 lb. the square inch, the impulsive effort on each side of the cubical chamber would be 72,000,000 lb. or 32,143 tons. As the point of least resistance must necessarily have been towards the face of the cliff, the acting power may be considered as having been exerted only in that direction; therefore the cliff would be forced outwards with an impulse upwards of 32,000 tons. As the rock yielded to this immense power, the pent-up air would expand, and its force would consequently be diminished. The cooling of the generated gas would also greatly weaken its expansive force, and its gradual escape through the fissures of the falling rock would prevent any sudden explosion.

The sound which was heard was that of the rending of the solid rock, and not the firing of the powder; for it is well known that the explosive report of any detonating body is caused by the concussion of the air. This fact is proved by the firing of explosive mixtures of hydrogen and oxygen gases in a strong glass apparatus, for the purpose of obtaining the product of the combustion of the two gases. The apparatus usually employed contains about half a pint, the explosion of which quantity of the mixed gases, when in contact with the atmosphere, is sufficient to produce a report as loud as the firing of a pistol; but when the gases are fixed in a closed vessel, no report whatever is heard. This experiment proves also, on a small scale, the possibility of controlling explosive forces. The expansion of an explosive mixture of hydrogen and oxygen gases at the moment of combustion, amounts to 13 times its original volume, which gives a pressure of 15 atmospheres, or about 225 lb. to the square inch; yet the glass bottle in which the gases are fixed is sufficient to control the explosive effort, and to prevent even any sound from being heard.

The quantity of gunpowder requisite in ordinary blasting operations must depend altogether on the hardness of the rock, and the mass intended to be moved. The proper adjustment of the quantity of powder to the resistance to be overcome, forms, however, an important consideration, for an excess of powder is not only a wasteful expenditure of a valuable agent, but it renders the operation more dangerous by the dispersion of fragments in all directions, and it not unfrequently diminishes the effect of a blast by concentrating the direction of the impulsive force. This is particularly the case in warlike operations, where the object in springing a mine is to make the destructive effects extend as far as possible. The aperture produced by the explosion, when a mine is properly charged, is a cone, the diameter of the base of which is double the height, taken from the centre of the mine. This calculation is founded on the supposition that the materials to be removed are either earth or soft clayey soil. The allowance of powder recommended for such mines is about 10 lb. per cubic fathom when the materials are loose earth, and for strong clayey soil about 16 lb. It is found that when the charge of powder greatly exceeds those quantities, the materials immediately above the powder are alone blown up, that the aperture is nearly cylindrical instead of conical, and consequently the sphere of its influence is diminished.

The explosive effects of a charge of powder in blasting, depends also materially on the mode of tamping. This is a point which, until a comparatively late period, was altogether overlooked, and it is not even now so generally attended to as its importance deserves. The notion which formerly obtained was, that the impulsive effort of the powder was greatly increased by ramming it tight. In gunnery practice this is correct; for when the ball is rammed closely to the powder, it is propelled with greater force than when it is not. But the required effects in the operations of blasting are exactly the opposite of those in gunnery. The ball and wadding of the gun may be considered as the tamping of the mine. To blow out this tamping without bursting the gun, is the object in gunnery—to retain the tamping and to burst the chamber holding the gunpowder is the object in blasting. To attain these different ends, the methods adopted in the two cases ought of course to be different. The well known fact that when a ball is rammed only a short way down the barrel of a gun, it will burst before the ball is forced out, affords a very instructive lesson in the practice of blasting, and shows clearly that to produce the most effect in rendering the rock, and to run the least risk of blowing out the tamping, ample space should be left between the tamping and the powder. It is true that by leaving such a space for the expansion of the generated elastic fluid, the intensity of its action is diminished, but the same amount of power is distributed over a larger surface; its action accordingly approaches more to that of an ordinary mechanical force, and the liability to split the rock into small fragments is thereby decreased.

One great advantage in mining operations, derived from the practice of leaving a space between the tamping and the powder, arises from its admitting the use of loose dry sand for tamping, instead of requiring the blast hole to be filled and rammed tight with hard substances. The labour, the trouble, and the danger of tamping by the common process, renders the substitution of dry sand a great advantage, as the risk of igniting the powder by striking a spark, is entirely removed; and we suspect that in those cases where it has been found to fail, and the tamping has blown out, that the cause of failure may be attributed to the neglect to leave a sufficient space between the tamping and the powder.

The manner in which the space between the powder and the tamping operates in preventing the latter from being blown out, has been explained in the following manner. The force of fired gunpowder may be considered as proceeding from a point, and radiating in all directions round it. This force must, therefore, participate in the nature of all central forces, and diminish in intensity as the square of the distance. When a ball is rammed close to the powder, it approaches near to the point whence the force emanates, and sustains consequently its full effect; but when the ball is placed farther from the point of radiation, the force acting on it may be diminished many times within the space of half an inch. Suppose, for example, that a musket ball which, when close to the powder, is within a quarter of an inch of the centre of radiating power, were placed a quarter of an inch from contact with the powder, the impulsive force it would receive would be diminished four times. If it were removed to a distance of one inch from the charge, the force acting on it would be diminished sixteen times. If, therefore, we view the first impulsive effort of fired gunpowder as a radiating force, we perceive at once the cause of its diminished action on the tamping of a mine, when a space is left between it and the charge, and whether the tamping materials be sand or hard fragments of rock, the vacant space must be equally advantageous. Should the resistance be too great to yield to the first explosive effort of the gunpowder, the direction of the action of the pent up elastic fluid would cease to be radiating. It would resemble the pressure of compressed fluids, and act uniformly in all directions. The tamping would then be acted on by a power equivalent to the compression of the generated gases, and in a direction tending most effectually to force it out. It is under such circumstances, we conceive, that the tamping, whether of sand or rock, is most frequently blown.

The mode of tamping with dry sand has been brought into notice more particularly within the last two years, in connexion with Mr. Martyn Roberts's plan of blasting by galvanism; but it was known and practised successfully, we believe, 30 years ago, at Lord Elgin's mines at Charlestown, in Scotland. It is to be regretted that an improvement, attended evidently with so many advantages, and which is calculated to prevent accidents in the dangerous occupation of blasting, should have made such slow progress that more than 30 years have elapsed since its introduction without its general adoption.
IMPROVEMENT OF GEODESICAL INSTRUMENTS.

As connected with the profession of a civil engineer, the principles and practice of surveying is an important branch of study; under this term, we do not confine our meaning to the delineation of a few fields, or to the surveying of a long narrow slip of land, such as railway plans usually present, but to the survey of extensive tracts of country or of islands, usually denominated trigonometrical surveying, because that branch of mathematics known as plain and spherical trigonometry, forms the basis or principle upon which such surveys are carried on. This branch of surveying has hitherto been principally confined to the officers of the corps of royal engineers, by whom the trigonometrical survey of the united kingdoms has been for so many years conducted; but although too much unheeded by students in civil engineering, it forms a legitimate branch of their studies, otherwise they cannot be said to be eligible to occupy such important stations as surveyors-general of our colonial possessions, where such surveys are so much needed, may almost indispensable. Connected with this subject, the knowledge of the use and adjustments of the higher class of geodesical instruments is necessary, such as theodolites of large dimensions, but more especially an instrument called the altitude and azimuth instrument, from its two-fold application to the measurement of vertical and horizontal or azimuthal angles, and its peculiar applicability to the measurement of so much of astronomy as is before the lower class of surveying, or we may call it the instrumental link which connects astronomy with geodesy and geography; any improvements, therefore, in the construction of instruments thus connected with the profession we profess to advocate, come fully within the limits of our province, and therefore we are desirous of calling attention to the following experiments from that branch of the science, which was recorded in the Journal of the Astronomical Society on January 13th last, entitled "On a new arrangement of a Vertical Collimator attached to the Altitude and Azimuth Instrument." By William Simms, Esq.

"The only essential respect in which the altitude and azimuth instrument now before the society differs from similar instruments by which it is provided, is that the object-glass is perforated and fitted with an achromatic object-glass having a diaphragm in its focus, so as to serve, in conjunction with the spirit-level upon the instrument, as a vertical collimator.

"At present the spider lines in the diaphragm of the collimator form an acute cross, subtending an angle of about 30°; but the preference of this arrangement over two parallel lines placed very nearly together, so as to present a narrow space for bisecting, admits perhaps of question; my own habit being that of bisecting an angle by a line, leads me to give to it the preference, although I have found by experiment that very satisfactory results may be obtained by the other arrangement.

"In the present state of things, if the telescope be directed vertically downwards, the image of the cross in the collimator will be seen upon the diaphragm of the telescope; and the adjustment, independently of verticality, which must be effected by the spirit levels attached to the instrument, consists in so rectifying the optical axes, that the centres, or intersecting points in the telescope and collimator, remain coincident during an azimuthal revolution.

"The mode of adjustment, described in order, may be as follows, admitting, however, of variation at the pleasure of the observer.

"1. It will be found convenient that the instrument be first generally levelled: the azimuth axis by turning 180° in azimuth, and correcting by the feet screws of the tripod and the adjusting screws of the spirit level; but, in all cases, if the error be not beyond the range of the scales, it is far better to leave these screws untouched, and to apply the correction by reference to the divisions upon the scales. The axis of the altitude circle must be rectified by the striding level, exactly in the same manner as in the transit instrument; all which, however, is too well understood to need a particular description, in this place.

"2. To adjust the line of collimation, bring the vernier marked A to 90° or 270° upon the azimuth circle, and, by means of the adjusting screws at the eye end of the telescope, make the middle vertical, or meridian line, bisect the angles of the collimator cross, turn 180° in azimuth, and correct half the error by the adjusting screws, and the remaining half by moving the object-glass of the collimator.

"3. To correct the nadir point, set the vernier A to 0° or 180° upon the azimuth circle, 90° distant from its former position, and make the middle horizontal line bisect the angles of the collimator cross; turn 180° in azimuth, and correct half the error by giving motion to the telescope by means of the tangent screw, and half by moving the object glass of the collimator. The micrometers should now set to the zero points upon the altitude and azimuth circle. By those, however, who prefer numerical corrections to mechanical adjustments, which, when extreme accuracy is aimed at, are always tedious and difficult to execute satisfactorily, the nadir point may be readily determined by reading the altitude micrometers with the circle in the reversed position. The indications of the spirit-level fixed to the instrument must, of course, be carefully attended to in such a determination.

"I shall conclude this notice by observing that the new application of the collimator does not deprive it of any uses and conveniences which it has in any other form, while at the same time it possesses advantages peculiar to itself. Its property, in common with the vertical instrument, or collimator, consists in the possibility of placing the altitude circle perfectly horizontal, irrespective of the rising level, is one which the level collimator does not possess. In common with the others, however, it affords a ready means of verifying and correcting the essential adjustments of the instrument without reference to any external object. An object adapted for such purposes should be both distant and well defined, conditions which imply a clearness of atmosphere perhaps not generally met with in any climate, and much less in that of our own country; moreover the collimator is equally available by night and by day: the light of a small lamp or taper being sufficient to render the lines visible.

"But it has greatly the superiori, particularly in operations out of doors, over the vertical instrument, and also over the level collimator, because the latter requires supports independent of, and equally steady with, that upon which the instrument itself is placed; things by no means easy of attainment under any circumstances, and to the scientific traveller often perfectly impracticable.

"Neither is it a small advantage to dispense altogether with an additional instrument, which, to say the least, lessens the number of the traveller's cases, and with them his cares also. An extra instrument may be accidently be injured, or through forgetfulness left behind, or for want of time to set up, or a steady support when set up, prove useless when it is most needed. But, by the new arrangement, the collimator becomes part and parcel of the instrument itself, and is so constituted as to be protected from the elements as a greater accident could hardly impair or destroy it without at the same time destroying the entire instrument. Its introduction, too, into the perforated axis adds so little to the original cost of an instrument, that it may make a final claim on the score of economy."
article on the subject; but an explanation of them so clear and so obvious has occurred to me; and even your own article contains such ample proof of the truth of my assertions on the main point at issue between us, namely, the velocity of water in a vertical pipe, that even at the risk of being charged with presumption, and under all the disadvantages of endeavouring to maintain a discussion with one superior to me in scientific acquirements, I am tempted to offer you a few more lines of argument.

"I think it will be well to treat first the velocity of the water in the pipe, that being the chief point of difference, and also because, succeeding in proving this, I think it will appear as a necessary consequence, that the uniform flow of water in the pipe is quite independent of the cohesion existing between one particle and that immediately above it."

"You state, and evidently quite correctly, that supposing a vertical pipe 16 feet in length full of water to have the supporting base removed, it would be emptied by the fall of water in one second, the final velocity of the water on issuing from the pipe, would be 32 feet per second, and the mean of the initial and final velocities would be 16 feet per second. This is evidently quite correct. The whole column of water falls like a block of marble; the upper and lower parts are equally subject to the action of gravity, and every particle of water descending equal spaces in equal times, the whole column will fall at once, and this even without supposing that each particle coheres to the particle immediately above it; and quite independently of黏 originally stated, or that existing between the particles of the same horizontal section. The momentum of such a column is, therefore, 16 feet multiplied by the weight of the water; but you also state that, if the pipe had not been permitted to empty itself, but had been maintained constantly full, the velocity of the column of water would be 16 feet, and consequently practically the same as in the former case. Would not this conclusion be sufficient to convince you that there is an error in your reasoning?"

"In the first case, the momentum, according to your reasoning, is the same as in the second, when the pipe is maintained constantly full. Surely this must be wrong. The mistake appears to me to arise from your not taking into account that, the pipe being supposed constantly full, the water in the pipe would act as a mass, as it were, whether this entering velocity is imparted to the water by the height of the reservoir or other force. If the height of the reservoir or other force, which supplies the pipe with water, is not sufficient to impart to the entering water a velocity equal to that due to the whole height of the pipe, then, I maintain that the height of the water in the pipe will diminish proportionally, so as to regulate the issuing velocity according to the supply. I shall endeavour to explain this. No doubt, still supposing the pipe to be constantly full, and, as before, to be 16 feet in length, in the first second, the mean velocity will be only 16 feet per second, but for the remainder of the time, the velocity will be 32 feet per second, as will be apparent by carefully considering the momentum of the column of water."

"Let us first examine the velocity of the water at different points of the pipe in the first case; when the pipe being supposed full, and the supporting base removed, the water is allowed to fall freely, according to the law of gravitation: that the velocity at any point varies as the square root of its distance from the top of the pipe. At one fourth of the height, the velocity will be 16 feet per second; and at a foot from the top the velocity will be 4 feet per second; therefore, to keep a pipe one foot long constantly full, the water must flow in at the rate of four feet per second; and to maintain one foot long full, the water must enter at 16 feet per second; if the reservoir does not supply water at this velocity, the pipe can only be perfectly full; and by analogy and following the same train of reasoning, the water falling at 16 feet in length, the velocity will be 32 feet per second, and the water must enter the pipe at that rate. Suppose, for instance, the area of the pipe to be one square foot, if the reservoir supplies 32 cubic feet of water per second, then the pipe of 16 feet in length will be maintained at a constant full; if the reservoir can only supply 16 cubic feet, then the pipe of 16 feet length can only be maintained full to one fourth of its height or four feet from the bottom; or let us suppose a glass tube 16 feet in length to be maintained full by pouring water from a jug, and let some colouring liquid, of the same specific gravity as water, be placed at the top, it will be found that as the column of water descends, the velocity of the water poured in must be gradually increased until the other end liquid by the bottom of the tube, when the velocity will be found to be 32 feet per second; during this second, therefore, the mean velocity will be 16 feet, and during the remainder of the time the velocity of the water to maintain the tube full must be 32 feet per second. If you do not pour in the water at this velocity, you will find, as I before stated, that the tube will not be maintained full, but that the surface of the water will fall until the height of the filled part corresponds with the velocity of the supply."

"I trust I have proved even to your satisfaction that my reasoning on this point is correct. I have shown, from your own admission, that if the velocity in the first second of a body falling in the first class, would be 32 feet per second, and the mean between the final and initial velocities 16 feet per second; that to maintain a pipe 16 feet in length constantly full, requires the water to enter at the velocity of 32 feet per second, and, vice versa, if the pipe be maintained constantly full, that the issuing velocity will be 32 feet per second. The explanation of velocity in the form of shot or recus is here true of shillings, in places, falling through a tube without friction, and fitting accurately the sides of the tube, so as to prevent the air from entering at the sides; they would also form a rope, and fall uniformly according to the same law, although there is here no cohesion in force; it is true from the mere effects of gravitation: but in order to keep up a continuous stream, if I must use that expression, the successive shillings must be dropped from a height such as to impart to them the velocity which the column has already acquired. In this case there is no cohesion, which causes one shilling to draw the one immediately above it; and, therefore, why should this property of water to explain a fact when it can be accounted for by gravity?"

"I have already occupied so much of your valuable space, that I must defer bringing forward many illustrations of the above truths for some future period, hoping that you in the mean time will remember your promise, and enlighten us on a subject present in so much obscurity. Since writing the above, I have met an authority of such eminence and celebrity on subjects in nature, that I cannot forbear quoting him at full length. The authority I allude to is Belidor, in the edition of his 'Architecture Hydraulique,' published at Paris in the year 1737, at page 170, paragraph 429 and 430, it is stated, 'that when a vertical pipe, of which the opening is equal to the base, is allowed to empty itself, the surface of the water acquires in falling a velocity which increases as that of both subject to gravity, the weight of the water remaining,' as you stated. In the next paragraph, 430, he states, 'As it is always possible to render uniform a retarded or accelerated velocity, in taking half of the greatest velocity, this must be done when we wish to compare the discharge (la dispence) of a pipe, such as the preceding, with one always maintained full; and in paragraph 431, always alluding to pipes, the velocities of water are in the ratio of the square roots of the heights;' and further he states that the velocity of the issuing water in a pipe constantly full, is that due to the whole height and half; and also 'we can then, when it is convenient, substitute for the velocity of the water of the column, the square root of the height of the pipe.' I must conclude by requesting any of your readers who are disposed to offer me arguments, to peruse that part of Belidor from which I have quoted the above passages."

"I have the honour to be, Sir,"

"Your obedient servant,"

"T. F——-

P.S. 'In addition to the extracts which I have already given you from Belidor, I beg to add the following, in order to show more clearly that I have his support to my statement that the velocity is that due to the whole height. Chap. 3, paragraph 438. 'We can then say that the discharge (la dispence) of a pipe or reservoir during the time necessary for a body to fall freely from the height of the surface of the water above the bottom, is equal to a column of water which has for its base the orifice, and for height a line equal to the space which a body can move over with an uniform velocity during the time of the fall with the acquired velocity.' Apply this to a pipe of 16 feet; the time is a second, the acquired velocity 32 feet per second, and not 16 feet, as stated in your remarkable proof, unlike the point of the above extract. It is true that Belidor has not remarked that the velocity of the whole column, if maintained full, increases every second, although it would appear that he was aware of the fact, from his statement in paragraph 574, when in treating of the momentum of water issuing from an orifice, he states that a pipe can never be maintained full by a reservoir unless this pipe be of such small diameter, that the friction retards the water more than gravity accelerates it."

Placing out of consideration for the present, the minor point respecting the cohesion of fluid particles, we shall confine ourselves to support my views, and next turn our attention to the water as it is touched."

Note: 1. It was the mean velocity we stated to be 16 feet per second, and not the final velocity.
strictly to the main question—the velocity of the water—and we shall endeavour to answer our correspondent's objections seriatim.

The first objection is founded on the momentum of the issuing fluid. We scarcely know in what manner it is intended to show the fallacy of our arguments, by placing the subject in that light. Our correspondent admits that the mean velocity of a column of water falling through a vertical pipe 16 feet long would be 16 feet per second, and surely if, as we contend, the issuing velocity of water from such a pipe kept constantly full be the same, the momentum in both cases must be equal. We do not see how this consideration proves any inconsistency in our arguments, nor that it gives any countenance to the view taken by our correspondent.

On the next point—the velocity of the water entering into the vertical pipe—the whole question may be said to depend. Our correspondent alleges that our "mistake" arises from not considering that the water must enter the pipe as quickly as it issues from it. We maintain, on the other hand, that his error consists in not considering by what force this velocity is imparted to the entering fluid. The water in the reservoir is, by the hypothesis, supposed only just to cover the upper end of the pipe; therefore the action of gravitation on the water between the surface and the top of the pipe can have no perceptible effect. The pipe is also supposed to be completely full, and the fall of the water down it to be uniform. By what force, then, is the same velocity given to the water in the upper part of the pipe, as to that which has fallen 16 feet? Our correspondent asserts that the velocity of the water at the top of the tube is 32 feet in a second; but we are left completely in the dark as to the nature of the force by which this velocity, which is due only to a fall of 16 feet, can be communicated to the water flowing into the top of the pipe. According to our view of the case, the force which communicates the velocity to the entering water is derived from the action of gravitation on the water falling down the pipe. Part of the force acquired by the water in its fall towards the lower portion of the pipe is communicated to the more slowly moving water above. The tendency to accelerated motion is thus continually checked during the flow of the water by the loss of the motion communicated to the fluid in the upper portion of the pipe, and the accelerated is converted into uniform motion. The laws of dynamics teach, that when accelerated motion is rendered uniform, the resulting velocity is the mean of the initial and final velocities, or one half of the latter; therefore, in a fall of 16 feet, the accelerated motion being rendered uniform, the mean velocity will be 16 feet, which is half the final velocity acquired by a body falling from that height.

In the illustration of the glass tube, when our correspondent says that if the water be not poured in with a velocity of 32 feet in a second, the tube will not be maintained full, he appears to forget that water in pouring only obeys the laws of gravity, and that to pour it into a tube with a velocity of 32 feet in a second, it must fall from a height of 16 feet. In the illustration of the rope of shillings, it is plainly admitted, indeed, that in order to obtain a uniform velocity of 32 feet in a second, the shillings must be dropped from a height of 16 feet before entering the tube; therefore, even according to our correspondent's own illustration of his case, a fall of 32 feet instead of 16, is requisite to communicate a uniform velocity of 32 feet in a second. We may observe, in passing, that the illustration of the continuous fall of shillings could never be practically exemplified, for we cannot admit that a row of shillings, or of any other non-cohering bodies, would fall in a uniform stream unless they were all allowed to fall at the same instant of time, like a solid bar.

Towards the conclusion of his letter, our correspondent calls Belidor to his aid; and he appears to imagine that thus supported, his position is impregnable. For our own parts we do not see the utility in any course of original inquiry of relying on authorities, however celebrated, as guides where we are professing to take a new road which they have never trodden. If old authorities were permitted to decide new questions, all scientific researches would be limited to the compilation of different and various opinions, and to the decision of their relative values; and we should never advance beyond the present limits of knowledge. The argument of authorities has this further disadvantage, that the opinions quoted very frequently refer to circumstances different from those to which they are applied, and errors thus originating become the more dangerous by the apparent sanction of authorities, which are, if properly understood, opposed to them. The apparent contradictions in the quotations from Belidor, cited by our correspondent, are sufficient to show, either that they refer to different circumstances, or that Belidor had not paid special attention to the velocity of water in vertical pipes, but had, like most other writers, assumed without consideration that the efflux of water from vertical pipes is the same as through orifices. To show the contradictory nature of the opinions to be gathered from Belidor, on the supposition that his words apply throughout to vertical pipes and not to pipes and to orifices alternately, we will quote a passage preceding those referred to by our correspondent. In paragraph 424, he says, when speaking of the cause of the velocity of water flowing through orifices, and contrasting such discharge with the flow of water down vertical pipes, "as the force on the top of the water is absolutely nothing as compared with that at the bottom of an ideal column, corresponding in size with the orifice, it cannot be said that it is this column constantly renewed from the surface which flows out, but that, generally, all the water in the reservoir assists in the discharge through the orifice." He then proceeds to show that if a pipe were inserted in the orifice, and reached to the surface of the water, the exterior of the pipe would bear the pressure of the water in the reservoir, and that the water within the pipe would descend by its own gravity alone, unassisted by the pressure of the other fluid. The circumstances of the discharge in the two cases having been thus distinctly shown by Belidor himself to be so different, he could never mean to assert that the quantities discharged in each case are the same. It must be confessed that he has expressed himself in this part of his work rather vaguely; but M. Navier, who was deputed by the French Academy of Sciences, to superintend the publication of a new edition of Belidor's Architecture Hydraulique, in 1817, adds a note to these passages, from which it clearly appears that he considered Belidor to refer only to the discharge through an orifice, when stating the velocity to be equal to that of a body falling from the height of the fluid.

The authority of Belidor, therefore, would avail our correspondent nothing, even were we disposed to admit that it has any weight in the discussion of a question to be decided by reasoning from facts rather than by opinions. As the flow of water down a vertical pipe is assumed to be uniform, it is evident that there must be some other force than its own gravity which communicates to the water entering at the top of the pipe the same velocity as that which has fallen to the bottom and is flowing out. No attempt is made by our correspondent to show whence this force is derived, though according to his estimate of the uniform velocity, it must be equal to the pressure of another column of water of the same height as the pipe whence it flows. In our view of the case, the velocity of the entering water is derived from the gravitating force of the water descending the pipe; and as the accelerated motion of the falling fluid is thus converted into uniform motion, the velocity can only be the mean of the initial and final velocities of a body falling from the same height.

Iron Dwelling-House.—A large iron mansion has been built by Mr. W. Laycock, of this town, in separate plates. It is to be sent to Africa, where it will be used as a palace by one of the native kings. This singular building has three floors, exclusive of an attic. The basement story is 7 feet high; the second, 10 feet; and the third, in which is the grand suite of state apartments, is 12 feet high. In these his sable majesty will give his state audiences. The principal reception room, the presence chamber, is 50 feet by 30, and ornamented throughout in a style of most gorgeous magnificence. To counteract any annoyance from heat, the inventor has contrived the means of admitting a current of air, which can be regulated at pleasure, to pass through an aperture left between the outer plate and the inner panel.—Liverpool Advertiser.
6. Floor.—To sitting rooms, wood; to open spaces, or chancel, stone or encaustic tiles. If not underrailed, it may be faced from damp by brick rubble, flints, ashes, or furnace slag, laid to the depth of 12 or 18 inches under the floor. Allowance should also be made for the future rise of the surrounding burial ground; the floors of many churches, originally above ground, are at this day many feet below the surface, and have thereby become damp and unwholesome. It is desirable that the church floor should be raised at least three steps above the ground line.

The distance between the joints of the floor should never exceed twelve inches.

All wood floors should be supported on walls, with a clear space of eighteen inches in depth, well ventilated beneath. No American timber to be used either in the floors or any other part of the building.

Flagged floors should be laid on cross walls eighteen inches high.

7. Walls. — In buildings so solidly constructed of stone, either squared, or rubble, or flint; or of brick, where no good stone can be procured without great additional expense. If the walls are of brick, with stone or flint, the stone or flint to be well bonded into the brick. As a general rule the thickness must not be less than as follows:

<table>
<thead>
<tr>
<th>Square stone of the Brick faced with</th>
<th>1 ft.</th>
<th>2 ft.</th>
<th>3 ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inferior stone, best quality, or brick.</td>
<td>1 1/2</td>
<td>2</td>
<td>2 1/2</td>
</tr>
<tr>
<td>Flint or Stone.</td>
<td>2</td>
<td>2 1/2</td>
<td>3 1/2</td>
</tr>
<tr>
<td>or Rubble, if less than 20 ft. high and carrying a roof not exceeding 20 ft. span.</td>
<td>2 1/2</td>
<td>2 1/2</td>
<td>3</td>
</tr>
<tr>
<td>or 20 ft. or more high, or carrying a roof exceeding 20 ft. span.</td>
<td>2 3/4</td>
<td>2 3/4</td>
<td>3 1/4</td>
</tr>
<tr>
<td>or more than 30 ft. high.</td>
<td>3</td>
<td>3</td>
<td>3 1/2</td>
</tr>
</tbody>
</table>

The above dimensions are on the supposition, that there are buttresses, of solidity and form suitable to the style adopted, placed opposite the trusses or principals of the roof; where there are no buttresses, the thickness of the walls must be considerably greater.

No cement or plastering of any kind to be used as a facing of the walls, or of any external part of a church or chapel.

If a wall be built with two faces of stone, filled between with rubble, great care must be taken that they be properly bonded together, as the wall will otherwise not stand a partial settlement. Where good stone is scarce, a thickness, otherwise perhaps unattainable, may be secured by this method of construction.

Walls built of flint or rubble should have bonding courses of stone or brick, and stone or brick piers at intervals, approaching at least within four inches of the external face.

Whatever be the material of which the substance of the walls is made, the dressings should, if possible, be invariably of stone.

The greatest attention should be paid to the quality of the mortar used.

8. Roof.—The best external covering is lead, which should be not less than seven pounds to the foot — or copper of not less than 22 oz. to the foot. Nine tiles of common Roman tiles, or one inch, are perhaps the next best covering. Westmoreland slates are better in colour than those commonly used, but are, in most cases, expensive. All slates to be fixed with copper nails.

Flat ceilings are inconsistent with Gothic architecture. Next to a stone vaulted roof, none has so good an effect internally as an open roof, exhibiting the timbers. It is desirable that this should be of high pitch, the transverse section forming or approaching to the figure of an equilateral triangle.

If a wooden panelled roof be preferred, the panelling should not be made to imitate stone.

In roofs of low pitch and wide span, horizontal tie-beams are necessary; but in other cases, where the Society is satisfied that due provision has been made for the safety of the construction without them, they may be dispensed with.

If the distance between the principal trusses exceed ten feet, intermediate trusses must be introduced. The distance between the common rafters should never exceed twelve inches.

Wherever the ends of timbers are lodged in the walls, they should rest in cast iron shoes or on stone corbels.

9. Windows.—In Gothic churches, where stained glass is not used, the glass should be in small panes, those of a diamond shape being generally preferable.

Hopper casements are recommended, and they should be inserted in almost all the windows, in order to secure due ventilation.

Where lead lights are adopted, copper bands to tie them to the saddle bars are portable to lead, being less liable to stretch and become loose by the action of the weather.

The very unsightly appearance often occasioned by the wet streaming down the window backs, can be prevented by fixing a small copper gutter at the bottom of each lead-light; to receive the moisture produced by condensation, with copper tubes to convey the same to the outside of the building.

This has also a tendency to keep the building dry, and to preserve it from decay; for the inside of the sills may be raised an inch and a half.

A much more effectual prevention, produced by keeping the sills of windows raised as much as practicable above the line of the tops of the seats.

10. Tower and Spire.—The usual place of the tower, in a church without transepts, is at the west end; or it may be placed about the middle of the side. If funds are scanty, it is better to leave this part of the church to a future period, than to attempt its immediate completion in an inferior manner.

When the tower contains more bells than one, the timbers of the bell framing or floor should not be inserted into the main walls, but should be supported either on set-offs or on corbels.

11. Gutters.—Where necessary, to be most carefully constructed to carry off the rain and snow into the perpendicular pipes, which are best of cast iron, cylindrical, and placed an inch or two at least from the wall, so as to admit air and keep it dry.

Drains or eaves projecting very far do not in all cases supersede the necessity of gutters and pipes, even in very sheltered situations; but in exposed places, eaves-gutters, and rain-water pipes will be absolutely necessary to prevent the wet being driven against the walls, and thus rendering the building damp.

Eaves gutters may be made of cast iron; but, unless very skillfully cast, they will not preserve their level.

The lead for gutters must not be less than eight pounds to the foot.

Lead gutters must not be less than twelve inches wide in the narrowest part, with drips at proper intervals; each drip two inches deep at the least, and the fall between the drips not less than one inch and a half in every ten feet.

The gutters to be provided in parapets to carry off the overflowing occasioned by rapid thaws or otherwise.

Drains on the roof should be protected by coverings, as it prevents the melting snow from congealing in the gutter, and thus obstructing the water-course.

Drains should be formed at the feet of all the rain water pipes.

12. Ventilation.—Ventilation cannot be always completely effected by windows alone, without incommoding the congregation. In such cases foul air may be expelled at or near the roof, either by horizontal or perpendicular channels or tubes.

Where there is a ceiling, apertures should be made in it for the proper ventilation of the roof.

All the original provisions for the ventilation of the building must be carefully looked after, and the apertures kept open.

13. Chiming.—If any be required, the utmost care must be taken to render them safe from fire. They should never be brought within eighteen inches of any timber. They should be as unobtrusive as possible, but not disguised under the form of any ornamental feature of the building.

14. The Lord's Table.—Should be raised two or more steps above the floor of the chancel, which should itself be raised a step or two above the floor of the nave. Where the rails do not extend across the chancel, no seats should be placed between the rails and the north and south walls; and as much room as possible should be left about the rails for the access of communicants.

15. Font.—To be fixed at the west end of the building, or as near as convenient to the principal entrance, but not so as to be under a gallery. Care to be taken that sufficient space is allowed for the sponsors to kneel. The font to be of stone, as directed by the Canon, and large enough to admit of the immersion of infants. To be provided with a water drain.

16. Reading Pew and Pulpit.—The reading pew should not be so elevated as to resemble a second pulpit; and both reading pew and pulpit should be so placed as to intercept the view of the east end as little as possible from the body of the church.

17. Seats.—The seats must be so placed as that no part of the congregation may turn their backs upon the pulpit, and the uniform passage up the whole length of the church, from west to east. No square, or round, or double pews can be allowed, and as few pews as may be. Much accommodation is gained by the adoption, instead of pews, of open seats with backs.

The distance from the back of one seat to that of the next must depend in great measure on the height of the backs and the arrangements for kneeling.

When the funds and space admit, convenience will be consulted by adopting a clear width of 3 feet, or even 3 feet 6 inches; but the width of 2 feet 6 inches in the clear may be allowed if the back of the seat be not more than 2 feet 8 inches in height. This height is in all cases to be preferred, both for convenience and for appearance. If a greater height be adopted, the distance from back to back must not be less than 2 feet 11 inches in the clear. There should be a graduated projection running upon the top of the backs by an open elbow for kneeling in all cases to be provided. Hassocks are to be preferred to kneeling boards, especially where the space is narrow.

Twenty inches in length must be allowed for each adult, and fourteen for
a child. Seats intended exclusively for children may be twenty-four inches from back to front.

18. *Galleries.*—None can be permitted in any part of the channel. Where necessary, they should not encroach on the clear against which they rest, so as to break the upright lines of the shafts from the floor to the roof. Wherever placed, they should, as much as possible, be made to appear as adjuncts and appendages to the architectural design of the interior, rather than as essential parts or features of it. The Society will not sanction any plan involving the erection of a gallery, unless in cases where it is distinctly shown that no room is unnecessarily sacrificed, by inconvenient arrangements, on the floor.

19. *Vestry.*—The vestry should have access to it from without.

20. *Finisings.*—Wall wainscoting, or wood linings to walls, to be avoided wherever convenient. Wood linings to walls confine the damp, and frequently occasion dry rot. For the same reason cement skirtings are to be preferred to wood, particularly on the ground floor. Where the linings to the walls are of wood, they should not be perforated under the seats to allow the circulation of air. As it is scarcely possible to prevent rot if any wood is in contact with the walls, the ends of seats next the walls should be omitted, and cement, painted, be substituted.

21. *Exeçable and Customable Articles.*—Architects are particularly desired to take care that an accurate account be kept of the quantities of customable and excisable articles used, where the expense of enlarging or building a church, or any part thereof, does not exceed £500 or upwards, such as may be duly certified or verified by affidavit.

**MR. VIGNOLES’ LECTURES ON CIVIL ENGINEERING, AT THE LONDON UNIVERSITY COLLEGE.**

**SECOND COURSE.**—LECTURE XVII, AND LAST; FOR WHICH WE ARE INDEBTED TO THE "MINING JOURNAL."

Before proceeding to a summary of the second course, Mr. Vignoles observed, that there was a material point connected with the subject which had not been sufficiently discussed—viz, the motive power to be employed; on this greatly depended the principles on which a line of railway should be laid out, the end and object being to convey the greatest extent of traffic at the least cost: this cost was compounded—first, of the interest of the capital expended, which should be considered a constant charge; and, second, of the periodical working expenses—the work to be done being summed up in the general expression of “overcoming all obstacles to facility of motion.”

What are these obstacles? They might be divided into two great heads—Gravity and Friction. 1st. Gravity is a natural cause existing under all circumstances, and, affecting lines deviating from the horizontal, in direct proportion to the sine of the angle of inclination. Engineers, therefore, have considered that the first principle in laying out roads, should be (under limits) to approximate as nearly as possible to the horizontal, in order to exclude one of the great causes of obstacle; since, with maximum loads, the retardation arising from gravity is most felt. When such could not be effected, then to distribute the total rise (or effect of gravity) along the easiest ratio of al-pe. But, in practice, the occurrence of maximum loads, in ordinary passenger and merchandise traffic, forms the exception, instead of constituting the rule, and it is only when a regular and constant heavy trade is to be anticipated that horizontal communications should be insisted on. 2nd. Friction, is a physical cause, varying according to the perfection of the road and of the vehicles moving on it. In the practical working of a railway, however, so many expenses arise under the heads of “conducting traffic, management, etc.”—which are common to most lines, whatever the gradient; that they tend to make the cost of overcoming friction and even gravity (particularly with the ordinary light loads) but a small fraction of the total charges. Comparing the amount of obstacles on a railway with that on the ordinary road (where the friction, meaning thereby axle-tree friction and surface resistance, may be called sixteen to twenty times greater than on a railway), and assuming the inclination on railway and road to be the same, the general result is that the perfection of the railway surface moved over, and the improvement of carriages, or rather that of their wheels and axles, cause the effect of gravity to be felt in the most sensible degree on railways; while the imperfection of the road causes it to be comparatively scarcely appreciated. Hence with the wretched surfaces of the old roads, and the clumsy wheels of our primitive vehicles, the hills seem to have scarcely added to the obstacles to be overcome. As the road surfaces and carriages improved, and increased speed and heavier loads were introduced, the necessity for the greater perfection of the ordinary road became apparent, and the remedy was applied in various degrees during the last 100 years until it was completed as far as possible, in the extensive improvements by Telford and Macquill on our great highways.

But in carrying out this principle on railways we have run into the opposite extreme. We should first take in one sum the retarding causes of gravity and friction—viz., the friction, being constant, or nearly so, putting aside the resistance of the air at high velocities, varying only in the inclination of the tube (the wheels and axles being the same), and the surface resistance on railways being, practically speaking, nothing), and the maximum gradient, or rather the gravity due to it—their sum will be the constant divisor for the motive-power, of whatever description that motive power might be; and, in considering the latter point, it must be the distribution of the traffic, or what may be called the average hourly load through which the railway is to pass, that is to be considered. From this point of view, it would probably often be found most economical to use animal power, (as is done on the Edinburgh and Dalkeith Railway), were not velocity required—which, on railways, enters so materially into the calculation, that mechanical power in some shape becomes necessary; and this divides itself into stationary power, or when the mechanical means are fixed, and locomotive power, or when the machine travels along with the load. Great, indeed, is the importance of the work, and the question of the additional cost to the line, equivalent on the average to doubling it; next, that the fuller through which the motive power must be transmitted—that is, the rail on which the locomotive driving wheel impinges—is greatly affected by atmospheric causes, occasioning great variation in the adhesion, and consequent uncertainty from slipping of the wheel, so that, as explained in a former lecture, the load after a locomotive engine is really limited by its adhesive power, and not, as might at first be supposed, either by the cylinder power or boiler power. Considered abstractedly, stationary power is cheaper, and always would be so if the traffic were certain and regular, with maximum loads and very moderate speed, even with the present obstacles of ropes, sheaves, and all their contingent complicated apparatus; but at high speed, with a great length of rope, the expenditure of the work of the whole will be proportional to the great add-on force to the rope, and the increased friction and wear of the rope, so that the advantage of the wheeled train, in this respect, would be nearly lost. But, with the additional load, which for the larger trains only, there was, compared with the least expensively worked lines on the locomotive system, to say the least, no economy in the motive power, though other conveniences arising from the peculiar arrangements on that line, were, perhaps, in this special case, more than an equivalent. A most serious obstacle to stationary power, was the necessity of absolutely stopping, and disengaging and relaxing, the trains at each station, which stations could not be conveniently, and certainly not economically, placed further apart than three or five miles, for it could readily be proved, than on a continued distance of six or seven miles of railway worked by a rope, the power of the largest engine that could well be erected, would be absorbed in moving the rope only. The Professor then went largely into a consideration of applying stationary engines as the motive power in working inclined planes under a variety of circumstances, and recommended to the students to consult the valuable work of Mr. Nichol- as Wood on this subject, and indeed on all the details of railway working, of which, particularly in the third edition, there was most of the latest information. In many situations, however, where water power could be obtained, the stationary rope and pulley system might be advantageously introduced. Gravity became the motive power, or another stationary engine, but the principle of a descending train of laden carriages brought up a train of others empty or partially laden: or where skeleton wagons, or water tanks on wheels, could be used as artificial counterbalancing weights in either direction alternately; the circumstances under which self-acting inclined planes could be properly introduced were rare. Mr. Vignoles then gave a clear account of various modes of working self-acting inclined planes; among these was described a curious and interesting one near the great limestone quarries in North Staffordshire; another on the St. Helen’s and Runcorn Gap Railway, which he had himself put up, and also the planes for the Great Portage Railway, across the Allegheny Mountains, in the United States of America. Stationary power might also be used to a greater extent on the atmospheric system, whereby, to speak metaphorically, one might almost look upon the whole of the necessary apparatus as being in a perpetual state of motion, as no pulleys were required, nor any necessary stoppage at the intermediate engines, where only the carriages had to be moved, and where nearly the whole dynamic force generated was made available for motive power. This system had already been explained to the class, and practically illustrated on a railway thus worked, and need not be further alluded to. The Professor was preparing for publication a separate lecture on “The Atmospheric Railway System,” to be illustrated with plates and tables, and appendices, in which that interesting subject would be fully gone into, and all the mathematical and philosophical investigations given, with estimates of the cost of such railways under various circumstances of traffic and gradient; fully enabling the value of the principle, as a motive power, to be appreciated. Although locomotive engines had been introduced as engines of locomotion from railways, it might be proper to refer curiously to it. A horse seems adapted to draw a carriage, the body of the animal is bent forward, throwing upon the latter the part of its weight necessary to overcome the resistance, the muscular force of the legs being employed in keeping up his traction and moving the
TESSELLATED PAVEMENTS, 
ANCIENT AND MODERN.

[A work has been recently published, at a great expense, under the direction of Mr. Blashfield, who is connected with the old established firm of Messrs. Wyatt, Parker & Co. the cement manufacturers, for the purpose of exhibiting to the profession that truly beautiful patterns may be adopted in tessellated and mosaic pavements, by the aid of the small porcelain squares recently introduced by Mr. Blashfield for that purpose. The work consists of ten elaborate designs by Mr. Owen Jones, the author of the “Alhambra,” splendidly printed in colours. These designs cannot fail in directing the public taste to this admirable description of ornament, for the floors of halls, saloons, conservatories, baths, &c., and also add the airs of churches; for to our taste, it is far preferable to the dimg encamnic tiles. The following essay on the materials and structure of tessellated pavements is by Mr. F. O. Ward, who has devoted considerable research in collecting the information.]

The object of the following notice is to call public attention to a new material for tessellated pavements, and to an improved method of constructing the same, by the adoption of which this ancient and esteemed mode of decoration may be re-introduced, at a moderate cost, for the embellishment of our modern buildings. The improvements, in question will, it is confidently believed, enable the modern architect to execute mosaic floorings, equal in point of extent and elaborateness to the most celebrated of the remains that have descended to us from antiquity, and very far superior to these in brilliancy and variety of colouring, in the accurate co-adaptation of the pieces, and in the uniform durability of the surface.

In order to arrive at a just conclusion on this subject, it will be necessary in the first place to bestow some attention on the materials and structure of the old Roman tessellated pavements, as described by Vitruvius, and still to be traced in the remains existing in various parts of the country, and in the specimens preserved at the British Museum.

The materials of the best and costliest pavements at Rome (such, for example, as those still remaining in the baths of Caracalla), are coloured marbles of various kinds, differing considerably from each other in hardness and durability. The inferior pavements, found scattered through Britain, France, and other parts of Europe, and along the northern coast of Africa, are usually made of such coloured stones as the neighbourhood happened to supply, with the exception only of the red tesseræ, which are almost invariably of burnt clay. Thus, in the celebrated Roman pavement which was discovered in 1793, at Woodchester, in Gloucestershire, the grey tesseræ are of blue lias, found in the vale of Gloucester,—the ash-coloured tesseræ of a similar kind of stone, often found in the same masses with the former,—the dark brown of a gristy stone, met with near Bristol, and in the forest of Dean,—the light brown of a hard calcareous stone, occurring at Lypiatt (two miles from the site of the pavement)—and the red tesseræ, as usual, of fine brick. These materials differ from each other in point of hardness even more than the colored marbles of the costliest pavements. The hard tesseræ of Roman pavements is evident that a surface composed of such heterogeneous materials must wear unequally at different parts, and ultimately fall into hollows wherever colours produced by the softer kinds of stone are employed.

If this remark should be met by a reference to remains of ancient pavements, discovered in this country after a lapse of sixteen centuries from their first construction, and still retaining a level unwarped surface, it is obvious to reply, that the mere length of their duration gives no force to the objection, seeing that, during by far the greater portion of the time, these pavements have lain buried; and, further, that even when in use they formed floors to the baths and best chambers of the residences of Roman provincial governors, and were therefore, doubtless, subject to very inconsiderable traffic. The entrance hall of a modern club-house would afford a much more trying test of durability; and it will hardly be disputed that a pavement composed of heterogeneous materials would in such a position be liable to wear unequally.

The materials which have been referred to as the Roman tesseræ, is the want of uniformity in their size and shape, and the consequent irregularity of their junctions, especially in the more minute portions of the design. Whosoever will take the trouble to examine the choicest specimens of old pavements at the British Museum (as, for example, one presented by Mr. Lysons, which formed part of the Woodchester pavement referred to above,) will perceive that the tessera, instead of coming into contact by smoothly ground and equal sides, are in many places separated by broad uneven lines of cement. In some parts the intervals are of such width that the cement, which in a good pavement should be scarcely seen, forms at least a fourth of the visible surface. It is scarcely necessary to point out the effect which this set-work of brown cement lines, running through the whole design, and mixing a muddly hue with every tint, must have in diminishing the purity of the colours, and in deadening the sharpness and brilliancy of their contrast. It is much as if a picture, when finished, should be crossed and re-crossed all over with lines of brown paint.

Proceeding from these remarks on the materials of the Roman pavements to consider the mode of their construction, we shall find that, while the effect produced was imperfect, the means employed for its production were costly and inadequate to the end proposed.

Vitruvius, in the first chapter of his seventh book on architecture, after describing in manner in which the foundation of the pavement should be formed, goes on to say, that on the topmost layer of cement the tesserae are to be laid—care being taken to place them flat and true with the level; that, in the next place, all unevenness and projections of the surface are knocked down by rubbing and polishing; and that, lastly, a layer of cement is to be spread over the whole and scraped off again (in order, it would seem, to fill up any cavities in the cement between the tesserae, and to render the surface as smooth as possible all over).

We need not dwell at length on the time and trouble that it must have taken to set each tessera separately in the cement, and to try the surface with the level after every few pieces were laid. With respect to the subsequent operation of grinding down and polishing the surface of the work, it must have been in most cases (and particularly where stones of a hard and gritty nature were employed) the most tedious and laborious part of the process. We shall presently see that all these difficulties are obviated by the employment of the newly invented material and mode of construction, which we will next proceed to describe—taking, however, in the first place, a rapid survey of the various experiments which preceded this invention, and of the successive improvements by which it has been gradually brought to perfection.

About forty years ago, a patent was obtained by Mr. C. Wyatt for a mode of imitating tessellated pavements by inlaying stone with coloured cements. Floors thus constructed, however, were found liable to become uneven in use, in consequence of the unequal hardness of the materials; which defect prevented their general adoption. Terra cotta inlaid with coloured cements has also been tried, and found liable to the same objection.

During the last ten years, cements coloured with metallic oxides have been used by Mr. Blashfield to produce imitations of the ancient tessellated pavements; and, for work protected from the weather, the material appears to have answered tolerably well; but for out-door work, required to stand frost, it has been found necessary to employ Roman cement, the dark brown of which gives a dingy hue to all colours mixed with it. This, with some other practical difficulties, has interfered with the success of the plan.

Bitumen coloured with metallic oxides has also been tried by Mr. Blashfield as a material for ornamental floorings. The groundwork of the pattern was first cast in any given colour, and the interstices were afterwards filled up with bitumen of various other shades. But this method was even less successful than the former; the contraction and expansion of the bitumen soon rendered the surface uneven; the dust, trodden in, obscured the pattern; and the plan, besides being ineffectual, was expensive.

Three years ago, Mr. Blashfield succeeded in constructing an extensive and elaborate inlaid pavement, on the plan of the Venetian Piêl floors. It was made after designs furnished by H. S. Hope, Esq., at whose country-seat Deepdene, in Surrey, it was laid down. It is still in good preservation.

In the same year (1839) Mr. Singer, of Vauxhall, obtained a patent for a method of forming tesserae, out of thin layers of clay, pieces of the required form, which are afterwards dried and baked in the usual way. His patent also included an improved method of uniting the tesserae with cement, so as to form slabs of convenient size for paving. He has executed in this manner some very admirable mosaics, and his invention must be regarded as one of the most important steps towards the revival of the art in this country.

We now come to the discovery which led to the invention of the tessera particularly referred to throughout this treatise.

In 1840, Mr. Prosser, of Birmingham, discovered that if the material of porcelain (a mixture of flint and fine clay) be reduced to a dry powder, and

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1 This is the general sense of the passage according to the best commentators. The phraseology in the original is here very obscure and has probably suffered from the carelessness of copy transcribers.
in that state be subjected to strong pressure between steel dies, the powder is compressed into about a fourth of its bulk; it then undergoes a process of semi-vitrification, and is converted into a compact solid substance, of extraordinary hardness and density; much less porous, and much harder than the common porcelain, uncompressed.

This curious, and as it has since proved, very important discovery, was first applied to the manufacture of buttons, to supersede those of mother-of-pearl, bone, &c. The buttons thus stamped out of porcelain powder are capable of resisting any pressure to which they are subject in use, and are more durable, as well as cheaper, than buttons of the materials ordinarily used.

The applicability of this ingenious process to the manufacture of tesserae for pavements soon afterwards occurred to Mr. Blackshield, who made arrangements with Messrs. Minton & Co. (the manufacturers appointed to work Mr. Prosser's patent), for a supply of small cubed made according to the new process; these he submitted to various trials and experiments, and having found them in every respect suitable for the purpose, he has recently, in conjunction with Messrs. Wyatt, Parker, & Co., carried out the invention on an extensive scale. Tesserae of various colours and forms—red, blue, yellow, white, black, brown; quadrilateral, triangular, rhomboidal, hexagonal, &c.—have been manufactured on this principle in large numbers; pavements of considerable extent have already been constructed with them; and they have been found to possess the following advantages:—

First, being formed in similar steel dies, they are of uniform size and shape, so that they can be fitted together accurately in the laying down of the most complicated designs. Secondly, being all composed of the same material, variously coloured, they are all of precisely equal hardness, so that pavements made with them are not liable to fall into hollows in use. Lastly, owing to the effect of the intense pressure under which they are made, they are quite impervious to moisture, of a flinty texture throughout, and, in a word, to all intents and purposes absolutely imperishable.

In these several respects, their superiority to the Roman tesserae, (which, as we have seen, were shaped imperfectly by hand, and differed from each other in hardness,) must be manifest to the reader. Nor less conspicuous is the superiority of the modern process of uniting the tesserae to form pavements for this purpose (instead of spreading the cement on the surface to be paved, and laboriously setting each single tessera in it, according to the directions of Vitruvius), the pavement is first put together, face downward, on a smooth surface, so that the tessera find their level without any trouble to the workman; and as soon as a sufficient portion of the design is finished, it is backed with fine Roman cement, which is worked in to fill the crevices between the tessera; the pavement is thus formed into smooth flat slabs of convenient size (according to Mr. Singer's method), and these are laid down on a foundation properly prepared in the usual way.

One peculiar feature of this process is, that private persons, if so inclined, may set out their own pavements in the coloured tessera, leaving it for a workman afterwards to cement and lay down the slabs. Fine mosaic work for the bases of tables, for illuminated monuments, &c., may be made in the same manner with a superior kind of tessera, glazed on the surface, and richly ornamented in gold and colours.

Pavements thus constructed are singularly beautiful. The outline of the design strikes clearly and sharply upon the eye, and the brilliant colours of the tesserae are reflected from the level surface, uninterrupted by those broad uneven lines of cement, which in the Roman pavements detract so much from the general effect. The truth of every line and angle in the figure, and the just proportion of all its parts, however complicated and various, impress the mind with an agreeable sense of order and precision. Such, indeed, is the exactness and facility of the workmanship in these pavements, that the oblique and intricate intersections of the Mauresque designs are as readily executed as the simple rectangular patterns of the Pompeian style. Even the scroll and twisted gilclothes, the quaint emblematical devices, and grotesque representations of horses, warriors, &c., found in the most elaborate of the Roman pavements, may be accurately imitated with the new stamped tessera.

The Roman designs, however, have little to recommend them to the modern artist, beyond their historical interest. Even the earliest of them, which are the best, were produced subsequently to the Roman invasion of Greece, when art was everywhere declining; and they abound with indications of the extravagant and licentious taste which grew up amidst the general corruption of Roman manners, occasioned by the rapid influx of foreign wealth and foreign habits of luxurious excess.

When designs after the antique are required, the elements of them should rather be sought in the beautiful decorations of the Etruscan vases, and in the admirable remains of Greek art in general, during its best period,—i.e. from about 400 to 200 n.c. or during the time of Phidias, Praxiteles, and their immediate successors. (Such are the models which have guided the composition of the magnificent tessellated pavement designed by Mr. Barry, and executed under his direction by Mr. Singer, for the hall of the New Reform Club; a pavement so beautiful and so generally admired, that it can hardly fail to give an impulse to the re-introduction of mosaic decoration, hitherto so sparingly employed by modern architects.) For although the obeliscs, the mosaic dados of St. Alhambra may be advantageously consulted. They are executed in glazed earthen tiles, variously coloured, shaped with considerable exactness, and joined with cement. They present many examples of ingenious arrangement and well-contrasted colouring.

But, whichever of these various styles the architect may adopt, he will find that, for the realisation of his conceptions, there is no material which presents so many advantages as the compressed porcelain tesserae:—whether on account of their uniform size and shape—the purity and brilliancy of their colours—or their extreme hardness, and unalterable durability.

NEW CHURCHES.

(At the request of several architects residing in the country, we give the following "Suggestions and Instructions, as amended May, 1832." of the "Incorporated Society for Promoting the Enlargement, Building, and Renovating of Churches and Chapels.")

1. Site.—Central, with regard to the population to be provided for; dry; if possible, rather elevated, but not on a high or steep hill:—not near nuisances, such as steam-engines, shafts of mines, noisy trades, or offensive manufactories:—accessible by foot and carriage-ways, but not so near to principal thoroughfares, as to subject the service of the church to the danger of being incommoded by noise. The building to stand east and west as nearly as possible.

2. Style and Form.—No style seems more generally suitable for an English church than the Gothic of our own country, as developed in its successive periods. The Norman (or Romanesque) style is also suitable, and offers peculiar advantages under certain circumstances, especially when the material is brick. The Society earnestly recommend that, in the proportions and great features, as well as in the details, good ancient examples should be closely followed.

For Gothic churches, the best form is either the cross, consisting of a nave, transepts, and chancel, or the double rectangle, composed of a nave, with or without side aisles, and of a chancel. In a chapel, the single rectangle is also suitable; the length being at least twice as great as the breadth. If the funds do not suffice to complete satisfactorily a design, otherwise eligible, or if the circumstances of the neighbourhood render it probable that, at no great distance of time, the building may be enlarged; it is better to leave a part of the original design, as, for example, side aisles or transepts, to a future period, than to attempt the completion of the whole design at once in an inferior manner. In such a case, the temporary walls and fillings up of arches should be so built, as clearly to show that they are temporary, and that the building is incomplete, but at the same time not without due regard to ecclesiastical propriety.

3. Foundation.—To be surrounded, if requisite, by good covered drains. If the soil wants firmness, the walls may often be better secured from partial subsidence, by spreading the footing on each side, than by deepening the foundation, or resorting to more expensive works.

In all irregular or doubtful soils, concrete is recommended for the foundations, in preference to any other material.

No interment should be permitted under a church, except in arched vaults properly constructed at the time of building the church, with entrances from the outside only; nor should any graves be made within 20 feet of the external wall.

4. Area.—It would tend much to the preservation of churches, and render them more dry, if a paved openet area, not less than 18 inches wide, were made round them, and sunk 6 or 8 inches below the level of the ground about the church, with a drain from the area to carry off the water. Or the same objects might be attained either by turning a segmental arch from the wall outside the footing, or by laying in the wall a course of slate in cement.

5. Basement.—The inequalities of the ground, the dampness of the soil, &c. often render it desirable to have crypts under a church. They should be of a massive construction, turned upon semicircular or segmental arches, resembling the early examples, entered only from without.
of France and England, especially in the low lands of Lincolnshire and the North, the spire and the tower are found to be the effective and all-sufficient means of obtaining that sublime which man desires in architecture—that confidence and elevation which make a man carry a ladder on his back, are in character with the style and the manner of building.

But, recurring to the theory of the art, we find that Vitruvius (lib. i. c. 11) lays down six principles: order, as addressing the understanding; disposition, respecting the eye; proportion; symmetry; consistency; and distribution, or economy.

Order, as evincing design, whether geometrical or moral, affects the mind with the sentiment of sublime. Whoever considers the movements of the planets and the sun in the immense distances, the fixed stars, in the vastness of their position, and the variety in the distribution, in such and such periods, is more often, and more truly, the sublime than the beautiful. When a curve is formed by a certain rule and a constant law, as the semi-circular vault and the apsis at the end of a church, both which shall be concentric, a great satisfaction is experienced; if these are elliptical, the rule and law is less easily evinced, and the effect of the segments is employed, the want of that uniformity is felt, and a kind of violence is done to the eye and understanding. So the rhomboid, and much more the triangle, displease by their anomalous and unequal angles. No predetermined counsel, order, or industry are evinced, and the essential sense of order is disturbed.

If the philosopher finds any natural production—a stone, or a root—assuming the regularity of a geometrical form, he judges it worthy of a place in his museum: such is the love of order. Individuals in a mob have neither force nor effect, but ranged in regimental order they acquire a new quality. So it is in the architecture of the ancients, who have, in many situations, an effect superior to the forest. The desire of imparting variety to his work, often misleads the architect from this important principle of his art; forgetting that his building is to derive its chief effect from the contrast of its regularity and order with the irregularity of nature. Thus the irregular columns, or oblong arches of the nave, or equidistant windows along an unbroken front, have more energy and effect than all the varieties of such features that can be contrived. The surrounding irregularities make order tell by their contrast.

Vanbrugh was remarkable for this quality, and he knew at the same time how, by the composition of his parts to produce, from certain points of view, the utmost variety of combination and picturesqueness, while, from others, the whole was perfectly regular.

Perrault observed order rigidly, as did Wren; while by the contemporary fashionable architects amongst the Italians it was totally abandoned, as may be regaded in the front of St. Peter’s, and in the works of Borromini, and Maderno. Columns in groups, or at irregular distances, broken entablatures, for the sake of a repetition of profiles, curvilinear fronts, and such scenery as belongs to painting, established the novelty of picturesque architecture, and have in effect, in proportion to their number, little effect, except from combinations from certain points of view as above.

If we call to mind the fact, that the greatest architectural efforts have usually followed periods of political and moral disorder, we may recognize in such works that natural love of order, which revolutions and tumults have denied. Certain it is, that after a long period of civil tranquillity, architectural efforts, especially of regular order, have ceased to be fashionable, and the picturesque or the irregular is resorted to as a change.

Disposition or composition of the various features of an architectural work, is the second principle laid down by Vitruvius. Order and economy dictate the idea of the iconography; the idea of the orthography, or elevation; and the idea of the scenography, or view in perspective, taken on the angle.

“These,” continues he, “are the result of thought and invention; thought, full of attention, application, and vigilance, accompanied with delight and invention, which is a solution of different problems by new applications seized with promptitude.”

Thus he proceeds as nature does: putting the purpose or the plan first, to which the figure of the object adapts itself, and then each composition displays peculiar features; and the appearance of his buildings would be as various as the objects by which he was inspired, and by which he was determined, and they constrain the plan to a preconceived orthogonal. How otherwise is it that we recognize the master the moment we see his work? The orthography over the same, and the plan adapting itself as it can: so we proceed in the works of the ancients.

But the exact conception of the ultimate effect of the building, the realization of the prophetic vision of the architect, are of extreme difficulty, and subject to lamentable disappointment. They can be attained only by great knowledge of perspective, and by careful models; and the greatest masters have been the most grievously disappointed. Wren, whose feelings were the most easy and natural, who, perhaps, with the least passion, and without the very heat and passion of the true architect, has the least of this unfortunate dejection.

“The architect,” says Wren, “ought, above all things, to be well skilled in perspective, for everything that appears well in orthography may not be good in the model, especially when there are many angles and projections; and everything that is good in model may not be so when built, because a model is seen from other stations and distances than the eye sees the building. But, if we could build ourselves a villa or palace himself at a distance of 500 to 1000 feet from his buildings; consequently his sky line and contour are well studied, but his details wholly neglected, and the pleasing effect of his buildings in approaching them; whereas Adams supposed himself safe, or at least that he had no contour from a distance, but are full of elaborate detail on the approach. The visual angle, extending at most to 45°, should be carefully applied to the points of distance; and the scale of the drawing or study should be correctly adjusted to this distance, so that no misconception should arise. As it is, there are no buildings in the British Isles that are a large scale, and occupy the whole height of the paper; whereas, seen at 500 feet, it may be only one-fourth that size.

The Greeks were consummate masters of this branch of optics, as we see in the colonnade of Palmyra, and that of the temple of Baalbek, reserved to us. The terms synoptic and euysonic correspond with the points of view which all their arrangements were calculated to afford.

The Parthenon and the Temple of Jupiter Olympe—indeed, almost all the great temples—were approached on the angle, the peribolus and the propyla, by which they approached the great part of them, with which they could be contemplated to the utmost advantage from a synoptical point of view. The plans of Palladio, and Belli, and those of Rome, preserved to us by Palladio, are lessons, in these respects, demanding the most careful attention.

It is obvious that street architecture, being seen chiefly from the side, should be treated otherwise than buildings at right angles with the point of view, as triumphal arches, or terminations to the vista.

In the 15th and 16th centuries perspective delineation became a new art in itself; and architecture and painting were practically the same. The rule of the renowned Pozzi; and though Vitruvius assures us that in the 5th century B.C., Agatharchus wrote a treatise upon perspective, it is probable that the ancient architects never arrived at the skill attained by those masters.

But perspective calculation applied to architecture, and the adjustment to the perspective of the objects, or of the parts of the object, is the work of the architect himself, not of his clients, or the work of a client, when it is permitted to be seen in its overhanging majesty.

The columns of Trejan and Antonine are placed in confined positions, and the effect is tenfold.

Palladio was remarkable for the adjustment of his building to the position, of which the Town Hall at Vicenza is one of the most remarkable examples. But perspective calculation applied to architecture, and the adjustment to the perspective of the objects, or of the parts of the object, is the work of the architect himself, not of his clients, or the work of a client, when it is permitted to be seen in its overhanging majesty.

Vigolo is said to have made his studies of his buildings at the points of view from which only they could be seen.

It is quite certain that Sir W. Chambers was less master of this part of his art than of many others. Any one visiting the front of Somerset House, in the Strand, is satisfied with its scale and sufficiency in all respects; but when he enters the spacious quadrangle, and looks on the back of the same building, he experiences some disappointment; he finds the scale too small for the size of the quadrangle; but much more, when he observes the same proportions from the opposite side of the river, he deplores their littleness and want of mass and feature, the petty dome in the centre, and the confusion of chimney shafts which disfigure the roof. Had Vanbrugh disposed the river front, we should have seen those chimney shafts in full view. The remaining parts have been repeated, and varied with emulative features, suited to the scale of the river and the majestic position given to the building.

“It is the part of a wise man,” says Alberti, “to have the idea of his work well fixed in his imagination. The architects, therefore, not only by means of perspective, but by means of models, and of whole, and of parts, submitted their works to practised men before they laid a stone. Such models should not, however, be pretty toys, in which delicacy of workmanship draws the attention from the merit of the design. Finally, they should not only be of the whole, but of the parts, and of the separate objects. I judge that there should be no hurry to begin, but if possible time should be allowed that the conceit of the design may cool; when, having laid aside the natural overweening affection for your own production, you may judge more justly of its effect. Time discloses the effect of the different proportions for the avoidance of many defects, which at first escaped attention, at length become apparent.” Scamozzi used to say, that pretty little models were like pretty little birds, no one could tell whether they were masculine or femi-
nine; but if made large, you might then discern which was an eagle and which a crow.

Proposition is the third principle set forth by Vitruvius, the most difficult and therewith the most significant of all. It is more than the name of a mathematician. Symmetry, which is the fourth principle of our author, is, by a vulgarism, often mistaken for proportion; but the etymology defines its meaning, as correspondence or parity of parts on either side of a central axis. This is the most original of the principles of architecture—especially as an original of architecture has occupied the speculations of the ingenious more than proportion, and those who have not found the analogy of the human form, as set forth by Vitruvius from the Greeks, sufficient, have endeavoured to find a more certain analogy in the laws of musical sound: Blondel, Ouvvart and others, may be referred to in this. To the artist observer of the proportions and forms of animal nature, the Greek analogy seems to develop the science of proportion in the comparison of animals of the same genus, but of various species, sufficient to show that beauty readily enters by the manifestation of the inequalities is, indeed, not so easily defined; but the establishment of the fact may help to construct to some valuable conclusions.

Thus, if we divide the human profile, the forehead, the nose, the upper lip, and the chin, equal parts, we have a profile: the profile of the Apollo presents these parts in inequalities, and upon the nice variety of these beauty depends.

The satyr, or baboon, is ugly, compared with the man: amongst many other reasons, for this, especially to the architect, that his proportions approach no nearer than the proportions of six hands of the inequalities is, indeed, not so easily defined; but the establishment of the fact may help to construct to some valuable conclusions.

Atrides

Proposition is the third principle set forth by Vitruvius, the most difficult and therewith the most significant of all. It is more than the name of a mathematician. Symmetry, which is the fourth principle of our author, is, by a vulgarism, often mistaken for proportion; but the etymology defines its meaning, as correspondence or parity of parts on either side of a central axis. This is the most original of the principles of architecture—especially as an original of architecture has occupied the speculations of the ingenious more than proportion, and those who have not found the analogy of the human form, as set forth by Vitruvius from the Greeks, sufficient, have endeavoured to find a more certain analogy in the laws of musical sound: Blondel, Ouvvart and others, may be referred to in this. To the artist observer of the proportions and forms of animal nature, the Greek analogy seems to develop the science of proportion in the comparison of animals of the same genus, but of various species, sufficient to show that beauty readily enters by the manifestation of the inequalities is, indeed, not so easily defined; but the establishment of the fact may help to construct to some valuable conclusions.

Thus, if we divide the human profile, the forehead, the nose, the upper lip, and the chin, equal parts, we have a profile: the profile of the Apollo presents these parts in inequalities, and upon the nice variety of these beauty depends.

The satyr, or baboon, is ugly, compared with the man: amongst many other reasons, for this, especially to the architect, that his proportions approach no nearer than the proportions of six hands of the inequalities is, indeed, not so easily defined; but the establishment of the fact may help to construct to some valuable conclusions.

Atrides

Prim as identifying the Greek leaders from the walls of Troy, he is said to inquire of Helen—

HAD Homer (always a painter) confined his description to the stoutness and the shortness of Ulysses, we should have been at a loss for his heroic dignity; he might have been a tub or an ablerma, but the "broad shoulders and spreading breast" imply the rapid diminution of the waist, and the same beautiful and vigorous character through every limb; and Ulysses stands before us in all the energy of the Grecian hero—

Though some of larger stature tread the green,

Hitherto, therefore, in his style of description, he has given us, rather an example of this kind of analogy. In the vast practice of all the churches of this metropolis and the examination of all the authorities which he had occasion to consult, he had seen that the hollow spire which he had seen or built in so many varied churches, had all but an infirm structure; and he desired that model which should enable him to impart to it the utmost solidity and duration. Simple was the original from which he adopted his idea. He found that the delicate shell called turrellia, though extremely long, and liable to fracture from its base to its apex, by the action of the water after it had been cemented, was rendered unapproachable by the weight, and therefore the round rises which the spiral turned. Therefore, in his spire of St. Bride's, he establishes the columna in the centre, round which he forms a spiral staircase to the top, issuing on stages of arched apertures: thus giving us (if not the most beautiful) certainly the most remarkable and endurable of any spire hitherto erected.

One more instance equally remarkable may be given. When Brunelleschi was charged with the erection of the dome of Sta. Maria, at Florence, nearly equal diameter with the pavement, and the pavement, upon a base raised on piers, and by no means of the strength and cohesion of the original model, the Pantheon. He was appa rent that in giving it the same solidity, the weight would be insupportable on such a foundation. How was this object to be accomplished? Brunelleschi was an observer of all nature's productions, and he reflected that the bones of animals, especially of birds, possessed solidity without weight, by the double crust and hollow within. But above all, he remarked that the dome which completes the architecture of the human form divinest construction: and a double crust, formed by the double wall of the hollow cancelli, so that strength and lightness were combined in the utmost degree. Brunelleschi followed this model in his dome of Sta.
body onward; the effort of the animal being resolvable into these two parts—viz., the action on the load, and that required to move it itself. It may be gathered from writers on the subject, that the force a horse is capable of exerting, is equal to about one-seventh or one-eighth part of his own weight: or that, on an ascept of one in seven or one in eight, the exertion required to overcome his own gravity, is a force equal to that he is able to exert on a load on a level plane. Taking the average weight of a horse, and considering that he is capable of occasionally exerting great extra power upon the load, the maximum possible weight of a load which the parts out of eight of the muscular power of a horse is required to drag his own weight forward, leaving, of course, only one part applicable to the load. But the criterion of a horse's power in practice is not the occasional effort of which the animal is capable at a dead pull, or for a short period: we must estimate his strength by what he can do daily, and day after day for a long period, and that without breaking in from the weight and pulling of 10 or 12 horses, or more; his power of pulling is greatly diminished, and he can work only an hour or so in the day: at two miles an hour he may give out a power of 150 lb. on the load: at 10 miles he has scarcely 33 lb. to spare, and at 12 miles an hour, he can seldom be expected to do more than move himself. This was on the average of horses—all beyond were exceptions. Thus, the application of horses to railways as the motive-power was very limited and in laying out lines where they are to be used, to full effect, gravity should be arranged to be always with the load, or, at least, not against it: the rate of travelling only 2 or 2½ miles per hour, and the traffic uniform. Mr. Vignoles proceeded to an interesting comparison between locomotive and stationary power upon inclined planes, taking the inclination of 1 in 50 as a maximum, and showed that when the traffic was small, and the loads consequently comparatively light, and that the rate of 2½ miles, or even a little less, per hour, the motive power, (taking into consideration all circumstances of first cost, and working expenses—particularly the latter, of which the locomotive power was but a small part), would not be so expensive as stationary engines, while they would be certainly more convenient; and that, with all the best modern improvements in the locomotive engines, the system of working with large cylinders, using the steam expansively on the level and falling parts of the railway, improved boilers, &c., plus of 1 or 2½ miles would have been consistently done. The material drawback being, occasional slipping of the wheels on the ascent, and the necessity of great caution and careful application of the brakes on descents; but on the whole, the balance, under the above circumstances, was much in favour of the locomotive system. The Professor then entered into a very long and minute comparison of the present system of working the Blackwall Railway by stationary engines, with ropes and pulleys, with what would be the case if the motive power were locomotive engines—and by tables, showed that while the working of the Blackwall Railway (3 miles) on the stationary system, was costing about seventy-two pence per mile on the train, the cost of working the Greenwich Railway (3 miles) was only about forty pence—but, Mr. Vignoles admitted, that by the former, great accomplishments to the public was afforded by the numerous intermediate stations, while on the latter, there were but two—a short distance of about 10 miles, and in comparison between the two principles of mechanical motive-power, the Professor observed that on the locomotive system, a minimum of power need only be provided in the first instance and the number of engines might be increased gradually as the traffic required, which was a great consideration when the first expenditure of capital had to be kept down to the very lowest terms, at all future risks. On the stationary system, provision had to be made, from the outset, for the maximum anticipated traffic, which of course increased the first outlay on the railway establishment, and depended on the ultimate economy of future working to make up the difference. Having concluded the notice of various descriptions of motive-power employed on railways, of which the preceding is but a mere outline, some general remarks were made on the principles of laying out railways, in reference to the several concerns of the line. 

In a concluding general summary, Mr. Vignoles observed, that in his first course, at the latter end of 1841, he had fully considered the practical rules for earthwork and constructions—these were not peculiar to railways; the theory and practice of bridge-building, applied to all internal communication, and would be most conveniently considered in a separate illustrated course, for an entire class. Mr. Vignoles next recalled to the class generally, that in proceeding to lay out railways in the country, he had been principally engaged in laying railways on contract, and that he might now be considered as having been so as a general practitioner, from the inspection of railways in this country. The earthwork and ingredients of railways, regulated the cost, particularly as regarded contingencies, and the utmost consideration should be bestowed as to how far it was justifiable to encounter the expense of these operations. The average cost of earthwork, and all consequent works of art, &c., on the English railways was nearly £1,500 per mile, or about 59 per cent. of the whole capital expenditure. Mr. Vignoles was decidedly of opinion that in all future railways to be built in this country, the corresponding outlay ought not to exceed £500 per mile, and that beyond that sum perfection of gradient would be sought too dearly. In reference to the gauge of railways, Mr. Vignoles stated, distinctly, that theoretical investigations and practical results led him to consider a six foot gauge as the best, but the present 4½ foot gauge was certainly rather cheaper. In regard to the number of courses of rails, he had been accustomed to work on a recent lecture, entered so fully into the comparison, that he need only now notice, that the expensive and complicated system of heavy rails and chairs, and cross sleepers, were preferred by engineers, than the ingenious improvements of Mr. May, of Ipswich, in chairs and fastenings, applied by Mr. Cubitt on the South Eastern (Dover) Railway, with great care in laying, draining, and ballasting, made that system perfect and complete. The Professor, however, decidedly gave the preference to the less costly, and the more simple system of lighter rails, without chairs, laid on continuous longitudinal balks of timber of sufficient scantling, and fastened on Evans's principle, modified in the manner shown by the models exhibited to the class; and several engineers were adopting this opinion. On the continent of Europe, where iron was dear, and timber cheap and abundant, Mr. Vignoles calculated a saving of full £2000 per mile in the cost of trackwork, when compares the adoption of this new system, instead of the vast national expenditure of the subject of a cricking drawings, plans, and sections, the Professor reminded the class of the importance he attached to having all such previously made out on a large scale, that the cubic quantities might be accurately obtained, and the just prices considered; and thus, in proceeding to make the estimates, nothing would be left to conjecture, and as little as possible left to be actually shewn. The period of time for the execution of the works should be deemed as of the greatest importance; but, consistently done. The two great sources of the extra expenditure on railways had been, the extreme haste with which the works had been pushed on, and the changes of every kind from the original designs. These points being all carefully considered, soon after the plan was brought before the public in general, the estimates might be better depended on. Mr. Vignoles then went through all the great items of expenditure generally arising on first construction, and explained how the accounts of measurements should be made out and kept under very distinct general heads, subdivided into minor items, from the purchase of the land to the last finish to the stations, and the entire fitting up and furnishing of the carrying establishments. Sufficient experience had been attained in all these matters to enable the engineer, in future, to use this if the above rules were faithfully followed out, to place himself beyond all chance of reproach for making errors. Mr. Vignoles had now passed to the subject of selected railways at the request of the class, as the theme for the course just concluded; but although so much consideration had been given to the subject, he had only been able to touch in a very general way upon the chief points; yet it was to be hoped a sufficient idea had been given of the principles of construction, and of their general application, to create an interest in their minds. Should any of the students hereafter be employed to execute a railway, he trusted they would recollect these lectures with advantage, while they would also probably better understand and appreciate them: at the same time, he must not neglect to impress upon them, that it was not at the college, in the lecture-room, or even in the office of an engineer, that all the duties and knowledge necessary could be taught: the young aspirant must pass much time in the work-shop, indeed, he must become a workman, before he could begin to attempt any thing; the whole of the training of a mechanism of every kind—and passing to the actual works, ought to learn to be able to direct personally the labour of the mason, the carpenter, and the smith. "Above all," said Mr. Vignoles, "the student in engineering must carry into life with him the constant remembrance of what I have so repeatedly enforced, that the reputation of an engineer in this country is based upon the success of his works, of his mechanism, and of all the efforts of his, in general, and hand, in respect to, and in proportion to their being productive of commercial and beneficial results, to those who, at his suggestion, may undertake to provide the necessary funds: and he should consider how this result can be best obtained, rather than study the splendour of his undertakings. It is for the architect to attend to the decorative and the beautiful; it is sufficient for the engineer to study the practical, and make his work click as a whole. It is related that Napoleon once observed to the celebrated Carnot, "Les ingenieurs doivent toujours m&oslash;urs des id&egrave;es magnifiques!" this is true as to their first conceptions, but in the realization, they must be sobered down by the rules of economy and judgment. After the first burst of talent, after image and form has been given by the
Hand to the bright idea emanating from the brain, let it be brought down to practical application only after a strict inquiry into the cost. Remember what I quoted on a former occasion, when contrasting the two celebrated light-houses, Edgemoor and Carlingford; that the Carlingford light-house was constructed by celebrated engineers whom it may. Venture to add of their respective nations—remember, I say, "‘Tis use alone that sometimes expense."

Having been appointed surveyor to the warlike engines and stores of the empire by Augustus, Vitruvius was endowed with leisure; and very probably wished to have collated on the one hand, and completed, and who were collected and deposited in the magnificent library institutes at that period. He appears then with singular advantage as transmitting the well digested and received principles of the greatest masters who had thought and written on architecture, to modern times; and the principles thus derived directly from the Greeks merit our attention.

But a few preliminary observations on external forms, in detail and in general, were to be made. The universality of certain primordial forms in all styles, favours the notion of innate ideas, the cube, the sphere, the cylinder, the cone, the lozenge, the pyramids, the cymas, the cyma-reversa, the serpentine, the ovalo, the spiral, the volute, gradation or division of forms, are common to the art of all times and people.

The pyramid is universal, from the compressed to the acute. Such is the charm of the pediment, that "in heaven, where we may not suppose it to rain," says Cicero, "the pediment is in its effect the same, no matter where it is."

ROYAL ACADEMY.

Professor Cockerell's Lectures on Architecture.

(From the Athenaeum.)

Lecture V.

The love of fine art, and the lively discussion of its principles, which occupied the wits and the courts of Italy in the 15th and 16th centuries, employed the solitary reflections of literary philosophers in the 18th; and in 1730, Baumgarten suggested the title of aesthetics, by which these studies have been designated ever since, and many works remarkable for ingenious criticism, learning, taste, and result, have been. These may be ranked in two classes. The first resolves the questions of taste directly into an original law of our nature, implying sense by which the qualities of beauty and sublimity are perceived and felt as their appropriate objects; it is this species of hypothesis to which artists and amateurs chiefly resort. The second class of hypothesis arises from the opposite view of the subject: resisting the idea of any new and peculiar sense distinct from the common principles of our nature, this class supposes some one known and acknowledged principle or affection of the mind to be the foundation of all the emotions we receive from the objects of taste, and resolves them into some more general law of our intellectual or moral constitution. Thus Socrates and Homer, and others, resolve them into our sense of utility—Aristotle and St. Augustine, in order and design—Diderot and Addison in relation and association. But though in such discussions we recognize many truths, the partiality of individual views renders them often dangerous.

When a philosopher can find Some favorite system to his mind, I say, the laws to make it fit, He'll force all nature to submit.

For language itself fails in defining those phenomena which elude ordinary observation, and even when it approaches definitions, the use of quantity, and quality, and circumstance, can alone be adjusted by the magician genius.

The ethetical principles of architecture, as handed to us from the Greeks by Vitruvius, concur with the notions of ancient philosophy, and have not been controverted by the moderns; and though subject to late years to some rule attacks, they have never been superseded, and we can follow no better text-book in the consideration of our subject. Those principles apply to every style and invention of architecture which the world has hitherto known; they belong to the physical and intellectual nature, and will never change but with an alteration in these. When the works of Vitruvius were first discovered, they were accounted a revelation to the craft, and called "divine" by Sulpicius, the first translator; and, nearly 200 years after, Perrault, in his translation, calls them "a very singular piece, and an inestimable treasure in the opinion of the learned."

Eighteen translations, in 41 editions, are enumerated to this day. In 1876 the philologist Schneider republished Vitruvius. "My whole scope," says he, "has been to purify the text, so as to enable men learned in art to reconstruct and understand the theories of Vitruvius, hitherto obscured by interpolations and various translations." But he detracts from the merit of his work by a severity of criticism, as uncandid as it is derogatory to the character of his author. He deprecates his apology, as writing neither as an accomplished philosopher, an eloquent rhetorician, nor as an expert grammarian, but as an architect, therefore not useful to those who build. He calls his language obsolete and plebeian, accuses him of pride and envy, and rates him as a morose, inexact, infirm old man, querulous and vulgar. But Schneider was the less justified in such treatment, as being weak upon those points in which his author was most strong, for he says, "on architectural subjects, or that which has to do with the subtilities of the art, and the questions and disputes concerning them, I neither could nor would have anything to say." So that the science has received no direct advantage from the labours of Schneider, and yet how much was to be done might be understood by ten discoveries in coarse and popular as that of Vitruvius, made within a few years, and chiefly by Englishmen, cited by the Professor in his previous course on the literature of the art. Such discoveries suggested the desirability of a new English edition of Vitruvius, as highly honourable and useful to this country.

The slanders of Schneider had been adopted in this country with little honour to the parties, and no advantage to architecture. Vitruvius remained the father of our art, and was entitled to our respect, as the text-book of our studies.

Age cannot wither her, nor custom stale
Her infinite variety.

The Greek profile is general (more particularly in the Parthenon) is incalculably superior to any other in gradation, quantity, delicacy, and expression, and should be the student's constant study. It was the observation of the human, animal, and vegetable forms, by the sculptor, which gave rise to the system of proportions and oppositions of such forms, constitute the art of profile—a most difficult grace of architecture; for this, that variety of form and grace may be given which the primary architectural masses and proportions do not admit of. Variety in the details of sculpture and profile is essential to the combinations of those rigid, and the successful imposition of architectural composition impose; in all the arts, and even in architecture, variety is an all-important principle, provided the masses are undisturbed. Shakespeare describes Cleopatra as chiefly admirable for this quality:

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The last quarter of a century has been distinguished by the scientific and successful researches which have been made into the material and moral world of unrecorded ages. What the far-seeing pre-dicted, but hardly hoped would occur, was that the visionary exhausted himself in vain efforts to ascertain, has now taken place; the film, the mist which concealed and disfigured the unknown past, is giving way before the labours of men of science, and the long-hidden forms of antiquity's infancy are becoming revealed to our eyes: while the progress made is such that we can scarcely doubt of a glorious harvest of results in the end. While geology and paleontology have shown us the rudiments of the physical world, portrayed its vegetation, and pictured the creatures which inhabited it, philology and palentology have thrown glorious light upon the early history of the human race. While geology was pursued on a false system, and theories were formed before facts were accumulated, its votaries were the tormentors of the world; nor did the philosophers suffer less deservedly: their wild speculations drew from Voltaire the definition that their science was one in which "la conscience y entrain pour fort peu de bonne et la voix pour rien!" and Goldsmith sarcastically determines from the resemblance of the letters, that Con-fran-ci-us and Noah were the same personages. This time, however, has now passed, and both geology and philology are studied upon the same principles. The deposits of Bacon are now becoming fixed sciences.

From philology spring paleontology, or the science of applying philological evidence to the history of the human races, and Bopp, Pott, Raske, Prichard, Winne, and others have successfully laboured in this department. In connection with these studies is that of the early monuments of art, the elucidations of which in Egypt, in Iranistan, in India, and America, deeply engage the attention of men of science. If in the old world we are astonished at the gigantic records of ancient civilization, we were totally unprepared to find the new continent as rich in these memorials as our own. Records of a race which seems to have "died and left no sign," works without a name, monuments bearing the impress of the fathers of civilization in India and Egypt—these are calculated to awaken the deepest interest, and to enliven the strongest sympathy of the artist and the scholar. Humboldt and Lord Kingsborough prepared the way in the study of Mexican antiquities, which Waldeck, Stephens, and Norman have followed out; and the result is, the opening a field of study in Yucatan, rich in architectural and artistic interest.

For a copy of Mr. Norman's work, we have been indebted to the kindness of Mr. Lloyd Wiley and Putnam, and we proceed to give some account of it and its author. Mr. Norman was led to Yucatan in a chance excursion in the autumn of 1841, and commenced his researches with no other instrumental aid than a knife and pocket compass, and pencil and paper; yet, although he pretends to no scholarship, he has produced a work, containing minute descriptions of the ruins, and many notes derived from the works of his predecessors. He seems to have been an active and energetic observer, and to have gone about his task with all that poco-curiosity for trifles, which the wanderer in Spanish countries must possess if he would make himself happy and useful. Mr. Norman's journal contains descriptions of the manners and customs of the people, as well as accounts of the ruins, which were noted during his visit.

Yucatan, we need scarcely remind our readers, is a peninsula, remarkable for running from south to north, bounded on the east by the English settlement of Honduras, on the south by Guatemala, and on the south-west by Mexico, of which it was recently a province, although now independent. The west coast is known to us as the Campeche shore, and was the scene of many exploits in the lives of our wood-cutters in the early part of the seventeenth century. The country itself presents but little to interest us in its modern state, but in the northern parts have been discovered the ruined cities of Uxmal, Kabah, Zayli, Tiel, Sisal, Chi-Chen, and Esquita; and it will be observed that not more than a third of the country has been as yet imperfectly explored, while what the mountain regions of the interior may present is unknown. The inhabitants are chiefly of Indian descent, called Mayas, of whom we shall speak again hereafter.

Leaving Mr. Norman to speak for himself, the first place to which he leads us is Chi-Chen, of which a plan is shown below.

![Fig. 1.—Plan of the Ruins of Chi-Chen.](image)

It was on the morning of the 10th of February that I directed my steps, for the first time, toward the ruins of the ancient city of Chi-Chen. On arriving in the immediate neighbourhood, I was compelled to cut my way through a most impermeable thicket of under-brush, interlaced and bound together with strong tendrils and vines; in which labour I was assisted by my diligent aid and companion, José, who was finally enabled to effect a passage; and, in the course of a few hours, found myself in the presence of the ruins which I sought. For five days did I wander up and down among these crumbling monu-ments of a city which, I hazard little in saying, must have been one of the largest the world has ever seen. I beheld before me, for a circuit of many miles in diameter, the walls of palaces and temples and pyramids, more or less dilapidated. The earth was strewn, as far as the eye could distinguish, with columns, some broken and some nearly perfect, which seemed to have been planted there by the genius of desolation which presided over this awful solitude. Amid these solemn memorials of departed generations, who have died and left no marks but these, there were no indications of animated existence save from the bats, the lizards, and the reptiles which now and then emerged from the crevices of the tottering walls and crumbling stones that were strewn upon the ground at their base. No marks of human footsteps, no signs of previous visitors, were discernible; nor is there good reason to believe that any person, whose testimony of the fact has been given to the world, had ever before broken the silence which reigns over these sacred tombs of a departed civilization. As I looked about me and indulged in these reflections, I felt awed into perfect silence. To speak then, had been profane. A revelation from heaven could not have impressed me more profoundly with the solemnity of its communication, than I was now impressed on finding myself the first, probably, of the present generation of civilized men walking the streets of this once mighty city, and amid those temples, palaces, and piles stupendous. Of which the very ruins are tremendous. 1

For a long time I was so distracted with the multitude of objects which crowded upon my mind, that I could take no note of them in detail. It was not until some hours had elapsed, that my curiosity was sufficiently under control to enable me to examine them with any minuteness.

"My first study was made at the ruins of the Temple. These remain consist, as will be seen by reference to the engraving (a, Fig. 3, & Fig. 1), of four distinct walls. I entered at an opening in the western angle, which I conceived to be the main entrance; and presumed, from 2

1. Chi-Chen signifies, mouth of a well. "Iza," said to be the Maya name for one of the old possessors of these ruins, is sometimes added by the natives.
2. The names by which I have designated these ruins, are such as were suggested to me by their peculiar construction, and the purposes for which I supposed them to have been designed.
the broken walls, ceilings, and pillars still standing, that the opposite end bad been the location of the shrine or altar. The distance between these two extremes is 400 feet. The walls stand upon an elevated foundation of about six feet, and were covered with a rank and luxuriant vegetation, and even with trees, through which I was obliged to cut my way with my Indian knife. In the rear of the pillars are the remains of a room, the back ceilings only existing: sufficient, however, to show that they were of rare workmanship.

"The southern, or right hand wall, as you enter, is in the best state of preservation, the highest part of which, yet standing, is about 50 feet; where, also, the remains of rooms are still to be seen. The other parts, on either side, are about 20 feet high, 360 long, and 1 thick, and about 130 apart. The interior, or inner surface of these walls, is quite perfect, finely finished with smooth stone, cut uniformly in squares of about two feet. About the centre of these walls, on both sides, near the top, are placed stone rings, carved from an immense block, and inserted in the wall by a long shaft, and projecting from it about four feet. They measure about ten feet in diameter, and two in thickness—the sides beautifully carved.

"The extreme ends of the side walls are about equidistant from those of the shrine and entrance. The space intervening is filled up with stones and rubbish of walls, showing a connexion in the form of a curve. In the space formed by these walls are piles of stones, evidently being a part of them: but there were not enough of them, however, to carry out the supposition that this vast temple had ever been enclosed. At the outer base of the southern wall are the remains of a room; one side of which, with the angular ceiling, is quite perfect, measuring 14 feet long and 6 wide. The parts remaining are finished with sculptured blocks of stone of about one foot square, representing Indian figures with feather headdress, armed with bows and arrows, their noses ornamented with rings; carrying in one hand bows and arrows, and in the other a musical instrument similar to those that are now used by the Indians of the country. These figures were interspersed with animals resembling the crocodile. Near this room I found a square pillar, only five feet of which remained above the ruins. It was carved on all sides with Indian figures, as large as life, and apparently in warlike attitudes. Fragments of a similar kind were scattered about in the vicinity.

"From this room, or base, I passed round, and ascended over vast piles of the crumbling ruins, pulling myself up by the branches of trees, with which they are covered, to the top of the wall; where I found a door-way, filled up with stones and rubbish, which I removed, and, after much labour, effected an entrance into a room measuring by 24 feet, the ceiling of which was of the acute-angled arch, and perfected by layers of flat stones. The walls were finely finished with square blocks of stone, which had been richly ornamented. Even yet the heads of Indians, with shields and lances, could be distinguished in the colouring.

"The square pillars of the door-way are carved with Indians, flowers, borders, and spear-heads; all of which I judged to have once been coloured. The lintel, which supported the top, is of the zupore wood, beautifully carved, and in good preservation. One of the Indian head-dresses was composed of a cap and flowers.

"Immediately in front of the door-way is portion of a column, to which neither cap nor base was attached. It measured about three feet in diameter, with its whole surface sculptured: but it was so obliterated by time, that the lines could not be traced. Four feet of its length only could be discovered. It was, evidently, imbedded in the ruins to a great depth. Numerous blocks of square hewn stones, and others, variously and beautifully carved, were lying in confusion near this column.

"Of the exterior of these walls, a sufficient portion still exists to show the fine and elaborate workmanship of the cornices and entablatures, though the latter are much broken and defaced. They are composed of immense blocks of stone, laid with the greatest regularity and precision, the facades of which are interspersed with flowers, borders, and animals."

"I cut my way through the thick growth of small wood to the House of the Caciques, and by the aid of my compass was enabled to reach the east front of the building. Here I felled the trees that hid it, and the whole front was opened to my view, presenting the most strange and incomprehensible pile of architecture that my eyes ever beheld—elaborate, elegant, stupendous, yet belonging to no order now known to us. The front of this wonderful edifice measures 32 feet, and its height 24, extending to the main building 50 feet. Over the door-way, which favors the Egyptian style of architecture, is a heavy lintel of stone, containing two double rows of hieroglyphics, with a sculptured ornament intervening. Above these are the remains of hooks carved in stone, with raised lines of drapery running through them; which, apparently, have been broken off by the falling of the heavy finishing from the top of the building; over which, surrounded by a variety of chaste and beautifully executed borders, encircled within a wreath, is a female figure in a sitting posture, in baso-relievo, having a head-dress of feathers, cords, and tassels, and the neck ornamented. The angles of this building are tastefully curved. The
Ornaments continue around the sides, which are divided into two compartments, different in their arrangement, though not in style. Attached to the angles are large projecting hooks, skilfully worked, and perfect rossettes and stars, with spears reversed, are put together with the utmost precision.

The ornaments are composed of small square blocks of stone, cut to the depth of about one to one and a half inches, apparently with the most delicate instruments, and inserted by a shaft in the wall. The wall is made of large and uniformly square blocks of limestone, set in a mortar which appears to be as durable as the stone itself. In the ornamental borders of this building I could discover but little analogies, as not as known to me. The most striking were those of the cornice and entablature, crenel and the cable moulding, which are characteristic of the Norman architecture.

"The sides have three door-ways, each opening into small apartments, which are finished with smooth square blocks of stone; the floors of the same material, but have been covered with cement, which is now broken. The apartments are small, owing to the massive walls enclosing them, and the acute-angled arches forming the ceiling. The working and laying of the stone are as perfect as they could have been under the directions of a modern architect."

Another description we take from him is that of the ruins of Zayi.

"The Ruins of Zayi are situated in the midst of a succession of beautiful hills, forming around them, on every side, an enchanting landscape.

"The principal one is composed of a single structure, an immense pile, facing the south, and standing upon a slight natural elevation. The first foundation is now so broken that its original form cannot be fully determined; but it probably was that of a parallelogram. Its front wall shows the remains of rooms and ceilings, with occasional pillars, which, no doubt, supported the corridors. The height of this wall is about 20 feet, and, as near as I was able to measure around its base, (owing to the accumulation of ruins,) it was ascertained to be 208 feet long, and 116 wide.

"in the centre of this foundation stands the main building, the western half only remaining, with a portion of the steps, outside, leading to the top. This part shows a succession of corridors, occupying the whole front, each supported by two pillars, with plain square caps and plinths, and intervening spaces, filled with rows of small ornamented pillars. In the rear of these corridors are rooms of small dimensions and angular ceilings, without any light except that which the front affords. Over these corridors, or pillars, is a fine moulding finish, its angle ornamented with a book similar to those of Chi-Chen. Above this moulding is a finish of small plain round pillars, or standards, interspersed with squares of fine ornamental carvings; the centre of the façade showing the remains of more elaborate work, concentrated within a tower, the arrangement of which is lost. There is an evident analogy existing between these ornaments and those of Kabah, but order is less apparent. I could discover no resemblance whatever to those of Chi-Chen."

"Over these rooms of the main building is another terrace, or foundation, in the centre of which is a building in similar ruins to those under it; having, also, broken steps leading to the top. It stands upon a foundation, apparently, of six to eight feet in height, occupying about two-thirds of the area; the residue, probably, forming a promenade. There are three doorways yet remaining, the lintels and sides of which are broken, and which have caused the walls above to fall down. The walls of this part of the edifice are constructed of hewn stone, without any signs of ornament. A plain finished moulding runs through the centre; portions of the cornice still remain, with three or four pieces of flat projecting stones, which formed a part of the top finish.

"The whole extent of the rear is covered with confused piles of ruins, overgrown with trees. Near by these are fragments of walls and rooms, with a few ornaments yet remaining about them. Some of the rooms appear to have been single, and apart from all other buildings. There are also various mounds in the vicinity.

"A few rods south are the remains of a single high wall, with numerous square apertures, like pigeon-holes. Its foundation is elevated; around which the broken walls and ceilings are to be seen. The summits of the neighbouring hills are capped with gray broken walls for many miles around. I discovered no hieroglyphics or paintings of any kind; neither the extraordinary skill displayed in the ornamental carvings, as at Chi-Chen. On my route to these ruins I made digressions from the road, and found, on all sides, numerous remains of walls and ceilings; also, mounds and small pyramids, covered with the wild vegetation of the country."

Of Uxmal he gives a copious description, from which we extract the following.

"The Governor's House is a vast and splendid pile of ruins. It stands upon three ranges of terraces, the first of which is a slight projection, forming a finish. The great platform, or terrace above it, measures upwards of 500 feet long, and 415 broad. It is encompassed by a wall of fine hewn stone 90 feet high, with angles rounded, still in good preservation. In the centre of this platform, upon which trees and vegetation grow in profusion, stands a shaft of gray limestone in an inclined position, measuring twelve feet in circumference and eight in height; bearing upon its surface no marks of form or ornament by which it might be distinguished from a natural piece. Near by is a rude carving of a tiger with two heads; also, I think, a figure near them, with level carvings and smoothly finished inside, which are conjectured to have been cisterns or granaries. Along the southern edge of this platform are the remains of a range of small pillars, now broken and in confusion."

Upon the northwest corner of this platform is an edifice, which was, no doubt, from its location, connected with the Governor's House. It is the smallest of all
the ruins. Its ornaments are few and plain; the most remarkable of which is a continuous line of turtles, cut from stone of about a foot square, arranged under the cornices.

"The south-west corner has connected with it two piles of loose stones, in the pyramidal form: one 58, and the other 106 feet high, and the sides of the bases measuring about 200 feet. Their tops are broad platforms, over which, and down the sides, are scattered the remains of edifices, of which these pyramids were once probably the foundations. Here we found pieces of pottery, consisting of broken pieces of vases, and supposed cooking utensils.

"Upon the main terrace stands another of smaller dimensions, constituting the foundation of the Governor's House. The measurement of this terrace is 335 feet long, 59 broad, and 24 high. The whole building is plain (unlike those of Chi-Chen) from the base to the mouldings, which run through the centre over the doorways; above which, to the top, are ornaments and sculptured work in great profusion, and of the most rich, strange, and elaborate workmanship. It is divided into double ranges of rooms, from front to rear. Two of the principal are situated in the centre, 34 feet long, 10 broad, and about 19 high, with an angular ceiling, occupying one-half of the whole. There are 14 other rooms in the front and rear; also, two rooms on each end, and one in front and rear of the two recesses, of about one-half of the average size.

"The interior of these rooms is sometimes covered with a beautiful hard finish, and at others presents a surface of uniform square blocks of smooth stone. The floors are of stone, covered with a hard composition, which, together with the stone, is now much broken.

Mr. Norman's work contains a sketch of the Maya language, and the latter portion is devoted to speculations on the population of America, and the history of the remarkable antiquities to be found in different parts of the continent. The Maya language resembles the Chol, a language of Mexico, and is of very remarkable structure, the grammatical forms very much resembling the English, except that suffixes are used. A striking point is the use of auxiliaries with the verbs, a general indication of the descent of a language from one of rich forms. The assumption of what we may call the auxiliary state, is a remarkable and inexplicable philological phenomenon of which the instances are very frequent; and we may mention Anglo-Saxon and English, Hellenic-Greek and Romaine, Persian and modern Persian, Sanskrit and Lignaice. We have neither had time nor opportunity to compare the Maya language with many of the American, but we have with the Aymara (Peruvian) some of the Brazilian dialects, the Paraguay Guarani and Abipone and the Californian, and the result is no apparent resemblance with any of the languages but the Ayamara. The Brazilian and Guarani are as closely allied as Spanish and Portuguese, but seem to have no points of resemblance with the others, and use affixes instead of suffixes. The Aymara, it is to be observed, is one very extensively spread in Peru, and is spoken by the Coacuis, Castas, Collas, Colguedas, Laucapac, Pacapec, Caracas, Characas, and others, being the native language of the Lapapec. This language has a good deal of its meaning from missionarsters, as the Maya has been, and a grammar of Ayamar was published at Rome as early as 1603, the first Maya grammar appearing in 1569. The following words seem to show a resemblance between the two languages.

<table>
<thead>
<tr>
<th>Maya</th>
<th>Ayamara</th>
</tr>
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<tbody>
<tr>
<td>Father</td>
<td>hachyum</td>
</tr>
<tr>
<td>Mother</td>
<td>chacma</td>
</tr>
<tr>
<td>Man</td>
<td>unie</td>
</tr>
</tbody>
</table>

In construction there is also a considerable resemblance, the pronouns being suffixed to the infinitive. The following is an example of pronouns in the two languages.

<table>
<thead>
<tr>
<th>Maya</th>
<th>Ayamara</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr</td>
<td>in</td>
</tr>
<tr>
<td>Mrs</td>
<td>in</td>
</tr>
<tr>
<td>His</td>
<td>nu</td>
</tr>
<tr>
<td>Theirs</td>
<td>nd</td>
</tr>
</tbody>
</table>
Fielding in Charles Dickens; which we shall believe when we believe that Tom Moncrieff is a second William Shakspere.—After all, we may be mistaken in one very essential point,—namely, the authorship of the work: insomuch as it professes not to be written, but merely edited, by Boz. Consequently he does not give it to the world as his own, but from some person’s literary cut.


The interest of this work continues unabated. We find in the numbers before us, the Tower of the Giants at Gozo, Temple of Segesta, St. Vital at Ravenna, the Cathedral of Freiburg, the Certosia at Pairs, the Mosques of Cordova, and Eba Touloun at Cairo, and a Gallery in the Church of the Madeleine at Troyes. The two plates of St. Vital and its details give as good an idea of that remarkable monument as could be desired, and also another remarkable monument of very remote antiquity, the Tower of the Giants, is extensively illustrated. The designs seem, indeed, to be executed with that care which is requisite to give them value, as a work of reference.


This is a quarterly work, which takes up a good position in a field where much service is to be done. In the first article on the Earls of Lincoln, we recognize a spirit of critical research, which promises to do much good in the weed-abounding field of genealogy; but we should have liked also a more comprehensive grasp of the historical bearings of the subject. The catalogue raisons of brasses, monuments, and other curiosities of public interest will prove invaluable to the amateur and student, and makes stores of information readily available, which now require unnecessary labour to reach. If this work can but keep pace with the mass of scattered information constantly springing up on the subjects of its research, and present regular digests of them, as digests of cases are supplied to the legal profession, antiquarian and topographical studies will be very much advanced. We may notice a slight clerical error, by some mistake. Mr. Akerman’s valuable Glossary of the Wiltshire Dialect has crept under the head of works relating to Yorkshire.


This number contains some examples of heraldic tiles, which perfectly show the applicability of this material for such kind of decoration. It also illustrates a series of wall tiles from Malvern, and the different varieties in Worcestershire, bearing the following inscription here slightly modernized.

"Think, man, thy life may not aye endure—
That thou dost thyself, of that thou art sure.
But that thou kepest, unto thy factor’s cure,1
Ampersand will stand.
Mr. Nash reads executor, but we should suggest factor or succurjer, an agent, by which the applicability of the text is equally maintained, and its language better preserved.

BADEN-BADEN.

The new Trinkhalle, or Pump-room, by the architect Hubsch, at Baden, is spoken of in terms of very high commendation by a writer in a German periodical. "I consider this building," he says, "to be one of the happiest specimens of architecture that have been perfected in our Souths. Delightfully situated, the structure itself is beautiful in its form and proportions, and unfeignedly expressive in character,—significant in design, and preserving a tasteful medium between unmeaning decoration on the one hand, and bare and dry scantiness of it on the other." The building is raised on a boldly rusticated substructure, and consists of seventeen open arcades, whose flatless tiles spring from columns, which last are not according to any particular order, except that their capitals, being foliated, partake of the Corinthian character; but the columns themselves are of

1 We may note that we have observed great resemblance between the affixes and suffixes of the Hebrew and Arabic and the Magyar, and in the pronouns generally.

2 It is curious to observe the wide spread of the roots mira (Samer), sea or water, and ship or skil—words perhaps which boast of the most extensive diffusion; and admitting the seat of the human race to be in the East, easily to be accounted for by the neighbourhood of the Euphrates and the Indus, the Persian Gulf, the Arabian and Caspian seas.
shorter proportions, and the angles of the abacus are cut off so much as to render that member octagonal. The centre consists of five arches, resting on two ante and four columns, with steps leading up to it, and is crowned by a pediment with a "base-relief" by Reiche, a young sculptor now rising into celebrity. The merits of the design must, however, be taken entirely upon trust, for there is very little amounting to description in what Ernst Forster says of it. Some particulars that might have been stated have been passed over altogether, notwithstanding that, for want of them, it is impossible to form any distinct idea of the structure. There is, for instance, not a single dimension given by which we might even guess at its size: nor is it even so much as said whether it is an edifice of any architectural design. We are again opaque, too, as to the "seventeen arches" belonging to the principal elevation, or not. The "description," in short, is of that kind which, though it may be clear enough to those who have seen either the building itself, or drawings of it, is unintelligible without such additional information,—a very common, but also a particularly provoking fault.

DREDGING AND DREDGING MACHINES.

[The following communication describes a practice called radius cutting, which has been recently introduced into several large dredging operations. In this new process a lateral sweep, or circular motion, is given to the ladder, or bucket frame, which swings upon its upper extremity as a centre, and in its action imitates that of a seythe in mowing,—with this difference, that the seythe is driven forwards from right to left, while the bucket works backwards and forwards, which is the meaning of our correspondent when he says the machine cuts in both traverses. According to the old system of working, which our correspondent styles trench cutting, the bucket frame has only a vertical motion, the effect of raising or lowering its inferior extremity by means of ropes and sheaves fixed at the bows of the vessel. To understand whether the "seventeen arches" belong to the principal elevation, or not. The "description," in short, is of that kind which, though it may be clear enough to those who have seen either the building itself, or drawings of it, is unintelligible without such additional information,—a very common, but also a particularly provoking fault.

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Sin—Having twice had to make out plans and specifications of new dredging machines for works where I have been an assistant, I have witnessed a good deal of attention on this subject; and recent accidents to masonry where modes of cutting other than dredging have been adopted, have induced me to send you the following remarks on the new system of "radius cutting," which has been found so successful on one of the largest navigation improvements at present going on.

In the ordinary method of "trench" cutting, the power applied to lead the machine ahead into the cutting, has also to resist the reaction of the buckets; so that in the Dublin machines it was thought worth while to take the power from the engine. In the Clyde boats this process requires an enormous expense of manual labour, but Mr. Ball's has taken the power from the engine in the newest machine† (No. 5).

Now, in radius cutting, the chain from the bow of the machine is not wound up while it is cutting, but is only shortened at each return of the machine, which may be described as swivelling on that chain just like the "bobbin" on a pendulum: the machine being led laterally to the cutting by the side chains. These side chains are comparatively easy to work, as the reaction of the buckets is mostly against the radius chain.

There is no more difficulty attending the use of these lateral chains in a harbour, or narrow navigation, than in "trench" cutting, where corresponding chains, or "gussets," are required to keep the machine in line, and these are necessarily used on both sides at once; whereas these lateral chains are only tightened on one side,—namely, that on which the machine may happen to be traversing; and where it is required to lower them, to allow vessels to pass, they have only to be tightened up till the buckets fill again.

But when the system of "trench" cutting is already in action, it has to stop when it has cut a trench, come back over the same ground, and be set again to commence cutting another trench; and after the requisite breadth is traversed, the machine must again work over the same breadth, in the same zigzag manner, to cut the "ridges" which were left between the先前的 trenches. This is the most clumsy and unprofitable part of the process. For these ridges have to be cut by hand, and the buckets would stand when hard, causing a continual raising and lowering of the "ladder." Any engineer may satisfy himself of this, by standing to see the soundings at the "well," which are so irregular that half the full work is not performed, and there is no doubt of the immense loss, by the machine cutting in what is termed "holes."

All these evils are greatly reduced by working with a radius chain. The machine cuts in both traverses, and carries the work clean before it. The surface of the bank can be pared to any level, the machine passing over the hollows and cutting only the heights, and so never wasting time by dredging in holes.

There is no loss from taking the machine rapidly over the ground, when such might be required to keep the buckets full: but in the old system there would be a great loss in doing so, and piring only to a certain extent at each run,—for the backing of the machine is a dead loss of time. Yet though this loss is obvious, there might be a greater, from endeavouring to reduce it by keeping the buckets full the whole length of the trench, for then they might get into holes; and this they would continue, as we have already seen, to do, or to be buried by the cuttings. The bucket may happen to be near a hard part of the bank, it can do little good, as the hole, if quickly filled up, may or soon be expected to collect alluvial matter.

Although it may be true, that, to cut or trench a bank in the proper current, will, by changing the currents and eddies, remove it by a natural process; yet, as this is a point so difficult to hit upon, it is generally allowed, that, to get large stones and rocks taken up, and to cut the surface fair, is the surest way of reducing a bank, and of leaving it in the condition least liable to "silt up." It is with these views of the advantages to be derived from the judicious application of machines, that the preceding mode is brought under the consideration of our readers.

There have been great improvements made in the machinery by the practical engineer; but the civil engineer has not made any corresponding advancement in the working of the machine, although it is his right hand instrument. By attention to the working of the machine, much time and expense may be saved, which no improvement in mere construction of the machinery could ever effect. Dredging machines seem just to be put into the hands of their captains and engine-keepers, to make the best of them. And it cannot be doubted that the performance of these machines might be greatly increased by improved application; indeed, the improvements here described go far to prove this, as they effect a saving of at least one-fourth of the power. When once we come to consider the question, the subject, farther advancement may yet be made, and the dredging machine be found not only by far the most safe and expeditious, but also the cheapest mode of cutting.

The difference of construction in the machine for working on the radius principle is very little, and need only be made at the lower end of the bucket ladder. As the machine is led side-ways, the staff, the lower "tumbler" has no flanges, as in the ordinary tumbler, on which they are necessary to assist in keeping the buckets from swerving as they are pressed forward; but instead of the flanges there are "snugs" on the tumbler between the chains to keep them on. It would be useless to notice other parts of the construction in this paper, as that is the characteristic difference. The four crab winches usually erected on the deck of a machine serve with a snatch-block to wind the traverse chains.

30, Hope Street, Glasgow, 21st March, 1835.

W. C., C.E.

Bell Rock Lighthouse.—The monthly return from this establishment for February takes notice of a heavy sea upon the rock, from the north-east, on the 14th and three following days, when the spray rose from 70 to 80 feet on the side of the cliff. On the 21st the return says, "we felt the building tremble but very little." Various of the travellers or boulder stones upon the rock have been shifted from "Armist and Ulster" to the west end of "Hope's" Wharf. The boulders connected with the "Royal Burghs" have also been tossed about, one of these measures nine feet in length.—Caledonian Mercury,
ABERYSTWYTH HARBOUR.

Sir,—In pursuing "Blackford and Imray's Charts and Sailing Directions for St. George's Channel, 2nd ed." lately published, at p. 40 I find an account of this harbour as follows:—"Aberystwyth is a narrow creek, and not fit for vessels that draw above 9 or 10 feet water, and these must have spring tides to go over the bar." From the following account it will be seen what alterations have been made in the entrance to the river, which has completely set aside the above description.

The entrance to the harbour is situated at the bottom of the Bay of Cardigan, terminated by Bardsey Island on the North, and Strumble Head on the South, and lies about 5 leagues E. by N. from New Quay, but more immediately between two points of land, the Castle Hill on the North, and Abermenach on the South. Between these two points of land, the River Rhyned and Ystwyth empty themselves into the sea. Aberystwyth Harbour may be distinguished at some leagues distance by Pen Dinas Hill, which rises steep on the south end, also by the ruined castle near the town.

The sea coast hereabouts is nearly N.N.E. and S.S.W. by compass bearings: the prevalent winds from the W., and more especially from the W.S.W. produce the heaviest swells; for in that direction the Aberystwyth coast is exposed to the fury of the Western Ocean.

The Harbour, in its original state, was probably only the mouth of a mountain river, the Rhynedol, which, after a course of about 20 miles through a slate stone soil, falls into the sea. The Rhynedol, like other mountain streams, is subject to sudden and violent floods, or freshets, during heavy storms and at other times. The Rhynedol at this place is brought down the river by the effect of these freshets. The foregoing observations equally apply to the River Ystwyth. The Ystwyth having united its waters with the Rhynedol at the entrance of the Harbour, these two rivers maintain one common outfall, through the beach into the sea. The slate gravel brought down the rivers, and the beach that was brought from the southward, accumulated, and being blown up by the action of the sea, a bank or bar was formed at low water. This bar offered a constant obstruction to vessels, in their ingress and egress, and often caused great destruction of life and property.

Now to show what engineering has done. In the year 1838, the trustees commenced a substantial new pier on the south side of the entrance of the harbour, to protect the harbour from the western gales, and to prevent the beach from accumulating and forming a bar. This pier is now (1843) extended from the beach 250 yards in the direction of S.E. and S.W., and as far as is completed, has answered their expectation. In this respect, it has stopped the progress of the beach, and deposited the same at the back of the pier. Secondly, the pier has guided the rivers into a proper channel, by which it has caused a deeper channel to be formed, and removed the bar. Thirdly, instead of 9 or 10 feet water at spring tides, it has now obtained that height or more at the neap tides, and an average of 16 feet at spring tides. Lastly, it has removed that danger to vessels and mariners arriving or sitting or having to wait in the bay during the new tides, for water to enter the harbour. The portion of the river Rhynedol and the harbour at high water, occupy an area of about 20 acres. On the pier is erected a powerful capstan, supplied with ropes, and a stone house; and about 400 yards to seaward off the end of the pier, are moored two large transporting buoys, lying in 4 fathoms low water spring tides, for vessels to moor to or warp from, and every facility is rendered vessels making or leaving this port, by signals and lights at tides; it is now considered by all mariners that visit this port to be the best tidal harbour in the principality, when, but a few years since, it was the worst.

Vessels visiting this port can be supplied with every accommodation for repairing, &c., there being two ship-building departments, a rope walk, and sail makers, also bar and block warehouses. The markets are well supplied, and sufficient stores can be obtained.

An Old Subscriber.

Aberystwyth, March 1st, 1813.

In consequence of an inadvertent change of my expressions from "a cubic foot of water expended as steam, is equivalent to one horse power per hour," to "the evaporation of a cubic foot of water is equal to one horse power," you appear to have overlooked the limits intended to apply to the assertion. The words in italics, which had been used in a few lines above as "expended as steam,", were inserted to exclude the power due to expansive action, as well as the waste, 1st, in blowing off 2nd, at the safety valve, 3rd, clearance steam, and 4th, cooling. I happened to roughy estimate these losses at 11% of water for an expenditure of 7 lb. of water as "dense steam" going in the cylinder, while the communication with the boiler remained open, and the power in the boiler, with your assumption: and I feel assured you will grant me permission to refer to this charge of inaccuracy, and to the standard of horse power assumed in my remarks on nominal horse power in the Nautical Magazine.

I merely followed Trevithick in the assumption that steam of atmospheric strength will produce 3,600,000 lbs. pressure one foot high, and consequently maintain during one hour, a gross power on the piston of 60,000 lbs. one foot high; and I apprehend this assertion is equally true, with a slight increase for higher steam, and a slight decrease for steam below the atmosphere for the "dame steam" not worked expansively.

As a secondary assertion I added "this gross power is capable of producing 25,000 lbs. on the connecting rod," and perhaps in the best engines from 40 to 50 per cent. more, still it is not competent to produce an excess of 7.5 per cent, and much less an excess of cent. per cent. as due to 14 lb. net pressure, which amounts to 65,000 lb. per minute.

This standard of 60,000 lbs. gross pressure I had understood has been occasionally used, or been recommended to be used, by civil engineers in contracts, to prevent disputes with engine makers respecting the excess of power above nominal horse power to be supplied, and it seems a fair mean. Moreover, it meets the difficulties arising from higher steam, and the reduction of power due to expansion, and it is equally applicable to non-condensing engines (the estimate of horse power of these engines seems somewhat undefined).

The employment of an indicator, the value of which you have adverted to, is obviously required in estimates of the above nature; and though well adapted as a standard of comparative power and coal consumption, yet nominal horse power might still be used as a measure of the size of the engine: which seems a good commercial unit, of the same value as the inch diameter of the cylinder used in Cornwall, where the loads vary from 5 lb. to 10 lb. per square inch, and the strokes from 2 to 11 per minute in large engines.

Accustomed to refer to the "work performed" or duty, I concur entirely in the appeal to the "work to be done" by the engines of the Great Britain, especially as I anticipate the most favourable results from the mode in which the designers of the Great Britain have availed themselves of the conditions for which the cylinder sizes have been increased in a faster ratio than the areas of the midship sections of vessels.

I have the honour to remain, Sir,

March 10th.

Your's, obediently,

John S. Enys.

INSTITUTION OF CIVIL ENGINEERS.

Jan. 10.—The President in the Chair.

The business of the meeting was commenced by reading an abstract of Mr. Davison's paper (No. 539) describing the mode adopted for sinking a well at Messrs. Truman, Hanbury, Buxton, and Co's, Brewery, which was published in the minutes of proceedings of session 1843, p. 192, and the following observations were added:

The author described the difference between the method employed in sinking the well for Messrs. Truman and Co., and that for Messrs. Reid and Co. In the former the bore was small, and would therefore only produce as much water as was procured from the veins through which it passed vertically, while the latter, by its larger diameter, permitted lateral galleries to be driven in the direction of the fissures in the chalk; thus forming feeders for the well, and at the same time capacious reservoirs wherein the water accumulated when the pumps were not at work.

He lamented the comparative failure of Mr. B. Hanbury's experiments at Messrs. Truman's, to errors in the mode of sinking; the length of the cylinders which had been attempted to be forced down was too great, and the lateral pressure had prevented them from reaching the chalk, so that when the pumps were set to work an unmeed quantity of sand was drawn up with the water, causing a cavity behind the brick-work, which at length fell in. The water having been pumped out to a lower level than was proper, the equilibrium between the water and the sand around the cylinder had been disturbed, and the "blow" of sand had ensued.

The New River Company had been advised to sink a well of sufficient
Time was, before the invention of the water-wheel, when the water was obtained by the use of the larger wheel, and what would be the maximum advantage?

3. Is any increase of labouring force obtained, by causing the loaded arc of an overshot wheel to revolve in a closely fitting circular race, or conduit? and if so, what is the amount of advantage, and what the conditions for making it practicable?

Mr. Davison explained that a bore of small diameter had been adopted, because it was calculated that a supply of water, sufficient for the wants of the brewery, could be obtained by it. The diameter of the wheel was to be within five feet of the distance, was suggested by the sudden dropping of the cylinder. He believed that when (albeit to his own instructions) the level of the water was reduced by pumping to below a given point, the sand from beneath the easter-bed rushed in to restore the equilibrium within the cylinder, and thus caused the whole of the difficulties encountered to be cleared, it is readily obtained. The diagram of a well sunk, for wells in the red sandstone, and in practice it had universally been found that, by the latter system, the best supply of water had been procured, particularly when side drifts had been made.

Mr. Vignoles remarked that the same question, as to the relative merits of boring and sinking, had been discussed by Smeaton at length, for wells in the red sandstone, and in practice it had universally been found that, by the latter system, the best supply of water had been procured, particularly when side drifts had been made.

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an overshoot wheel, whose diameter is equal to the fall. The velocity of a water wheel working thus, may vary through a larger range without a material loss of power, and a steady motion is continued to a lower velocity than when it is working in a free race.

The more it finally arrives at the following general practical conclusions:

1st. When the depth of water in the reservoir is invariable, the diameter of the water-wheel should never be greater than the entire height of the fall, less, so much of it as may be requisite to give the water a proper velocity on entering the buckets.

2nd. When the depth of water in the reservoir varies considerably and unavoidably in depth, an advantage may be obtained by applying a larger wheel, dependent upon the extent of fluctuation and ratio in time, that the water is at its highest and lowest levels during a given prolonged period; if this be a ratio equal or greater, there will be no advantage; and in practice, the cases will be rare when any advantage will obtain by the use of an overshoot wheel, greater in diameter than the height of fall: minus the head, due to the required velocity of the water reaching the wheel.

3rd. The depth of water in free race is never in fall below the mean depth of the reservoir, when at the highest and lowest. When the average depth be between an eighth and a tenth of the height of the fall, then the average labouring force of the large wheel will be greater than that of the small one; and it will of course retain its increased advantage at periods of increased depth of the reservoir.

Dr. Robinson’s views, therefore, upon this branch of the subject, should, he contends, receive a modification. A positive advantage is obtained by the use of the conduit varying with the conditions of the wicel and fall, of nearly 11 per cent. of the total power.

The value increases with the wheel’s velocity up to 4 3/4 feet per second, or 6 feet per second, in large wheels. Hence, he argues, that it is practicable to increase the efficiency of the best overshoot wheels, as now usually made, at least by 11 per cent. The only objections urged against the use of the conduit are of a practical character, relating to the difficulty of making it fit close, of repair, &c.; but however these may have applied to the rude workmanship of the older wooden wheels, with wood or stone conduits, they are insufficient, as referring to modern water-wheels made of iron. The circular conduits were designed to be of cast-iron, provided with adjusting screws, and hence of being always kept fitting, readily repaired, and capable of being withdrawn from the circumference of the wheel in time of frost, &c.

The paper is illustrated by a drawing, showing the elevation and partial sections of the experimental apparatus, and a diagram showing the full size of the wheels used.

Mr. Farey observed that the result arrived at by the experiments, appeared to correspond nearly with those recorded by Smeaton, who had experimented upon, and used practically both kinds of wheels. The buckets of the best wheels made by the experiments did not appear to be of the best form, and they were entirely filled with water; hence an apparent advantage had been obtained, by the use of the circular conduit to retain the water in the buckets. But that would not be realized in practice, for as the form of the bucket regulated the point at which the water quitted it, and it was the practice to employ millwrights to make the best wheels very broad, in order that the buckets should not be filled to more than one-third of their depth, the circular conduits became useless, and in fact were now seldom used. Smeaton’s practice was, to entirely fill the buckets with water, but he never adhered to the low velocity of revolution which he recommended theoretically in his paper to the Royal Society.

Mr. Fairbairn had adopted broad wheels with an improved form of bucket, partially filled, and had obtained a more regular motion, particularly at high velocities.

Mr. Farey promised to present to the Institution, a copy of the method of calculation adopted by Smeaton for water-wheels.

Mr. Taylor corroborated Mr. Farey’s statement of the advantage of using broad wheels, with the buckets of a fine pitch and partially filled; circular conduits then became unnecessary: this was practised among the millwrights in North Wales with eminent success, and a velocity of six feet per second was given to the wheel.

Mr. Homersham believed that in Smeaton’s latter works he increased the velocity of the wheels to six feet per second.

Mr. Rennie gave credit to the author for the ingenuity of the apparatus with which the experiments were performed, and for the clearness and tabulated results; but owing to the necessary limited size of the model wheels, he feared the results could not be relied upon for application in practice to large wheels. The experiments of Borda, Bossut, Smeaton, and Fairbairn were all liable to the same objection.

The best modern experiments are those by the Franklin Institute, by Ponecel, and by Morin.

The result of these might be taken thus:

- Undershoot wheels, the ratio of power to effect varied from 0.27 to 0.30
- Breast wheels
- Overshot wheels
- Average

The velocity of the old English water-wheels was generally about three feet per second; the American wheels four feet, and the French wheels six feet: this latter speed was now adopted by the best millwrights in England. Mr. Hughes, at Mr. Gott’s factory at Leeds, and Mr. Fairbairn, had found advantage from it; the latter also had a particular contrivance for carrying off the air freely from the buckets.

It was important to regulate the thickness of the sheet of water running over the shuttle upon the wheel; four to five inches was found in practice to give the maximum effect of various sizes.

The object being to utilize the greatest height of fall and the greatest available quantity of water, by means of properly constructed openings and such sluice-gates as were first introduced by the late Mr. Rennie for the breast wheels of an overshot river wheel, instead of stopping up the water in a trough, it was made to flow into the conduits or buckets, at the top of the shuttle, and by a self-regulating apparatus to adjust itself at all times to the height of the water; thus obtaining the advantage of the full height of the fall at its surface, and obviating the necessity for the apparatus proposed by Mr. Mallet.

Mr. Mallett begged to dissent from the validity of the objections which had been made to the practical value of his experiments. With respect to the form of the bucket, that used by him could not, he contended, be called a bad form, although it might be susceptible of improvement; but as the experiments made by him showed no design to the question whether the form was bad or good, the same having been used in both wheels.

As it was shown that a certain relation subsisted between two water wheels with the same total descent, but with different diameters, as to their coefficient of labouring force, a proportional relation would exist with any worse or better form of bucket. The results considered as absolute measures of effect, being obtained with a form of bucket which approached nearer to the best forms now in use, than did those of Smeaton or any other experimenter. These were not applicable to professional practice, and therefore he must consider his results, as not without utility.

With regard to the custom of only partially filling the buckets, it must be remarked that buckets of the best forms begin to spill their contents before arriving at the lowest point of the loaded arc; the partial filling could, therefore, only be practicable, if the head of water was so increased, or the height of fall so diminished, as to make the bucket pass the shuttle: this distance could be but little varied by the fineness of pitch of the bucket, and depended more upon the depth of the shrouding. That there was a constant loss of labouring force by a practical diminution of the effective leverage, or a reduction in the “moment” of the loaded arc. That as the wheel revolved, the fluid of the bucket was not completely emptied, and by adopting a lower portion of the loaded arc, was transferred to a greater distance from the centre of motion even before the contents commenced spilling; but the angular motion of the centre of gravity of any one bucket was at first that due to its distance from the centre of motion of the wheel, or to its radius; and as the radius increased, a greater angular velocity would be acquired by the water which had changed its position on approaching the lower point of the wheel; but this increased velocity was gained at the expense of the power of the wheel, and hence a partially filled bucket would, he contended, be a bad form of the water-wheel. To the last objection, a full bucket was not liable.

From all these reasons, he felt justified in concluding, that the use of the circular conduit was more advantageous than the practice of partially filling the buckets.

With respect to the shuttle delivering the water over the top, where the head of water and the fall were constant, no advantage could be obtained by the use of a wheel greater in diameter than the total descent; it was assumed that this form of shuttle would be used in order always to deliver the water as high as possible upon the periphery of the wheel; but the question was, “How bad was a variable, what should be the diameter of the wheel to secure the best effect?” The paper showed that a wheel whose diameter was equal to the total descent, when the head was a maximum, did not always give the greatest average labouring force. The question was therefore independent of the sort of shuttle used, but it assumed the power of always admitting the water upon the wheel at the highest point of the total descent, and sought to establish the best relation between the diameter of the wheel and the whole descent when the head alone was variable, according to given conditions. The results of this part of the investigation, therefore, while they illustrated the full value of Mr. Rennie’s shuttle, went further, and pointed out the limits of its useful application.

It was fully aware of the prejudice which existed against the circular conduit, and once participated in it; but his attention was forcibly drawn to its practice, and having grasped the principle, he had applied it uniformly upon wheels of every order, on which he had constructed for mining purposes, he wished to draw the attention of the profession to the consideration of their practical merits when adapted to good wheels.
THE PYRAMIDS OF GIZEH.

At the Royal Institute of British Architects, on the 6th ultimo, a letter was read from Mr. Perrington, containing some remarks on the great Pyramid, accompanied by a model.

"The model is on a scale of 30 ft. in the inch, and represents the pyramid in its original condition,—that is, immediately after the sarcophagus was placed therein, and before the third and fourth blocks closing the entrance. From a examination of the ancient Egyptian cubit, now remaining, I deduced the length to be 1'713 English feet, divided into four palms, each of seven digits. This measure, when applied to the pyramids, agrees as closely as to render its correctness certain, and I proceed to mention a few of the more obvious results in this breadth, and height. The base covered a square of 418 cubits each side, which, from a statement of Pliny, I take to have been equal to eight Egyptian jungars, or acres; and this supposition is somewhat confirmed by finding the second pyramid would then cover seven, and the third pyramid seven or eight jungars, and so on with the other pyramids of Egypt. The height of the great pyramid appears to have been 280 cubits, being a proportion of height to side of base of 5 to 8; and I may here mention that several other pyramids have the same proportion.

This gives the following ratio on a direct section: As half the base is to the perpendicular height, so the side of a square, or slant height to the whole base; or for each side it may be thus stated as

\[
\text{Rad} : \text{Tang} : \text{Sec} = 2:2:1.
\]

"Sir John Herschel having the angles only of the pyramids and their passages before him, gave his decided opinion that they were "not connected with any astronomical fact, and probably adopted for architectural reasons"; and that the knowledge of the above proportions will I think lead to the same conclusion; for with the most solid and enduring shape possible, the builders obtained a mathematical symmetry which no other proportions could give. Although this pyramid was nearly 480 feet in perpendicular height of solid measure, and the pyramid itself is so distributed, that the lower courses have only to sustain about 25,000 lb. for each square foot, whilst the material is equal to at least 1,100,000 lb., therefore it is evident that the main objects of the architect—viz., stability and eternal duration—were well effected. The inclination of the entrance passage of the great pyramid was regulated by a proportion of 2 to 1; that is, two feet horizontal to one foot perpendicular.

"The same mode of regulating the angles is observable in every instance; thus where inclined blocks were used to cover an apartment, a certain portion of the width of the room was taken for the rise or pitch; as in the queen's chamber, where the rise is a third of the width of the apartment; and also the angle of the air passages leading from the king's chamber to the exterior, have a rise of one perpendicular to two horizontal. From finding, in every case, that the angles were thus regulated, I have come to the conclusion that the Egyptians, at the time of the existence of these mighty monuments, possessed no knowledge of the division of the circle into degrees, but that their angles were regulated by the proportion of base to perpendicular height; in fact, the tangential measure of the angle, and not its abstract measure, that they learned to divide the circle into degrees at a later period is highly probable, as they were celebrated for their astronomical knowledge.

"In every part of the pyramids evidence of premeditated and careful design are apparent; but my present purpose is to draw attention to the more striking points in the great pyramid only. The situation of the apartments in the pyramid appear to have been regulated as follows:

| Height from base (external) to floor of passage of queen's chamber | 40 cubits |
| From the above to floor of king's chamber, or principal apartments | 40 |
| From the above to top of upper chamber | 40 |
| From the above to apex of pyramid | 160 |
| Total | 280 cubits |

Making 280 cubits in perpendicular height, as above stated. The floor of the subterraneous apartment was also 60 cubits below the base of the pyramid.

ROYAL COMMISSION OF FINE ARTS.

Her Majesty's Commissioners hereby give notice:

1. That the cartoons or drawings intended for competition, according to the notice published in April and July, 1842, will be exhibited in Westminster Hall, London, on the following days, viz., from the hours of 10 and 5 on any day, Sunday excepted, during the first week in June next, when there will be in attendance to receive them; but no drawing will be received after Wednesday, the 7th of June.

2. Each candidate is required to put a motto or mark on the back of his drawing, and to send, together with his drawing, a sealed letter containing his name and address, and having on the outside of its cover a motto or mark similar to that on the back of the drawing. The letters belonging to the drawings to which no premium shall have been awarded will be returned unopened.

3. The title of the subject of each drawing, together with the quotation, if any, to illustrate it, must be affixed either to the back or front of the drawing.

4. Each drawing is to be sent upon, or accompanied by, a stretching-frame; but no ornamental frames in addition to the stretching-frame will be admissible.

5. The artists or their agents may attend to examine the works sent by them, and to re-stretch such drawings as shall be detached from their stretching-frames and rolled for the convenience of carriage.

6. No drawing will be allowed to be re-touched after having been received, except to repair an injury occasioned by accident, and then only by the artist himself.

7. Every possible care will be taken of the works sent, but in case of injury or loss, the commissioners will not be responsible.

8. All the drawings will be exhibited, and catalogues will be published.

9. The names of the judges appointed to award the premiums will be made known.

By command of the Commissioners,
Whitehall, April 24.
C. L. Eastlake, Secretary.

THE NEW HOUSES OF PARLIAMENT.

REPORT FROM THE SELECT COMMITTEE.

That the committee have met and considered the subject-matter to them referred, and have examined witnesses, and have come to the following resolution, viz.:

That considering the great inconvenience of the present House of Lords, and that such inconvenience will be greatly aggravated by the progress of the new buildings before the commencement of the session of 1844, no delay should take place in the building and preparing the new House of Lords beyond what is absolutely required for the safety of the work; that the architect be directed so to conduct his operations as to secure the occupation of the new House of Lords, with temporary fittings, at the commencement of the session of 1844; that in case the architect in the progress of the work of the new House of Lords shall find that more time will be required in consequence of any apprehension of injurious consequences to the building, he shall report the same to the Commissioners of her Majesty's Woods and Forests, in order that such report may be communicated to this house in due time; that it does not appear to the committee that it is advisable for any additional expense, which would lead to additional expense, should be adopted; and the committee have directed the minutes of evidence taken before them to be laid before your Lordships.—March 13.

A return made to the House of Commons, published 27th ult., states that the total amount already expended for building the new Houses of Parliament is £386,483 10s.; the amount voted has been £438,500, and consequently £52,016 10s. is in hand unexpended, which will be required for completing the works in progress of completion. It is estimated that a further sum of £378,422 7s. 6d. will bring the whole sum to £816,924 7s. 6d., but what will be required for completing the landing-places, making good the pavings, furniture, and fittings, and for decorations by works of art.

The House of Commons, on the 27th ult., voted an additional grant of £140,000 towards the works.

NEW INVENTIONS AND IMPROVEMENTS.

DREDGE'S SUSPENSION BRIDGE.

The very economical, simple, and powerful principles of the lever in the construction of bridges, may be illustrated thus. A bridge is a two arms united at the ends of the chains, the centre, where weight begins and increases from thence progressively, as the chains increase in magnitude and power to the points of suspension. This is effected by an oblique instead of a vertical projection of the platform to the main chains, which fixes all horizontal force in the horizontal line, and gives to the stability of a bridge the most valuable assistance, as is proved by the numerous bridges already erected upon the principle in various parts of Great Britain. Its truth may also be easily understood by the following experiments. Cut the chains in the middle and the bridge will stand as firm as ever, there being no strain there; then cut the platform in the middle and it will be separated into two independent brackets, each supported by the chains and the strength of the horizontal line against the abutment. The force required to resist this tendency, is a measure of the power conferred upon the bridge, by reason of the oblique connexion of the horizontal line to the chains, independent of the advantage gained by tapering them. On the other hand, cut the chains of a common bridge at the centre, it will destroy the structure; or cut the platform in the middle and leave the chains entire, then it will be seen that there is no tendency of thrust against the abut-
ments, or any horizontal power in the platform, and that it is the chains only which sustain the structure. To a chain or rope in a pendent curve this cannot be avoided, but in a bridge which consists of curved and horizontal lines, it is clear that the vertical and horizontal forces should be divided, as it is sufficient for the chains to any bridge, in the portion of required power, to support themselves, the platform and the transit loads: and, independently, it is very clear that the horizontal force should not be in the chains to facilitate their destruction, but in the horizontal line, where it cannot act in the direction of gravity, but where it is as essentially useful towards the maintenance of the structure, as are the chains themselves. It may be remarked that this system facilitates the manufacture of bridges, out of the cheapest and most durable materials—it enables their strength to be computed as easily as the contents of a block of marble is ascertained—requires but one lamina of timber for the roadways, and presents but little surface of resistance, therefore the wind cannot affect it, nor is any longitudinal trussing required, as in other bridges, whose equilibrium is easily affected by the slightest force, because they rest on their centres, similar to the logan stone.

A. Z.

IMPROVEMENTS IN METAL FOR SHIPS, &c.
Mr. William Fairbairn, of Manchester, engineer, has obtained a patent for "certain improvements in the construction of metal ships, boats, and other vessels; and in the preparation of metal plates to be used therein."—They consist in preparing or rolling the iron intended to be used in the construction of ships and vessels, by forming at each edge, and the whole length of the plate, a raised border,—or, in other words, the plate is made at each side or edge, to pass the thickness of any other part of the plate: one side of the plate being plain, which is to be the outside in the construction of a vessel, the other side having two projecting edges, or borders. The rivet-holes on the plain side of each plate are to be placed so that the heads of the rivet may be flat or flush with the face of the plate; and in joining two or more plates together, they are not to overlap each other, as hitherto practised, but the plates are placed with their edges together; and behind the two is placed a metal band, bar, or rib, perforated with a double row of holes, to correspond with the holes in the edge of each plate, and the whole are firmly rivetted together so as to form a water-tight joint; and where greater security or strength is required, the metal bands or bars are made in the form of a T, or with a projection on the back side; by this arrangement the resistance of a vessel in the water will not be so great, and the plates at the parts where the rivets pass through will be equal in strength to any other part of the plate; whereas, in those of ordinary construction, the plates are considerably weakened by making the rivet-holes, as such parts have always been found to give way when the plate itself has remained entire.—Record of Patents.

IMPROVEMENTS IN CHIMNEYS.
M. Eugene de Varroc, of Bryanstone-street, Portman-square, has obtained a patent for "apparatus to be applied to chimneys to prevent their taking fire, and for rendering sweeping chimneys unnecessary."—This invention relates to the application of reticulated metal surfaces, at the commencement, or near the entrance of the chimney, in order to prevent the escape of the flame, and also to intercept the soot. The apparatus consists of two cylinders of wire-cloth, one within the other, but so constructed that the surfaces of the two cylinders touch, or are in contact with each other. The inventor prefers to make the cylinders of wire-cloth, having sixty-four holes to the square inch, or closely perforated metal plates may be employed, but such will not be found as useful as wire-cloth. The cylinder, which is mounted upon an axis, is fixed in the chimney, as near the fire as convenient, the flue or chimney being so constructed as to prevent any passage for the smoke but through the double-wire of the cylinder, the wire forming the reticulate, or open work, of one cylinder, being interposed between those of the other cylinder. By this arrangement the flames and soot will be prevented from passing through the cylinder; but there will be sufficient draught through the cylinder for the fire, and the chimney beyond the apparatus will not be coaled in the same degree as it is prior to the adoption of apparatus, which will require to be brushed off every morning, and, if desired, the cylinder can be turned partially round, so as to present another part of its periphery. A modification of this apparatus, composed of a number of perforated plates, and arranged in a rectangular form, is shown, as being applied to the chimney of a steam-engine in which the soot is removed by brushes constructed for clearing the same occasionally from soot.—Ibid.

A FIRE ESCAPE.
A correspondent suggests the following simple plan for a fire escape:—
1st. Two ropes of 40 feet in length, each attached to a small chain also 40 feet in length, the end of each chain armed with a spring hook.
2nd. A stout sack of incombustible material (like the fire-proof dresses), open mouthed, with a metallic rim, about four feet deep, and wide enough to hold two persons, with two spring hooks on the opposite sides of the metallic rim, and connected therewith by a small chain of 9 inches long.

These articles should be brought to the spot on the first alarm of fire by a porter or a footman. On hearing the alarm, each person should be placed next adjoining on the right of the one on fire, and while the rope is held fast, the chain should be dropped from the upper window till it touches the pavement; and the same should be done with the other rope and chain from the house on the left side; the two chains should then be hooked together by the policeman or neighbours. The escape sack should immediately be attached to the centre of the combined chains, and be rapidly drawn up to any window where a person may appear in danger. The moment the individual has got into the sack, one rope must be eased off, so as to allow the other rope to become perpendicular, when the rescued party may be taken at a lower window of the neighbouring house, or lowered to the pavement; the rescuers giving the rope a half turn round a bed post, so that the lowering may be effected discreetly. It need scarcely be added, that this operation may be repeated several times in a minute, if there should be more individuals to be rescued. The sack, when empty, is to be drawn up and dropped in some solution prepared to resist combustion, and care should be taken that the ropes are not unnecessarily exposed to flame.

FLAX MILL AT CASSANO, IN LOMBARDY.
A flax and power loom mill has been established at Cassano, which has excited a good deal of attention in Italy. It belongs to Messrs. Battaglia and Co., and the works were erected by Mr. Albano, C.E., of London. The mill is for flax and hemp, and is divided into three compartments, containing upwards of 8000 spindles, set in motion by a water-wheel worked by the Adda, and 16 ft. in diameter, by 21 ft. or 21 ft. broad. This wheel is of cast iron, except the floats, which are of sheet iron, and the whole weighs 56 tons. To this wheel are attached apparatus for governing the velocity of the machinery, lifting weights to the upper stories, and working fire-engines. In the factory is also included a steam drying apparatus. Altogether the arrears behind the east compartment, and the adaptation of the machinery are looked upon as conferring great credit on the engineer, and has given great satisfaction to all parties concerned.

THE THAMES TUNNEL.
This important undertaking was opened for foot passengers on the 25th of March last. Thus, after many years of anxiety and difficulties, perhaps without parallel in the history of great Public Works, the practicability of forming a thoroughfare for carriages and foot passengers under a deep navigable river, and without interruption to the navigation, is proved and executed. The obstacles, which have from time to time impeded and all but stopped the progress of the Tunnel, have been numerous. The work was commenced in 1825, but was stopped in 1828, by an irritation of the Thames. From that time to the spring of 1833 no progress was made. In this year, under the sanction of an Act of Parliament, the Treasury allowed the fee of £6000 a year to the Tunnel Company. As the cost of Public Works, the money necessary to complete the Tunnel; and it was again commenced and has been continued with few but inevitable interruptions and delays to the present time, when, as the Directors have stated, it is secured completed, and is now opened to the Public and displayed for foot passengers. The two roadways for carriages under the river are also perfectly completed. From its commencement to the present date there have been but 11 years within which the excavation could be carried on. And during this time, for nearly two years or ninety-nine weeks, the works were suspended from circumstances beyond the control of either the Directors or the Engineer. The work has been in fact executed in about 9 years of actual work, at a cost of about £146,000, including property and expenses of every kind, with the particulars of which the Proprietors have been accurately and annually ascertained. The Tunnel of 1200 feet was, however, 9 feet below the high-water mark. The Carriage-way descents are now alone wanting to complete the work. They are susceptible of being constructed for in the ordinary way.

The Nelson Monument.—The whole of the leaves, roots, and parts of the Corinthian capital, to be placed on Nelson's monument, Traflagar-square, have now been cast at the foundry of Messrs. Smith and Son, in which the parts of cobalt, with those of the ornaments, are brushes constructed for clearing the same occasionally from soot.
This machine, lately brought into operation in the town of Manchester, where it excited a considerable deal of public attention, has lately been introduced into the metropolis, and is now employed in cleaning Regent-street. It is the invention of Mr. Whitworth, of the firm of Messrs. Whitworth and Co., of Manchester, engineers, by whom it has been patented. The principle of the invention consists in employing the rotary motion of locomotive wheels, moved by horse or other power, to raise the loose soil from the surface of the ground and deposit it in a vehicle attached. The apparatus for this purpose is simple in its construction; it consists of a series of brooms (3 ft. wide) suspended from a light frame of wrought iron, hung behind a cart, the body of which is placed near the ground, for greater facility in loading. The draught is easy for two horses, and throughout the process of sweeping, scarcely a larger amount of force is required than would be necessary to draw the full cart an equal distance.

The following description of the machine is given by a reference to the accompanying sketch, which will explain its action. The cart is constructed with plate iron, and consists of two parts, A, A: the lower part A is suspended to the upper part, and when filled is lowered and replaced with an empty one. To the off-side wheel, B, is attached, on the inside, a cog-wheel, C, which works in a cog-wheel, D, on the cart, and is fixed thereon are two pulleys, 1 ft. diameter and 4 in. apart: two other corresponding pulleys, E, are fixed upon a loyer shaft, which is suspended to the upper shaft by a wrought iron frame, and over these pulleys pass two endless chains, F, to which the brooms G, consisting of 20 rows, each 3 ft. 4 in. long, are attached. It will thus be seen, that when the large wheel of the cart is set in motion, it will, by means of the large spur wheel C, turn the pinion D, and with it the pulleys and the endless chain and brooms that pass over them: and as these brooms come in contact with the road, they sweep the mud up the inclined plane into the bottom part of the cart A. For the purpose of raising the brooms from off the ground, there is an apparatus, H, consisting of an endless screw working into a bevel wheel upon a shaft: which passes across the top of the cart: upon this shaft are fixed two pulleys, to which are attached two chains, which pass along the top of the cart and over the quadrants I, at the back, and there fixed to the iron frame of the apparatus, so that when the endless screw is turned the chains are coiled round the pulleys, and raise the apparatus to any height it may be requisite. For the purpose of removing or emptying the lower portion of the cart, it must be raised to a horizontal position; as this apparatus is raised, it throws itself out of gear by means of a lever attached to a chuck fixed on the end of the pinion shaft D. To the apparatus H there is another motion attached for regulating the pressure of the brooms on the ground, according to the state of the weather and the nature of the surface, consisting of a series of weights in the box in front, suspended to two chains, which pass over pulleys on the axle of a wheel that works into another wheel on the same shaft as the first wheel described of the apparatus H.

There is also another apparatus, K, for raising and lowering the lower part of the cart, consisting of an endless screw working into a cog-wheel, the shaft of which passes across the top of the cart, and on each end are pulleys, round which chains are coiled that suspend the cart on each side. This provision is made for lifting off the water collected in the cart, by means of a pipe, having its interior cut off some inches above the level of the mud after settlement: the cart, when full, is drawn to the side of the street, at some distance from a sewer grid, and the pipe plug being withdrawn, the water flows into the channel. A slight modification of the original form of the machine, by bevelling the ends of the large spur wheel in the box front, suspended to machinery more to the near side, and enables it to sweep close up to the curbstone of the foot-pavement; and the hands before required to clean out the gutters are now dispensed with. An indicator, attached to the side of the sweeping apparatus, shows the surface swept during the day, and acts as a useful check on the driver. Parties working to hire horses to work the machine over a given quantity of surface, the rate of hire being per 1000 yards actually swept. This will be found convenient where parties working the machine do not keep their own horses, and will tend to facilitate the introduction of the new system under management of the local authorities.

Where provision cannot be conveniently made in large towns for deposit in yards at proper intervals, the patent machine is constructed of two parts, as above described, viz., an upper, A, carrying the sweeping apparatus, and a lower, B, for depositing the brooms. Both are so constituted, as to permit of being easily detached from the carriage, and, being detached, are immediately employed for conveying the loads of the boxes to the place of ultimate deposit. No difficulty has been found to arise in the management of the machine by ordinary drivers. It has been worked regularly on every kind of street surface—the round and square stone, the Macadamized road, and the wood pavement; all of which are found in the districts before mentioned. Its peculiar advantage, as applied to the present purpose, in preventing the slippery state of the surface so much complained of, has attracted particular attention, and will, no doubt, tend to facilitate the general introduction of that useful invention. By the use of proper precautions in cleaning and oiling the machine before setting it to work, the friction of the working parts may be materially reduced.—A point of great importance, in reference both to the consumption of horse power and the cost of repairs.

The wear of the brooms, which at first was considerable, has been diminished more than one-half, by the action of the regulating weights before mentioned. A product of South America, called by the Portuguese "Piassava," forms an excellent material for the beads of the brooms, having great pliability and strength combined, and also remarkable degree of durability.

Two machines are advantageously worked together, one a little in advance of the other. Not only is the operation of cleansing a particular street thus effected more rapidly, but the two drivers can occasionally assist each other, and one of them (at higher wages) may exercise a supervision over both machines.

The success of the operation is no less remarkable than its novelty. Proceeding at a moderate speed through the public streets, the cart leaves behind it a well swept tract, which forms a striking contrast with the adjacent ground. Though of the full size of a common cart, it has repeatedly filled itself in the space of six minutes from the principal thoroughfares of Manchester. This fact, while it proves the efficiency of the new apparatus, proves also the necessity of a change in the present system of street cleaning.

Another Great Blast at Dover.—On Wednesday, 1st March, about four o’clock, another great blast took place at the South-eastern Railway works, a little beyond the Rounddown cliff. This blast, as compared with that at the Rounddown (when 18,500 lb. of gunpowder was instantaneously ignited), was comparatively insignificant; but when we mention that 7,000 lb. were fired at the present explosion, it will be seen that this insufficiency was only comparative. The present operations, like the blast on the 28th January, were conducted by Mr. Cottrell, the engineer-in-chief to the South-eastern Railway, who, with Lieutenant Hutchinson and a number of the directors of the company, were present to-day, witnessing the blast. The effect of this blast has been quite as successful as that which effected the destruction of Rounddown. About 50,000 yd. of chalk have been dissolved, the smoke being communicated by the voltaic battery. Nine chambers were formed in the cliff, about ninety feet from its top, the object being to blow away the crown of the cliff, to render it safe for the railway carriages to pass over the sea wall under it. The explosion on the 26th of January, the present was effected with very little noise and smoke. The instant Ignite was communicated the cliffs burst out with a low booming noise, and the ruins were gently, though majestically, thrown down on the beach below; but, instead of, like the Rounddown, shot out into the sea at a distance of 1000 feet, if scarcely, we should say, extended 200 feet in any direction, after reaching the base of the cliff.

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**STEAM NAVIGATION.**

*Virago* Steam Frigate.

The *Virago* is one of the second class frigates belonging to our service. Her dimensions are as follows:—Length between perpendiculars, 180 ft.; keel, 165 ft.; beam, 52 ft.; depth in hold, 21 ft.; tonnage, 994, 4 M. She is fitted with two engines, of the collective power of 300 horses, manufactured by Messrs. Boulton, Watt, and Co., which are eminently novel in their arrangement, occupying less space than the engines of the same power employed on board any other vessel. They are covered with containing great strength with lightness of construction—facility of access to all the working parts with a ready and simple mode of handling them, being stopped and started with as much ease as if they were intended for river use. Each cylinder is supported upon a foundation plate connected by a foundation beam with the main plate, the foundation plate being expanded at various parts with the cross, and the valves for that purpose are simple, and work without the usual noise attending those generally employed. There are four boilers, situated close to each other, but having a clear passage round the sides of 18 inches within. There are stop-valves in each, so that they may be worked separate or together, as occasion may require. There are 16 fire places, and two firing-places—one forward, towards the engines, the other aft—to which access is afforded by the above mentioned passage of 18 inches. The chimney is surrounded by a water-case, from which the boilers are fed with water at nearly a boiling temperature, by which a saving of fuel is effected, and the risk of fire diminished. This plan was originally adopted by this firm shortly after the destruction of the Prince Regent by fire in 1817.

The entire of the boilers and steam-chest is covered with felt, two inches in thickness, sewed on to canvas, protected by iron tongues, and finally coated with sheet lead to prevent any leak from the deck saturating either the wood or the felt. On each side of the engine and boilers are ranged the coal boxes, extending from bulkhead to bulkhead, and calculated to hold 23 days' consumption. The machinery is there protected from shot by the thickness of the stratum of coal, while the greater part of the engine is considerably below the load line.

The following are some of the principal dimensions of the engines:—Diameter of cylinders, 64½ in; length of stroke, 5 ft; connecting rod, 8½ ft.; diameter of the whole of the space round, 3 ft. 7 in. and over, is fitted out within three months. The forehold, afterhold, and iron coal boxes before the boilers and abaft the engines, are nearly finished. The boilers and funnel are fixed in their places, and the cylinders, couplings, air-pumps, and other weighty parts of the engines. To add to her strength and diminish the apprehension of fire, the decks and partitions of the hold of the ship occupied by the engines, &c., will be filled up in iron. Nearly all the masts and spars are made, and should nothing unforeseen arise, she may be floated out within three months. The Directors take good care that the public shall be kept in ignorance of their proceedings as much as possible; for they will not allow any one to inspect the engines until they are completely finished and sold, without an order signed by two Directors, and a commission of 5½ per cent. towards the sick fund of the workmen. Whoever heard of such a demand?—Government allows the public free entry to those that are going forward in public works, and most of our first engineers will permit any respectable person to visit their works without such an extortionate demand. Lately a profession gentleman applied at the works for admission, and obtained an order to inspect the engines, on which he was directed to be a person that he must first pay 5s. for his admittance, which he very properly declined to pay, and consequently lost it in disguise without seeing the vessel.

**THE "GREAT BRITAIN."**—At a meeting of the Proprietors, held last month, the Directors reported that *The Great Britain* is in a very forward state. The frames and hull are complete. The whole of the upper decks, as well as the decks of the forecastle, forecastle, and aftercastle, are laid and caulked; nearly the whole of the plate rooms, and other joiner's work, is finished. The forehold, afterhold, and iron coal boxes before the boilers and abaft the engines, are nearly finished. The boilers and funnel are fixed in their places, and the cylinders, couplings, air-pumps, and other weighty parts of the engines. To add to her strength and diminish the apprehension of fire, the decks and partitions of the hold of the ship occupied by the engines, &c., will be filled up in iron. Nearly all the masts and spars are made, and should nothing unforeseen arise, she may be floated out within three months. The Directors take good care that the public shall be kept in ignorance of their proceedings as much as possible; for they will not allow any one to inspect the engines until they are completely finished and sold, without an order signed by two Directors, and a commission of 5½ per cent. towards the sick fund of the workmen. Whoever heard of such a demand?—Government allows the public free entry to those that are going forward in public works, and most of our first engineers will permit any respectable person to visit their works without such an extortionate demand. Lately a profession gentleman applied at the works for admission, and obtained an order to inspect the engines, on which he was directed to be a person that he must first pay 5s. for his admittance, which he very properly declined to pay, and consequently lost it in disguise without seeing the vessel.

**THE "PENEPHEL."** Steam Frigate. This large Man-of-War Frigate, which has been designed for the purpose of converting it into a first-class frigate, has been towed up the river Thames from Chatham to Messrs. Cookworthy at Launceston, in order to examine her engines. The engines are constructed on the Corren direct action principle, and are designed for the purposes of these engines, very small space, and of a magnitude proportionable to their power. The cylinders are 92 inches diameter, and 7 feet stroke, at 17 strokes per minute, the collective nominal power of the two engines is 600 horses, but she can be worked up to 750 or 800 h. p. without incurring the slightest risk. She is fitted with Hall's patent condensers, and an ingenious contrivance for altering their arrangement according to the demands of the service. This con- trivance the steam can be expanded to any degree, without the aid of an ex- pansion valve: the air-pumps are of solid brass; there is also an ingenious con- trivance for admitting air at various rates, and for adjusting the expansion valve before it is adopted. There are four boilers, which are tubular and only 9 feet long; the fire-grate is under the boiler; the fire rises from the grate up the trunk and returns through the tube to the front. It then returns again over the top to the trunk, and so back to the fire-grate. The chimney funnel is made like a telescope, the upper half sides down. When the vessel is completed, we hope that she will be able to give some idea of the perfection of the several improvements that we have now but slightly alluded to.

The Hindostan Steam-Ship.—This steamer, it will be remembered, left Southampton on the 24th September for Calcutta. She arrived at Madras on the 12th November, and afterwards proceeded to Bombay. She left the latter port on the 17th December, and arrived at Singapore on the 10th January. The next intermediate port of call was the Cape of Good Hope, where she was to sail on the 14th of January for Suez; Capt. Moresby, the commander, gives the following account of her performance on the voyage to the Cape of Good Hope. She was running at a moderate pace in a head wind and contrary winds; the ship showed off her power and good qualities to advantage; she neither rolls nor pitches much, steers well, and is easily managed in turning; sail when set does not increase her speed much, beyond what full power of steam will give her; it has one advantage—sail when set the vessel requires less steam, therefore a saving of fuel. With a beam wind she seldom rolls at all; when steaming head to sea and wind, is very dry on deck, no water taken on; when steaming up wind, very dry as well. The Assis- tion to the Cape of Good Hope against a strong south-west trade wind, she averaged against wind and current 931 miles per day. The north-east mon- son at the Cape, with the usual sea, made the vessel suffer much. On the 8th April, the vessel had been a long with a head sea against her and a current of 22 to 24 miles per day against her; yet she has made the distance in three days one hour.

**STEAM NAVIGATION.**—During the last month, a new steam vessel, fitted with a single engine of 30 horse power, has made several trips up and down the river from Shrewsbury to Chester. She is owned by Mr. David Napper, of Millwall, whose two fast boats, the Eclipse and the Isle of Thanet, excited great attention on the Ramsgate and Margate station last year. The hull of the new vessel is of iron, and has a false bottom, which forms a condenser. The steam passes into the condenser, and cold water under and over it. The machinery occupies a very small space, and the consumption of fuel does not exceed a ton and a half per day. With these very generous, the ship navigates the estuary at about the ordinary speed. Her ordinary speed with the tide is stated to be 18 miles an hour; but she is said to have actually proceeded down the river with the first tide at the rate of 10 or 20 miles an hour. In one of her recent voyages, she performed the distance from London Bridge to Greenwich Hospital, exactly 5 miles, in 19 minutes, and on the following afternoon the same distance was effected in one minute less. She is to be called Waterman, No. 5, and is intended to ply between the Adelphi pier and Woolwich.

The Largest Steam Frigate in the Navy. — The Lords Commissioners of the Admiralty last year approved of a plan submitted by Mr. Oliver Long, Master-shipwright of the Woolwich Dockyard, of a steam frigate on a far larger scale than any that have been built or proposed, and power, than any lately constructed. The vessel, designed by Mr. Long, is intended to be built at Woolwich, and named the Terrible. It is now contemplated that this splendid steam frigate shall be built at Deptford Dockyard on the steam slip from the small frigate which will shortly be launched. She is to be of the following dimensions:

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<th>Feet</th>
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<tr>
<td>Length between perpendiculai</td>
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<td>Breadth extreme</td>
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<td>Depth in hold</td>
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<td>Burden in tons</td>
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She is to be supplied with Maul and Field's patent double cylinder marine engines of 800 h. p. The cylinders will be 72 inches in diameter, and the erection of the engine alone has been contracted for at the cost, including the boilers, of the large sum of £10,250. The engine-room will be of the following splendid dimensions:—75 ft. long, 38 ft. breadth, and 27 ft. deep; and the weight of the engines and requisite gear connected with them, will be 350 tons. The engine-room, including the machinery, will be 34 ft. by 13 ft. in breadth. The coal-boxes will contain 500 tons of coal; and altogether this great vessel will far exceed in length and other points the largest ship-of-the-line ever constructed in this country.—*Times*.

St. Petersburg.—A joint-stock company has been formed for the purpose of establishing a communication by steam boats along the south coast of Lake Ladoga, between Shinshelsburg and Saint Peterbourg, by a line of posts between Shinshelsburg and Sest boli, the boat to touch at Ketholm, and the coasts of Lennowets and Wallag: At present 800 vessels from Sermor annually navigate the lake.

**Portsmouth Dock-Yard.**—The Ilem, Captain Corry, one of the Lords of the Admiralty, and Captain Philip Selby, of the 110 gun Frigate "Rothesay," to the Admiralty, have visited this dock-yard during the last month upon official business. It is understood that one of the objects they had in view was to examine the accommodation of the engine house, a part of the Portsmouth dock-yard, comparatively modern, and to see whether the masters of the Admiralty have it in contemplation to make this port, as well as Woolwich, a rendezvous for the equipment of steamers. A site has been selected which is considered as answer the purpose.
MISCELLANEA.

IMPROVEMENTS IN LIVERPOOL. Most of our readers are aware of the contemplated improvements in the vicinity known as the New Haymarket, which, being now numbered amongst the things that were, the surrounding slumming houses, tinder-yard, &c., are gradually disappearing and giving place to buildings which will impress upon strangers entering the town some idea of its immense wealth, extent, and importance. The façade erected at the terminus of the Liverpool and Manchester and Grand Junction railways will be a step forward in decorating the4.

From the top of St John’s lane, extending along the west side of Lime-street to Ranelagh-street, a distance of between four hundred and five hundred yards, the entire range of houses, cheeks, &c., have been pulled down, the space widened, and buildings of suitable magnitude erected, which, when accomplished, we may with some degree of pride point to this locality as the centre of attraction in the good old town. Among the other improvements alluded to is the addition of an alcove to the front of the large building on the corner of St. George’s Hall, the time since completed.

William Walker, of George-yard, Crown-street, Soho, coach-smith, for “improvements in the manufacture of springs and axles for carriages.”—March 2.

Charles Wilson, of New-lane, Leighton, engineer, for “improvements in machinery for raising and forcing fluids.”—March 3.

Robert Stirling Newall, of Gateshead, Durham, wire-rove manufacturer, for “improvements in the manufacture of wire-ropes, and in the apparatus and arrangements for the manufacture of the same.”—March 7.

James Pilbrow, of Tottenham, engineer, for “improvements in the application of steam, air, and other vapours and gasous agents to the production of motive power, and in the machinery and apparatus by which the same are effected.”—March 8.

William Betts, of Ashford, Kent, railway contractor, and William Taylor, of the same place, plumber, for “improvements in the manufacture of bricks and tiles.”—March 8.

William Kenworthy, of Blackburn, Lancaster, cotton spinner, for “improvements in machinery or apparatus called beam or weaving machines.”—March 10.

Arthur Chiver Topper, of New Burlington-street, Middx, gentleman, for “improvements in the means of applying carpets and other covering to stairs and steps, and in the construction of stairs and steps.”—March 16.

Charles Chilton, of Gloucester-street, Curtain-road, and Frederick Braithwaite, of the New-road, engineer, for “improvements in machinery for cutting and polishing hard stone for fire and other purposes.”—March 16.

Charles Wilson, of New-lane, Leighton, engineer, for “improvements in the manufacture of metal covers for bottles and certain other vessels, and in the manufacture of sheet metal for such purposes.” (A communication.)—March 16.

Frederick Cook Matchett, of Birmingham, manufacturer, for “improvements in the manufacture of laces.”—March 16.

William Barbour, of Bremcraen, Carmarthenshire, gentleman, for “improvements in the composition of ink, blacking, and black paint.”—March 16.

James Malam, of Huntington, gas engineer, for “improvements in the manufacture of gas retorts, and in the modes of setting gas retorts.”—March 16.

William Laycock, of Liverpool, merchant, for “improvements in constructing houses and such like buildings.”—March 16.

Wakefield Pum, of the Borough of Kingston-upon-Hull, engineer, for “certain improvements in the construction or formation of booms or other water works.”—March 18.

Alexander Simon Wolcott, of City-terrace, City-road, machinist, and John Johnson, of Manchester, in the county of Lancaster, machinist, for “improvements in photography, and in the application of the same to the arts.”—March 18.

William Barker, of Manchester, millwright, for “improvements in the construction of metallic pistons.”—March 20.

Solomon Rolinson, of Dudley, Worcestershire, roll-turner, for “improvements in the manufacture of shot.”—March 20.

Joseph Needham Taylor, of Chesham, captain in Her Majesty’s navy, and William Henry Smith, of 33, Fitzroy-square, civil engineer, for “improvements in breakwaters, beacons, and sound-alarmers; also in living or transacting persons and goods over or through straits or obstructions of any nature, any of which may be used either separately or in combination.”—March 21.

Andrew Barclay, engineer and brass founder, Kilmarrock, Scotland, for “improvements in lustres, chandeliers, prandants, and apparatus connected therewith, to be used with gas, oil, and other substances, which invention is also applicable to other purposes.”—March 21.

Gregory Scale Walters, of Coleman-street, merchant, for “improvements in the manufacture of chlorine and chlorides, and in obtaining the oxides and peroxides of manganese in the residuary liquids of such manufacture.” (A communication.)—March 21.

Alfred Hooper Neville, of Chichester-place, Gray’s-inn-road, corn dealer, for “improvements in preparing loutis and other matters for food.”—March 24.

John Pearson, of Birmingham, machinist, for “improvements in fastening fasteners for iron and other apparatus.”—March 3.

Thomas Simpson, of Birmingham, manufacturer, for “an improvement in buckles.”—March 2.

Masta Joselin Cooke, of Gray’s-inn-square, solicitor, for “improvements in the manufacture of artificial hair.”—March 2.

John Grosvenor, of Nottingham, tailor, and Alexander Alliott, of Lenton, bleacher, for “improvements in machinery or apparatus for drying or freeing from liquid or moisture, woolen, cotton, silk, and different fibrous materials, and other substances, and also for stretching certain fibrous materials.” (A communication.)—March 7.

John Heathcote, and Ambrose Drewin, of Tiverton, lace manufacturers for “improvements in the manufacture of ornamented net or lace.”—Sealed Feb. 28.

Gottlieb Boccini, of New-road, Shepherd’s Bush, for “improved arrangement and apparatus for the production and distribution of light.”—Feb. 28.

George Bush, of Tiverton, lace manufacturer, for “improvements in machinery for drying wheat, malt, corn, and seeds, and for boiling, dressing, and separating flour, meal, and other like substances.”—March 1.
EMISSION.—LAND SURVEYING IN THE COLONIES.


Fee for the Course, to commence the 25th April, Five Guineas. Apply at 20, Queen-square, Bloomsbury.

P.S. The College Classes will be resumed at the same time.


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The two last heads are intended to contain all that is new in the literature of the arts, and an account of all new discoveries, inventions, and constructions. All the articles are original, and none but the most meritorious are admitted. Opinions of the Press.

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"A periodical that would give a decided and unbiased opinion on those subjects which relate to their particular trade, would be found very useful to the Artizan, as well as other professionals. There are too apt to state opinions favourable to the inventor or executor of a work of art, without considering that in so doing they are deceiving the public."

—Greenock Advertiser.

J. R. Smith, Son, Marshall, & Co., and all Booksellers.

TRANSPARENT DRAWING AND TRACING PAPER. REDUCED IN PRICE.—TO CIVIL ENGINEERS, ARCHITECTS, & SURVEYORS.—B. DIXON, after a number of years' study, has made perfect the most beautiful (Cryography) tracing papers, TRACING PAPER, very smooth and transparent, which will take ink, oil, and water colours, without running. The price is very low, and the following are the sizes:—80 by 20 ... Dia. Double Crown . 7s. 6d. 49 by 30 ... Double Double Crown . 7s. 6d. Yellow imitation of French 12.

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THOMSON'S IMPROVEMENTS IN HORTICULTURAL HEATING, &c. J. THOMSON, late Head Gardener to His Grace the Duke of Northumberland, at Syon House, and for many years in the Garden Establishment of Her Majesty, has introduced an improved plan of applying the Pipe Tank and Trough System, for both top and hot to hot houses and other horticultural erections, by which the perpetual nuisance and labour attending the continual opening and closing of the various ventilating and fire shutters, commonly used to produce bottom heat, are obviated. The apparatus can be fixed so as to produce a humid or dry atmosphere at will; and the expense does not exceed half that of any other plan of hot water.

Fig. 1.

Pipes for Bottom & Top Heat. Troughs for ditto.

The above plan of applying the Pipe Tank and Trough System of Heating, combined with his newly invented and economical boiler, has been adopted by, and may be seen at, the two largest Horticultural Establishments in Great Britain, viz., Messrs. Less Nursery, Hammarsmith, and Mr. Wilmot's, Bermondsey and Isleworth.—Designs and Estimates for warming horticultural erections, public or private buildings, &c., may be obtained on application to J. Thomson, Landscape Gardener, 1, Chapel Place, Hammarsmith.

3. T has applied the above system for bottom heat to pines, and for other purposes at Lord Prudhoe's, and several other places in England, with great success, within the last six years.

TO ARCHITECTS, ENGINEERS, SURVEYORS, AND OTHERS.

HOGCRAFT respectively calls the attention of the above, and all persons requiring accurate Rules, Scales, and Mathematical Instruments, that from the advantages it possesses, being a Manufacture, the trade is supplied to them with goods of a superior quality at prices reduced considerably below those usually charged, by which from 15 to 25 per cent may be saved. Rules and Scales of every description for Mechanical and Scientific purposes made to order on the shortest notice. Leveling Staves, Optical and Philosophical Instruments, equally reasonable, Merchants, Captains, and the Trade supplied on advantageous terms. Country orders, containing a remittance or an order for payment in London, promptly attended to.

W. Hogcraft, 38, Princes-street, Leicester-square, London.

Books of Instructions, grafts, with Side Rules.

AMERICAN STEAM EXCAVATING (Orris', New York) AND PILE DRIVING MACHINERY.

COMPLETE DRAWINGS to a large scale, together with every detail of these machines, may be had of GEORGE SPENCER, 29th March, 1842. Draftsman for Machinery and Patents.

G. S. respectfully offers his services to the profession and to patentees in preparing working or finished drawings of every description of machinery.

SEYSSL ASPHALTE COMPANY, "Claridge's Patent." Established March, 1838.—The extensive patronage which this valuable MINERAL production continues to receive from the most eminent ARCHITECTS, ENGINEERS, and contractors, in this and every other country, from the numerous fictitious compositions which its reputation gave rise to, but which having been tried very inferior to the original material, most of them have ceased to be used. Its merits being well known, it is only necessary to state, that a few of the public works already executed and now in progress, on the London and Greenwich Railway, and Joint Station, London Bridge, 480,000 superficial feet; several thousand feet at the Great Western, Birmingham, Midland Counties, South-western, Brighton, Blackwall, and other Railways: covering of Arches at the South Metropolitan, Highgate, and Nonhead Cemeteries; the covering of the Crematoria at the Peru Rock Battery, Liverpool, the installation of the Schoolbadges in the Horse Guards, and at the entrances to the Park at Apsley House; the Cells and other apartments of the new Prison at Herford: several works at the Stations on the Dublin and Kingstown Railway; and many other public and private works in this country, and in Scotland, Ireland, and the Western Counties.

A Scale of Prices, with Books of Testimonials, can at all times be had at the Company's Depot, where specimens of its various applications may be seen.

Seyssel Asphalte Depot, Stagante, near Westminster Bridge, March, 1843.

FROM "THE TIMES." December 5, 1842.

"Many of our readers may, perhaps, remember that some years ago, and previously to the introduction of Asphalte into this country, we expressed our admiration of the pavement, composed of that substance, in Paris, and that the same has since been laid in the Place de la Concordie, the whole of which has been long since paved with Asphalte. It now behoves us to point out the piece of Seyssel Asphalte that was laid in April, 1838, in Whitehall, opposite the Horse Guards, and in the Place de la Concordie, or in any part of Paris, and considering that its thickness is only half an inch, its having so long stood the traffic of so great a thoroughfare, without any apparent change, except a greater smoothness of surface, is very remarkable."
PRINCE'S PARK.

To Architects.

One hundred guineas will be paid in premiums for the best designs for four terraces to be erected in the Prince's Park, now in progress near Liverpool!—Plans of the ground and tall instructions may be obtained by applying to Messrs. Foster and Stewart, or Architects, Liverpool.

SMOKE NUISANCE.

The Metropolitan Improving Society having on the part of the public, determined to get abated the long-existing nuisances arising from furnaces used in the working of stream-engines within the metropolis, are desirous of receiving information from public bodies, and also private individuals, as to their experience in such nuisances, in order that injunctions may be preferred against the offenders; the same to be forwarded to James Amorion, Esq., the Honorary Solicitor of the Society, 20, New Bridge Street, London, or to the Committee, at the Society's Office, 20, Belfield Street, Strand.

HENRY AUSTIN, Hon. Sec.

THE THAMES TUNNEL IS NOW AT ALL TIMES OPEN TO THE PUBLIC as a Thoroughfare for Foot Passengers, at a Toll of One Penny each.

By order of the Directors,

J. CHARLIER, Clerk of the Company.

Company's Office, 2, Walnut Buildings, City, 25th March, 1843.

N.B.—Steam Boats to Wapping, from Hungerford, Adelphi, Temple Bar, Blackfriars Bridge, Old Shakes, Old Swan, and Adelaide Ferries, London Bridge; and from Old Battery to Cross Keys, from the West End, and from Gracechurch-street, at every half hour.

ANTI-DORY ROT COMPANY—KYNAN'S PATENT.

The directors of this Company having removed one of their 60-f. hydraulic presses to their Station, City Basin, City Road, desire to draw the attention of the public to the great facilities they now offer for preparing timber for railway in a few hours. When the quantity exceeds 100, the directors allow a considerable reduction in price.

GILLOTT'S PATENT FAN STOVE, for Heating and Ventilating Churches, Courts of Law, Hospitals, and all large public Buildings—It is particularly adapted for drying the walls of newly-built houses, for various manufactures where heat is required, without the possibility of accident by fire, as the apparatus is not only placed on the premises, but the hot air may be conveyed into the manufactory by a pipe, or pipes, and it would not ignite gunpowder. It is invaluable also for ships, as warm or cold air is admitted into any part of them, either for warmth or ventilation. May be seen in use at J. L. Benham's, 15, Wigmore Street, Cavendish Square, and at 60, Great Queen Street, Lincoln's Inn Fields.

TO AMATEUR TURNERS, CONNOISSEURS, AND OTHERS.

HARD WOODS.

R. HENENSEY, of 383, High Holborn, begs to announce that he has on hand a small stock of the choicest AFRICAN BLACK WOOD, the only impotation for 30 years. This beautiful wood contains no acid, has a remarkably fine grain, is not liable to rust, and on this account particularly recommended to the notice of surgical instrument makers; for eccentric turning purposes, R. t. has always on hand at his warehouses Brazilian and French tulip, sandal, and violet woods; also the root of the olive tree, kibob, and a greater variety of curiosity hardwoods than can be found in any other establishment in the kingdom.

N.B. An immense assortment of veneers.

TO CARPENTERs.

Elm and American timber.

New and Old Oak Ground Joists and Sleepers.

Yellow and White Dry Prepared Floor Boards.

Yellow and White Dry Prepared Dado from 4 in. to 1 in. thick.

New Fir Scantlings, all sizes.

New Oak Dado.

Mahogany at Reduced Prices.

Apply at WILLIAM CLEAVE's, THREE-YARD, 9, Smithfield Yard, Westminster.

WANTED, A PARTNER, in an extensive and well established Ironfoundry and Engineering Concern, in full work, in a populous manufacturing district in one of the Midland Counties. To a practical man, with a capital of from £1,000 to £200, the above presents such an opening as is seldom to be met with—Apply C. Y. at Messrs. J. Barber and Co.'s, Newhall Street, Birmingham.

TO ARCHITECTS.

A young man wishes to meet with an engagement in an architect's office, or to superintend the erection of works. Highly respectable references can be given.—Address, prepaid, to A. Z., Mr. Elliot's, 268, High Holborn, London.

SKE.—The following remarks on Rodda's Plan were made at a meeting of the Leeds Parks Co. on the 26th Jan., 1843.

The Rev. J. A. Rodda said, that, if the meeting would permit him, he would mention what plans he knew to be very effectual. He had been for years annoyed at his residence at Mytholm by the smoke arising from the mill of Messrs. Robinson and Co., at that place. He had remonstrated with them on the subject, but, being the owner of a mill himself, he thought it best to try to prevent smoke at his own mill, in order that, if he succeeded, he might do the same at Mytholm. He had purchased one or six other plans that he had tried. He had persevered in the use of Rodda's apparatus, which prevented smoke, effected a saving in the fuel, and had cut down the cost of the milk. He had raised his business gradually, and certainly the apparatus had been put up to his (Mr. Rodda's) entire satisfaction, and was quite effective in preventing smoke.—Mr. Macleod had Rodda's plan in use for six months, and he could testify to its good effects.

Mr. Atkinson, if any plan that was known could prevent a large quantity of smoke being emitted from the flour-mill at Mytholm, was to the allowance to Rodda's. Messrs. Pease and Heath were also of opinion that Rodda's plan was the most effective and the best. Mr. Horrocks replied that Mr. Rodda's did to a great extent.

Mr. Lecceus said that Messrs. Pease and Heath, and also Mr. George, had had Rodda's plan in use for three years, and found it was not at all well; he had found that, when the plan was in operation, the smoke was raised above the chimney, and there would be no saving in the fuel; he affirmed that Mr. Rodda's plan would have no effect. Mr. Holtforth stated how he did with his men. He went to the chimney and said, when the plan was in effective operation, "Now, you see there is no smoke issued from this chimney? Not so; the chimney will be as black as before. " 'Yes,' said the man. 'Well, then,' replied Mr. Holtforth, 'take notice and remember, that if I see any smoke coming out of the top of the chimney at all, you must take that as my month's notice to quit.' Mr. Holtforth had found that the effect of the plan was to make the men attentive to his duties; and the man managed well, and to his (Mr. Holtforth's) satisfaction, he occasionally gave him a little reward.

The letter was read in Levens, and begins to inform the proprietors of steam engine, &c., in Yorkshire, Lancashire, and elsewhere, that he has reduced his prices, and is also furnished with numerous testimonials as to the perfect satisfaction derived from Rodda's Patent. Communications, addressed to 11, Bridgegate, Leeds, attended to immediately.

DREDDGE'S PATENT IRON BRIDGES.

This economical and powerful system of construction is based upon the principles of the lever—therefore, it is adapted for the heaviest traffic on rail and other roads, and for the largest or smallest spans in all situations. It is half as expensive as timber bridges; and, taking an average of two years of service, it is found that the time occupied to construct this system admits of the erection of 10 powerful bridges for one, there being so much less material and labour in their construction. The Clifton-bridge, upon which the principle of the patent was first adopted, was reduced to a model for a future enterprise. The first bridge thus constructed was first used by the Victoria Bridge Company, over the Avon at Bath, in 1836, in a bridge 520 feet long, and 19 wide. Afterwards, the government adopted it in five bridges in the Regent's Park; and Sir James Cowgill, Bough, over the Lowther, in a bridge 2300 feet long; this bridge is 100 feet high and 200 feet wide. Another is erected at Weymouth, near Windsor, for G. S. Harcourt, Esq., and one across the river Frome, for H. Miller, Esq. The principles of the patent, sections, and description of Mr. Harcourt's bridge is published in the “Architect, Engineer, and Surveyor.” No. 36. It is 100 feet long and 19 broad, and its cost was less than the centering for a stone bridge of the same magnitude.

* * * J. Desvres will undertake the construction of bridges, and guarantee their stability; and he will take shares in any toll bridges he may erect.

Bath, March 1.

By HER MAJESTY'S ROYAL LETTERS PATENT.

Gerish's Patent Door Springs, for Closing the Entire Division of Door. Manufactured, 16 East Road, Hoxton New Town.

These springs consist of parallel and rising hinges in Brass or Iron, and swing centres for doors opening both ways.

These improved and patented door springs merit general attention, as they can be applied to any door, in every situation, without defacing the wood-work; their action is easy and noiseless, neat and not visible when the door is opened or closed, and more than one half the price; they allow the door to go quite back, and are likely to get out of repair.

There is one of the largest centres possesses in a simple combination of power double the strength of any hitherto invented in a much smaller size, and at little more than half the expense.

LITHIC ANTI-CORROSION PAINT, long known for its durable qualities in all climes as a cheap door-varnish for covering brick Wood, or Iron. Manufactured in Stone or Slate Colours by J. B. WHITE and SONS, Millbank Street, Westminster, Roman Cement Manufacturers.
ROOF OVER THE RIDING SCHOOL,
NEWCASTLE ON TYNE.

AMERICAN STEAM EXCAVATOR.

REVERSING APPARATUS FOR LOCOMOTIVE ENGINES.

Scale

Fig. 1. Fig. 2. Fig. 3. Fig. 4. Fig. 5. Fig. 6.
THE AMERICAN STEAM EXCAVATING MACHINE.

("YANKEE GEOLOGIST")

(With an Engraving; Plate VI.)

This machine, which is the invention of the late Mr. Otis, of New York, is an application of steam power to the purposes of excavation and dredging; and for the former purpose, appears greatly superior to any thing which has hitherto been achieved in excavating machinery. The accompanying engraving, which has been made expressly for our Journal, by Mr. George Spencer, Mechanical Draughtsman, from the original working drawings in his possession, presents the principal side elevation (Fig. 1) of the machine, which brings all the working parts sufficiently into view; Fig. 2, a plan of the horse-shoe pulley and crane top; the dotted lines show the position of the lower framing or stage and boiler; Fig. 3, shows the crank shaft and gearing; Fig. 4, the main drum; Fig. 5, the main drum for working the excavator; and Fig. 6, a plan of the excavator.

The whole of the details of this machine, which are very elaborate and complete, of course cannot be attempted in an article of this nature; we will, however, describe as much of the details and its principal feature as are necessary to a proper understanding of the several movements of the machine, and then describe each of those movements separately. The machine consists of a strong horizontal wooden framing or stage A, mounted upon two pairs of railway wheels B, for locomotion, which run on temporary rails, laid down as may be required; on the one end of the stage is fixed a cylindrical boiler C, and the gearing for turning the crane round. In the middle is placed the gearing for working one of the motions of the excavator D; and, at the other end is placed the wooden crane E, in form similar to an ordinary timber crane, on the diagonal brace of which is placed a platform f, on which an assistant stands; and gearing U, for working another motion of the excavator D. To support the machine laterally, strong brackets or arms project on either side, the ends of which are furnished with screws to adjust the machine to the inequalities of the surface of the ground.

The excavator or shovel D, (Figs. 1 and 6,) is formed of stout boiler plate, and is firmly riveted together; it is of a box shape, having one end open; on the lower edge are four tongs or points, which serve to penetrate and loosen the soil; the other end is hung on swivel hinges, and fastened by a spring d, which may be set at liberty by means of the lever and rods a, Fig. 1.

The machine is made to perform three distinct movements; 1st, the digging movement; 2nd, the turning movement, and 3rd, the locomotive movement.

The Digging Movement consists of two motions, one for drawing the excavator forward, and the other for driving it into the ground, both of which is done simultaneously; the first motion is performed in the following manner. On the horizontal stage A, and in front of the boiler C, is placed a small high-pressure engine, (not shown in the engraving,) the connecting rod of which acts upon the crank e, and gives a rotary motion to the shaft I, and with it the pinion g, (Fig. 3,) which works into the large wheel M, mounted on the shaft N, upon which is fixed a large channelled barrel or drum n, (Figs. 1 and 4,) round which the hauling chain O is coiled; this chain passes upwards through the hollow crane post, over the indented pulley P, to a double pulley fixed at the jib head, thence round the blocks R, to which the excavator is suspended, as the chain wound up draws the excavator out of the ground both in a forward and upward direction, when driven into the ground by the second motion. This last motion is communicated by the chain traversing over the indented pulley P, to another gearing. On the axle of the indented pulley P, is fixed a bevelled wheel s, (Fig. 2,) which works into a similar one t, (Fig. 1,) mounted on to the upper end of the oblique shaft V, on the lower end of which is a corresponding bevelled wheel w, working into another w, fixed upon the shaft W; upon this shaft is a pinion m, which takes into the large spur wheel n, mounted upon the shaft U, upon which is a channelled drum s, round which is coiled the chain s, attached to

the diagonal wooden arms S; on the lower end of these arms is fixed an iron yoke, to which is suspended on pivots the excavator. By this arrangement, as the main chain O passes over the pulley P, motion is communicated to the shaft U, for the purpose of forcing downwards in a diagonal direction the arms S, and with them the excavator into the ground. A man stands upon the stage f, for throwing in and out of gear this apparatus, and to regulate the motion for lowering or raising the excavator.

The next motion to be described, is for the purpose of turning the crane round either to the right or to the left; this is effected by another gearing in the following manner. On the first crank shaft L, is fixed a bevelled wheel l, (Fig. 3,) which works into a similar wheel g, mounted on to the end of a horizontal shaft G, upon which are placed two bevelled wheels g', g'', either of which can be thrown in or out of gear so as to work, as may be required, into the large bevelled wheel k, mounted upon the shaft H; upon this shaft is a pinion k', which works into the wheel j, fixed upon the shaft J, upon this shaft is fixed an indented pulley j', round which the chain r, is coiled, and passes upwards over pulleys s, round either side of the horse shoe pulley, to the ends of which it is fixed by iron bolts; the horse shoe pulley is fixed by means of strong iron stays to the crane, and when it is made to revolve the crane jib is turned round on the stationary post l, either to the right or to the left as may be required, and empties the contents of the excavator into a wagon or barrow.

The Progressing Motion is effected by placing on the hind wheels axle a strong wheel, shown by a dotted circle b, (Fig. 1,) which communicates with a pinion b', on the shaft j, by an intermediate pinion b'', as shown by a dotted circle; motion being given to the shaft H, by the bevel gearing, described in the last motion, a forward or backward motion of the machine is obtained.

We have no precise data as to the cost of the machine or the quantity of work that can be performed by it, further than a short paragraph we gave in the last November number of the Journal, wherein it states that the machine is capable of digging 1000 cubic yards of earth per day, and that a machine complete costs about 6000 dollars in America.

ROOF OF THE RIDING SCHOOL AT NEWCASTLE-ON-Tyne.

(With an Engraving; see Plate VI.)

Sir—Having expressed your intention of giving some examples of construction useful to the student, in the description of the roof of the Polytechnic Institution, Vienna, in a former number of your excellent work, I am induced to send you the enclosed sketch, on account of the similarity of construction in the two, and they bring the only cases I know extant where support is obtained from the side walls of the building on a line lower than the level of the tie beam, I shall first describe the peculiarities of the Vienna roof, and then of the roof at Newcastle. The former is 50 ft. span, and formed of curved ribs 12 in. square, standing on a set-off of the wall considerably below the wall plate, and the crown of the rib rising above as much again above it, the slope or pitch of the roof being made uniform with rafters of smaller scantling. The ribs are cut out to the sweep of the curve, and are not laminar ribs, by which mode much additional stiffness is acquired. It is evident the arch is the principle of construction. The covering is copper, the weight being about 100 lb. per square, whilst tiles are 650 lb. weight per square. The annexed engraving exhibits the roof constructed over the circus or riding school at Newcastle, erected in 1759, under the superintendence of Mr. David Stephenson, architect, who was a resident and practised in Newcastle; he was the architect of the Theatre Royal and All Saints' Church, and architect to His Grace the Duke of Northumberland, &c. The span of the roof is 64 feet in clear of the walls, the length about 75 ft., and the height of the room from the floor to the crown of the arch, or horizontal beam at the foot of king post, 30 ft. The tie beams and principals are 12 ft. by 6 ft. placed 10 ft. apart. The struts from king post 8 ft. by 8 ft. No. 68.—Vet. VI.—May, 1843.
The king post, straining collar (the horizontal beam) and struts from side walls, 12 ft. by 10 ft. in two thicknesses and bolted together. The purlings are 10 ft. by 6 ft. and about 9 ft. apart, being four in number on each side of the span. The common rafters are 5 ft. by 2 in. and are placed 3 ft. apart from centre to centre. The ridge 12 in. by 2 in.

By a comparison of the two roofs, the simplicity of the Newcastle roof over that with curved ribs is at once apparent; no wall plates are used at the foot of the struts on the side walls, and at the level of the eaves; a pole plate and vertical posts at the foot of each rafter is dispensed with. The braces are prolonged to the king post, and act both as a tie beam and a counter strut to the main struts or portion of the curb roof, resting on the side walls at a level lower than the eaves.

The principle of this roof is that of the common curb roof, as by inspection of the sketch it will be seen that the strongest scantlings are so arranged. On a few of the couples or pairs of principals a curved rib is affixed to the tie beam and strut, so as to give the roof a curvilinear form; but as it is dispensed with in some, it shows that it is not essential to the stability of the structure.

I am, Sir,

St. Ann's, Newcastle-on-Tyne.

Your obedient servant,

O. T.

ON REVERSING LOCOMOTIVE ENGINES.

(With an Engraving, see Plate 1')

Sir,—Having by chance fallen in with a number of your Journal, (the number for February, 1842,) I perceive in it a design for reversing locomotive engines, signed H. and P., upon which, with your permission, I beg to make a few remarks, as the principle of it is similar to one of my own.

In the latter part of the year 1841, I designed two plans for reversing, the reversing valve being in the one case a slide, and in the other a four way cock; the former of these was published in a contemporary journal, but having been forestalled in my design for the latter, it was never published. The two grand objections to be contended against in these designs were, the pressure of the steam against the under side of the slide when reversed, and the impossibility of obtaining double lead; to obviate the former of these, I proposed the design enclosed, which is much more simple and less complex than H. and P.'s plan. In the first place, the use of the four way cock for changing the direction of the steam, does away with the necessity of filling up the smoke box with the piston valve, and besides, less expensive; secondly, the connexions between the pistons in the working valve box, are mere rods, instead of the pipes used by H. and P.; thirdly, a less quantity of steam pipes are required, as instead of two sets of pipes between the reversing and working valves, I use three short pipes crossing the bottom of the smoke box, connecting the centres of each box, and the ends individually.

For explanation of my design, allow me to refer you to the sketches enclosed.—See plate V.

A, is the steam pipe, which conveys the steam from the top of the dome H, through the top of the smoke box, to the four way cock B, from whence the pipes C and D, take it to the valve boxes, the pipe C, connects the cock with the ends of each valve box, or that part on the outside of the working pistons in it, and the pipe D, connects it with the centres of each box or that part of the box between the pistons, in Fig. 1; the four way cock (shown in section) is so set as to allow the steam to proceed along the pipe D, to the centres of the valve boxes, while the waste escapes up the pipe C, from the ends of them, into the blast pipe; there are three pipes between the valve boxes E F, one of which is shown at P; the section of the valve box in Fig. 2, shows the positions of these pipes, which enter the box at K, K, K, the pipe D, being connected to the box opposite K', and hence proceeding across to the other box, and the pipe C being connected opposite to the passages K K, and thence crossing to the box on this side; the mode of action of the valve is so simple, as not to require any explanation further than that the pressure is balanced as effectually, as in H. and P.'s plan: the dotted lines show the position of the four way cock plug when reversed. Having, as I hope, fully described by own plan, will you allow me to say a few words respecting H. and P.'s mode of obtaining double lead, may I ask them if this plan has ever been tried, and if so, if it was found to answer the inventors' expectations, as it is my firm belief, that if it had been tried before its appearance in your pages, it never would have made that appearance. The mode of working two valves with one eccentric, is an exceedingly ingenious one, and as far as I am aware, is quite an original idea; but it will not require much demonstration to show the futility of the mode of obtaining lead, by the use of the circular slots; the mistake into which H. and P. seem to have fallen, is by no means a solitary instance of premature conclusions, as witness the propositions contained in the 3rd and 4th Vols. London Mechanic's Magazine. I will take the same position of the eccentric, as given by H. and P., thus in Fig. 3, let the perpendicular dotted line represent the position of the crank, being at half stroke, then (lead being given) the position of the pin on the lever for working the valve, will be at D; but suppose the steam passages to be reversed, the crank, carrying with it the eccentric ring, will revolve in a contrary direction, and the pin D, will not be moved until the crank arrives at C, as shown in Fig. 4, consequently the valve will be just so much in error as it had lead in the former position, as the valve lever will not be in the proper position for giving lead until the crank arrives at C, whereas it ought to be in the same position as in Fig. 3, which is at half stroke. It is not, perhaps, generally understood, that the real position of the valve to obtain lead requires no alteration, when reversed in this manner, but the relative position of the valve to the motion of the eccentric must be altered.

I am, yours, obediently,

42, Great Avenham Street, Preston,

April 7, 1843.

WILLIAM JOHNSON.

VELOCITY OF WATER DOWN VERTICAL PIPES.

Sir,—I have attentively perused the several articles which have lately appeared in your scientific Journal, on the velocity of water down vertical pipes under certain conditions; but by no means agree with your correspondent T. F. . . . n, who asserts, that the velocity of water down a vertical pipe 16 feet long, under these conditions, will be 32 feet per second. Nor does it appear to me, that the mutual cohesion between the several layers or particles of water in the pipe, is a force sufficient of itself, to account for the solidity of the issuing stream, as stated in a late number of your Journal.—The following is my humble opinion on this interesting subject.—

First, as to the velocity of water down a vertical pipe 16 feet long, the top of the pipe being considered to be always covered with water.

The following table extracted from "Grier's Mechanic's Dictionary," exhibits the natural velocity due to a body, after having fallen through the aforementioned distances: and will be found useful as a reference in the following remarks.—

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<th>Velocity acquired at the end of the time in feet per second.</th>
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<td>18</td>
<td>33.1975</td>
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</table>

It appears from this table, which is founded on the well-known law, that "the velocity acquired by a body falling from rest in a free space, is as the square root of the space fallen through," that the velocity of
water at the end of the 1st ft. is 7-3103 ft. per second, (and not 4 ft. as stated by your correspondent T. F. . . . n); at the end of the 4th ft. it is 15-6502; and at the 16th ft. 31-3176 ft. per second: or, in round numbers, 8, 16, and 32 ft. per second. If then the motion of the whole of this column is uniform, whence has the power been obtained to increase the velocity of water at the end of the first foot, from 8 feet per second, to, say, 16 or 32 feet per second? Doubtless from the superior velocity due to the lower parts of the water in the pipe. If this is the case, then must the natural velocity due to the lower portions of the water be diminished; for nobody in motion can impart any motion to another body at rest, or increase the velocity of that body if in motion, without a diminution of its own velocity, in proportion to the respective momenta of the two bodies.—Therefore, it is not possible that the water at the end of the 16 feet pipe, whose natural velocity is 32 feet per second, can, after it has imparted a quicker motion to the higher portions of water, still possess the same velocity that it would have had, if it had not parted with a portion of that velocity, in increasing the velocity of the upper parts of this column. Consequently, it follows, that the velocity of the water issuing from the pipe must, (if the stream fills the pipe and flows uniformly through it), be diminished, and therefore be less than 32 feet per second.

Next, as to the cause of the **solidity** of the issuing stream.—Let us first consider the phenomena of a stream of any liquids falling from a height, but not down the interior of a pipe; or even a continuous stream of leaden bullets. For a short distance we perceive the stream solid, till the increased velocity of the lower parts as they descend causes them to leave those immediately above them, air filling up the intervening space, and thus the solidity of the stream is broken. Now let us turn to the pipe, and we see, by the above table, that the natural velocity of a layer of water which has fallen one foot, is 7-3103 feet per second, and of another which has fallen two feet, 11-0637 feet per second; why then does not this lower portion fall faster than the higher one, and separate from it, and thus break the solidity of the stream? Simply because if it did so, there would be a vacuum between these two portions of water, because the sides of the pipe are impervious to the air; and as the atmosphere is pressing on the water at the top and bottom of the pipe with a pressure, say, of 11 pounds per square inch, these portions are kept together by this pressure; for no sooner does an under stratum of water try, as it were, to leave the stratum above it, and form a vacuum, than the pressure of the atmosphere at the top of the pipe is brought into action, and the velocity of the upper stratum increased; while at the same time a portion of the atmospheric pressure, being by the same tendency removed from the upper surface of the lower stratum, the full pressure of the atmosphere is exerted upwards at the base, and the velocity of this lower stratum is consequently diminished. This certainly appears to account more satisfactorily for the solidity of the stream, than the force of cohesion; for this force must have the same influence over the particles of water whether they are in the inside or on the outside of the pipe.—As a proof, that when water is descending in the interior of a pipe, which is continually covered with water on the top, the atmosphere has a tendency to rush in through the sides. I need only mention the well-known fact, that if in a pipe under these circumstances there happen to be a crack, or a hole bored through the sides, the air immediately rushes in, and the solidity of the stream is destroyed.

Lastly, to determine the actual velocity of this continuous column of water.—Let us suppose the water in the pipe composed of an immense number of lamina, each of the thickness of a particle or atom of water, and consequently of the same thickness and weight; and let us take under our consideration the case of any two of these contiguous lamina, and suppose that the velocity due to the higher one is, say, one inch per second; and the velocity due to the lower one is, say, two inches per second. Then if these two lamina, when moving with these velocities, be at the same instant connected by the pressure of the atmosphere, or otherwise, so that the one cannot move on without the others moving along with it, it is evident, since the quantity of matter in each is the same, that the resultant velocity of the two will be one half of the sum of their original velocities, or one and a half inches per second. If then we could obtain the natural velocities due to each respective lamina, the average would be the result and velocity for the whole column. On taking the average of initial and final velocities due to the water at the end of each successive two feet, from the foregoing table, and then dividing their sum by 8, we have 20-6077 feet as the average velocity of the whole column. And if by approximating rather more closely to the system of atomic lamina, we take the average of the initial and final velocities due to each foot of water, and divide the sum by 16, the resultant is 20-7265 feet per second.

Again, since “The velocity acquired by a body falling from rest in free space is as the square-root of the space fallen through,” the space varies as the square of the velocity. If then, we take the spaces fallen through at the termination of each foot in the 16 feet, (as in the first column of the above table) as abscissa, and the respective velocities (as in the second column) as ordinates, the resultant curve will be a parabola similar to the figure below.—

Let us suppose the line AB, represented in this figure 16 feet, or the space fallen through, to be divided into an almost infinite number of parts equal to the number of atomic lamina in the column of water; then if we could find the length of the several ordinates at those points, and divide the length of the whole by their sum, the result would be the average length of all the ordinates, and consequently the average velocity. This can be done by finding a rectangle whose area is equal to the area of the parabola, and one of whose sides is equal to AB.—Now, \( \text{area of abscissa } AB \times \text{ordinate } BC = \frac{3}{8} \times 16 \times 31-3176 = 334-0544 \text{ ft.} \), therefore \( \frac{334-0544}{16} = \frac{1}{16} \times 31-3176 = 20-5784 \); consequently the two sides of this rectangle are 16 feet and 20-5784 feet, of which 16 feet represents the space fallen through and 20-5784 feet the average of all the ordinates, and consequently the average velocity. 20-5784 feet therefore is the average of the natural velocities due to the several atomic lamina composing this column of water. Again, it is evident, that since the abscissa AB (or 16 feet), enters both into the numerator and denominator of the fraction representing the average velocity, it may be eliminated altogether; and the expression then becomes \( \frac{3}{8} \times 31-3176 \); or, “The velocity of water descending the interior of a pipe 16 feet long, is equal to \( \frac{3}{8} \) of the natural velocity due to a body, after it has fallen through a distance, in free space, equal to the length of the pipe.”

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SHELPSHEER LUNATIC ASYLUM.—We understand Messrs. Cooper, builders, of this town, have entered into contract with the magistrates of the county of Salop, for the erection of a Lunatic Asylum for that county. The building is from a design by Messrs. Scott and Moffatt, of London, in the Elizabethan style. The extent of the front 280 feet, and arching 170 feet. The plan is in the shape of the letter H. The first part of the building will cost £11,000.—*Derby Reporter.*
THE AERIAL TRANSIT MACHINE.

Analysis of the projected Aerial Transit Machine, and of the principles involved in its construction and employment.

From the earliest period of antiquity the desire to navigate the skies has ever formed one of the most prominent passions of the human breast. In the commencement, ere man had acquired sufficient skill to be able to submit his ideas to the test of experiment, the indulgence of this passion could only display itself in vain aspirations or the wild effusions of an unrestrained and romantic imagination. To this source may be traced some of the most elaborate conceptions of the Heathen poets; the fables of Dedalus and Icarus, of Persians and Bellerophon, the air-born car of Modea, the winged heel of Mercury, the Harpy, Chimara, Pegasis, and many others equally fanciful and absurd, which characterise the history and mythology of the remoter ages.

As the world, however, advanced, and some insight began to be obtained into the nature and constitution of the surrounding atmosphere, the reveries of the poet gradually gave way to those of the philosopher, and men at length bethought themselves of imitating what, before, they had been contented to admire. Thereafter to the present period, all that human ingenuity could devise, has been constantly arrayed in the pursuit of this favourite object, and the empire of the skies has never ceased to be contested with an energy and zeal almost as great as ever was displayed in the subjugation of the earth.

Of the schemes to which this interesting inquiry has given rise, some, and those among the earliest, professed to operate after the manner of birds, by the mechanical reaction of wings against the subjacent air. Such was the nature of the plans of Roger Bacon, Fleyder, and others, too numerous to mention, some of whom attested the insufficiency of their devices at the expense of their limbs, and even of their lives, while some, more cautious, only projected experiments, which they left to others to perform.

To schemes of this description, which may be termed the mechanical, succeeded others based upon the physical or chemical principles of the atmosphere, real or presumed. Of this nature were the designs of Bishop Wilkins, and the Jesuit Lana, and that (more absurd than either) which, proceeding upon the supposition that the particles constituting the upper strata of the aetherial mass were of a more buoyant consistency than those below them, proposed to accomplish its object by enclosing in a proper vessel a portion of air abstracted from the very regions which itself was to offer the only means of approaching.

It would occupy more space than we could here afford, and serve moreover no beneficial purpose, were we to attempt to recount, much less to describe, all the schemes that have been successively proposed, dilated upon, tried, found wanting, and subsequently abandoned, in the prosecution of this interesting design. Suffice it to say that in the one material point, namely, the procuring an elevation into the bosom of the air, they all proved equally infeoffed, until the discovery of the balloon by the brothers Montgolfier in the year 1782. Two instances, indeed, and but two, are authentically recorded, in which the attempt to fly by mechanical means had been attended with partial success—that of the Marquis de Baequeville, who, in the year 1742, accomplished a flight partly across the Seine in Paris, and that of an individual of the name of Degen, who, at Vienna, some years ago, succeeded in raising himself to a height of about 50 feet by means of the alternate reaction of large surfaces shaped after the fashion of an umbrella, and worked by the exercise of the arms and legs. These, however, were but the more splendid failures; and the prospects of aerial navigation may be said to have been at the very lowest ebb when the ingenious discovery of M. M. Montgolfier, with the subsequent improvements of M. Charles, in which hydrogen gas was made to take the place of heated air, revived the drooping spirit of enterprise with the promise of a more easy triumph in the fields of air. Abandoning the former mode of operating for the purpose of obtaining an ascent, men now directed their attention entirely to the means of controlling the motions of the machine, by the intervention of which that, apparently the most arduous and perplexing condition of atmospheric transport, had been so suddenly and unexpectedly accomplished.

In this, however, as in the more independent processes of flight by mere mechanical reaction, human ingenuity was doomed to be defeated. With all the flattering prospects of success which an almost unlimited power of support appeared to hold out, not only was there no commensurate progress in the essential object of securing a definite direction, but even greater difficulties appeared upon further acquaintance to stand in the way of aerial guidance by means of the balloon, than were apprehended, before that instrument had brought men into a more practical acquaintance with the character and conditions of the element with which they had to contend. The magnitude of the forces developed, owing to the necessary bulk of the machine, seemed to deride all attempts at control, while at the same time the expenses attending its construction and employment, imposed a limitation upon the experiments, by means of which alone these obstacles could be expected, if ever, to be overcome. Under these accumulated and, perhaps, insurmountable difficulties, the balloon gradually ceased to be regarded as an object of scientific interest, and at length shared the fate of all other discarded favourites, in a neglect as inconsiderate as it had formerly been courted and admired.

After a period of excitement, a state of lethargy is no uncommon result; and accordingly when the first burst of admiration and wonderment had subsided, and a succession of failures had begun to characterise the new art with something like a tinge of absurdity, the public gradually settled down into a condition of apathy and disregard in respect of aerial navigation, even the more profound from the greatness of the disappointment to which they had so recently been subjected. Occasionally, indeed, the rumour of some new improvement in the art of "flying made easy," more plausible or presumptuous than the rest, would startle them from their propriety, and, for a while over-casting their antipathy to the balloon, awaken a languid spirit of speculation, in which the dread of disaster connected with an instrument by which they had been so often before deduced, has again roused all their sympathies, and produced a fever of expectation which a month of cool reflection has not yet been able to allay.

The first communication of this project in a tangible form, having taken place since the publication of our last number, we were precluded from giving it that notice at the time which we would otherwise have bestowed upon it; not only as in itself meriting investigation, but in consideration of the intense interest and divided opinions it had certainly excited throughout no small nor undetermined portion of the community. ushered in with a somewhat more than ordinary degree of pretension, backed by reference to experiments of a most flattering description with models, and, to crown all, stamped, as it were, with the authority of a bill in Parliament, it not only justifies but imperatively calls for an inquiry which, to be available, must be equally searching and exact. It is of no use to regard a scheme of such complicated contrivance and involving such recondite principles, in a superficial manner or in a general point of view. The mere fact of a principle being correct is no proof of the practicality of a scheme which is founded upon it; and if the success of a model be conclusive in respect of the object it is intended to represent, neither would Mr. Cocking have perished in the descent with his parachute, nor would this very question of aerial navigation have remained undetermined to the present day. 1 In fact the working of

1 The public were first made acquainted with the details of Mr. Henson's patent through the plans and descriptions which appeared in the weekly journal of that rather eminent date, the 1st of April.
2 It is well known that Mr. Cocking had spent upwards of 20 years in framing and improving models of the machine in which he afterwards lost
A model determines nothing that cannot as well be determined without it—the correctness of the principle, which is the proper subject of mathematical research. With regard to the possibility of its construction upon the great scale it would determine nothing, even if it were, which in this case it is absolutely impossible it should be, in the strict sense of the word, a perfect model, observing all the proportions of strength, weight, bulk, power and dimensions as they will appear in the real machine with reference to which they are contrived. The only true and satisfactory mode of arriving at any thing like a correct conclusion respecting the efficiency of the machine in question, or any other of the like character, is by a critical examination of its parts severally and with reference to each other, which is the course we intend to pursue on the present occasion. To enable us to do this the more intelligibly, we will begin by describing in a few words what Mr. Henson's machine is, and what is the principle upon which it is intended to act, so far as they can be collected from the statements in the public press. In general terms, then, Mr. Henson's machine may be described as an horizontally extended plane, 150 feet in length and 30 in breadth, (consequently containing an area of 4,500 square feet) across which, close beneath and in the centre, is suspended a uniform car or body accommodated with a pair of circular flying vanes, by the oblique impact of which against the air (upon the principle of the Archimedean screw) it is designed to be propelled, and furnished with two caudal appendages like fans, one of a large and the other of small dimensions, by means of which the vertical and horizontal course of the machine is intended to be controlled. The whole is proposed to be set in motion by an accession of extraneous force acquired through the intervention of a preliminary descent down an inclined plane, and maintained by the operation of a steam-engine located in the body or car of the machine. Omitting therefore the consideration of minor details, our attention will be directed, in succession, to the suspending plane—the caudal appendages—the flying vanes—the motive power—and, finally, to the principle upon which the elevation in the first instance is intended to be secured.

And, first, with regard to the suspending plane. The object of this contrivance, involving, in fact, the essence of Mr. Henson's patent, is, simply, to obtain a direction for a certain amount of weight different from what it would assume if left to pursue its course according to the unobstructed force of gravitation. This it accomplishes, or would accomplish if efficiently constructed, by a progressive motion conferred upon it at an angle inclined to the horizon, whereby a part of the force generated by its opposition becomes resolved in a direction opposed to its descent; and the merit of it consists in this,—that a less degree of force is required to produce this progressive motion than that which the actual weight of the machine would require for its support. A familiar mode of illustrating this has been adopted by Sir George Cayley, in the Mechanic's Magazine for the first of April. It proceeds upon an analogy with the suspension of spherical substances upon an inclined plane, and cannot be better explained, as far as it goes, than in his own words. "Suppose A B to represent an inclined plane, rolling back. Conceive the same line A B to represent, also, the section of a large surface, like the sail of a ship, and that C G represents a cord by which it is sustained from being driven back by a horizontal wind in the adverse direction. If the sail contains 100 square feet of surface, and the wind has sufficient power to press with one pound to the foot, 100 lb. weight will be supported, and the tension on the cord will be only 10 lb. It is the same thing whether the wind thus blows against the sail, or the sail be driven with equal velocity horizontally in calm air; the 10 lb. propelling power will still sustain the 100 lb. in the air." It only remains to observe in what manner it effects this; namely, by producing such a rate of motion in the inclined plane as, at the given angle, would generate a pressure of one pound to the square foot.

Now to apply this to the case of Mr. Henson's machine. In the first place, the area being 4500 square feet, and the weight (taking it according to the statements in the public prints) being 3000 lb. supposing the same angle of inclination to be observed as in the foregoing illustration (that is to say, one in ten) if the wind move at a rate sufficient to generate a pressure equal to two-thirds of a pound upon the square foot, the resistance to its horizontal progress, and consequently the force it would require to compete with that resistance, would be one-tenth of its actual weight, or 300 lb. If, instead of an angle of inclination of one in ten, be substituted an inclination of one in twenty (which is perhaps more nearly in the ratio observed by birds in their flight, and consequently more consistent with the analogy Mr. Henson appears most desirous of maintaining) the same result will be obtained with half the force, or a resistance of 150 lb.; and accordingly it is upon this hypothesis that we shall proceed, in the next place, to investigate the rate at which the machine must be propelled in order to enable it to realize this resistance.

The proposition which we here have to deal with is simply, "having the pressure upon a plane surface at a given angle of inclination, to find the rate under which that pressure is developed," and the solution is deduced from a consideration of the rate corresponding to the resistance the same plane would experience if perpendicularly impinged upon.

We will not trouble our readers with entering into the details of the equations by which the ratio of the forces generated by inclined planes moving in fluid media has been determined; but, content with referring them to the solution of these interesting problems to Whewell's Treatise upon Dynamics (or indeed any other works of good repute upon the same subject), proceed at once to observe that the resistance experienced by an inclined plane in passing through the air with a given velocity, varies as the cube of the sine of the angle of impact; and that, consequently, whatever be the ratio which this number bears to the cube of a radius (the sine of the angle of 90 degrees), the same will be the ratio of the resistance it will experience at the angle assumed, to that which it would experience at the same rate of motion if perpendicularly encountered.

Now the velocity under which the plane in question, containing an area of 4500 square feet, would develop the prescribed amount of resistance, namely 3000 lb. by perpendicular impact (being at the rate of two-thirds of a pound per square foot) is, according to the tables of Mr. Henson; Rouse and Simmanton, founded upon actual experiment, about 12 miles an hour. The angle of inclination at which we have agreed to dispose the suspending plane, being one in twenty, may be considered with sufficient accuracy for practical purposes, as an angle of 3 degrees, the sine of which (radius being estimated at 1) is 0.05 As therefore 1/5 = 0.05 = 0.00125 = 0.00125 = 375 = the resistance on the inclined plane at the rate of 12 miles an hour; and the resistance increasing as the squares of the velocities and consequently the velocities following the ratio of the square roots of the resistance, as √375 = 6 = √300 = 5.5 = 12 = 1100, the number of miles per hour representing the rate of the inclined plane required to support it, in conformity with the conditions described.

The consideration of some of these conditions will, however, show that this rate of motion, and, consequently, the amount of force by which we have presumed it to be generated, is far from sufficient to
satisfy the exigencies of the case. In the first place, the data upon which the calculations of the resistance of the atmosphere have been grounded, are deduced from a consideration of the density under little more than mean pressure, equivalent to the support of a column of mercury 30 inches in height; whereas it is well known that it frequently, or at all events occasionally, falls to an extent of nearly two inches, implying a reduction in the density equal to \( \frac{2}{\sqrt{3}} \) of its whole amount.

In respect of this condition alone, therefore, 25 miles per hour would have to be added to the above to enable the machine to maintain its pristine elevation, but slightly removed above the surface of the earth. But the mere retention of this elevation, without the power of augmenting it at will, within certain limits, would be evidently very insufficient for the purposes of a perfect aerial navigation. It is unnecessary to dwell upon the many occasions which the inequalities of the earth’s surface would present, in the extasy of the objects upon it, both natural and artificial, when it would be necessary to assume a higher course in order to escape a collision. Some of these, it is true, could be gone round, and thus avoided, instead of being surmounted. But there is still a great variation in the prominance or altitude of the plains and large ranges of mountain country, which could not be so dealt with; and in respect of these, a considerable allowance must be made in the powers of the machine. No part, for instance, of the Alps or Pyrenees, extending entirely across Europe, could be traversed under an elevation of 8000 feet, and without the power of accomplishing this, the use of the machine would be restricted to a very small portion of our own continent, or forced to make a detour equal in some cases to perhaps the entire extent of its intended route. Now for every 1200 feet of elevation, in the beginning of the scale, a reduction of one inch may be counted upon in the height of the barometrical column; so that if we only presume an elevation of 8000 feet, we shall have imposed upon the aerial machine an obligation of conducting her operations in an atmosphere the density of which will have been reduced to an extent indicated by a fall of the barometer to 23 inches; from which, if we further subtract the amount of the variation from mean pressure previously mentioned, we shall have a density of the medium only three-fourths of that, upon the hypothesis of which her former velocity had been assigned. Now the pressure, according to the first law of resistances, being directly as the densities of the media, by this condition, therefore, we shall have incurred a fresh obligation of speed, following the ratio of the square roots of the densities, the total amount of which will be determined by the rule of three proportion; thus, as \( \sqrt{3} : \sqrt{4} : 1100 = \) the number of miles per hour necessary to accomplish the required resistance under mean pressure : 1246 miles (nearly), = the rate at which the machine must be impelled to enable it to effectuate the same amount of resistance under the reduced pressure to which, in its elevation, we have seen it will have to be exposed. And this augmented velocity, be it observed, arising solely out of the reduction in the density of the medium, will be maintainable by the application of the same effectual force, namely 150 lb., by which the first assigned velocity was shown to be determined.

Hitherto we have regarded the qualifications of the machine in respect of rate and force apart from any considerations but the necessity of securing an elevation in the air. But a velocity of 50 miles an hour, however it might satisfy the conditions of support, would evidently be insufficient to realize that progress independent of the action of the winds which is necessary to the constitution of a certain and serviceable mode of transport. For this purpose, something more than the actual rate of the winds is the least amount of speed which could be considered sufficient to meet the exigencies of the case. Now, the average rate of the winds, in this climate at least, may be stated to be about 25 miles an hour. This we are enabled to determine, not from the observations of the meteorologist alone, but also, (and what is more to the point because founded upon experience in that part of the atmosphere with which we have more especially to do) from a consideration of the average rate of Mr. Green’s aerial excursions, deduced from a series of 240 voyages,

\[ \frac{26}{D} \text{ gives the number of first 200 aerial excursions, a very accurate computation enables him to fix at 6000 miles; and the time consumed in the performance at 240 hours. The former of these two quantities divided by the latter gives the result above.} \]

Arreanceition, page 206.
feet per second which constitutes the terminal velocity of the falling body. In the present case, \( D \) being equal to 76 feet and the weight 3000 lb., we have \( \frac{26}{76} \sqrt{3000} = \frac{26}{76} \times 55 = 19 \) feet nearly in a second, or somewhat less than 13 miles an hour. It is unnecessary to point out the insufficiency of this retardation to effectuate the safe descent of human beings. It will serve to give some idea of the force and necessary consequence of such a precipitation, merely to suggest the shock that would be experienced by an individual if he were to be launched unprotected against a solid wall from the top of a vehicle travelling continuously at the rate of 12 miles an hour. In this respect therefore, the suspending plane of Mr. Henson's machine is particularly deficient. It has been calculated, and no doubt upon good grounds, that the least rate of descent which consists with human safety is 3 miles an hour; and though if we could always command the conditions of the descent so as to alight upon our legs, we might be able to sustain a greater concussion without peril, yet, as a general principle, and more particularly with reference to the circumstances of the case before us, we shall not be too exigent in requiring a power of retarding the descent within double these limits. Now the resistance upon a square foot of plane surface in motion through the air at the rate of 6 miles an hour, is \( \frac{175}{2} \) of a pound; and the whole weight to be sustained being 3000 lb., we shall have an apportionment of surface to weight in the ratio of about 6 feet to the pound; amounting in the aggregate to an area of 18,000 square feet, or 4 times the actual size of Mr. Henson's plane. The correctness of this estimate may be readily verified by reference to Dr. Hutton's formula before adduced, by which it will be seen, that such is the rate at which such a plane so loaded would make its descent through the air.

But for the continuation of these investigations we must refer the reader to our next number.

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THE CAUSES WHICH HAVE ENNOBLED ARCHITECTURE.

By Frederick Lush, Associate of the Institute of British Architects.

An art which depends upon the cultivated powers of the human mind must be necessarily slow in arriving at perfection. As it had its origin in some simple want, its primary object is to satisfy the necessary and promote the happiness of man, in whatever condition he may be placed. The end of architecture, like all other works of imagination and taste, is to give pleasure; but it will fail doing so, when this principle is lost sight of. On this account the expression of use and fitness has been considered by all writers on art, as the chief element of beauty; and we expect to find that the buildings of different nations will be indicative, not only of their peculiar habits and customs, but also of the country in which their several styles originated. There is no occasion to speculate on the influence which scenery and climate exert upon the mind, and how they consequently operate upon all the productions of man. The difference of opinion and degree in which the sentiment of the beautiful has unfolded itself in various parts of the globe, plainly shows that the temperature and circumstances of one clime are more congenial for the practice of this noble art than another. Nature scattered her beauties on the soil of the Greeks with a liberal hand, and as they were quick to discern and appreciate them, they were wrought by the sculptor on their temples and monuments. The embellishments with which they were thus supplied, were in harmony with surrounding objects; and we cease to wonder at the fascinating works which emanated from this favoured people, when we see that the finest models in nature were ever present to their imagination. Among these resources, none gave them, perhaps, greater power of conceiving what was beautiful, than the various passions, attitudes and proportions, which they had the opportunity of studying during the exercises of their athletes. Here was exhibited to their astonished gaze the wonderful structure of the human frame; and it is when contemplating the character which man sustains in the varied scenes of life, when watching the many ways in which his hands are employed for advancing the good of his fellow-creatures, or, when he breathes and speaks to us out of the marble or canvas, that we recall to our memory the fine soliloquy of Hamlet:

"What a piece of work is man! how noble in reason, how infinite in faculties! in form and moving, how express and admirable! in action, how like an angel! in apprehension, how like a god! the beauty of the world, the paragon of animals!"

Who can deny then, that an anatomical knowledge of the human figure is the best education for the eye, and the basis of all grace and propriety in invention and design? The student needs to be reminded that his art will never be ennobled by only copying the orders of Vitruvius or Palladio. If the works of nature had not been their guide, the ancients had never attained to such perfection in architecture.

One of the most striking features in ancient art is grandeur. It was an object with the builders of antiquity to give great permanence to their works: a wish which sprung out of their natural love of glory and desire to appear great and enterprising in the eyes of posterity. An instance of the extravagance to which this passion carried them, is recorded in the tower of Babylon. Such a failure, however, occurring among men who were unguided by precedents and blinded to the consequence of their rash and presumptuous undertakings, would have the most beneficial results, and lead them to view the art of building for eternity, on more sound and philosophical principles. Curiosity has ever been busy in inquiring into the causes of things; and the most useful discoveries have arisen upon the errors of former ages. Michael Angelo had never, perhaps, raised a dome so triumphantly, if the attempt had not been made by others with less success before his time.

But although this sense of immortality is the first step towards a grand style, it depends likewise upon the goodness of the materials that are introduced, as it is these which give to buildings, whatever may be the purposes for which they are intended, all their character of strength and durability. Now, on these latter points, much of the fame of an architect rests, and for want of attention to them, we owe the ruin of many modern edifices: I allude to the one at Pont Hill as an example most familiar to the reader. Every one remarks the great contrast between the size and dimensions of timber, for instance, used in buildings of a bygone age, with those of the present day: and the difference in their duration is equally great. The system of contract, which has been so prevalent of late years, and the heavy duty on materials of every kind, have operated powerfully in the change; and although in some cases the exorbitant proportions of strength observed in old houses seem to indicate an ignorance of the principles of construction, yet as they long outlast our feeble erections, and require force to raze them, we can scarcely blame what appears in some of their parts a want of geometrical skill. The architectural merits of our ancestors must be judged by the circumstances of the age in which they lived. They had doubtless been more sparing, and displayed more science in the use of their timbers, had they been less abundant; or had they been compelled, by the restraint of taxes, to make them answer their several ends with the least possible expenditure.

With regard to stone, we have no cause to complain of its deficiencies, or think lightly of the resources of our British quarries, although we have not the granite of Egypt or the marble of Pentsileus. Yet when we look on the dilapidated state of many of our edifices—when we think of the ruinous appearance of some of the colleges in the beautiful city of Oxford, the nurseries of so much profound learning and eminent piety, we have reason to lament the corrosive nature of the stones with which they have been constructed. In these latter, their rapid decay is owing to the broad surfaces of the laminae or cleaving grain being presented to the action of the weather; and we see the result of placing them in a position contrary to that in which they lay in the quarry. One remedy for this evil would be the establishment of a society for testing the capabilities of stone and its fitness for durability, previous to its being employed on public and national edifices.
On the other hand the mild and equable temperature of the east was favourable in effecting for the ancients that perpetuity at which they aimed; they did not suffer from frequent frosts and sudden changes; their beautiful statues were not injured by that quantity of coal-smoke which accumulates in our dense cities; nor did they see a Parthenon or Erechtheum perishing in the lifetime of its founder. Instead of a few years altering the appearance of their temples, they remained as firm and perfect as ever after the lapse of centuries, and promised to be as lasting as the rocks out of which they were originally hewn. The immense size and weight, moreover, of the stones which their architecture demanded, contributed, independent of the cement, to the stability and breadth of the masses. And as the site of their cities was generally on the tops of lofty hills, it being the custom with idolatrous nations to offer sacrifice on such places, it is evident that to raise such huge blocks to the required height, bestowed some degree of mechanical skill. Besides, when they knew the grandeur of effect which would be conferred on their buildings from an elevated position, and the advantages it would give them over invaders, they needed not a further stimulus to exertion; nor would they be slow in applying the principles of geometry to the carrying forward those great works. The Egyptians were unquestionably masters in this science. But their simplest and most effectual method in transporting their vast monoliths (as may be learned from one of their own paintings) was the use of rollers and the incline; in fact they would skid these obelisks, and by means of proper tackle, set them up just in the same way as modern labourers.

If we consider their cement, we find, as in the aqueducts, it presents a hardness that is impenetrable to water; and this through no less than 2000 years. The Romans and Greeks were particularly careful in the making of their mortar and in the use of it; with us, on the contrary, it is deemed a second rate consideration, especially in house-building, and is usually committed to the least instructed class of men. Allan Cunningham, in his life of Wren, speaking of St. Paul's, says: — "Though the stones are hewn with the greatest nicety, and the masonry seems all firm and compact, yet the mortar which should unite the whole into one solid mass, is in many places decayed and become as dust. This is the case even with some of those piers against which the public monuments are erected; when the outer line of stone is cut through, the mortar comes gushing through the aperture; the sand is sharp and good, but the lime, like too much of the lime used in London, has been deficient in strength." Notwithstanding this defect, every one who knows that the architect endeavoured to give permanence to his works and secure the praise of posterity, will be glad he is deaf to the voice of his biographer.

Of the religious edifices of the middle ages, there are some which retain, despite of time and tempest, so much of their original beauty, that most of their ornaments and rich carvings seem as if they were the work but of yesterday. There are even preserved to us those curious devices with which the early sculptors were wont to decorate their handy works; and whether they alluded to the mysteries of their craft, or were emblematic of some moral truth, were yet always used to work and identify a favourite subject. I regard their sacred architecture with feelings of reverence; for cold, indeed, must be the heart of that man who is insensible to the sublimity of the Gothic, when looking upon the roof at King's College, the Minster at York, or the magic groining and tracery of Henry VII's chapel. There is something so embalming in this style, that it is peculiarly adapted to our Christian churches. It is easy to point out its claims upon our admiration. The Gothic architects, well knowing that devotion would be heightened by great size, loftiness, and durability, preserved all these characteristics of grandeur; and it is when surrounded by them, we are impressed with the religion of the place, and feel that we are in a building dedicated to the worship of Jehovah. Everything is calculated to excite the most profound emotions. Worldly feelings die away, and piety grows warm when we view its consecrated walls through the obscure and subdued light which streams through the painted windows; when the voice of prayer alone breaks the stillness of its ailes; and, as the sounds of the organ thrill through our souls, we listen to the beautiful and affecting chant—

Stabat mater dolorosa
Juxta crucem laceriosa
Dum pendebat filius, &c.

During the period of the building of these magnificent structures art was the favourite study of the monks, and the most eminent architects were bred within the walls of the cloister. The abbeys, the cathedrals, and conventual churches, were planned and superintended by successive abbots and bishops; for learning thes was a kind of monopoly, and chiefly confined to the clergy, and the nobles of the land. But this was a propitious era for architecture, inasmuch as there was less fear of its being debased by illiterate men. The knowledge of its principles, too, seemed to operate far more powerfully, when concentrated in such a circle, than when scattered in various forms over a whole community. It is thus that the noblest style and the most perfect system of architecture, as seen and universally adopted throughout Europe, is supposed, and with every probability, to have originated among the fraternity of freemasons. For such could only have been accomplished by many different minds acting in concert.

Nor were wealth and labour among the least causes which contributed to this end. To command them is indeed the object of every nation eager of renown, and desirous to distinguish itself by its public institutions and monuments. We admire the beautiful villas of Italy, her lakes and gardens, her palaces and academies for the arts, and we think of the rich cardinals and noble families who built them; we look at other stupendous fabrics and are reminded of the wealth of the Roman patricians. The prelates, too, of the great Catholic churches, from being prohibited to marry, had no motive for accumulating property, but expended it on the service of the altar; and aided by the munificence of princes, the donations of the people, and the revenues arising from monasteries, they were enabled to seek out, from both at home and abroad, the most skilful artists, for the purpose of making those edifices in all respects worthy of religion. Such a capital was applied by the Gothic architects for their embellishment. That unrivalled skill in construction—that elaborate ornament in sculpture, and those beautiful allegorical and legendary decorations, arose from this source. The interior of their churches became one mass of splendour; to compose them, the priests exhausted their knowledge of the passions; and with it they exhausted their fortunes.

The time and labour which were bestowed upon them equally deserve our attention. In our contemplation of any object to which genius has given all the excellence it is capable of, we seldom reflect upon the numerous difficulties through which it has struggled to perfection; although what appears as the effect of enchantment or produced without any effort of the mind, is generally the fruit of many years of painful toil. Those who witnessed the foundation laid of one of these great piles, and those who saw the last stone raised for its completion, were almost two distinct generations. During this long interval, separate portions were built at different times and by different hands; and this was especially the case under the Popacy; so that we find in the history of the cathedrals, a succession of bishops who added some screen, shrine, tower, or transept, in the design of which, they acquired great fame as architects.

This mode of building by degrees is at present rare amongst us. It has been lately followed in one or two parts of England; but the recommendation of it by the "Incorporated Society for promoting the Building of Churches" is likely to lead to its more extensive practice. The only evil that is to be feared will result from it, is the want of unity in design; as we see it in St. Peter's and other works in which this system was pursued.

(To be continued.)
CANDIDUS'S NOTE-BOOK.

FASCICULUS XLVII.

"I must have liberty
Withal, as large a charter as the want,
To bow on whom I please."

I. It is curious to observe how much fashion and custom prevail in matters where they ought not to be allowed to have any authority. It is still the fashion to talk of Michael Angelo as a "great architect," and he is accordingly considered quite a luminary in that character—a mistake of which some of our now rather numerous Professors would do well to disabuse the public; at any rate those who can admire him and his caprices have no right to turn up their noses at these of Borromini. It is the fashion—with book-making tourists more especially—to extol Palladio, generally in criticism pilfered from guide-books. And as it is also the fashion to make no mention of Calderari, or any of the buildings designed by him in the same city of Vicenza, the unfortunate Count Ottone is treated as a mere nobody. For tourists of the Trollope breed, who make trading voyages of their travels abroad, and who are content to return home with as much gossiping and blundering as will serve them for a book-making and book-selling job—for such persons there may be an excuse, since, if ignorance can be pleaded as a sufficient one, they may generally claim it most amply; but that a professional man, and one who made architecture the chief object of his journey, should not even so much as once mention Calderari or any work of his either at Vicenza or Verona, is almost incredible—certainly quite unpardonable. Nevertheless, after speaking of Palladio's buildings in the last-mentioned city, Woods says, "I will not trouble you with criticisms on other palaces, where there is nothing particularly beautiful to render them objects of study." Pitiful and humbugging evasion! Did he mean to say that Calderari, a decided Palladianist in his style, produced nothing that will bear any comparison with Palladio's own works? If such was really the case, that should have been a reason for his entering into the subject, and explaining wherein the great difference consists, and to what it is owing that, with far fewer solcisms and defects, Calderari's buildings are decidedly inferior to those of Palladio. This might have rendered a highly interesting and instructive piece of criticism, therefore we may fairly suppose that Woods's reason for passing over Calderari was not that which he has assigned, but the unwillingness to "trouble himself" with any farther remarks on the subject of the palazzo architecture of Vicenza. The only mention at all I have ever met with respecting Calderari, in any English book, is—pace Joseph Gwilt—in an article on the "Palladian Architecture of Italy," in the Quarterly Review, where it pleases the "ignorant reviewer" to remark, "Ottone Calderari particularly distinguished himself by simplicity and elegance, and a knowledge of the true principles on which the beauty of Grecian architecture depends. The Loschi and Bessaro palaces at Vicenza, and the Seminario at Verona, are noble specimens of his skill." Where then were Woods's eyes—where those of the hundreds of others who have visited Vicenza only to praise like so many parrots about Palladio? It is just as if a foreigner, visiting England, should extol Temple Bar as a work of the 'great Wren,' and of course a perfect architectural gem, yet should not bestow a syllable upon the palazzi of Pall Mall. As to Buckingham Palace, the less any one, either foreigner or Englishman, says of that, the better. It is a thousand pities it was ever built, and at least five hundred that it has not since been burnt down.

II. The plea of insanity is now becoming a very fashionable, and is certainly a most convenient one. For some of the things they designed, both Nash and Soane, not to speak of a good many others, deserved to have been hanged; and if tried could have escaped only on the grounds of positive insanity. But then, those who employed them ought to have been hanged too—at any rate, ought to have been shut up in Bethlehem, as being equally insane. Oh! the untold millions squandered away upon lost opportunities! Let us not think of it, for it is enough to drive us all mad, and qualify us for the glorious private

lege of insanity. Apart from their architectural phrenzies, there was, however, little in common between Nash and Soane; the one lived as prince and died a beggar, the other lived very much like a hunk and left a vast fortune, which he most assuredly would not have done could he by any possibility have carried it away with him. I well remember once being witness to a complete scene, in which Soane was the actor. In reply to some complimentary remark about his house, he burst out with "D—in the house! curse the house! Could I have my mind, I would tear it all to atoms this very instant—yes, this very instant. I am sick of hearing of it—I abhor it—I detest it—I loathe it—I abominate it. And so you are come to see the house?—here is a d—d dull day to come on such an errand. 'Tis as dark as pitch—as black as Erebus. Confound the house, it is my eternal torment, and a parcel of folks are continually coming here, to see the d—d house: they don't come to see me—no, I am nobody, they only come to stare at the d—d, infernal, abominable house?" After which furious explosion, and tempest, the old man suddenly became not only tranquil, but very condescending, gracious, and chatty. If he was really mad, there was also a certain degree of method in his madness, and a most extraordinarily queer method it was. "Rich and rare" are the anecdotes that remain to be told of Sir John Soane. I know one who promised to give a collection of them to the public, but he has not kept his word.

III. Independently of the egregious blunders with which it teems, the English translation of Milizia's Lives of celebrated architects, would disgrace a penny-a-liner. That work has been done into English, with a vengeance. It seems to have been done by way of exercise while the translator was learning Italian, and in all probability such was really the case. The best part of the book is the index, which as matters go, is saying something in its favour, indexes, even to books of reference, having now gone almost entirely out of fashion. No matter, this is an age when, thanks to the march of intellect, everybody reads and nobody studies.

IV. So Albert has actually shed the light of his countenance and the glory of his presence on the Institute of British Architects; yet his visit to it turned out one of the dullest and flattest affairs imaginable. If the Institute really felt flattered or encouraged by it, they must be the most easily satisfied mortals breathing. Of course all was conducted very "properly!" no blunders were committed either on the one side or the other. The Prince was exceedingly prudent and discreet—which for a Prince, is saying something; he did not attempt any compliments; he did not pretend to congratulate the Institute on their unwearyed zeal, and on what they had done for the advancement of architecture in this country. In abstaining altogether from brawn, his Royal Highness showed good taste, but he certainly did not manifest the slightest cordiality or sympathy with them. The whole affair was more matter of form and ceremony—at once perfectly correct and intolerably chilling. The Prince seemed to consider it a bore—how the others relished the taste they got of Royal condescension and patronage, I pretend not to say. There was, at all events, a paragraph for them in the newspapers and Court Circular; but as to the patronage itself, that is likely to turn out a mere phantasma—of just as much real service to the Institute, as the Institute itself is to the art and the profession.

V. "I cannot recommend frescoes," says Mr. Eastlake, "for the sitting rooms of dwelling houses;" a very reasonable piece of advice, now that we seem to be threatened with a fresco mania. If that mode of painting is to be employed for the merely general decoration of walls, it would soon sink to the level of paper-hanging, and its greater pretension would chiefly serve to render it all the more palpable and unsatisfactory. On the other hand, if it is to be employed for subjects upon a large scale, and with figures of the size of life, it would be a most obtrusive and oppressive species of decoration. In that respect painted ceilings are objectionable enough, but they are comparatively quite removed from notice. Saints and virtues may cut capers over our heads, and dance jigs in the clouds, without our being compelled to look at them; but it would be very different were the walls of our rooms to be peopled with such figures—poetical or
historical, and converted into so many “scenes.” Pictures in frames do not force themselves importantly upon our attention; while they contribute to general embellishment, they do not insist upon being looked at; but we may do so or not according to the humour of the moment. Few would relish dwelling in rooms where the same scene, be it either solemn or the contrary, is constantly acted before their eyes. However masterly the paintings themselves might be, they would soon sicken of being shut up to a Milton “Paradise” or “Pandemonium,” or a Dantean “Inferno,” while a perpetual Elysium would be likely to inspire them with the blue devils. Nay it is not every picture that one would care to have hung up in a drawing-room or other domestic apartment: the “Lazarus” of the National Gallery, for instance, would not be particularly desirable or exhilarating as a companion in such a place. It is all very well to talk about fresco-painting and the grand style of art; yet it does not follow that we are bound to admit them into our houses. They neither suit us, nor do we suit them; which may be unlucky, but is nevertheless the case. The truth is, we are a very matter-of-fact people, and live in a very matter-of-fact age; nor will all the arguing in the world render us otherwise, for we might as well attempt to change the natural atmosphere, as the moral one which surrounds us. It is very easy to say, let us revise this, or revive that; but how are we to impose actual life and vitality into that which has been extinct long ago? The utmost we can do is to conjure up the mere ghost of it, and for ghosts the world has now little relish. The king of Prussia is now endeavouring to revive the Greek theatre and Greek drama in their pristine purity; and he will do so—how?—precisely after the manner in which Egkinton brought back again the age of chivalry, with its pageants and tournaments. It would perhaps be wrong to say that art in this country is not yet ripe enough for fresco painting, since it is more likely to be too rotten.

SUGGESTIONS FOR THE MORE EXTENSIVE EMPLOYMENT OF CONCRETE IN DISTRICTS WHICH DO NOT POSSESS ROCKS SUITABLE FOR BUILDING PURPOSES.

It is now many years since our active neighbours, the French, undertook on a very large scale, the manufacture of artificial hydraulic limes, with a view principally to introduce them as an ingredient into that species of concrete which they have termed béton. Following in the track of Berthier, Vicat, and Troussaut, our own countryman, General Pasley, has long since endeavoured to arouse the attention of landed proprietors, engineers, architects, builders and others, to the method of forming artificial cement, by the mixture of chalk and clay in certain proportions, which should vary according to the qualities of those two ingredients. Hitherto, however, notwithstanding the perfect success which has attended the manufacture in the neighbourhood of Paris, where it is carried on at this day on the very same principles as those which General Pasley first had the credit of introducing to this country, nothing has yet been done by ourselves to carry out the practical application of a process which is evidently calculated to afford a very fine field for the employment of labour, the exercise of skill and ingenuity, and the profitable investment of capital.

Under the general head of calcareous concretes may be classed all those substances which are composed of fluid mortar mixed with broken stones, gravel, pebbles, fragments of bricks and tiles, or such other hard mineral substance as may be at hand. An ordinary concrete is that which is made from a common chalk or other lime stone which does not possess the property of setting under water. On the other hand, the quick setting limes, and those which possess hydraulic properties, as the Barrow lime, the Aberthian, that of Lyme Regis, and other places, as the lias formation, compose the species of concrete which is termed beton. Now it is known that all the limes which have been mentioned, owe their hydraulic property principally to the presence of a small quantity of clay in intimate combination with the lime. Hence it is that Roman cement, which is burnt from an argillaceous limestone containing more clay than any of the before-mentioned, and indeed more than any of the rocks properly called limestones, forms in concrete a more perfect kind of beton than any other. Conceiving an ordinary limestone to form a simple concrete, and conceiving Roman cement to form a true beton, all other kinds of limestone may be considered capable of forming a mixture intermediate between simple concrete and true beton, according to the proportion of argillaceous matter they contain.

It is quite a mistake to suppose that the beton so much in use throughout France, Holland, Italy, and other states on the continent, is invariably composed of broken stones mixed with lime, &c. Such appears to be a mistake into which O. T. of Newcastle has fallen in his paper on concrete, in the Journal of February last, since he observes “that beton differs from concrete in broken stone being used instead of gravel, in the proportion of two of stone to one of lime or pozzolana of Italy, &c.” Now the truth is, that although broken or angular stones are commonly used in the manufacture of beton, yet gravel and pebbles are not unfrequently made use of; and the real and true distinction between concrete and beton lies, as we have already said, in the employment for the latter of a more or less hydraulic lime instead of a lime made use of for ordinary mortar.

Among the best of the hydraulic limes employed for the French béton, may be mentioned that of Metz and that of Senonche near Dreux. The hydraulic limes of Tourmey in Flanders and of Viviers upon the Rhine, are also of excellent quality. The hydraulic limes manufactured in the neighbourhood of Paris are composed of three parts of chalk ground into powder, and made up into paste with two parts of plastic clay. This mixture is formed into cakes, burnt in a kiln, and then ground to powder.

APPLICATION OF CONCRETE TO BUILDING PURPOSES.

The Romans extensively employed concrete not only in building walls of every description, but even constructed vaults and arches entirely of this substance. Examples of this are found in the remains of their baths, their theatres and temples. The arches in the Coliseum, in the baths of Caracalla, in the temples of Peace, of Minerva, and of Venus, are mostly of concrete with an occasional rib of brickwork.

The spherical vault of the Pantheon at Rome, which is 133 Roman feet in diameter, and also a great vault at the baths of Dioclesian 71 feet in diameter, were both built of concrete, and their condition is as perfect at this day in point of stability as when they were first erected. A more modern example exists in the great concrete vault for the dome of St. Peter’s, which is 52 Roman feet in diameter, and 114 in height. While admitting that the excellent preservation of many Roman walls in Italy, Spain, and the south of France, clearly proves the almost imperishable nature of the concrete or béton of which they are composed, it has been objected by many modern architects, that the variable climate of Great Britain is unfavourable to the duration of concrete in exposed situations, and the opponents of concrete have not hesitated to assert that, if those Roman monuments, whose preservation we so much admire, had been tested beneath a more changeable sky, and exposed to the rigours of a more northern climate, they would have furnished far different evidence, that is, far less favourable evidence of the value of concrete for building purposes. In reply to this, however, it will be sufficient to adduce numerous old castles which were built in this country soon after the Norman conquest, and whose walls, consisting of irregular masonry, which bears a close resemblance to beton, are found at this day in a state of excellent preservation. The extreme Pietish wall, which is well known to have been executed by the Romans, is also a striking instance of the durability of well composed béton; and upon the whole we are justified in concluding from ancient remains existing in our own country, that where good hydraulic lime is employed, béton will last even in the atmosphere of Great Britain, for at least as many centuries as most of the stones at present employed for building pur-
poses. We have observed in the walls of many old castles in England, that the stones have been greatly decomposed and eaten away by atmospheric influence, while the mortar joints stand out in relief and indicate what was originally the face of the work. In such cases the mortar has been obviously far superior to the stone, and this superiority is further evident, by trying the relative hardness of the two. While the stone will crumble away and yield to any metallic edge applied to it, the mortar can only be impressed with considerable effort. Now we do not hesitate to affirm that the same excellence as that for which the ancient mortar is so celebrated, has never ceased to be within our reach in this country, which is fortunately favoured by an abundance of the materials most proper for the purpose. In works of this kind the ancients had no secret with which we are unacquainted, but on the other hand, the researches of modern chemistry have brought to light a great deal connected with the subject of mortars and cements which in all probability our ancestors knew nothing about. The fabrication of artificial cements and hydraulic limes is entirely a modern discovery, and one of which the Romans were perfectly ignorant.

It appears quite clear, from all we can gather on the subject, that the superiority of ancient mortar depended chiefly on a judicious choice of good stone for the purpose of burning into lime, and afterwards upon careful attention to the manipulation of the calcined lime; and such being the case, there is no reason on earth why modern buildings of every kind should be constructed of materials less imperishable than those which our Roman and Norman ancestors made use of.

The great sea wall at Brighton, the dock walls constructed of concrete at Woolwich, and a church said to have been lately built near Brighton entirely of concrete, afford examples of what may be effected by this material. It is quite certain, however, that several circumstances have most unfavourably operated to retard the more general employment of this most valuable substance. Among the foremost of these, we cannot avoid referring to the patent which was taken out a few years since for forming concrete into artificial stones. The signal failure which attended the use of this artificial stone in some government buildings at Woolwich and other places, has too hastily led many engineers and architects to regard as impracticable the employment of concrete or béton for building above the surface of the ground. But let us observe the difference between small blocks of stone formed of concrete and the firm cohesive body which the substance presents when used en masse, as it always should be. The stones which were manufactured of concrete were found, as might have been expected, so tender and brittle at every corner and arris, that it was almost impossible to preserve them with perfect edges up to the time when they were set in the work. The process of setting them by mortar in the same way as ordinary stones, left these tender rises still exposed to injury, and it was no wonder that all along the joints a destruction of the walls took place to a very serious extent. It appears to have been the practice, in forming these artificial stones, to face them with a kind of plastering, which is said to have pealed off in great quantities from the action of frost and other external influences. We repeat that this absurd project for making concrete into blocks of stone has greatly impeded the real advantages of concrete from being properly appreciated. We protest, however, most strongly against any inference being drawn unfavourable to a judicious use of concrete from the failure of this attempt to form it into artificial stone.

According to the system of building with concrete, which we propose, the walls should in all cases have coins and coping of stone or brick, so that only a smooth plain face of concrete will be exposed. By adopting this method, no sharp corners or edges will be liable to injury from external violence, and there will be no irregularity or broken roughness in the work to admit the lodgment of moisture and occasion that injury which always takes place when frost ensues. To substitute a pile of separated cubical blocks of concrete for the solid mass of which a building may be at once constructed, appears to us in no respect more rational than the act of a man, who in proceeding to found upon solid rock, should break the rock in pieces, and join these pieces separately together, instead of founding at once upon the solid material. It may be said that we employ stone and bricks in cubical blocks of small dimensions, but this is a matter of necessity not of choice. Nature furnishes in the quarry blocks of stone, which have a fixed and limited size according to the natural beds, joints and fissures by which the strata have been divided, and in the case of bricks the convenience of manufacture, particularly with reference to the condition of being properly burnt, limits the size to comparatively very small dimensions. In building with concrete, however, no such limits exist, and there can be no comparison between the expediency of fabricating little detached pieces of concrete stone, and that of raising the whole mass of any house, wall, or building, by united and continuous layers extending without a joint over the whole area of the building.

In seeking for another cause why concrete or béton has not been successfully employed of late years in this country for building above the surface of the ground, we are strongly inclined to the belief that a fair and workmanlike attempt has never been made under judicious superintendence to apply a good hydraulic lime to this purpose. It is indispensable, in constructions of this kind, that the lime should possess some degree of hydraulicity, in order that it may harden before the injurious action of frost comes upon it. It is generally admitted, that mortar which contains no hydraulic principle, that is, mortar made from pure, or as they are technically called, fat limes, require a very long time to set perfectly hard; and it has even been asserted by experimentists, who are well worthy of credit, that mortar has been found in a soft paste state several years after it had been used in a building. On the other hand, hydraulic lime will harden in a very short time—requiring, in fact, a period which varies inversely with the strength of its hydraulic principle, this period, in the case of Roman cement, the most hydraulic of all mortars, seldom exceeding a few hours. The readiness with which concrete, composed of strong hydraulic lime, is found to set, confers peculiar value on béton for building purposes, because when once hardened, it is no longer subject to be affected by atmospheric changes, and may safely defy the influence of rain, moisture, frost, and the other destructive means by which imperfectly hardened mortar is so speedily destroyed.

As we have no wish to disguise or conceal what may be called the unfavourable side of this question, it may be as well to refer in this place to the opinions expressed by Lieutenant Denison and other officers of engineers, upon the use of concrete for building purposes. The opinions of these gentlemen are hostile to the employment of concrete, and are founded upon experiments and observations made upon concrete walls at Woolwich and some other places. Now we are perfectly ready to give every possible credit to the officers of engineers, for the care with which these experiments were made, and the fidelity with which these results have been recorded. We believe them also to have been free from any prejudice against concrete in the first instance; but granting all this, we are greatly mistaken if they have made use of the right material. Their experiments appear to have been made upon a simple concrete instead of a true béton, and owing to the long time which the former requires to harden in this climate, it was found to have been dissolved by water, and to have been shattered by frost before it had been allowed time to set. When we look at the undoubted fact, that constructions of béton have actually been practised in France with great success, within the last few years, there are only two ways of reconciling the anomaly which their reputed failure in this country appears to exhibit. Either the experiments have not been made with proper care and with good faith, or they have been made upon the wrong substance. At once, without a moment's hesitation, we reject the former supposition, and decide that the latter must have been the case.

In order that no doubt may remain on the minds of the sceptical with respect to the perfect success which has attended the use of béton for actual building in France, and at the same time to convey some knowledge of the process and style of building adopted, we
shall here lay before our readers some particulars of a dwelling house lately constructed entirely of beton, by M. Jean Auguste Lebrun, upon his estate at Marsac near Albi, in the department of Tarn. This building consists of three stories, with three rooms in each floor, and a large granary or garret at the top. Along the front of the house extends a gallery which has a height equal to that of the building itself. Not only are the walls of this house composed of beton, but each floor is supported upon arches of beton thrown across from one wall to the other, so that throughout the whole building scarcely a particle of timber is made use of. The arches which support the first or principal floor have the following dimensions:

That for the gallery or passage, has a chord or span of 10 ft., a rise of 1 ft. and a thickness at the crown of 4½ in. The three arches which support the three rooms of this floor are each 17 ft. 4 in. in span, with a rise of 3 ft. 3 in., and a thickness of 10 in. at the crown. The roof of the building is formed by two semicircular arches, one covering the gallery already mentioned and the other covering the gallery. The principal of these arches has a span of 20 ft. 3 in., with a thickness of 10 in. at the springing and 6 in. at the crown. The smaller arch over the gallery is 10 ft. in diameter, with a thickness of 6 in. at the springing, and of only 3 in. at the crown.

The beton was generally composed in the following proportions:
One part of lime slacked by immersion;
One part and a half of pure sand;
And two parts of gravel or broken flints, from 3 to 5 in. in diameter, according to the thickness of the walls in which they were to be employed. Thus the largest stones were used for the thick exterior walls, those of smaller size for the large arches, and the smallest of all for minute arches and ornamental mouldings on the outside.

The beton was in the first place well mixed up by hand labour, and then thrown into a framework or encaissement in regular courses of 1 ft. in thickness. This encaissement was simply composed of a few uprights, to which were secured horizontal planks placed on edge one above the other at the proper distance apart, so that when removed, the beton filled in between shall occupy the proper thickness required for the wall. This method of raising the walls in courses of about 12 in. deep, appears to have been practised by the ancients in building with beton. The system will be quite familiar to those of our readers who have even witnessed the building of mud or earthen walls, as practised at this day in the Lyonnais and other parts of France, in the eastern countries, and in a rude form even in this country and in Ireland. The arches for supporting the floors were turned upon centres of the usual kind, and the exterior mouldings in front of the house consist of beton filled into moulds prepared to receive it. A thin layer of lime mortar was plastered over the exposed surfaces of the walls. This plastering was painted to a sharp arsis at all the exposed edges, and seemed to give to the whole structure an appearance of smoothness and regularity which could not be expected from the naked beton.

In the summer time the beton of one course was generally sufficiently set in six hours to admit of the next course being filled in, and about twelve hours were required in spring time. As each course was regularly completed throughout over the whole area of the walls, the part which had been first filled in was commonly set by the time the course was finished, so that no delay took place on the completion of the separate courses. The centres for the arches of the gallery were struck at the end of a month after its completion, and those of the large arches were removed at the end of two months and a half. It was found that after this interval the beton had acquired so much consistency as to produce no thrust upon the abutments.

The exterior surface of the front wall, and the outside of the great arch which forms the roof, were painted with several coats of oil paint. This was done as much for the purposes of decoration as to enable the surface to withstand more perfectly the rain and frosts of the succeeding winter. It was found afterwards, however, as far as durability was concerned, this precaution was unnecessary, for those parts which had not been covered with paint, perfectly resisted all the rigors of the most severe seasons.

Not only has M. Lebrun, the architect who constructed this building, declared its perfect condition, after the lapse of two years, but he has accompanied a report, which he addressed to the Société d’Encouragement, with certificates from the prefect of the department of Tarn and the sub-prefect of the arrondissement of Gaillac, both of which attest the perfect solidity of the building, and state that it presents all the appearance of stone. In order to try the strength of one of the arches supporting the principal floor, it was loaded three months after the centres were struck, with a mass of earth 10 feet in thickness, and extending over the whole top surface of the arch. The weight thus applied amounted to 1250 lb. per square foot, or about eight times as much as that which a floor supports when a room is full of people, and this weight was borne without the slightest injury to the arch.

The great economy of this method of building is highly important. It appears that the cost of the whole work was no more than 5s. 3d. per cubic yard, which is about one-third the price of brickwork in that part of France.

It may be necessary to explain that the process of slacking lime by immersion, which is mentioned in a former part of this description, is performed in the following manner. The lime stone, after being burnt, is taken from the kiln and placed in a pan in pieces from the size of a walnut to that of an egg. The pan is then plunged for a few seconds into water, and withdrawn as soon as the lime begins to emit heat. After this operation, the lime continues to heat and swell and falls at length into powder. It is placed in this state in chests or casks, where the heat being concentrated, and a great part of the moisture being condensed and not allowed to escape in steam, will be again taken in by the lime which is then more perfectly slacked than otherwise. If the lime is intended to be kept any time before being used, the chests or casks should be covered with straw and placed in a perfectly dry place entirely removed from any danger of being penetrated by any kind of moisture.

(To be continued.)

ARE SYNCHRONISM AND UNIFORMITY OF STYLE ESSENTIAL TO BEAUTY AND PROPRIETY IN ARCHITECTURE?

As Essay to which was not awarded the medal of the Institute.

By a Student.

The question whether synchronism and uniformity of style are essential to beauty and propriety in architecture, is so novel, that it might have been well had the Institute of British Architects accompanied their proposition by some definition of the terms in which it is conveyed—or at least set some limit to the sense in which they are to be understood.

Of all the arts and sciences, none has ever been, or must necessarily be, more strongly affected by the inexorable course of circumstances, than architecture. None has been found more essential to the civilized existence of mankind. None has contributed more to the comforts of the humble, to the grandeur of the mighty, or to the gratification of the refined perceptions of those blessed with taste. None has so perfectly attained the combination of the useful and the beautiful. Since architecture assumed the conditions of an art, human genius has been on the stretch in every period and in every community, to bend its capabilities to existing manners and circumstances, and to study the modifications dictated by climate, by religion, by the comparative progress of the sister arts, by the state of mechanical science, and the minor effects exercised by soil and the choice of materials.

That architecture, practised during a long succession of ages, and modified by these and many other influences, moral and physical, should have exhibited the most opposite extremes in style, seems a necessary condition of its existence as an art. If, therefore, by synchronism and uniformity is to be understood the strict adherence, at the present period and in the locality of Great Britain, to any style
of architecture appropriate to any other period or any other locality, such a condition seems primâ facie not only not essential to beauty and propriety, but to be utterly incompatible with any state of architecture worthy to be dignified by the name of art. It may be asserted that no such principle has ever obtained in any recognized school of architecture, and its conception seems altogether due to the new light, (or darkness visible,) thrown upon architecture some fifty or sixty years since.

Widely as the styles of architecture, which the lapse of ages has spread over Europe, may differ from each other—numerous as may be the subordinate varieties to which the great divisions of style may have given rise—the elements of all will be found few and simple. The origin of the existing architecture of Europe, must be sought in the works of the Greeks. The inventive faculties, and the fine perceptions of that people, have produced the most perfect adaptation of the means afforded by architecture to the end upon which they were employed, that has ever existed, and more perfect than can ever exist again; because the objects to which their architecture was adapted were compatible with its simplest forms. Until other nations have the same objects to fulfill, they never can use the same simple means with equal propriety, nor consequently produce by them the union of usefulness and beauty in the same degree. The simplicity of Greek architecture, its oneness, (to use a phrase of the cockney poets,) is the element which not only forbids its reproduction synchronically, but defies the invention of its parallel. To the simple elements which the felicitous genius of the Greeks reduced to the conditions of an art, may be traced all the systems of architecture which have followed in succession. From the Greek to the Roman, from the Roman to the Romanesque, from thence to the Byzantine in one direction, and to the Arabesque in another, from the Byzantine to the later Romanesque, and from thence to the Gothic, from the Gothic again to the Italian Renaissance, and from thence to the classical Italian schools, and the French and English schools of the 17th century, are transitions familiar to every architect who has studied the history of his art. These are styles, every one of which, judged by the circumstances under which it arose, and the purposes to which it was applied, whether civil, military, or ecclesiastical, will bear the severest test by which architecture can be tried—the test of usefulness, propriety, and beauty, mutually dependent upon each other.

But where among them is to be found what it is presumed the Institute mean by synchronism and uniformity of style? If the hypothesis be founded that Greek architecture owes its origin to the Egyptians, it is evident that it never could have existed at all had the Greeks been infected with such a principle.

After ages of prosperity, English architecture languished in the hands of the followers of Lord Burlington. To something analogous to this synchronism we may perhaps trace its decay, since the unmitigated imitations of Palladio by the Burlington school, ended by driving the public taste to take refuge from their insipidity in the frivipery decorations of the Adans.

The publication of the discoveries of Athenian Stuart was hailed as the means of a thorough regeneration of architecture. Greek and Roman republicanism shortly after filled the mouths of the orators of Europe, and the simplicity of the Greek style carried with it a prejudice that it might be "done cheap." Under these circumstances Greek architecture appealed forcibly to the vulgar. Those who really felt and appreciated its exquisite purity and refinement, unfortunately over looked the fact, that those very qualities rendered it ineflexible to the combinations necessary to adapt classical architecture to modern requisitions. The Romans knew better. When they adopted the orders of the Greeks, they modified them with consummate skill, to fit them for combination with the arch and with each other. The modern Greek school jumped to a different conclusion, as logical as the sentence which annihilated the Alexandrian library. Greek architecture, like the Koran, being perfection, nothing could be necessary or expedient which was not contained therein, and in this conclusion triumphed the principle of synchronism. A brilliant popularity could scarcely fail to attend a doctrine pointing out a royal road to architecture, rendering superficial the tedious study of the theory, the philosophy, may, the very grammar of the art, and conducting to the glory of a Culleret or an Apolloleum, every possessor of a Stuart's Atheneum and a pair of compasses. Roman architecture was rejected as spurious—the Italian schools dismissed with contempt—Inigo Jones esteemed an ignoramus—Wren a bungler—Vanbrugh a barbarian—Burlington a humbug—Chambers an imbecile. They built no Greek! As reasonably may Burke or Canning be decried for not declaiming in Greek. The principle would place Chatham below the school-boy who spouts a Greek oration by rote—no inapt parallel to the architect who compounds his odds and ends out of Stuart's Atheneum (not forgetting the supplements,) to eke out his ready made portico, and looks with disdain upon Vignola and Perrault. If we suppose the boy's oration to consist of unconnected words like nonsense verses, the similitude may run a little closer.

Had Greek architecture been studied in a Greek spirit, important advantages might have resulted from its revival, but it is by no means certain that its peculiar forms and character will ever permit it to be amalgamated into any such combinations as the Italians have effectuated with the Roman, the flexibility of which, as displayed in their hands, enabled it to become the universal style of modern Europe, (modified by each country according to its wants,) until the Greek mania superseded it in Great Britain. Purity has ever been the ultimatum insisted upon by the advocates of the Greek style; but if a Greek architect could rise from the dead he would scarcely admit the purity of Anglo-Greek architecture. To face a building with an avant-corpus much below its height, for the sake of introducing a single order—to back a Greek Doric portico with two stories of windows, or to flank it with arches cut into segments, and shorn of their impost and archivolt, that if they are not Greek they may at least look like nothing else—to associate the most decorative modification of the Greek Ionic, with doors and windows mutilated of their architraves—to condemn pilasters as a Roman invention, and to range Greek ante on a wall—to force into combination two or three crude imitations of Athenian buildings where one has been found unmanageable—our re-suscitated Greek would surely not admit that either the letter or the spirit of his art had been followed in such treatment of it.

These observations on Greek architecture, in its modern acceptation, have been put forward, because it is to the introduction of this style that the principle now recognized by the Institute under the name of synchronism is chiefly due, and its failure most signally apparent—so much so, that the argument may be thought levelled at a bygone subject of discussion. The error is not, however, so worn out, but that designs may still be seen for purifying St. Paul's, by elevating a couple of lanterns of Demosthenes at the west end—opinions still heard, that Blenheim might be improved by the infusion of a little Athenian detail—commination still bestowed on Sir Christopher Wren, for the limited intelligence upon architecture in his time. If these fancies of fancy be not so rife as they may have been at an earlier period of the present century, they have been replaced by others not more to the credit of British architecture, upon which there will be a few words to say presently. In the mean time, it may be observed, that if synchronism and uniformity of style be indeed essential to propriety and beauty, then have the architects of the world been in a long error of some three and twenty centuries. Admit the principle of synchronism, and architecture ought to have stood still since it attained perfection at Athens. The Colosseum, the Thermas, the Basilicas, Santa Sophia, the Alhambra, the churches of Amiens and Salisbury, the Vatican, the Palazzo Farnese, the Louvre, and a few other works by a few other architects, to which and to whom the world in general, down to the ultra-enlightened period of modern Greek, have agreed to allow some meed of praise, must all be denounced as worthless, should synchronism be essential to beauty and propriety, since they have all arisen from the perpetual state of transition of the art. What aberration from synchronism and uniformity is to be tolerated for the purpose of forming new styles? Where is the line to be drawn by which different styles ought to have been set apart as worthy to afford a new starting point for synchronous
treatment, or where are they to be separated for the future? Or are the architects of the present day alone to be limited to the servile imitation of styles gone before, and their whole intelligence limited to treating them synchronously, excluding invention and the study of character and fitness as beyond their comprehension? What style is to be selected as best fitted to our exigencies—or are we to set up here a bit of Greek, there a bit of Italian, Arabesque in this place, Cinquecento in that, Gothic or Egyptian in another, to show how perfectly we have studied synchronism and nothing else! Forbid it ye sacred muses! and forbid the Institute of British Architects to entertain questions which expose them to the eyes of all Europe as plagiarists and imitators pretensuus!

Of late years, our ancient national architecture has occupied much of our study, and the investigation of its transitions has done much to fix this said principle of synchronism upon our practice. It is a wretchedly narrow path which our architects have chosen, and it is to be hoped that it may widen as it is pursued. It has certainly expanded since a Gothic cloister of the 13th century was erected for a ball-room (at Belvoir castle.) This work is executed with a knowledge of style and detail, with an attention to synchronism in one word, which leaves nothing to be desired so far; and it is evident that the clerical amateur architect, who has to answer for this performance, was perfectly innocent of the knowledge that anything was to be desired beyond it. Let us hope that such an error may not infect our professional practice, and that we may not be too complaisant in yielding to the prejudices and prepossessions, which a march of ignorance, unparalleled in activity and impudence, is just now spreading through the land in the shape of a "little learning." Our Gothic architecture and the peculiar national modification of the Italian which succeeded it, have been extinguished upwards of two centuries. The reformation of the church in the first place, and the alteration in our habits and customs since the erection of the last of those domestic edifices which it is now the fashion to revive, point to the necessity of some modification of the architecture of the middle ages for ecclesiastical and civil, not very consistent with the principle of synchronism and uniformity. This consideration leads to a question involving these principles in something like a dilemma.

How are we to dispose of the mixed style which forms the principal stock in trade of this revival as far as domestic architecture is concerned?

The remains of the habitable portions of our great castles, and of some few buildings of a more purely domestic character, show clearly that in the earlier period of our architectural history, little attention was paid to the internal fittings, which now constitute the necessary comfort of our mansions, even of the most moderate class. Bare walls and such inconveniences as attest grated windows and ill-closed doors, were the general lot of those who could not afford the luxury of tapestry. Wainscot linings were not unknown, but their use was certainly not common, and none of an early date have survived. By the time a demand for more habitable interiors became general, the Gothic style was on the wane, and we may be troubled to find an interior among our ancient mansions, fitted up in a manner approaching even the commonest exigences of the present day, in which the wood and plaster work does not bear another character, although the fabric itself may be very unexceptionable Gothic. How far this mixture was carried, and how far it presently affected the fabric, it is unnecessary here to explain—but it may be observed, that the first Italian architect whose works are still extant in England, exercised his discretion in some very important modifications of the style he imported.

The works of John of Padua exhibit as genuine a specimen of the school of architecture to which he belonged, as will be found in Lombardy itself—but with this difference—he adopted the English window and the English chimney. It did not enter into the mind of this distinguished architect, to condemn his clients to darkness and damp, for the sake of following the arrangements expedient in his own climate—in other words, he did not think synchronism and uniformity of style necessary to beauty and propriety. The example set by John of Padua became the type of the architecture of Elizabeth and James I, and the question is, when we recognize this mixture as a distinct style, and follow it, as the fashion now is, do we not set synchronism and uniformity in direct opposition to each other?

Some modern examples there are, of interior fittings founded altogether upon Gothic forms, but certainly possessing nothing of the Gothic character. A plaster cornice bordering a flat plaster ceiling is not Gothic, however serenely the mouldings may be profiled or the foliage modelled—a sash window with its apparatus of folding shutters is not Gothic, however artfully its structure may be disguised—a door case with its architrave and cornice, rebated jamb linings and butt hinges, is not Gothic, though its head may be pointed, and most orthodox putty squizes glued into the spandril—and yet this sort of internal architecture has been coined, in preference to adopting what was considered an inconsistency, though practised boldly and successfully by our ancestors of the 16th century.

Perhaps we are held bound, when circumstances call upon us to work out an early style of Gothic, to make everything cold and contemptious for the sake of synchronism and uniformity. This position would undoubtedly solve the dilemma, and the architect would then only have to persuade the inhabitants of his dungeon to dress themselves in the ancient costume and cultivate their beards, to speak Norman French, pray in Latin, eat with their fingers, and drink ale out of leather black jacks for breakfast, in order to earn immortal gloe as a restorer of the arts.

We may aptly conclude with the following observations of the late Allan Cunningham—

"We never can lawfully become heirs to the fame of men who wrought in other lands and died three thousand years ago. No poet will claim as much merit from translating Homer or Dante, though he should excel Cowper or Cary, as he would deem his due had he written a Fairy Queen or a Task—but your architectural copyist takes a much loftier view of himself—he imagines he has achieved something truly grand, when he has persuaded a prince or a peer to have a house, every pillar and architrave of which can be justified from antique example. This servile spirit disgraces the architecture of our country—Greece will never surrender to us the honour of her porticoes, or Italy of her elevations, and there is the more reason that we should dwell on the memories of such men as Wykeham and Vanburgh, whose genius, whatever else we may say of it, has at least given us architecture that we can honestly call our own."

THE CHAPTER HOUSE OF SALISBURY CATHEDRAL.

Read before the Institute of British Architects.

By T. H. Wyatt, Esq., Fellow.

MR. CHAIRMAN & GENTLEMEN—I have always felt that there are no subjects of communication which may be made more generally useful to our members, than observations on points of questionable construction, or propriety of style and date, occurring, as they frequently must, in our practice. The paper read at our last meeting by Mr. Granville, has strongly confirmed me in this belief; it was one which could not fail to interest and instruct all who heard it. Acting, then, on this strong conviction, I venture to lay before you the particulars of a case which will, I believe, well repay its consideration.

The Chapter House of Salisbury Cathedral having fallen into a neglected if not a dilapidated condition, and the Lord Bishop of that diocese, being desirous to take upon himself the restoration of this interesting building (and so far to assist the funds at the disposal of the chapter, already hardly sufficient for the mere repair of the Cathedral itself), did my partner and myself the honour to ask for a report as to its present condition, and advice as to its entire restoration.

My first step was to inform myself of the history of this portion of the Cathedral group, and I referred to a variety of works bearing on the subject, and to such records as existed in the Cathedral library; at all likely to assist in the inquiry: but the amount of information they furnish is very slight, the Cathedral itself usurping, in all of them, almost exclusive consideration. There is no record of the exact period when this room (if I may call it so) was built, or in whose bishoprick. It is supposed to have been commenced a few years
The present roof is a flat one, rising to the level of the parapet, as at Wells and as at Lincoln (previous to 1500, when the high pitched roof was restored). It is covered with heavy lead, by no means in a weather-tight condition. The construction of the roof is of the most primitive order, and has exercised a very injurious effect on the walls and on the centre pier. Its general effect is very much like that of an open umbrella. For the solid spandrel of the centre column rises a heavy octagonal post of oak, 16 in. diameter and 17 or 18 ft. high, morticed into which are eight heavy beams about 12 in. square, taking their other bearing on the solid wall over the buttresses. These beams, which are 36 ft. long, are supported by bent braces of all sorts of form and substance. The outer ones, which spring from corbels very low down, and curve over the spandrel of the pier, have rests in the wall in some places, and have occasioned a considerable outward thrust. These braces have become twisted and decayed; some of them have got out of bearing, and have allowed the strain on the centre pillar to become most irregular. The space between these eight main beams which I have described, is filled with seven heavy timbers 12 in. in. most injudiciously applied. The outer ends bearing on a heavy plate about 4 ft. above the centre of the window, the thrust from which has much shaken the wall and injured the tracery of the windows: the other ends are wedged and skew nailed into principal binders. Nothing can be more injudicious than this construction; instead of throwing the weight of all these timbers on to the eight main beams, and so weighting the abutments, their load is thrown on the jambs, which are the first structures and U which are composed of oak and Baltic fir, indifferently mixed, and are generally in a pretty sound state.

The buttresses, which are of solid Chillmark stone, are perfectly sound, and show hardly any symptom of decay or settlement; the intermediate walling is not so free from injury, the spaces below the windows are generally enclosed by large timbers of the greatest possible mass and weight of the buttresses. The tracery of the windows is very much shaken, and the mullions have suffered considerably from the action of the weather and the corrosion of the iron bars. Internally the masonry is much injured, the exquisitely sculptured capitals, and the interesting series of scripture subjects commemorative of the life of Joseph having been sadly mutilated by the Parliamentary Commissioners and their satellites, who quartered men and horses in these sacred buildings. The walls and niches bear evidence of having been highly decorated with colour and gilding, and there is still a strongly coloured ornament remaining from the bosses at the junction of the ribs. The stone seat running round the Chapter House originally occupied by the members of that body, is in a damp and persisting condition. The enclosure the paving which covers the whole space of the floor is in a very unsatisfactory state, the colour much faded, and where the concrete foundation is carried round the walls, and the central pier does not extend, it has sunk considerably below the original level. The windows have, alas, long lost the rich and glowing colours which, little doubt, originally added to the beauty of this exquisitely wrought and intended to be a noble building. Many subsequent repairs are due to Mr. Britton's survey in 1812. Although of the trailer material, wood, the old Chapter table (a most interesting relic) exists with less apparent injury and decay than even the walls which enclose it. The Purbeck shafts and capitals in the interior are, curiously enough, more decayed than the Chillmark stone ones.

The central pier, Purbeck marble, 13 ft. 6 in. high, 12 ft. 11 in. wide, the inner piers, 10 ft. 6 in. wide. The shafts of the two outer piers, 11 ft. thick, in the upper surface of which is a coating of lime concrete or mortar, the underside being plastered, and the joints of the stone marked upon it. I believe I have nothing to add to the description of its present state, and I now pass to the consideration of its restoration.

The removal of the iron bars to which I have already alluded, and which, I believe, have all been carried out, was the first point to which my attention was directed, and this has naturally involved a difficult and anxious consideration, resolving itself however into this one point: Whether the abutment now offered by the buttresses, with the additional power of resistance they will gain by the whole weight of the roof being thrown upon them, instead of being diverted over to the spandrel of the pier, will act the thrust of the groin itself: (for care will of course be taken that the new roof shall occasion no outward thrust). I was led to suppose that, in the Chapter Houses of similar form and construction to this one, as at York, Lincoln, Wells and Westminster, I might find prece-
dent of some kind. The inquiry has confirmed me in my previous belief, that the one at Salisbury was the lightest in construction of this class. At York, the groining to the Chapter House is not less deceptive, as the stones are the same, the height being 6 ft. in one span, of 57 ft. diameter. Till lately, it was enriched with painting and gilding; it has, unfortunately, of late years, been much injured by that worst vice in architecture, being made to assume the appearance of a material it really is not. It has been plastered and jointed and coloured in imitation of stone. With a sort of the same effect, the great piédroits of the Abbaye of St. Martin at Abbeville, by Mr. Hutton, Mosely, and Peterboro', supposed to have been suggested by the circular churches of the Knights Templars. The Temple Church being dedi-
cated in 1185, being 15 years before the completion of the Lincoln Chapter House, Giraldaus Cambriensis attributing it to Bishop Hugh, who died in 1200. It undoubtedly must be considered a very perfect work for so early an era. "St. Hugh was a native of Burgundy, and may have obtained artists or designers from his own country." That of Wells is an octagon of 57 ft. diameter, resting on a groin crypt, its height is considerably less than that of Salisbury, but like it, the groin stones being 4 ft. 9 in. in thickness, forming 16 smaller shafts, just doubling the size of the centre shaft, and the number of smaller ones at Salisbury. At first sight, the great disproportion between the abutments of this Chapter House and that at Salisbury, seems unaccountable; but on referring to the plan of the groining, it will be found that this of Wells is much more elaborately groined, and that the proportion of the stone ribs is as 9 to 3, ribs springing from each buttress at Wells, 3 from each at Salisbury, naturally adding considerably to the weight and thrust even if the intervening groin was not heavier. I am not aware of the material used for this purpose. I believe chalk is not a material found in that part of Somersetshire; it is in all probability of stone instead of the lighter material, and that the writer of the description in the magazine has supposed a discrepancy between the abutments at Wells and Salisbury may be satisfac-
torily accounted for. I do not know the exact date of the building. In feature and general detail it is of the same century as those I have alluded to; although in all probability it is subsequent to them. Whether it has gained in effect by reduced height and lightness, I must leave to others to determine.

The Chapter House at Westminster, the last I shall speak of, is of octagonal form, and was a "remarkable instance of lightness and richness of ornament." It was built in the reign of Henry III, probably about 1250. As at Wells there is a crypt, the groining of which is of excellent workmanship. I believe that this building, in its original form, must have more closely resembled the Salisbury one than any of those I have referred to; apparently of similar height and width, its groin was originally supported by a central shaft having eight smaller shafts surrounding it. The walls are of greater thickness than those at Salisbury; and the projection of the buttresses (where the original structure was slightly altered) it was as close as possible the same as at Salisbury. These apply to those on the north-east, north-west, and two to the west, where the cloister joins it. What the character of the original stone groining was, I believe there is no history remaining. Nor is it known exactly how long the monks held it, but in 1377 the Parliament held their sittings there, the crown having been given to the chapter (which was restored to the diocese) and it was seated in 1517, when Edward VI gave St. Stephen's Chapel for this purpose. It was then occupied as a place of deposit for exchequer records. On the 4th March, 1705, the House of Lords memorialized the Queen (Anne) to have it put into repair, and it is stated to have been done soon afterwards by Sir Christopher Wren, though I know not where are the existing traces of such repair.

With the exception of this last instance, my consideration of the polygonal Chapter Houses has led to little satisfactory result; and if it were not that I fancy there is to be traced in each, good cause for the variations we find, I might become a convert to Mr. Wight's belief: "That the investigation of the equilibrium of arches by the laws of statics is a great problem. At present, in the minds of ancient architects; experience, imitation, and a sort of unostentatious intuition, seem to have been their guides. They appear to have pre-
ferred positive solidity to nice balance; nor have they left us precept or clue to ascertain by what means they reached such heights of skill as their works exhibit." I think if Mr. Wight had remembered the Church of St. Peter, Peterboro', Prebendaries, and the Chapter House at Wells, he would have made exceptions to his rule, and have allowed that at least they have worked as close to "nice balance" as in these examples they could well do.

Having failed, then, to discover, in these works of similar form and coeval date, any positive rules which could be a guide in determining the question of sufficient abutment, I endeavoured to find, in the works of those who have written on the theory of arches, some actual rule which I could reduce to practice, applying to this case. In this search I have not been very successful. The works of Peyronnet, Roodet, Gautier and other foreign writers on arches, apply generally to bridges and other forms of vaulting rather than to groining as practised by the English architects; and, with respect to bridges, the rule, if any, does not apply in one case is not very surprising when it is remembered that "rib pointed vaulting," composed "ex capite et toplo," has invariably the actual rib thinner than the uniform thickness of the Roman vault; and that the panels of the groin (the principal part in superficial quantity) sometimes does not exceed one-twelfth the rib in thickness. A reference to their sections shows how light is the construction of the polygonal linen and Salisbury Cathedral as compared with that of St. Paul's, so much vaunted for the mathematical science it is said to display. The nave of St. Paul and Lincoln are the same height and width; the piers of the towers are double the diameter of the shafts in the latter, and its continuous wall exceeds in thickness by one-half the wall thickness of Lincoln. If I find anything in the works of Ware, Hutton, Mosely, Wight and others which actually bears on this case. In the work of Durand, an old French writer on arches, a curious problem is laid down to determine the abutment of an arch, which, if not based on the soundest laws of statics, is at least ingenious and plausible, adapting itself to every form of architecture; the French engineers, I am informed, rely upon it to a great degree. I was so pleased with its simplicity, that I determined to test it by an experiment on a large scale. Having to construct the clerestory wall of a church, which was 50 ft. high, to the wall plate, with semicircular arches springing from columns 2 ft. 3 in. diameter, at a height of 15 ft. 6 in. from the ground, and abutting against a pillar, (of the strength of which I had some doubt), and I carried on in brickwork, to a quarter the full size, an arch of this description, retaining only as an abutment the width which this problem gave. The arch was loaded (in proportion) to the full height of the 50 ft., and no deduction was made for the openings of the triforia or for the clerestory windows, which in the original, would much reduce the weight over the crown of the arch. This experiment was made in a foundation of very questionable nature; it was carried up in mor-
tar, and the centres were struck within an hour or two of its comple-
tion. This arch stood perfectly, and until the period of its being taken down, some weeks afterwards showed no symptoms of weak-
ness. Having more abutment than this problem called for, and taking no deduction, it was calculated that the weight of 50 ft., and the arches had formed in the span of the groin itself. That at King's College Chapel, Cam-
bridge, although of a much flatter and more thrusting arch, has the thickness of the abutment only 3½ times the width of the arch.

Trinity Church, at Ely, has a stone vault of segmental form, which has the abutments only one-fifth of the span of the arch, that arch being a very flat and thrusting type. In this we can see the errors of the arch, so seldom brought to bear on individual cases, and so seldom accordant, one is almost inclined to say with La Fontaine—

"Quand on ignore, ce n'est rien,
Quand on le sait, c'est peu de chose."
Unfortunately this discrepancy in theory extends itself to data given as the result of practice and actual experiment, and adds infinitely to the difficulty of arriving at anything like a satisfactory result in inquiries of this kind. As instances, I may state that Ronelet, a French writer of much celebrity, gives a force of 5000 lb, on the square inch, to crush a piece of oak, and upwards of 60,000 lb. on one inch of Mr. George's column. In the latter case, and others in which I have made no allowance for the increased tenacity afforded by an increase of surface, I consider these weights quite equal to the additional resistance thus afforded to the thrust of the groin by the weight above, would be considerable. Of the value of this heavy superstructure, Sir Christopher Wren was fully aware. In his report on Salisbury Cathedral, he says, "As for the vaults of the aisles, they are indeed supported on the outside by the buttresses, but inwardly they are supported by other stays, which give themselves, which as they are usually proportioned, if they stood alone without the weight above, could not resist the spreading of the aisles one minute."

Should, however, the Chapter (whose consent to any plan must be obtained) object to the high form of roof, and require the new one to retain the pitch of the present one, and not to rise above the parapet, they may be found, perhaps, to be much less expensive. If the expense of the construction of this roof, though simple enough in its construction, has at last this advantage over its predecessor, that it causes no outward thrust.

In either case lead would form the covering. The roof being made perfect, and all defects in the external masonry having been made good, I propose gradually to loosen the nuts which are now attached to the iron ties, watching most carefully if any fresh thrust follows. Those bars I propose to re-introduce above the groin and immediately under the roof. They would form a perfect tie at this level, and if unuckily any accident or failing shall take place in the cast-iron shoes or tension rods of the truck roof, these bars could then come into play, and would prevent the effect of any lateral thrust. The internal stone work we shall gradually fill, next, until the vaulting is complete. When the stone work round the Chapter House will be taken up, cleaned and re-laid, making good with new stone. Under this seat, it is proposed to form a floor in brickwork, into which would be introduced from a stove, to be built under the stairs, a current of warm air, having vents through, and stone ornaments on each face of the octagon, thus keeping the building free from the damp which now disturbs its surface.

It is proposed to relay the whole floor (containing 236 yards) with encaustic tile paving, of similar design and colour to those now existing; and instead of their being laid on the earth as at present, which has tended to make the floor damp and irregular, I propose to have a thin bed of concrete made with water lime formed over the whole surface not occupied by the foundations.

The plastering to the sofit of the groin, which now exists, is in a defective state, cracked and discoloured. It will be repaired and recoloured; and as the chalk groin is of rude and irregular surface, it perhaps will be desirable to refine it as it now exists, restoring the present coloured ornaments which now diverge from the bosses.

I have now only to add that the same principle which directs the location of the steel girders exists in the Chapter House. It was then taken down and used in the restoration of some of the Cathedral windows. If there ever existed a building in which colour was an essential ingredient, it was this: and I have every confidence that if the restoration, to which I have already alluded, can be satisfactorily carried out, that it will not be a very distant period before these stoves are covered with glass, whose colours shall be not less rich and harmonious than those which originally decorated this interesting building.

Iron Sails.—"The Iron Queen."—We find that iron, as a material for shipbuilding, is fast gaining ground. For steamers, iron has been a favourite for some time past; and there is not now one wooden steamer building at the Chatham dockyard which can compare with a vessel of the same capacity, built of iron, as regards speed of steam, rigidity of construction, and economy of fuel. The essential parts are completed, and, we understand, contracts are made for the building of more three. We are also now satisfied, that the only objection to sailing vessels of iron, namely, the getting foul during a voyage, has entirely removed. This is proved by the result of two voyages of the Iron Queen. This barque, 550 tons register, left the river Tyne in February 1842, with 124 tons of coal for Havana; from thence she went to Mobile for a cargo of cotton, and returned to Galveston, in Texas, carrying 300 tons of salt out, and a full cargo of cotton home. She has been in the graving dock, where she was visited by many gentlemen, and is now navigating the Mississippi. The anchor has struck heavily on Galveston Bar. There is no appearance of corrosion, the red lead being fresh on the plates; and neither shells, barnacles, nor any fouling, was on her bottom. This desirable result is caused by the simple application of a compound of iron, a mixture of iron, small pieces of bright varnish, arsenic, and bluestone, which effectually destroys marine, vegetable, and animal substances. The Iron Queen was built by Messrs. John Vernon and Co., of Aberdeen, and has proved very efficient, and is in the usual state of the trade. The surveyors for this line's here are so well satisfied, that there is no corrosion that they have classed her A 1.—Liverpool Agent.
IMPROVEMENTS IN LIVERPOOL.

[The following observations by Mr. Ross, were made upon a paper lately read at the Liverpool Polytechnic Society, by Mr. Holme, on the improvement of Liverpool; we regret that we have not been able to obtain Mr. Holme's paper.]

Mr. Ross said, that in compliance with the invitation of his respected president, he rose to make some observations on the very interesting paper just read by Mr. Holme. Architecture had been one of his favorite studies, and he had been humbled during that period, to see the little progress which this great commercial metropolis of the north-west of England has made in exhibiting good specimens of construction. This was the more remarkable, when the vast means of private individuals, and the funds placed at the disposal of the corporation, were taken into account. Reference had been made to the noble models of architecture left by the Athenians, whose handsome and well-proportioned temples still excite the admiration of every traveler who looked upon them. The Parthenon, for instance. Let us inquire by what means that transcendent work of architectural genius was raised? Why, it was raised because the Phidias, the prince of sculptors of antiquity, had a Pericles for a patron, and by the influence of the illustrious sculptor, Ictinus and Callicrates were employed as architects, though under the control of Phidias. But, independently of the good fortune of the Athenians in having a Pericles to judge and guide them in the application of high art, the Greeks had a mode which he (Mr. R.) would strongly urge the people of Liverpool to adopt, now that public competition had become the rule to guide them in their choice of the artists who were to execute from time to time the works that were to adorn their great city. The practice among the ancient Greeks was to call upon a number of distinguished architects to send in designs by a certain day, and when they had all been exhibited, to leave to the artists themselves the choice of the one that was to carry away the palm. This was by giving each artist two votes: one in favour of his own design, and the other for the one he thought the best among the compositions of his rivals. The best of the whole always turned out to be the one approved by the majority of the second votes, as a reposing beauty, at a public ball, is always considered by every handsome girl in the room decidedly the handsomest present, after herself. (A laugh.) Thus the wisest of the people judged and attributed artists, and artists themselves judged and appreciated each other, in the face of all Greece, assembled on great public festivals. And in modern times, a very remarkable instance of public justice occurred at Rome, in the pontificate of Benedict XIV. That distinguished pontiff invited a competition of designs for the improvement of the Piazza del Popolo, in which our, then, young countryman, the late Mr. Harrison, of Chester, entered the lists. The judges selected a Roman design; against the decision the famous Piranesi protested. His holiness caused the drawings to be re-examined. The consequence was that the judgment was reversed, and young Harrison received the gold medal. He (Mr. R.) lamented to say that that distinguished architect, the greatest since the days of Wren and Gwynne, chose afterwards to bury his fine talents in the little obscure city of Lucca, still so happily settled by his compatriots, the Soane, Nash, and others. When a resident in the Temple, he (Mr. R.) had joined with his hon. friend, the member for Scarborough, Sir Frederick Trench, in the efforts made about fifteen years ago to construct the Thames Quay. The society, however, they then formed, though under the immediate protection of his late Royal Highness the Duke of York, and, indirectly, under that of the crown itself, could not accomplish their great object, though aided by many distinguished noblemen, gentlemen, merchants, and, by "the unsullied grace," and elegance, and talents, and powerful patronage of the late all-accomplished Duchess of Rutland. They, however, managed to erect some good buildings, amongst which must be named Stafford House, in the Stable-yard of St. James's Palace, the finest noblemen's town residence in the empire. He (Mr. R.) was cognizant of every stone laid in the construction of this magnificent edifice, and he, therefore, felt the pride and justness of placing a model of that of Versailles, and the house, with the recent additions of the present noble proprietor, the Duke of Sutherland, formed decidedly the finest private palace ever erected in England. Finding, however, that public taste was not ripe for the quay, they intermitted their labours, as he observed, fifteen years ago; but he was happy to say that they had resumed them recently with great application that it might be the aid of the government, and the awakened taste of the age, and the labours of his friend Charles Barry, at Westminster, on the new Houses of Parliament—all those combined, he thought, would at length enable them to achieve the object of all their toils, and give a new character to the banks of the noblest river in our domestic empire. At the period referred to, when they (the committee) were busily engaged in the preparation of plans for the new pleasure-ground of which they so proudly, and were gradually drawing the attention of the London public, the elder Mr. D'Irval entered their council-chamber, and assturned them with the information that they could not establish any claim to originality—that he held in his hand a book that set at rest and put the extinguisher upon all their claims as exclusive authors of the grand schemes they were projecting. He (Mr. R.) had referred to a "great unknown" of the name of Gwynne. Had any gentleman present ever heard of his name? He dared say not; and yet Gwynne was one of the greatest architects that this or any other country had ever produced; the book Mr. D'Irval brought was the work of that illustrious architect. He (Mr. R.) had erred in his judgment in the year 1763. Every public improvement that had been made in London or Westminster, during the last thirty years, was done in that book, with this especial difference, that Gwynne's designs are infinitely better, exhibited greater taste, elegance, judgment, imagination, and resources than the works actually carried into execution. For instance, a bridge was suggested in the very place where the present one is erected, "Farringdon Bridge." The present one is called the "Third Bridge," with approaches on each side the Thames, infinitely finer than those erected. Regent-street appears under the name, I think, of "Great George-street," with elevations much superior to those actually existing—the bold cornice, the stone balcony, the harmony of parts, the solidity, in fine, which all our streets want, were to be found sketched, giving a new character to London as it then existed. But that great man, whose talents were appreciated by Edmund Burke, Dr. Johnson, and the great men of the Literary Club formed by the great lexicographer, had the misfortune to be born forty years too soon. The times were not germane to his labours; public taste, from want of education, was not ripe; and his work, which deserved immortality, and would have obtained it in a better age, fell, still-born, from the press. His name would almost have been lost, had not the Duke of York recently, in his letter to the Duke of Devonshire, in his Life of Dr. Johnson. But to return to the improvements of our "dear native city," Liverpool—for, though not a city in law, she was a city in fact,—he (Mr. R.) entirely concurred with his friend Mr. Holme, in all the observations made in his very excellent lecture; but he must confess that when he came down to the bottom of South Castle-street, he was much disappointed and surprised to see him make no allusion to it, as it were, and avoid all mention of the "New South Castle-street," in spite of all his words about improvements but with sorrow and disappointment—sorrow, that that erection destroyed the finest inner harbour formed by nature in the kingdom (and in this he was confirmed by the opinion of the greatest engineer now living, whose name was another name for science in civil engineering), and disappointment, that so noble an opportunity of displaying architectural genius had been thrown away, for the erection of a building whose composition was full of bad architectural grammar, and whose vastness and solidity alone relieved it from absolute contempt. It was faulty in composition and in position, and its bad material excited the amazement of every one who knew that the vigilant jealousy of government was generally exercised with reference to the materials wherewith every specimen of architecture civil or naval, was constructed. Look (said Mr. R.) at the basements of the columns. No geologist, deserving the name, would consider such material stone, but rather a conglomeration of sandstone in its primitive formation, full of cracks, and threatening to fall to pieces: the columns in ten pieces, instead of two. The joints will be the first part of the building to decay: posterity will have to replace them sooner than the present generation imagine. Walking round, you may almost thrust your thumb into holes filled up with sulphate of rosin! All this was done with money; and yet you do not mention of the circumstance of competition. It was a bad thing for the architect himself. His (Mr. R.'s) friend, Charles Barry, competed with all the rising talent of Britain both for the Houses of Parliament and the Reform Club-house—the finest private palace, for its purpose, perhaps in Europe. To return to the Custom-house. In point of composition—the utter want of distribution of light in the rooms and corridors produced a "darkness visible," which, independently of its perpetual inconvenience in a place where so prodigious an amount of business is transacted, gave the whole the appearance of the gloomy chambers leading to the catacombs of the dead. Indeed, said Mr. R., I have long denominated it "The Tomb" of the inner harbour of the port of Liverpool. Mr. R. proceeded to say,—"I speak this in sorrow; but pars-miser is the tax which all public men are subjected to, for the enjoyment of their talent. The money had been thrown away, by the erection of a building whose composition was full of solidity, and whose vastness and solidity relieved it from absolute contempt. But he would now turn to a more pleasing subject. He begged to congratulate the society on the prospects before them. Liverpool had at length obtained the aid of an architect, whose talents were of a high order. He had been recently introduced to him in London—was delighted with his designs, and pleased to see the improvements. Liverpool had been an ornament to exhibit to the stranger; those would pass muster with the greatest engineers. But they had now turn to look forward to the erection of a Place (as the French called it) that would form the capital of the city, containing a street and courts of justice of surpassing beauty. That would be the era from which posterity would date the commencement of the architectural style worthy of the second commercial city in the empire, and consequently, in the line of art, felt justly proud, encouraged, and animated by the approaching triumph.
BLASTING OF THE ABOTT'S CLIFF AT DOVER.

Another of these remarkable engineering operations which have already attracted the public attention, in connexion with the South Eastern Railway, took place on Tuesday, April 18th, at a distance of about three miles to the westward of the town of Dover. In order to afford an outlet to the Abott's Cliff Tunnel, and a platform on which the rail could be laid between that and the Shakspeare tunnel, it became necessary to remove a portion of the projecting cliff. From the success that had attended former operations of the kind, and especially the recent blast at Rounddown Cliff, it was resolved to remove it by the aid of gunpowder.

The surface of the cliff acted upon by this explosion lay to the westward of the Rounddown Cliff, and its remaining face, upon the other side of the mouth of Abott's Cliff Tunnel. It extended 300 feet in length, and the height of that portion which was directly acted upon was 200 feet. The object of the operation was to slice off, as it were, a large portion of this surface, so as to make that which was before rugged and uneven, and which projected far too much in the way of the proposed line along the side of the cliff, perfectly flat and smooth, and fit to afford a sufficient platform for the road to be laid down upon, and to prepare the terminus of the tunnel. The “slice” to be removed varied in thickness, according to the extent to which the surface projected beyond that which would be convenient to the operations; at some points it was 60 feet, and at others 50 feet, and the quantity of powder introduced at the different parts was, therefore, proportioned to the thickness of cliff to be removed, regulated, of course, by the degree of resistance which, from the greater or less nearness of the surface to the chambers in which the powder was deposited, would be offered to the action of the powder.

The quantity of powder calculated on the surface of the line of least resistance. Cutting the line of least resistance, one-half the number of feet is the number of ounces of powder used. The arrangements made for the introduction of the powder and the simultaneous ignition (if possible) of the different charges were simple, and, at the same time, ingenious in the extreme. There were altogether 100 barrels of powder, or 10,000 lb. This quantity was distributed in various proportions in 15 different chambers; some of them equal in size, and others larger, the chamber to be perforated at those nearly equal distances, and the different proportions of powder were introduced on Saturday last, and “tamped up” close. There were two separate lines of these chambers of powder, and therefore two series of charges; one being near the top of the cliff, about 200 feet from the summit, the other about 100 feet lower down. Thus a space of about 150 feet from the bottom of the cliff remained altogether untouched by the explosion, that being required as a platform for the road to run upon at the entrance of the tunnel. The apparatus for igniting these different charges was placed to the eastward, about 2000 feet from the nearest, and about 500 feet from the furthest chamber. It consisted of six batteries of 20 plates each, and by an ingenious invention of Mr. Hodges, the assistant to Mr. Wright, the resident engineer of the line from Ashford to Dover, they were all fired simultaneously. Simple as the invention is, it is not so easy to describe it on paper. Such a battery of 300 plates would not be easily handled by a common string at the distance of about an inch or more from a framework beneath (resting on the legs of the chair), in which are fixed the batteries and connecting wires. Immediately under the string which suspends the other portion of the battery is placed a circular trough, in which there is a “blue” light. Through this light is passed a fuse, 12 feet long, and taking some minutes to burn down. This fuse was fired by Mr. Hodges, who had time to get behind before the explosion was in its progress.

The moment the string was severed by the flame, down went the upper framework, the volante action was performed, and the electric fluid communicated to the wires. These wires were two, one for the upper, the other for the lower range of chambers, each extending the whole length of the surface to be operated upon, and attached to them were other supplementary wires communicating with the chambers of powder. The ends of these additional wires were introduced into a large vessel in the sea, by which the explosion was affixed, which on being made red hot by the electric fluid ignited the gunpowder in what are called the bursting-charges—small portions of powder in cases surrounding the ends of these wires, which again immediately fired the larger quantities of powder contained in the different chambers.

Thus within a few moments after the ignition of the blue light, the upper framework was destroyed, and the volante action was completed, and in about an hour the whole explosion was effected. And yet how remote to all appearance the connection between the burning of a short piece of string (a foot long) and the fall of that immense mass of cliff?

The operations at the Rounddown cliff were carried on under the advice of General Pasley and Lieutenant Hutchison, who also took a great interest in the proceedings on the present occasion; but the whole of the arrangements for the explosion of to-day were under the control of Mr. Wright, the engineer, assisted by Mr. Hodges, as already mentioned. As far as the practical effect of the operation was concerned all was successful; but as a mere sight the affair was unfortunate, in consequence of the thick fog that hung over the cliff, and made it impossible to see the actual fall.

The hour appointed for the blast, many thousand persons were collected to witness it. The thick fog prevented all, and approached as near to the shore as was allowed, but could see no more than the crumbling mass falling down into the water beneath with a sound resembling the roar of artillery heard at a distance, and the noise of the surge breaking on the sea shore. In respect of the noise created, this explosion differed from that at the Rounddown Cliff. There no noise whatever to be heard, or scarcely any, but a great deal of rattle, as if sand were quickly sent into the sea like a mighty wave; but in the Abott's Cliff blast there was much more noise, and it was more prolonged.

Those who were on the cliff were sensible of a shock: a few moments before the detached portions of the cliff fell. Explosion is an inappropriate term to use; for, in fact, as far as hearing is concerned, there is nothing of the sort; —the operation of the powder is internal, and the effect only known by the fall of the fragments. Mr. Hodges, the assistant engineer, fired the fuse in connection with the battery. He had four minutes in which to get away, but had calculated that he could run down the ladder in two and a half. He was the last person who left the range of the batteries.

Beside the multitude of persons collected on the cliffs and on the adjacent shore, the sea was covered with boats of all sizes and shapes. There were about 12 steam-boats filled with visitors.

Although in consequence of the thick fog or mist the spectators were deprived of much of the gratification which such a sight would have afforded, the operation, in a scientific point of view, was held to be decided success. All the chambers of powder were ignited simultaneously (or nearly so), and the immense mass of disturbed chalk and earth fell slowly and evenly into the sea. The exact results, however, cannot of course yet be ascertained.

—Times.

ROYAL ACADEMY.

PROFESSOR COCKERELL'S LECTURES ON ARCHITECTURE.

(From the Athenaum.)

LECTURE VI. AND LAST.

Proportion, and the application of its golden rules, as they affect the external forms of architecture, had occupied the latter part of the preceding lecture; the αριθμός of the Greeks, delivered to us by Vitruvius, that analogy, by which all the conformations of artificial bodies were derived from natural bodies, seemed to be a principle of obvious importance and utility to the architect, and should be attentively considered.

It appeared that the animal kingdom furnishes clearer lights for our guidance than the vegetable, because organized nature was more constant in its forms, and enabled us to reason safely from the whole from a part; thus the hand of a Grecian statue, of the Icicles, the Apollo, or the Venus, or a fragment of any one of the Grecian orders of architecture, enabled us to restore the whole; indeed, the proportion by aliquot parts by which, a principle of the Greeks, as explained by Vitruvius, lib. i. c. 11, lib. iii. c. 1, was still practised in India, and seems founded in organized nature.

Not so in the productions of the vegetable kingdom, fragments of which would never enable us to comprehend the whole; however indebted to this part of the creation for the grace of ornament, and various essential analogies, architecture found a less sure guide of proportion in this than in the animal kingdom; in fact, all architecture so derived was anomalous, as the Egyptian and the Gothic, in which no fixed laws of proportion have ever been applied or attempted. Columns or supports might be from five to fifty diameters in height, and could be proposed by possibility. The stunted pollard, the spreading cedar of Lebanon, the aspiring poplar, or the attenuated cane, were extremes equally at the disposal of the architect.

But that guide, which the face of nature furnished to the architect for his external forms and proportions, was seeking for the internal,—as of areas, squares, courts, and open places; or of internal capacities (height as well as area); as of temples, halls, apartments, &c., in these we must appeal to the relations of reason, purpose, and convention.

Vitruvius (lib. vi. c. 2, 3, 4, 6, lib. v. c. 1, and 2.) gives us the experience and the serious judgments of an architect, who, in the conception of the Greek and Roman house: atria, alæ, tablinaeum, and peristyleum, triclinia, ecc., excedre et pinacotheca. He does not, however, establish any principle, and his rules are wholly empirical. But the great Alberti, not content with a principle, adopts the Pythagorean doctrine of universal harmony, and agreement between sounds and numbers, namely, that what pleases the ear pleases also the eye; he lays...
down, therefore, his harmonic proportion, in which Blondel, Ourard and others have followed. The notion of musical proportions is common, and has occupied many ingenious minds already versed in that art. Describing St. Peter's, Byron in this feeling, observes

Vastness which grows, but grows to harmonize. All musical in its immensities.

Alberti was the first also to establish the rules of arithmetical and geometrical proportions (ib. ix. b. 3, 4, 5, 6), applied to all the varieties of areas and capacities. He is followed by Palladio in the arithmetical and geometrical rules, ib. i. c. 23.

It is a comfortable conclusion to the practical architect that the empirical rules of Vitruvius, the harmonie, the geometrical and arithmetical rules of Alberti and his followers, agree in the main, so that either may be adopted without material deviation from correctness; but the neglect of these rules, in which lie that hidden charm that every one must be sensible of when examining a finished work, is abundantly evidenced after many years, as if the principle were of no value: the zealous student therefore should carefully notice that consent of the ancients and the most illustrious masters of the moderns, here set forth; and he will soon learn devoutly to repeat the denunciation of the Hindu Vitruvius (Ram Rau, Asiatic Society, 1834, p. 13), "Woe to them who dwell in a house not built according to the proportions of symmetry."

It is true, that the climate of this country and our habits do not often permit the finer Italian proportions; thus the arithmetical rule of proportion, common with others, in St. Peter's, 36 by 24, should give us 30 feet high to the vault, but we commonly limit it to 18 feet. To correct the defect of lowness, so frequent with us, the illusions of perspective painting, under the admirable Pozzo, may well apply; but even the arrangement of the trabeation and plaster enrichments, offer to the ingenious architect of the present age, many opportunities for the beautifying the apparent height, and for the attainment of an artificial proportion. But a manufacturing people are prone to carpets, rugs, curtains, gilded frames, and mahogany furniture, while the low ceiling is a sheet of paper stretched like a drum, at most a mere blank. A kind of indulgent mind, with a gift moulding; while the artistic Italian opens a window of perspective in his ceiling, through which a canvas of poetry and distance delights the eye, and deceives the understanding; but the floor is paved with tiles.

Again, in our modern churches, a ceiling, 60 by 80, has often been fearfully stretched under the weight of elegance and weight, in defiance of the fine examples of Charles's and Queen Anne's churches, in which a cove, after the Italian manner, has the effect of reducing the ceiling, and of rectifying the proportion in the simplest and most graceful manner. The student should well reflect on this important field for architectural skill and effect. He may be a good builder and he can have no pretensions as an artist who throws away his time and his character in such condescending as this mechanical employment of his talent implies.

The rules hitherto referred to, have the beautiful for their object. Beauty in architecture depends, amongst other causes, especially on the exact and graceful proportions of the parts and of the whole. But the sublime depends upon other causes, in which rules cannot prescribe; to the latter not only the rules of the former do not apply, but they are destructive of it. If both useful rules in the proportionate, it would appear that the sublime often resides in the disproportionate. The principles and the rules of beauty and sublimity are distinct. If we stand under an arch of London Bridge, the vaulted soffit, so vast and extended, sustained from such distant abutments, produces a kind of sublime; no doubt aided by its comparative low- ness. The Pantheon, as we have said, is of its height equal to its diameters in height, though scarcely more than half the actual width of St. Peter's nave—limited, therefore, in their dimension to the usual cathedral width, yet nearly double the usual proportion—the sublime is completely attained; and disproportion again appears to be the efficient cause.

But the optical combination of these proportions, so necessary to the several proportions present themselves is exceedingly important. Thus to the spectator of the dome of the Pantheon, the visual angle is 95', while the same dome raised into the air at St. Peter's is only 30'. In the nave of St. Peter's, the same angle, while the height of the dome of Cologne is only 22'. Since then the effect of magnitude is measured by the number of degrees in the visual angle, the architect will advert to this consideration as of extreme interest.

We come, then, to the important conclusion, that the sublime and the beautiful are to be formulated of proportions, rather than in dimensions; and we may infer, that no increase of scale to the beautiful will ever make it the sublime.

But the sublime is of rare occurrence: the use, however, to which these reflections may be turned by the practical architect, under limited means, is remarkably illustrated in the Casino at Chiswick, where the very circumscribed area of the rooms is compensated by their extraordinary height, and the accomplished Lord Burlington has given a nobility to very small apartments which no one could believe on seeing the plan alone, without visiting that elegant and work.

Magnitude is the great object and result of design, and this quality is only to be attained by the fine adjustment of relative proportions in magnitude and order. Architecture consists in magnitude and order (says Aristotle), in conformity of the several parts, and in the great work of the architect, compared with those of nature, display our insignificance. The pyramids, seen in the clear sky of Egypt, or St. Peter's at Rome, are proverbially disappointing to the first gaze of the beholder; it is only after he has inspected comparisons and measurements that he becomes sensible of the greatness of these human efforts—and his memory will supply him with many instances in which objects of very inferior dimensions have surpassed them in impress of magnitude upon his mind. It is plain, therefore, that art alone can produce the full effect of magnitude, and to this the architect should direct all his skill: the magnitude will be found consummated in this as well as in every other department of our art. It is, indeed, a fine art which enables the accomplished artist to raise ideas of magnitude and grandeur of composition on a piece of paper no bigger than your hand; while a less able one shall cover a vast canvas without executing any compara- ble effect. Worthy of imitation, but he can only learn to imitate, and to lend it to the whole art of design and proportion. Pliny cites a statue of Hercules, so small that it might be lifted by the hand, which, however, conveyed more grandeur, magnitude, and strength to the mind of the observer, than a Colosseum; with such a direct, verse in one unbroken surface of plastermasters, and if, with such small means, he could affect the mind with these impressions, how great the economy of cost and material to the employer! Burke, whose notions, however, of proportion are vague and erroneous, says admirably on this point (see x. c. 18): "In the vast number of purposes of design which the spectator and the spectator and the spectator and the spectator should effect the effect of magnitude, as respects composition of the whole, seems to depend on other principles: first, that appears, that to make a great whole, there must be many parts; secondly, to appreciate that whole, the point from which it is permitted to be seen should be eunopic, namely, so contrived as to fill the
angle of vision of 45°, and occupy the whole retina with multiplied impressions fairly and agreeably presented.

With regard to the second proposition, it may be observed, that in a young tree bursting from the ground, two or three branches with upward tendency grow from the polished bark; the subdivisions are few, and we may count the leaves. By and bye, with age and maturity, the bark becomes rough and corrugated, the base is surrounded with excrescences and roots, which, partly and indifferently, fill up the various moreable space; the branches now shoot out at right angles with the bulky stem, each limb becomes a tree, the subdivisions of these are infinite, and, in all degrees of size and proportion, the leaves are countless. So the young animal, simple in parts, and smooth, expanding with age and strength, develops a coordinate part. So the columns at Ptolemaeum have twenty-four instead of the usual twenty fithings; in short, examples are infinite to show that, to convey the full effect of real magnitude, an artificial magnitude must be superadded, or it is lost labour.

Gradation and repetition of parts is the same general resemblance in various buildings; the major and the minor, are main sources of magnitude; the artist will see, in the satellites surrounding the planet Jupiter, the best reason for the title of the Father of the Gods; the western towers of St. Paul’s give magnitude to the dome. The same principle was to have been applied to St. Peter’s, and that is the reason the towers are kept in the same size, and again the smaller towers accompanying this, are foils to the great done. Byron admirably enforces the number of parts:

“Thou seest not all; but piecemeal thou must break,
To separate contemplation the great whole;
And as the ocean many bays will make,
That ask a search, but so here come—
To more immediate objects, and control
Thy thoughts, until thy mind hath got by heart
Its eloquent proportions, and unroll
In mighty gradations, part by part,
The glory which at once upon thee did not dart.”

-Childe Harold, c. iv. v. 157.

So Palladio (as already remarked) characterized his style by the interpenetration of the larger order by a smaller.

In decoration we are careful to put a small scroll in juxta-position to the larger, to give its full effect; and so the painter, to give size to his principal figures, interposed the ground-levels and children; the wreath or swag which shall contain flowers or fruit, all of the same size, will be mean, or look like a string of onions; the whole secret of proportion and whole purpose of magnificence is attained, by satellites, and by gradation of the major and the minor.

With reference to the second proposition, the consideration of the point of view of architectural works, the ancients, as has been already observed, were consummate masters, and cannot be too carefully studied. The labour of the architect is vain, if he miscalculates the point of view, and the picture which he is to present on the retina of the spectator. As well might the painter consent to a bad light for his work, as the architect make no impression on this point. The genius loci will insist upon a perfect composition; each position requires its own adaptation; we should have proper things in proper places. A design good in one place may fail in another, and the unskilful approach and position of the parts may render one thing of itself insufficient for the purpose, without the other additional ornaments; and no argument can more effectually convince the student, that in ordering his studies he must first order his own character and conduct; and that nothing can come from him of great and noble, unless from a pure fountain and a well-regulated stream. We must endeavour to sustain that rank in society which both our position and station assign to the architect (see seeeth, e. iii. v. 1, 2, 3; and Cic. Off. p. 42.)

But an important principle in the arithmetical as well as in the real ends and purposes of our art is solidity, the result of equilibrium between the forces of gravity which can be manipulated to advantage, but which, if not employed, can be useful to others within himself; and we must not make it our object to build a building in itself sufficient, but that which minds seek in a well-ordered work of architecture. According to the simple notions of the ancients, it was the essence of the grandiose and beautiful. The temple of the eternal presence is the most beautiful, and it was, because it was strong also in its component parts, its “great stones.” Energy, meata and physical, and stability, were the expressed most desired in architecture; voids were to be above voids, solids above solids; the area even of the supports, and the incumbent weight (orthographically considered) in most instances of the finest temples are, or approach to, equality.

To this end the whole proportions of the edifice was pyramidal, the sides being inclined (as has already been observed) in every style of architecture known to us. The quoins and piers of the angles which iacule the work are larger than those towards the centre: and we may be sure that the external elevation of strength and duration given to a building is often of itself sufficient for beauty, without any additional ornaments; as we may also be certain that the want of this quality cannot be repaired by any expedient which the architect may apply. In fact, the qualities of solidity and equilibrium are the seeds of magnificence, which may grow into the most beautiful proportions by reason of beauty, as ornament, justice, and truth; as inspiring that security, stability, and peace, without which all is flimsy conceit and vain ambition.

But this rational propriety is sometimes in jeopardy from the love of the marvelous and the exhibition of skill in the artificer, from whom, while we demand equal and proportionate virtues, we must have a little reserve in the presentation of his skill upon the spectator, and by their skilful disposition he may often gain that ascendency which his real forces may not warrant. A familiar instance of this is seen at St. Paul’s, and often practiced upon the green-horn mason, which is a method peculiar to the first time. Of the two orders which decorate the exterior, the lower is the greater, the order of the interior, in the same precise dimension: but the angle of view in the interior being so much larger, the spectator is persuaded of its larger dimension. The rognish circumeone engages the novice in dispute on this question, enforced by a net, which on proportion the higher and the majesty of his pot of beem. Sometimes accident does more for us than wilt. St. Paul’s, constrained, and crowded amidst narrow streets, produces on the unsophisticated a magnetism and interest which would be lost if the pedants had their way, and large areas and terraces were to expose it from Farringdon Street and the
rather than columns to support it; beautiful, indeed, but so fragile that the
blow of a stick or the movement of an awkward visitor would put the whole
fabric in peril. If, instead of a friable stone or marble, these shafts were
made of wood, the artist might well rely into that security which is ever the
first requirement of our art.

The love of the marvellous is dangerous; exaggeration is the first sign of
indifference to the value and beauty and sufficiency of truth, and the
surest sign of depreciation of judgment. Truth must ever be the best founda-
tion of all art.

Rien n’est beau que le vrai; le vrai seul est aimable! Il doit règnir partout, et même dans la Fable.

De toute fiction, l’adolescence fausseté.

Ne tend qu’à faire aux yeux brillar la vérité.

But according to more Germano, the Saviour himself was to be figured; the choir, therefore, was inclined to the
south, to signify, that “he bowed his head and gave up the ghost.” John, v. 33; and there are few cathedrals in
which this deflection is not remarkable. The nave represents the body, and the middle aisle, “the soldiers pierced,” (John, xix. 34), considered to be the south as the region of
the heart, is occupied at Wells by a chantry, at Winchester with the
chapels of William of Wyckham, and is constantly the pulpit from which the faithful went to and fro. But in ancient
architecture, to place the head of the Christ where we have the highest point of the arch, is, as Zeich, xii. 10: who “was wounded for our transgressions,” Isa. liii. 5. For the
same reason the south was considered the most holy: the Old Testament was represented on that side, while the New Testament, and the local or national
Hagiology, was placed to the north. The same superstition still gives value to
the south side of the churchyard for burial. At the head of the cross
was the chapel of the Virgin, at the Fountain of Intercession with her son.
At the foot, the west end, was the “Parvis,” supposed by some to be a cor-
rupption of “Paradis,” that happy station from which the devout might con-
template the scenes of his salvation, while he likened the temple, and from whence they might scan the great sculptured picture, the calendar for unlearned men, as illustrative of Christian doctrine and of the temporal
history of the church under its princes and its prelates. Three great niches
leading up to the church, which were forty feet wide, were adorned with the statues of the apostles and holy men, who “marched to
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same reason the south was considere
ments. On the pinnacles or battlements are the figures of the emperors and electors in full armor. The emperor, who, at that time in alliance with the electors, had conferred the commercial union of the cities on the Rhine, and contributed to the protection of the Rhine frontier, appears with them, as the guardian and bulwark of the house. In the midst of the princes, is the figure of St. Martin, the patron of the city, dividing his cloak with his sword, to give it to the poor. Thus, the leading forms announce the destination and solidity of the building; the figures exhibit the princes, the protector of the people, and the Virgin Mary with the infant Jesus, over the entrance, the higher safeguard which the Divinity grants only to the just." Thus says the accomplished Moller.

It was the observation of Aristotle, that "a noble building without ornament is like a healthy man in indigence." Competence, if not wealth, must be added for the accomplishment of his happiness.

The sculptor's art affords the noblest ornaments to the architect. By his aid, the expression which he has been labouring to give by other associations, is added to the buildings. Sculpture may be called the voice of architecture. Unhappy a Protestant country, with the holy fear of image-worship, discards this generous and most essential art; and perhaps the want of character complained of in architecture may be mainly attributed to the absence of this fine art. But the carver and the decorator are highly serviceable to the architect, not only as multiplying images for the delight of the eye and the explanation of the subject, but as greatly magnifying the scale of the whole by these means, and giving value and distinction to the plainer features. Our mistress for sculpture is not so rich as for architecture; but, if its value, rather than its quantity is considered, sculpture is the more essential, its work is more permanent, in the larger sense, as the adjustment of means to the end; as the wise and fine thought, contrivance, and supply, of all the requirements and appliances of the building art; in which the highest intelligence is displayed; such, indeed, as by that figure of speech which designates great subjects by small words, art in sculpture is called to make, in its proper sense, the vegetable is increased by a texture of endless detail spread over the whole surface of her works.

Finally, Distributio, the ἀναλογία of the Greeks, the sixth principle, is explained by Vitruvius, dryly, as economy in the use and cost of materials; but undoubtedly it may be extended from what is generally understood in the larger sense, as the adjustment of means to the end; as the wise and fine thought, contrivance, and supply, of all the requirements and appliances of the building art; in which the highest intelligence is displayed; such, indeed, as by that figure of speech which designates great subjects by small words, art in sculpture is called to make, in its proper sense, the vegetable is increased by a texture of endless detail spread over the whole surface of her works.

Having thus reviewed the theoretical rules handed down by Vitruvius from the Greeks, as far as the limits and means permitted, the Professor proceeded to offer some observations to the students, with reference to their future advancement, which it was the object of these lectures, and the ardent wish of every teacher, to turn out accomplished architects.

First, with respect to drawing, which was the very language of the art, it was extremely important that the distinction between the painter and the architect should be clearly understood. He deprecated the vain ambition of making architects draughtsmen, especially on a small scale, as effeminate and un-constructive; as also of making painters, even the best, who were not architects. Much time was commonly occupied in this captivating study, which was wholly irrelevant, and at the expense of that valuable time which should be employed in the more essential accomplishments of the art and science. It might, indeed, improve the hand, but not the heart of the, and a architect had so much need. Drawing after the manner of painters had undoubtedly been an abuse and misdirection.

The orthographic drawing or elevation was conventional: it represented the proposed building from an immemorable distance—the object being to distribute those proportions and profiles which constitute the merit of the work, and undefined on this account. It was certain that such had been the practice of the great Italian masters, specimen of which, by the hands of Sanzio, (the front of St. Maria, at Florence, in the possession of Woodbury,) of Michael Angelo, Raphael, and others, and especially the designs for Whitehall, by Inigo Jones. The Professor had endeavoured in his practical experience, to exude perspective, proportion, and profile were more scientific, difficult, and more profitable to the student. The coloured picture was a pandering to a depraved taste, and it was a duty to inform the public on this head, and lead them to the appreciation of the true intent of architectural delineation. The draftsman should be habitual and large scale, both in drawing of profile and detail, such as a builder would comprehend and work

ste. The Professor exhibited a specimen of the architectural drawing of the actual school in Paris, which, though not wholly to be approved, as being rather too minute and elaborate in effect, still showed a more careful attention to the niceties of perspective and forms; and was far more adapted to the purpose for which a drawing should be made. The architect room in the annual exhibition was at great disadvantage in the neighborhood of the splendours of the sister art; the vain attempt at vying with her productions in architectural drawings, had both corrupted our style and exposed the utmost folly of the pretension. The true course would be a closer adherence to the province of the architect in the respect delineation of profile and proportion, and in the most accurate linear perspective; a tasteful employment of these resources would probably more effectually uphold the interest of that room than any other means that could be employed.

Constant observation and travel were essential to the architect; but the interesting objects of our own country should be seen before those of others. Much time was often lost in foreign travel by misdirection and the dangerous novelty of the student's position. In the study of ancient architecture, the student should bear in mind an important rule of criticism, which was, to account in precise terms, for the motives of approbation or dislike which he might experience. By applying a just expression on all occasions, he would soon cease to take one thing for another, and a Faculty of Art—cost for magnificence—and either of these for proportion or fitness—ornament for art. He would learn to apply characteristic terms to every gradation, quality, and style; and so, by degrees, he would learn a just and discriminating taste.

In an art and science essentially referable to association, this discrimination was essential, and he should learn, for example, to apply the names of the Romans to what was done by them, and the names of the Greeks, to whatever had been done by them. Architecture, and as much as possible, all the arts, would be of no value, if not adapted to the ends of the place to which they were applied. There would be some purely ornamental, some of utility, others of true artistic beauty. The music of architecture, which, if well applied, would often be found irrespective of the intrinsic merits of the performance, as the league in hearing "God save the Queen," union and patriotism in the "Marseillaise." Often patriotic, historical, and romantic associations will blind us to forms and styles, otherwise both unit and unworthy our age; often our work is the expression of a particular soil, or of a particular age, and the expression of the manners, superstitions, or habits of a people.

The student, and the architect, should be educated to observe without prejudice, and be able to judge with a discriminating taste, and with correct ideas of the limits of the art. He should not desire to describe the experienced critic; and the painter "who would make his Venus fine, not knowing how to make her beautiful," would be ranked as he deserved. The discernment of merits rather than defects will be his mark; of inability to judge will not be more to be esteemed. Beauties, however high in estimation, if not suitable to the place, and of the taste of the time, should be accounted for. The architect, and the student, must learn to design, that is, to draw, a form or a building, which, though not of high art, and of a most simple nature, be such as to harmonize with the objects around, to the taste of the age, and the means of the place.

There were two works, which the art was expressly liable to: the first was the presumption of absolute novelty; the second, the indolent and servile imitation of former styles. The latter was the peculiar vice of these times throughout all the civilized countries of Europe. Grecian, Gothic, Bycan-}
On Friction.

"An Investigation of the comparative loss by Friction, in beam and direct action Steam Engines." By William Pole, Assoc. Inst. C.E.

In consequence of the comparatively recent introduction of direct action steam engines on board the steam vessels of the Royal Navy, the attention of engineers has been drawn to the advantages or disadvantages they possess, when viewed in comparison with those constructed with side levers. The objection which is to be considered is one and the same, namely, that the amount of friction, the paper proceeds to show that it may be satisfactorily used in the present case, as it is only the friction caused by the strain, or load, which is involved in the objection, and this is more adapted for theoretical than experimental determination.

The three general laws of friction, as established by the best experiments, are:

1st. That the friction caused by one solid body rubbing upon another, is independent of the velocity with which the rubbing surface moves.

2nd. It is also independent of the area of the rubbing surfaces.

3rd. It is proportional to the pressure upon this surface.

From these it will follow, that if the pressure upon a moving body be multiplied by a certain co-efficient of friction (whose value is dependent upon the character of the rubbing surface), the product will be the resistance from friction; and this multiplied again into any space the rubbing surface moves through, will give the amount of "power, work, or labouring force," expended in overcoming the friction through that space.

If the pressure upon the moving body be variable throughout its motion, the differential calculus must be employed, but the principle of calculation is still the same.

The paper proceeds to deduce general mathematical expressions for the amount of friction on each bearing of an engine, by finding, first, by ordinary statistical rules, the pressure thrown on each particular bearing by a given force applying to the engine, and then determining this with the space which the rubbing surfaces move. This is done for the beam engine, and for three modifications of the direct action engine. Equations are also added for the oscillating or vibrating engine, and for an arrangement in which the connecting rod is supposed to be indefinitely lengthened. The numerical values of the expressions for friction thus found, are then calculated for an engine upon each of these different constructions, supposing them to be similar in all other respects, having the cylinders 6 inches in diameter, with a length of stroke of 6 feet; and the results are shown in a table, distinguishing the friction of every bearing. From this it appears that respects the friction caused by the strain, if the beam engine be taken as the standard of comparison—

The vibrating engine has a gain of \( \frac{1}{2} \) per cent.
The direct action engine with slides loss \( \frac{1}{2} \) \( \times \) \( \frac{1}{2} \) Ditto with rollers gain \( \frac{1}{2} \) \( \times \) \( \frac{1}{2} \)
Ditto with a parallel motion gain \( \frac{1}{2} \) \( \times \) \( \frac{1}{2} \)

This difference being so trifling, it is contended that the objection to the direct action engine, on the ground of its alleged increased friction, has, when investigated, no adequate foundation.

Mr. Field believed that the paper was correct in its view of the comparative amount of friction of the two kinds of engines. He was of opinion that an excessive allowance for friction had hitherto been generally made in calculating their effective power. It was found practically, that when the pressure upon the piston was about 12 lb. per square inch, the friction did not amount to more than 0.5 lb. per square inch. This was easily ascertained by the indicator, when the engine was working without a load, but when loaded, he knew of no accurate experimental mode of showing it. At the engines of the Blackwall railway, the experiment had frequently been tried, by casting off all the load, and so regulating the steam, that the engines should make only the regular number of strokes per minute; the result had invariably shown about 1 lb. per square inch for friction.

Mr. Taylor confirmed the preceding remarks; it had been the custom formerly in large pumping engines to allow one-fifth for friction, but modern practice had shown that the necessary additional pressure, occasioned by greater precision had been introduced into the construction of all kinds of machinery.

Mr. Miller agreed that the friction of engines generally had been overhe...
would contend that the circumstances being equal, equal results would be obtained, and that the conclusions arrived at by the author should be received as correct.

Mr. Murray contended that the second proposition in the paper, which assumed that "friction was independent of the distance of the rubbing surfaces," although agreed to by early experimenters, had been proven by Vince and others to be incorrect; it was natural to suppose that in proportion to the hardness and smoothness of bodies, there would exist a different proportion for the best proportion of surface to weight for every different body; if a surface carried a force of a certain amount, the surfaces would cut each other, become rough, and thus increase the friction; on the other hand, if the surfaces were unduly enlarged, there must be a loss from the additional amount of friction caused by the extended surface.

He conceived that the calculations in the paper must be affected by the introduction of the whole beam, when comparing the beam engine with the direct action engine. The friction of the beam engine with the direct action engine appeared to be to suppose two engines of the same length of stroke and diameter of cylinder; the proportions being good, it would be indifferent whether the power was transmitted through a direct connecting rod or through cylinders, air pump, arrangement of parallel motion, &c., being supposed to be alike, the friction of these parts would be alike in all cases, and the comparison would be limited to the parts employed in transmitting the power from the piston rod cross head to the crank pin; both connecting rods have the same number of diameters, which in both cases travel with friction nearly equal distances; it is allowed that the bearings of the shorter connecting rod have a larger amount of friction, and that from the greater angle it assumes, more friction is thrown upon all the bearings of the parallel motion, on account of the greater force required to maintain the piston in a vertical position, which makes the bearing larger. In the direct action engine, allowance must be made in the beam engine for the friction of the beam centres and of the top and bottom sides of the side rods. The friction being directly as the distance moved through, and the distance in the side rod ends being so very small, it follows that the amount of friction must be very trifling. The direct action engine has to be considered in the investigation, but it is not of importance, as it is the angular distance due to the vibration of the beam, measured on the circumference of the gudgeon. Under these considerations Mr. Murray was disposed to give the preference (if any existed) to the side lever engine. In a pamphlet published in 1818 by John Smeaton, to show the comparative amount of friction of the steam engines, it was shown by the packings of the piston and air-pump bucket, by the slide valves and by the different packings or glands; consequently one fifth was due to the whole of the bearings or valves throughout the engine. Now on comparing the large proportion of this amount of the friction that is due to the bearings of the main shafts, of the crank pin, and of the bottom end of the connecting rod, and of all those other bearings common to both sorts of engines, it must be evident that the total amount of the friction to those parts in which a difference between the engines exists, must be but a small part of that amount, and which is divided between the engines. The whole power of an engine, as the amount of power required to overcome the friction of the engine itself, which was allowed to be ample, one-fifth of this would be two per cent, and therefore the degree in which either engine could surpass the other in the amount of friction, could only be, as already stated, a small part, one-fifth of the difference. In the case of two engines, it would thus appear that neither could be said to possess advantages over the other, as regards friction, in such a degree as to be appreciable in practice, or to render the point of importance in a choice between the engines; and that if one kind of engine had advantages over the other, they must arise from other causes than difference in friction.

Having taken this view of the case with a supposed side lever engine, of the same length of stroke and diameter of cylinder as the direct action engine, if manufacturers varied in a slight degree from this proportion, it was for the purpose of obtaining a better proportion of stroke and diameter of cylinder, and consequently a better engine than the one supposed to exist for the purpose of making the observations.

Mr. Vignoles looked upon the second proposition assumed by the author, as being overthrown by the results of the experiments of Wood and others, as they were obtained to the area of rubbing surfaces; and it was well known practically, that the application of various unctionous substances materially altered the amount of the friction. A certain proportion was requisite between the area of the surface exposed to the friction and the pressure upon that surface, according to the general law. For practical purposes, he submitted that the law should be received for the general law. For practical purposes, he submitted that the law should be received.

Mr. Gravatt said, that even allowing, for the sake of argument, that the second proposition assumed by the author was incorrect, still as the paper was only a theoretical examination of the comparative friction of those parts of the engines which were considered, the rubbing surfaces of both to be of similar power and dimensions, equally well proportioned and constructed, and the same sort of lubrication of the bearings employed, he..."
tended over a period of three years (1831, 1832, and 1833), no expense or trouble having been spared to render them conclusive and satisfactory. The results were given by Professor Moseley, in his new work on the mechanical principles of machinery, published in 1834. Professor Moseley had examined the friction in various machines, and showed that the friction was directly proportional to the force with which they were pressed perpendicularly together, and that "the amount of friction was, in every case, independent of the extent of the surfaces in contact." The before-mentioned author had agreed; and it was found that the friction was proportional to the area, and was independent of the extent of surface. In opposition, however, to this, stood the experiments of Professor Vince, of Cambridge, which led him to the conclusion that the friction increased in a less ratio than the pressure, and that it was not altogether independent of the area of surfaces. In these experiments, however, the surfaces were examined, and it was also probable that equal precision had been used in those which proved the contrary; and if this was allowed, the majority of coinciding experiments might, as in all other cases, be safely received in preference to one dissentient. If the particles of the surface of Professor Vince's experiments were not pressed together with that proportion to the extent of the surfaces appeared which would render them less worthy of regard than others. It was not shown that he experimented upon metals, but that he used pieces of wood, either bare or covered with paper, and the experiments were on a small scale, the moving bodies being at the utmost a few ounces weight; while Coulomb, Rennie, and Morin, had extended their trials to all kinds of materials, and had used considerable weights. Professor Vince himself, although satisfied with the method of conducting his experiments, did not seem equally so with their results, as regarded the influence of surface and pressure, for he had remarked, "that no general rule could be established to determine it, even for the same body."

Quotations were then given from Gregory, Brewster, and others, corroborating this view of the inconclusive and unsatisfactory nature of Vince's experiments. The friction became a subject for investigation, and was occasionally modified by accidental circumstances, two of which might be noticed, as they had been expressly treated of by Rennie and Morin.

1. It was only applicable within the limit of pressure which would not injure and abrade the surfaces; for when heating and uneven attrition commenced, it was natural that the law would not hold good. Well-constructed machinery, however, was never supposed to pass this limit, and therefore this cause of irregularity might be rejected in calculation.

2. Another modification was produced by the application of unguents; this was treated of by Mr. Wood, whose experiments showed that when unguents were introduced, there was a certain area of bearing surface, proportional to the weight, which was peculiarly favourable as regarded the loss by friction, but that when this area was preserved, the friction was in strict ratio to the pressure.

It was, however, have been Mr. Wood's intention, from these results, to impugn the applicability of the established general laws to the purposes of calculation, but only to show the existence of modifying circumstances under certain conditions; for the formula he had given assumed the friction to be as the weight, and had no element in it expressing the area.

Mr. Rennie and Mr. Morin had also examined the influence of the unguents, and had found that their introduction did not materially alter the general laws of friction, but only affected the value of the co-efficient or multiplier to be used in ascertaining its numerical amount.

Having said this, the author proceeded to state the principal experiments on friction. Mr. Pole concluded by ascribing the testimony of writers on mechanics, who guided by these results, had promulgated the laws deduced from them. He gave quotations from the following authors in corroboration of his view:—Emerson, 17 Playfair, 17Tredgold, 17Dutch, Lardner, 17 Parry, 17Davy, 17Adams, 17 and Moseley. 18 With the last mentioned author Mr. Pole had taken an opportunity of conversing upon the points in question, and the principles adopted in the paper had received the Professor's full approbation as corresponding with those made use of in his own treatises.

Mr. Vignoles thought that great praise was due to Mr. Pole, for the research and mathematical reading exhibited in treating the question of comparative friction. In the former remarks he had made, it was not his intention to impugn the accuracy of the abstract proposition, that friction was independent of the extent of surfaces pressing together, but in the application of the proposition to various machines, it was considered that proportion were maintained between the area and the pressure, according to the description of mechanism, subjected to the question, as to how far in practice one kind of engine varied from the other in the general amount of friction, and to examine how far the areas of the bearing surfaces, were in proportion to the resistant weight, caused either by the position of the body, or by pressure of unguents or any accidental weight, or moving parts; this inquiry should precede the abstract mathematical investigation. The friction of different substances would not follow the mathematical rule, unless the due proportion between area and pressure was ascertained. If Mr. Pole's principles were correct, then engines, such as marine steam-engines, and the axles of railway carriages, with these qualifications he agreed with the general propositions laid down by Mr. Pole.

Mr. Murray agreed with Professor Vignoles in thinking that the extent of surfaces in machines materially affected in practice the amount of the friction. He did not mean to advocate the correctness of Professor Vince's experiments, but he would draw attention to the results quoted by Dr. Gregory, 19 in which the difference of Vince's experiments and those of other writers on the subject could be traced to an inaccuracy of the friction of the bodies experimented upon. Their experiments were made with inclined planes, which were raised until the bodies began to move, and the amount of friction was then deduced from the angle of inclination that had been given to the plane: from this mode it was contended that no definite laws could be laid down. Mr. Murray acknowledged that on dry surfaces, within certain limits, the amount of friction was not influenced by the extent of surface; but he contended that in practice, as different kinds of unguents were used, the cohesion arising from the impurity and clamminess of these lubricating substances, must be considered and allowed for.

Major-General Pasley said that when he was stationed at Malta, he tried some experiments on friction, by having a slab of Maltese stone, which resembled the oolite of Bath, rubbed smooth and placed horizontally; other pieces of smooth-faced stone of the same quality, but of different areas, were subjected to a rubbing or sliding resistance; the weights which were just sufficient to give motion to the several pieces of stone, were then noted, and it was found that the area of the surface was not important, the friction being directly in proportion to the resistant weight of the stone. He could therefore corroborate Mr. Pole's propositions, and had considered that the subject of friction so well, and had selected his authorities in such a manner as to establish his position incontrovertibly; he would therefore only remark, that in collating the friction experiments for his work from Dr. Gregory and others, he had not found anything that contradicted those of Vince, as being on too small a scale, and not of sufficient importance to rely upon as authority. It must be admitted, that viewing the question practically, there were circumstances which would influence the proposition. If the surface of a journal was so small as to drive out the unguent, or to cut into the lower bearing, the friction would be Unusually increased, and the theoretical position would no longer hold good. The use of unguents would not interfere with the general proposition, although in practice, any substance used for lubrication, which, when cold, solidified and became adhesive, might, for a time, produce an increase of friction; this of course would be avoided, but it would not bear upon the general question.

Mr. Davison stated that he some time ago made several practical experiments with an Indicator, constructed by Messrs. Maudslays and Field, for the purpose of ascertaining the power required to drive various kinds of machinery. He found, that an engine which indicated 50 horses power when fully loaded, showed, after the load and the whole of the machinery were thrown off, 5 horses, or one-tenth of the whole power.

2nd. 190 feet of horizontal, and 180 feet of upright shafting, with 34 horses power, and a superfine ground 3300 square inches, together with 11 pair of spur and bevel wheels, varying from 2 feet to 9 feet in diameter, required a power equal to 7-6 horses.

3rd. A set of three-throw pumps, 6 inches in diameter, pumping 120 barrels of water, to a height of 200 feet, required 5 horses.

By the usual mode of calculation, (viz., 33,000 lbs. lifted one foot high per minute,) it would appear that there was, in this case, friction to the extent of 15 per cent.

4th. A similar set of three-throw pumps, 6 inches in diameter, pumping 180 barrels of water to a height of 140 feet, required 6-2 horses.

By the same mode of calculation as before, there was here, friction to the amount of 15 per cent.

5th. A set of three-throw pumps, 5 inches in diameter, raising 80 barrels per hour, to a height of 54 feet, = 1 horse.

By calculation, as before, the friction amounted to 12½ per cent.

6th. A set of three-throw "starting" pumps, pumping 250 barrels of beer per hour, to a height of 48 feet, = 5½ horses.

By calculation as before, the friction amounted to 15½ per cent.

7th. Two pair of iron rollers and an elevator, grinding and raising 40 quarters of malt per hour, = 8½ horses.

8th. An alf-mashing machine, made by "Haigh," of Dublin; mashing at the time, 100 quarters of malt, = 5-6 horses.

9th. Two porter-mashing machines, made by "Moreland," mashing at the time, 250 quarters of malt, = 16-8 horses.

10th. 95 feet of horizontal "Archimedes screw," 13 inches diameter, and an elevator, conveying 48 quarters of malt per hour, to a height of 65 feet, = 3-13 horses.

Mr. Davison promised to continue these experiments, and to communicate the results to the Institution.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

March 7.—J. Shaw, Esq., in the Chair.

A paper "On the contemplated Restoration of the beautiful Chapter House at Salisbury Cathedral," was read, by Mr. T. H. Wyatt, Architect to the Salisbury Diocesan Church Building Association, which is printed in full in the present number.

Mr. Percy read a paper "On an old staircase at Tamworth Church which has fallen into decay." It is a sort of double corkscrew stair, winding in such a manner over each other, that two persons may go up and down without meeting, although both are circulating in the same well-hole. Mr. Percy offered some remarks as to its probable purpose. It is said to be a solitary instance of this exact kind of stair in England, but we remember to have seen one at Cologne.

April 18. His Royal Highness Prince Albert, the Patron of the Institute, presided at a general meeting of the members, and presented the medals awarded during the session, for essays and drawings. His Royal Highness arrived punctually at the time appointed, attended by Colonel Bourke; he was received by the Vice-Presidents, and the Honorary Secretaries, and conducted to the Library, where the other members of the Council being assembled, were severally presented. The Prince then presided at a Council, at which some ordinaury business was transacted; and, subsequently, having inspected the various antiquities, casts and models in the collection, proceeded to the large room, where His Royal Highness took the chair, and the business of the day was commenced. The minutes having been read, and some donations announced, Mr. Donaldson, Foreign Secretary, read letters from Italian and French correspondents, at Milan, Coblenz, and Paris.

Mr. Fowler, Honorary Secretary, read Bacon's Description of a Princecy Palace and Mr. A. W. Medcalf, entitled to the Prince as the author of the best design founded on that description, and received the Soane medal.

In like manner his Royal Highness presented to Mr. E. Chamberlain, of Leicester, the medal of the Institute, for his essay on the subject proposed, "Are Synchronism and Uniformity of Style essential to beauty and propriety in Architecture?" and to Mr. J. W. Papworth, the medal of merit, for an essay on the same subject.

Mr. Bailey announced the subjects for essays and drawings, for which the Council propose to offer the medals for the ensuing year, and then read a communication from Mr. C. Parker, "On the mode usually adopted in furnishing Pompodoms in the city of Venice," the soil of whichhaving a nature to require the greatest care, and yet where failure is seldom if ever seen.

At the conclusion of the proceedings Mr. Barry addressed the Prince in the name of the Institute, and expressed, in a few words, the gratifying sense entertained by the members, of the honour conferred on the body by the gracious manner in which his Royal Highness had acceded to their wishes in presiding on the occasion: to which his Royal Highness very graciously replied, that he had felt much pleasure in taking part in the proceedings of the day.

THE NEW HOUSES OF PARLIAMENT.

The Commissioners on the fine arts, of which Prince Albert is the head, having called upon Mr. Barry, as architect, to furnish them with a report as to "internal decorations, additions to be made to the Palace, and local improvements," that gentleman transmitted his report to his Royal Highness and the Commission last month. Judging the subject as likely to interest our readers, especially as many of the suggestions offered by Mr. Barry will undoubtedly be carried out, we place the following particulars of the proposed decorations, &c. before our readers, for which we are indebted to the Morning Herald.

As presiding over Majesty's commissioners for encouraging the fine arts in connection with the rebuilding of the new Houses of Parliament, I venture to address your Royal Highness, and, in compliance with the instructions of the commission, to offer the following suggestions relative to the internal finishes and decorations of the new Houses of Parliament, the completion of which is so essential to the architectural improvement of the country, that it is considered necessary to give full effect to the new building; and by way of illustration of the remarks I have to make on these subjects, I beg to transmit the accompanying plan of the principal floor of the new building, a general plan of part of Westminster, in which the new building is shown in connection with those improvements proposed to be made in its locality, and two drawings relating to Westminster-bridge.

THE DECORATIONS.

"With reference to the interior of the new Houses of Parliament generally, I would suggest that the walls of the several halls, galleries, and corridors of approach, as well as the various public apartments throughout the building, should be decorated with paintings having reference to events in the history of the country; and that those paintings should be placed in compartments formed by such a suitable arrangement of the architectural desigs of the interior as will best promote their effective union with the arts of sculpture and architecture. With this view, I should consider it to be of the utmost importance that the paintings should be wholly free from gloss on the surface, that they may be perfectly seen and fully understood from all points of view. That all other portions of the plain surfaces of the walls should be covered with suitable architectural decoration, or diapered enrichment in connexion with the ultimately intended and beautifully harmonized with paintings and emblazoned with armorial bearings, badges, cognizances, and other heraldic insignia, emblazoned in their proper colours. That such of the halls as are groined should have their vaults decorated in a similar manner, with the addition occasionally of subjects or works of art so interwoven as to promote the harmony of the effect of the architectural composition. That such of the ceilings as are flat should be formed into compartments by moulded ribs, enriched with carved heraldic and Tudor decorations. That those ceilings should be relieved by positive colour and gilding, and occasionally by gold grounds, emblazoned with other enrichment, legends, and heraldic devices in colour. That the screens, pillars, corbels, nitches, dressings of the windows, and other architectural decorations, should be painted to harmonize with the paintings and diapered decorations of the walls generally, and be occasionally relieved with positive colour and gilding. That the door-jambs and other enrichments should be constructed of enameled tiles, bearing heraldic decorations and other enrichments, laid in marbling, diapered, or diapered with gold lines, in combination with polished British marbles; and that the same description of marbles should also be employed for the steps of the several staircases.

That the walls, to the height of eight from ten feet, should be lined with oak framing, containing shields with armorial bearings emblazoned in proper colours, and enriched with other subjects, that in all cases be placed against such framing. That the windows of the several halls, galleries, and corridors should be glazed wholly, for the purpose of tempering the light and preventing the direct rays of the sun from interfering with the effect of the internal decorations, and various grounds be placed on the prostrate surface of the glass; the windows of the ground and upper stories, and in the larger or important windows, to be of ground glass, in single plates, and the inner glazing of an ornamental design in metal, filled with stained glass, hearing arms and other heraldic insignia in their proper colours; but so arranged as that the ground, which I should recommend to be of a warm yellow tint, in parts, by per glass or diaper, and occasionally relieved by legends in black letter, should predominate, in order that so much light only may be excluded as may be thought desirable to do away with either a garish or cold effect upon the paintings and decorations generally. Practically, I consider that the double glazing will be of essential service in carrying out the system of warming and ventilating proposed to be adopted in the building generally; which system renders it unnecessary that the windows in those portions of the building above referred to should be made open, so that all prejudicial effects upon the paintings and other decorations, which might be caused by the dampness and impurity of the air, which otherwise might be caused by the windows being probably used in the means that would be necessary to adopt for opening and shutting casements would be avoided.

"That, in order to promote the art of sculpture, and its effective union with painting and architecture, I would propose that in the halls, galleries, and corridors, statues might be employed for the purpose of dividing the paintings on the walls. By this arrangement a rich effect of perspective, and a due subordination of the several arts to each other would be obtained. The statues suggested should, in my opinion, be of marble, of the colour of polished alabaster, and be raised upon light and suitable pedestals, placed close to the wall, in niches, surmounted by enriched canopies; but the niches should be shallow, so that the statues may be as well seen laterally as in front.

"The architectural decorations of the steps, niches, &c. might be painted of such colours as will give this effect to the ceiling paintings, being relieved by positive colour and gilding; and the backs of them might be painted in dark colours, such as chocolate, crimson, or blue, or they might be of gold, for the purpose of giving effect to the statues.

"Having thus described the views I entertain as to the character of the
decorations of the interior generally, I now proceed to notice in detail the special decorations and arrangements which I would propose for the several halls, galleries, and principal apartments.

WESTMINSTER HALL.

"I would propose that Westminster Hall, which is 230 feet long, 68 feet wide, and 50 feet high, should be made the depository, as in former times, for all trophies obtained in wars with foreign nations. These trophies might be so arranged above the paintings on the walls and in the roof as to have a very striking and interesting effect.

"I would further suggest that pedestals, 20 in number, answering to the position of the principal ribs of the roof, should be placed so as to form a central avenue, 30 feet wide, from the north entrance door to St. Stephen's porch, for statues of the most celebrated British statesmen, whose public services have been commemorated by gold and silver in public expense, as well as for present and future statesmen whose services may be considered by Parliament to merit a similar tribute to their memories.

"The statues (26 in number) which have already been proposed to be placed against the walls, between the pictures, I would suggest should be those of naval and military commanders.

"The subjects of the paintings on the walls, 28 in number, 16 feet in length and 10 feet in height, might relate to the most splendid warlike achievements of English history, both by sea and by land, which, as well as the reliefs that are proposed to divide them, might be arranged chronologically.

"To give due effect to those suggested decorations, it is proposed that the light should be considerably increased by an enlargement of the dormer windows in the roof, by which also that extraordinary and beautiful piece of decorative carpentry of the 14th century may be seen to much greater advantage than has ever yet been the case.

"This noble hall, certainly the most splendid in its style in the world, thus decorated by the union of painting, sculpture, and architecture, and aided by the arts of decoration as suggested, is presumed would present a most striking appearance, and be an object of great national interest.

ST. STEPHEN'S HALL.

"I would suggest that this hall, which will be 90 feet long, 30 feet wide and 50 feet high, and have a stone-groined ceiling, should be appropriated to the reception of members of the House of Commons, and parts of its most eminent members in 10 feet high, might relate to some of the most remarkable royal pageants of British history or other appropriate subjects. Statues of her present Most Gracious Majesty might fill the central niches at the ends of the hall, and the other niches, as well as the pediments between the paintings, might be occupied by statues of her Majesty's ancestors. These statues might, with good effect, be of bronze, either partially or wholly gilt.

THE VICTORIA GALLERY.

"This gallery will be 130 feet long, 45 feet wide, and 50 feet high, with a flat ceiling, and will admit of both paintings and sculpture. The subjects of the paintings on the walls, 16 in number, may be of great local events. The niches in the walls and screens might be filled with statues of her Majesty's ancestors, in chronological order, even up to the period of the Tudors. In front of the eight clustered pillars in the angles of the hall, might be placed, with good effect,solid statues of some of the great law-givers of antiquity.

CORRIDORS OF ACCESS THROUGHOUT THE BUILDING.

"The principal corridors of access to the various apartments of the building will be 12 feet wide, their ceilings will be flat, and they will be generally lighted from windows near the ceiling. The walls may be decorated with portraits as well as paintings, illustrating some of the most remarkable events in the history of the country, or in the lives of most eminent persons. For this purpose about 2,600 feet in length of wall, by a height of about seven feet, may be appropriated on the principal floor: 900 feet in length, by a height of about seven feet on the one-pair floor; and about 400 feet, by a height of about seven feet, on the two-pair floor. These paintings may be divided into subjects, by years, or for borders of architectural decoration in accordance with the style of the building.

THE HOUSE OF LORDS.

"This house will be 93 feet long, 45 feet wide, and 50 feet high, will have a flat ceiling in panels. As the fittings for the accommodation required for the business of the house, together with the windows, which are necessary for daily lighting it, leave little space of plain wall, paintings cannot, with good effect, form any part of its decoration. Niches, however, will be provided where they might be placed, and the lives of most eminent of royal personages. The architectural details of the ceiling may be enriched and relieved with gold and colour, and the windows filled with stained glass as before described. The whole of the fittings are proposed to be of oak, with appropriate carvings. The throne will be highly enriched and relieved by colour and gilding, and the back lined with cloth of gold, containing the royal arms embazoned in colours.

THE HOUSE OF COMMONS.

"This house will be 83 feet long, 46 feet wide, and 50 feet high, and will have a flat ceiling. It is proposed to be finished in the same style as the House of Lords, but with less enrichment, and less of colour and gold in its decorations. The nature of its designs, and the extent of its fittings for the accommodation required, will not admit of either painting or sculpture.

THE QUEEN'S ROBING-ROOM.

"This room will be 38 feet long, 35 feet wide, and 20 feet high, and have a flat ceiling in panels, richly moulded and carved, and relieved with gold and colour. The ground of the panels of the ceiling is proposed to be of gold, covered with a diaper enrichment, and blended with legends, genealogical devices, badges, cognizances, and other heraldic insignia, and in colour.

"The wall fittings of the room are proposed to be of oak, richly carved and moulded, and enriched with heraldic and other decorations in positive colour, relieved with gold. Compartments will be formed in the wall-framing, which might be filled with paintings referring to events in British history in which the Sovereign has personally taken a conspicuous part, or with other appropriate subjects.

THE ANTI-ROOM, OR GUARD-ROOM.

"This room which adjoins the Queen's robing-room, will be 38 feet long, 35 feet wide, and 20 feet high. The ceiling will be of oak, with characteristic decoration, with gilding, highly polished, framed,一族 of the most celebrated personages, and inlays. The window will be 7 feet high, will have a flat ceiling, and will admit of oak framing to the height of about 6 feet, above which they might be covered with paintings representing celebrated state trials, and extraordinary sittings of Parliament, conferences, &c.

AS TO THE APARTMENTS APPROPRIATED TO THE PRIVATE AND PUBLIC USES OF EACH HOUSE.

"These rooms consist of libraries, refreshment rooms, robins' rooms, state officers' rooms, and committee rooms.

"Nine rooms are appropriated to libraries, six of which are fifty feet long and 28 feet wide; two are forty feet long, and 24 feet wide; one is 32 feet long and 23 feet wide. The refreshment rooms are four in number, of which one is 60 feet long and 18 feet wide; two are 28 feet long and 18 feet wide; and one is 34 feet long and 18 feet wide. The robins' rooms for the archbishops and bishops are three in number, of the respective sizes of 30 by 20 feet, 20 feet square and 16 feet square. The robes and other rooms for state officers are seventeen in number, averaging in size about 24 feet by 18 feet. The committee rooms are thirty-five in number. On the principal floor, five of them will be 57 feet long by 28 feet wide; two are 45 feet long and 24 feet wide; and one is 32 feet by 25 feet. On the one-pair floor, two will be 42 feet long and 33 feet wide; one 54 feet by 28 feet; four 36 feet by 28 feet; ten 34 feet by 28 feet; and two 34 feet by 22 feet; and on the two-pair floor the number will be eight, averaging in size 28 feet by 20 feet. The whole of these rooms are about 15 feet high, and the exception of those on the two-pair floor, which will be about 11 feet high, and will be lighted by windows of the usual height from the floor.

"The ceilings will be flat and formed into panels by moulded and carved ribs, relieved by characteristic and suitable carvings.

"The rooms are to be of oak, with gilding and marbles.

"The fire places and door jambs are proposed to be of British marbles, highly polished. The doors, frondipieces, fittings of walls, and fittings, will also be of oak. In some of the rooms it is proposed that the wall framing should be carried to the height of six or eight feet, in others that it should be to the full height of the room, and its panels for paintings, portraits, &c.

"The plain surfaces of the walls might be covered with paintings of historical events, and the panels in the wainscoting might contain portraits of celebrated personages in British history. Inlays.

"The architectural details, both in stone and plaster, might be painted in positive colours, occasionally relieved with gilding; and the ornamental bearings, badges, and other heraldic insignia, which will enrich the wood-framing, might also be relieved with gold and colour.
THE SPEAKER'S RESIDENCE.

"This residence, being designed for state purposes, might also be adorned with paintings. The style of its finishings, fittings and decorations will be in accordance with the best examples of the Tudor period.

Its principal rooms will be as follows:—A reception-room, 34 feet by 23 feet; a library, 34 feet by 23 feet; a dining-room, 45 feet by 21 feet; a writing-room, 38 feet by 22 feet; and a corridor of communication, 8 feet wide, surrounding an internal court.

"With respect to any further encouragement of the fine arts in the interior of the building, I am aware of any opportunities that offer, and arrangements have already been made for all the architectural or conventional sculpture that will be required to adorn the several elevations. Equestrian statues of sovereigns in bronze might, however, be placed with considerable effect in the proposed quadrangle of New Palace-yard, the Speaker's quadrangle, and the court.

"I have now described, in general terms the whole of those portions of the building that might, I think, with propriety and effect be adorned with works of art, and the arts of decoration; but in making the several suggestions which have occurred to me, I should wish to be understood that I have no wish to overthrow my own views upon matters of taste. It is, as I have hitherto been able to consider it in its general bearings, and with a view to show how the objects for which the commission has been established may, if desired, be carried out in the decorations of the new building to their greatest extent. I should not, however, wish to be strictly confined in all cases to the adoption of even my own suggestions, as upon a more mature consideration of the subject in detail hereafter, when the shell of the building is completed, I may be induced to vary and modify some of the views which I entertain at present, and which, I fear, I have but imperfectly communicated in this paper.

AS TO THE COMPLETION OF THE EXTERIOR.

"It has ever been considered by me a great defect in my design for the new Houses of Parliament that it did not contemplate a formation of sufficient length towards the Abbey, particularly as the building will be an imposing and more generally seen on that side than any other. This was impossible, owing to the broken outline of the site with which I had to deal. I propose, therefore, that an addition should be made to the building for the purpose of accommodation of the House of Commons, and that additional to the entire plan of the present Houses as proposed by Government, and now hired most inconveniently, there should be a provision for the accommodation of the town, at a considerable amount of rent; or for such of the Government offices as may, without inconvenience, be detached from the rest, such, as, for instance, the office of woods, or for a record office, and chambers or residences for the Speaker and others of the present staff. In my own opinion, provision for the increase of accommodation for the House of Commons, the principal entrance to the entire edifice at the angle of Bridge-street and St. Margaret-street—a feature which is at present required, and which would add considerably, not only to the effect of the building, but also to its security of times of public commotion.

"Of the several local improvements suggested, none, in my opinion, is of greater or more pressing importance than that which I have to suggest in respect to Westminster-bridge. The anomaly of the size, outline, and character of that bridge, considered, as it ever must be from its proximity, as an adjacent one, to the Palace, must have forcibly struck every one who has passed over or under it since the last renewal of the building has imparted to it a new importance; and the steep and dangerous declivities of the roadway, as well as its want of width for the traffic that passes over it, have constantly been a subject of public complaint.

"In order to remove these serious objections, I propose that the superstructure of the bridge should be rebuilt upon the old foundations, which are now in course of being repaired and extended under the able superintendence of Messrs. Walker and Burgess. As it is, in my opinion, of the greatest importance, both as regards the effect of the new Houses of Parliament when viewed from any object, and in the evident point of view, not only that the bridge should be materially lowered, but that it should be made to accord with the new Houses of Parliament, in order that both in composition as well as style the ensemble should be harmonious and effective. Upon a rough estimate which I have formed of the cost of the new superstructure, I would operationally present the House of Commons with the cost of 800l. beyond the cost it will be necessary to incur to carry out Messrs. Walker and Burgess's design for widening the present bridge to the extent proposed."

Mr. Barry, in continuation observes, it is clearly to be understood he has not interfered with the employment of the engineers who are now engaged in the repair and extension of the bridge, but that strongly recommends should be left to complete it. He expresses a hope that the commissioners, if they should think fit, will at their earliest convenience make a formal and urgent communication to the Government in accordance with the above views he has laid before them, as an early decision would be of great importance, in order that the works in hand may not be proceeded with farther than is necessary to carry out those views if they should be ultimately adopted.

The embankment on both sides of the river, from Vauxhall-bridge to London-bridge, he considers next in importance to the rebuilding of the superstructure of Westminster-bridge. He says—"As there would, doubtless, be serious objections to a public road upon the embankment on the north side of the river, I confine my observations to the southern side, where, if a road could be obtained, it would afford a success of fine views of that part of the principal front of the new houses of Parliament. Having maturely considered the subject, I think it would be practicable to obtain a public road of ample width upon arches, from the terminus of the South-Eastern and Dover and the Waterloo-bridge to the new house at Vauxhall.

"The road might be raised upon arches to a level that would coincide with the levels of the roadway of the several bridges which it would intersect, by which means the water-side frontages of the several wharfs need not be removed or destroyed. The frontage of such of the existing wharfs that it was reasonable to suppose frontages might, by the means of docks of convenient form and size, be very considerably increased, and the archways would, to a great extent, be appropriated, if desired, to warehouses and other purposes of trade. By extending the archways to a sufficient depth to the south, a frontage of considerable extent might be formed, the inhabitants of the Privy Gardens and the new houses of Parliament, where, if the houses were designed in masses, with reference to architectural effect, they would form an agreeable and striking view from the north side of the river, and effectually screen the present low and mean display of unpicturesque buildings on the Surrey side. The proposed houses, from being raised to a considerable elevation, would have a fine command of the river, and the principal public buildings of the metropolis, and having, in addition to these advantages, a southerly aspect, would form very agreeable residences, such as would probably be selected by the descendants of the adjoining wharfs, either for their own occupation, or that of their principal agents. Through the private accommodation to the several wharfs, and the value of the new building frontage, the proposed work would probably yield a very considerable return for the capital expended upon it, and, when effected, would not only remove the inconveniences so seriously complained of, but would render the improved portion of the metropolis susceptible, but would materially conduce to the convenience, the comfort, and the recreation of the public. It would also perhaps render unnecessary the fine road that has been projected from the termini of the railways at the foot of London-bridge, through Southwark to the foot of Westminster-bridge, the convenience of the west end of the town, as the distance to that part of London would be materially shortened by taking the proposed embankment road, and passing over Waterloo-bridge.

The local improvements immediately contiguous to the new Houses of Parliament and the approaches, Mr. Barry in continuation remarks—"Old Palace-yard is proposed to be considerably increased in size by the demolition of the houses which now occupy that site, as well as the houses on both sides of Abingdon-street, by which means a fine area for the convenience of the House of Lords, as well as a spacious landing-place adjoining the river, would be obtained. The Victoria Tower, as well as the south and west fronts of the building, would thus be displayed to the best advantage. The Chapter house would be laid open to public view, and if restored, would form a striking feature of the whole, in conformity with the beauty of the west front of Westminster Abbey. The effect of the omission of the fathers and son of the architectural scale of the present arches of the circular form. I am induced also to recommend this form of arch on account of another very important practical advantage which it offers, namely, the elevation of the springing above the level of high water, by which the water-way through the bridge would be the same at all times of tide; whereas at present the spandrels of the arches offer an impediment to the water-way at high water nearly equal to 1-20th of its sectional area, occasioning rapid currents, with a considerable fall, and sometimes much danger to craft in passing through the bridge, under the influence of high water.

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THE IPSWICH COMPETITION AND IPSWICH CUSTOM-HOUSE.

Sir—Notwithstanding that so very much has been said on the subject of competition generally, and also in regard to particular cases of it, never has a more striking proof of the manner in which such matters are managed, been brought forward, than that furnished by the competition now in progress for a new Custom-House at Ipswich. This, I think will be admitted by every one on reading the following statement and correspondence, for which I solicit insertion in your Journal, in order that the profession and the public may be acquainted with the whole affair, and clearly perceive how monstrously absurd are the so-called "Instructions to Architects," sometimes put forth on such occasions. No doubt this Ipswich affair is a very trepanny one in every meaning of the word—most remarkably so: and on that very account does it call for strong animadversion and exposure; since it is owing to so many things of the kind being quietly passed over, as too insignificant for notice, or because it is worth no one's while in particular to make any "fuss" about them, that they at length become an established system. Ordinances on the part of the profession looks like acquiescence, and local "committees," relished from the whole-some fear of committing themselves, perfectly irresponsible to public opinion, and at liberty to act just as they please, no matter how capriciously, how arbitrarily, or how absurdly. Bodies of that kind have, like private individuals, most unquestionably the right of pleasing themselves—that is, if they can, and also that of serving their own particular views and their own particular friends; but then it should be done in a different manner: for when they invite to competition by public advertisement, they become pledged to perfect dealing and impartiality, and bound to act with something like discretion. At all events, it may be supposed that they themselves have a tolerably distinct notion of what it is they do want, and ought, accordingly to express it as distinctly as they can: otherwise, the vagueness of their "instructions," either betrays their own incapacity, their inability to explain themselves in the first instance, and therefore, it may be inferred, their incapacity to judge afterwards on the designs submitted to them, or it very naturally excites a suspicion that all is not quite so fair and straightforward as it professes to be, but that the "instructions" have been conveniently mystified, in order not to enlighten people too much on the subject. Obliquity, we are told, is one source of the sublime; and if so, the committees who preside over competitions must be some of the sublimest people in the world.

The Corporation show that they are bringing forward this Ipswich affair, is the hope that the attention of the Institute of British Architects will now be called to it. It certainly is what it ought to take up; but although I belong to that body myself, I must own that it has hitherto shown itself by far too supine in all such matters: it is sadly deficient in that heartiness and zeal which, only exerted, would correct many abuses, and would do so less directly than essentially benefit both the act and the profession. It must be admitted that it is an Onoruous and not particularly gracious task of trying to effect what it is beyond the power of individual zeal and energy, however well directed to accomplish. The Institute, it may be presumed, possesses a certain degree of authority with public opinion: if so, let it exert that authority to some purpose, and beneficially. Let it convince the public that it is something more than a mere name, and that its influence extends beyond the walls of its own council-room. Unfortunately, however, those who have most weight and influence there, are least of all interested in bringing forward or promoting measures having for their object the interests of architecture and of the profession generally. That such should be the case, is, perhaps, natural enough: why should those who are not at all personally affected by them, give themselves any concern about grievances and abuses which they do not feel? nor is it that they may permit those who have to contend with them? The tranquility with which they view—for hardly can they be ignorant of them, may look like philosophy—like Mahomedan assignment to unavoidable evils; yet though their indifference may be very justifiable, all very prudent and proper, it certainly says nothing for their zeal, their generosity, or their public spirit; nor does it at all tend to raise the character of the Institute as a body in public estimation. Tout au contraire, it expose it to anamalussions of all the more severe, because well merited. Perhaps I am now expressing myself rather strongly, and may besides be thought to spin out these remarks too largely, for I began them merely by way of preface to what follows, and to what I will now let follow at once without any further comment.

"INSTRUCTIONS TO ARCHITECTS DESIRous OF SUBMITTING DESIGNS FOR THE PROPOSED NEW CUSTOM HOUSE, IPSWICH, SUFFOLK."

To Architects.

The Corporation of Ipswich, propose to erect a public building upon the common quay, in that town, as a Custom-house and Excise-office, and likewise all necessary offices for the accountant and collector of the dock commissioners, and other public business of the town connected with the mercantile and shipping interests; accommodation will also be required for the lessees or occupiers of the common quay wharf, which is the principal landing place for goods in the town, and any spare rooms may be adapted for private offices or a bonding warehouse.

Cost.—The expenditure not to exceed £4000.

Premium.—Twenty guineas will be given for the first selected plan, and ten guineas for the second. Such two plans to become the property of the corporation. The architect whose design is selected will most probably be employed to superintend the erection of the building provided he can produce satisfactory testimonials as to his ability, &c.

Site,—The site for the proposed building is an open space, measuring about 240 feet by 130 feet, with a water frontage.

Motto.—The different drawings, &c., are to be distinguished by a motto, and the name and address of each architect to be sealed up in an envelope bearing the same motto as his design, which letter will be returned, unopened, to the unsuccessful competitors.

The plans, &c., to be delivered at the town clerk's office, Ipswich, on or before the 1st of May next. The selection of the premium designs will be duly advertised in the local papers, after which, the remaining designs will be returned to their respective authors, on their writing for the same, stating the motto affixed to their various drawings, &c.

"S. A. NOLCUTT, Jun.,

‘Town Clerk.’

Ipswich, March 1843."

11th April, 1843.

Sir,—I shall feel obliged by your favours me with replies to the following queries relative to the competition for the new Custom-house, Ipswich.

1st. Is it necessary for the competitor to see the ground previously to preparing his designs?

2nd. What is the nature of the foundation? will it be requisite to use piling or concrete, or is the natural soil sufficiently solid to bear the ordinary foundations of a building of the size and nature required? What extra ordinary outlay for this part of the work?

3rd. What accommodation will be required for the Custom-house and Excise-office, and what dimensions will be required for the rooms?

4th. What is to be understood by suitable offices for the accountant and collector of the dock commissioners? are there two or more rooms required, or what are the materials to be used in the Institute as a body?

5th. What accommodation will be required for the lessees or occupiers of the common quay wharf?

6th. What spare rooms are expected to be provided for offices and bonding warehouse, and what dimensions are they required to be?

7th. Are all the rooms, warehouses, &c., contained in the first paragraph of the 'Instructions to architects,' to be included in the expenditure of £4000?

8th. What distance is the wharf or water from the site of the proposed building?
9th. For the premiums, it is expected that the architects should furnish the requisite number of drawings in order that the corporation may form a just decision on the comparative merits of the various designs. Will it be necessary that they furnish the following? viz. Elevation of the four fronts; plans of the different stories, foundations and roofs; six or seven drawings; one longitudinal and two or three transverse sections; one or two perspective views, about 16 drawings; a specification of the work and a detailed estimate of the cost.

10. What scale are the designs to be drawn to? Are the elevations to be coloured, tinted in the sepia or only to be drawn in outline?

12. Are the perspective views to be taken from any fixed points? And are they to be coloured or tinted in sepia?

13. What materials are to be used in the construction of the outside walls, and in whatever decoration the limited funds will allow?

14. As the architect whose design is approved will most probably be employed to erect the building, may I ask if any designs have been laid before the corporation previously to the competition being proposed?

15. Have the corporation an architect, or any one possessing a knowledge of architecture in their employ?

16. Will any means be adopted to ascertain that the designs can be executed for the sums estimated?

17. Will the corporation undertake to lay aside all designs which cannot be executed for the sums estimated?

18. By whom are the designs to be examined and selected?

19. Are the parties who examine and select the designs well acquainted with the principles of composition in architecture, as regards unity of style, fitness for the end in view, and harmony to which I may add the principles of construction, and the proper application of materials?

20. Is the approved design to be in strict conformity to ancient precedent, or to be an original composition, possessing all the requisites of a work of fine art?

21. In case the corporation should consider it necessary to call in the aid of a professional architect to assist them in the selection of the designs, will his report be delivered in writing, and will it be published or otherwise be made known to the competitors, in order that they may have an opportunity of reflecting any opinion therein contained?

22. The time for sending the designs is exceedingly limited. It would be of considerable benefit to the corporation as well as the architects that a greater length of time was allowed for preparing the design; can the corporation grant such a request?

23. Is it intended that the designs should be publicly exhibited previously to the decision of the corporation?

24. Who are the members of the corporation that are to form the judges in the competition?

25. I have to apologize for taking up so much of your time; but without the information herein required it will be impossible to furnish suitable designs for the proposed building.

Your earliest reply will oblige,

Yours, &c.,

Ipswich, 13th April, 1813.

Sir—I have your letter of yesterday. It is quite impossible for me to give the answers you require. £1000 is the total sum to be expended. The dock commissioners would only require two rooms, and these not large. The architect may choose the site of the building in the area, the dimensions of which are furnished in the paper already sent to you, except that a roadway of 30 feet from the water's edge must be left free of any building. There is no limit as to scale. The time for sending in drawings cannot be extended.

I am, Sir,

Your obedient humble servant,

S. A. NOLCUTT, Jun.

Ipswich, 13th April, 1813.

Sir—I am exceedingly sorry to be so troublesome to you, but without the requisite data, it is impossible for any architect to prepare suitable designs for the Custom-house at Ipswich. If it is impossible for you to give me the information required, you may probably inform me to whom I am to apply. In the printed instructions to architects, there is so little information, that the whole accommodation required for the Custom-house is quite undefined; and whether the offices are for one or two clerks or more persons is not mentioned. I respectfully submit that the architect's answers to the queries I sent on the 11th instant should be given by the committee, who of course are fully aware of the accommodation they require. I shall feel obliged by an early reply.

I am, &c.,

Ipswich, 15th April, 1813.

Sir—I have to acknowledge the receipt of your letter of the 14th, and regret that I can afford little more information than has been already furnished to you in common with those gentlemen who have stated their determination to send in plans for the new Custom-house here.

I can only say, generally, that the business of the port in both departments, custom and excise, is not likely to be very considerable, and the dock commissioners would not require more than a couple of moderate sized rooms. The limited expenditure must of course govern the extent of the accommodation.

Sir,

Your obedient humble servant,

S. A. NOLCUTT, Jun.

Ipswich, 15th April, 1813.

Sir—I should be wrong in expressing an opinion that the corporation of Ipswich were the only body who have published such vague instructions, when they require architects to prepare certain designs for the buildings they have it in contemplation to erect; was this the first instance of the kind, little could be said upon the subject, but as it is now the usual proceeding in most occasions of this nature, the profession, as a body, ought to complain, yet as a body, they do little, it therefore rests with individuals to do something.

I would not for a moment suppose that the corporation have already decided who is to be the architect of the building, nor do I suppose that each member of that body has his particular friend to support, and therefore all the information he possesses is necessarily reserved for this friend, I say I cannot presume that this is the case, but the very great difficulty I have experienced in obtaining the necessary information so as to prepare the required designs, naturally creates a suspicion, especially as the numerous results of such proceedings confirm those suspicions. I presumed, when I wrote to you, that officially you had the power of answering all necessary questions, and that if you had not such power, at least you could direct me to some person who must have known what was required, better than a stranger, for the commercial business of the port. The dock commissioners, the accountant, the merchants, who are interested in the slipping, the occupiers of the common quay wharfs, the town clerk, and others interested or connected with the custom house, must individually have some idea of the accommodation; surely it would have been no great or difficult task to collect such information, in order that the corporation should get the most suitable design for their building—or if they do not know what they want, they can want nothing—this is a natural inference, and perhaps the least requiring an apology.

I have to thank you for your letters, although you were unable to give me the information I required. It is my intention to publish to some periodical, the "Instructions to Architects," my queries, and the correspondence I have had with you on this occasion, my only wish being to obtain, in business of this nature, all the information that the subject may require, and in which I have been so unsuccessful in this instance.

The most extraordinary thing in this competition appears to me to be, that the corporation are to select the most suitable design for their building, yet admit through their official organ, that they do not know what is required, at least I must come to this conclusion, as the information I required on the most important subjects could not be obtained.

I am, &c.,

17th April.

South-Eastern Railway—(Folkestone.)—The works at this place are rapidly progressing under the contractors for the works, Messrs. Grissell and Beales. It is expected they will be able to proceed very soon in the hands of Mr. Bette's, the contractor for the permanent way, and there is now no doubt that the line will be in operation within seven miles of Dover before the end of July next, neither now is there any doubt expressed as to which will be the direct line to France.
MR. PUGIN'S NEW WORK.

An Apology for the Revival of Christian Architecture in England,


To recommend this production to the notice of our readers, would be almost superfluous, since it is one which can hardly by any possibility escape notice, or fail to obtain greater attention than usually falls to the lot of architectural publications in general, or even of such as have more than ordinary merit to recommend them. Any thing proceeding from the author of the "Contrasts" and "True Principles," is certain of being taken up with curiosity, and with not the least degree of it by those in whom that feeling may be more or less mixed with apprehension, and who are therefore anxious to discover whether they themselves come in for any remarks from a pen that is not always exercised very gently. In one respect, Mr. Pugin is quite alone, not only from all other architectural writers, but from nearly all other writers whatever; he is no respecter of persons, but speaks as one having authority—openly, boldly, without any observance of the quarter in which, without attempting to conciliate any one, and without caring what individuals he may offend. Mawkish liberality and excessive "good nature" are not among Mr. Pugin's foibles: so far is he from excusing himself upon grounds of "delicacy," and saying as little as possible in regard to living architects and their productions, that in speaking both of the one and the other, he goes to an extent quite unprecedented, except it be either in anonymous criticism, or hostile literary controversy. Neither is there anything apologetic in his tone; he does not offer his opinions as merely those of an individual, but as positive and unquestionable dogmas, no less implicitly to be adopted than they are fearlessly proclaimed without the slightest misgiving on his part.

Whether it be altogether prudent or becoming in an individual, let his ability be what it may, to set himself up as a sort of oracle, and to assume a self-elected dictatorship over all the rest of the profession, is a point we leave others to settle. Be it either with or without "right," such is in a manner the case; nor have we to read far in his book before we find, that however unwarrantably it may have been usurped, Mr. Pugin is determined to exercise his office with a high hand. We do not know if this new volume of his is the same in substance with a series of architectural papers announced some time ago under his name, in the Art Union, but which never appeared. It is not altogether unlike, for there certainly is much which not every editor would care to sanction; nor is Mr. Pugin a writer very submissive to editorial control, or disposed to expunge or qualify or soften down what may be objected to as offensive and unsafe opinions and expressions.

Like another Sir Huon, Mr. Pugin plucks a Sultan by his beard, the Sultan in this case being no other than the Professor—aye, the "living" Professor—of Architecture at the Royal Academy, whom he treats not at all more ceremoniously than he did Sir John Soane, when he showed up the "Professor's Own House." "It is a perfect disgrace to the Royal Academy," he says in a lengthy and piquant note, at his third page, "that its Professor of Architecture should be permitted to poison the minds of the students of that establishment by propagating his erroneous opinions of Christian architecture. The influence which his position naturally gives him over their minds is doubtless considerable, and the effect of his instructions proportionally pernicious. Not content, however, with the disapprobation of ancient excellence, which he introduces in his official lectures, he is practically carrying out his contempt of pointed design in both Universities, and in a manner that must cause anguish of soul to any man of Catholic mind and feeling. The ancient buildings of King's College, models of perfection in their way, are actually being demolished in order to make room for a monstrous erection of mongrel Italian, a heavy, vulgar, unsightly mass, which already obscures, from some points, the lateral elevation of King's Chapel, and which it is impossible to view without a depression of spirits and feelings of disgust. A man who paganizes in the Universities deserves no quarter."

We need not quote further, but may leave the remainder as a tit-bit in store for those who feel their curiosity whetted, by the "taste" we have given them of this formidable note, merely remarking here that it hints at "gin-palace design" at Oxford, and prophesies that those, and many other works of the present day, "will be the laughing stock of posterity." Still, though we are inclined to admit that the buildings Mr. Pugin so mercilessly reprobrates are decidedly bad, yet not perhaps quite so much as to occasion "anguish of soul," and actual "depression of spirits," we consider them such, not because they are not of "pointed design," but because they are very tasteless and excessively poor in themselves—strangely crude and patched-up abortions, without any manifestation of study bestowed upon them, and egregiously defective, not only in regard to taste, but as buildings, and devoid of all unity of plan and composition. In falling foul of the professor for "paganizing," in the universities, Mr. Pugin is perhaps rather too severe, and somewhat unguarded, for there has been a good deal of "paganizing" elsewhere before now, and the example was set by the very fountain head of orthodoxy, the apostolic city, and by the very successors of St. Peter. The Vatican itself is most dreadfully and scandalously pagan; its galleries are a perfect rendezvous of heathenism. We are, therefore, at liberty to fancy that, although he has not had the audacity to admit as much, Mr. Pugin devoutly damns "Leo's golden days," and the "paganism" of Popes and Cardinals, who, to make use of his own expressios, poisoned the minds of architects, artists, and students of all countries, by propagating erroneous opinions of Christian architecture and art. Certain it is that he could not point to that quarter, to Catholic Rome itself, as a model of Christian and Catholic purity, or else he would most assuredly have done so in the language of triumphant argument: whereas it may fairly be suspected, he is tolerably conscious that the less said on that head, and the more it is kept out of sight, the better, since he would, no doubt, be puzzled to reconcile the gross laxity of Rome, with his own rigorous ultra-Catholicism in architecture. Why, then, does he keep continually harping upon that string? why is he for ever taunting the profession and the public with a reproach which, however well deserved, and how great soever he may consider it to be, cannot possibly have any effect upon either? He tells them that architecture is no longer "the expression of our faith, or government, or country," and they reply by laughing at him in his face, as a crack-brained enthusiast—an arrant Don Quixote, the champion à l'entrance of a chimerical Dulcinea. He lays by far too much stress on what are now regarded matters of perfect indifference, and not without reason so—on the mere externals and paraphernalia of religion, which both have been and are substituted for religion itself where not a particle of the latter exists. The attaching so much importance to the costume of devotion is dangerous, for it leads to a species of mummary and mountebankery which disgraces what it professes to honour.

It might be more discreet on the part of Mr. Pugin were he not to dwell so emphatically and so exclusively, on what forms the staple of his writings, and renders them quite as much polemical as architectural. Most certainly we should have been better satisfied had he undertaken upon us fewer of his religious opinions, and favoured us with something more in the shape of tangible criticism. Of the last we obtain but very little; it may, perhaps, be said to bear the "pointed" style—and so far appropriate enough; yet it is too bare and indiscriminate, and is in manner what would be termed downright vitriolic and inflammatory in a review, or a magazine article. By deploring, with all merit to, and endeavouring to convict of absurdity what he does not belong to the only style of the art he is disposed to tolerate, he overlooks the mark altogether, and deprives his stric-

tures of efficacy. He gives—at least leaves, us to understand, that our former English style is the only one at all suitable for us, and that all buildings in any other, are, without further inquiry into their merits, to be condemned as naught. The consequence is, the sweep-
ing invective becomes a most harmless, if not inoffensive tirade: falling all alike, it affects no one in particular more than another, but leaves all, the best and ablest as well the most idle and the meanest, involved in the universal disgrace. So that the latter may even take consolation to themselves, by finding that their superiors are brought down to their own level, and made to appear just as incompetent as themselves.

With respect to Mr. Pugin’s remarks on what has been done in architecture within the last twenty years, we do not complain so much of their severity and of want of patriotism, as of the indiscriminate censure manifested in them. It would seem, that all is bad alike—that is nothing for exception—that the Italian style is quite out of place in the Travellers’ and Reform clubhouses, and treated without either propriety or guisa. We cannot, indeed, for a moment suppose that such is really Mr. Pugin’s opinion—for in that case his opinion would be perfectly valueless, but what he says implies nearly as much, though he has reserved to himself the power of explaining a good deal of it away by saying that it is to be understood in a qualified and limited sense. At all events, what he does say, amounts to little more than the expression of universal disapprobation: let him make what exceptions he may, he reserves those for the ear of his father confessor, who is not likely to divulge them. While, however, we agree with him that, notwithstanding the enormous sums they have cost, many of our public buildings are decided architectural failures, we are of opinion that the mischief is not so much to be attributed to the style adopted for them, as to the incompetence and want of artist-like feeling with which it has been treated. We are far also from believing that the style, so exclusively advocated by Mr. Pugin, would have been at all more appropriate or more efficacious, in the majority of the instances alluded to. The merely adopting a style does not confer genius; so far from it, that were we to judge of any particular one by the use which is made of it, we should be compelled to confess that the “pointed”? is the most barbarous a balaam style conceivable, according to a great many modern samples of it.

Not content with advocating the claims of the pointed style for ecclesiastical and collegiate structures, Mr. Pugin seeks now to recommend it, exclusively of every other, for modern buildings of all kinds—for street architecture, dwelling houses and shops, although the specimens he gives are not at all calculated to enforce his arguments. Had any one else ventured to propose “Gothic” for shop fronts and windows, he might have been fancied to be quizzing. Nearly arrant masquerade in itself, such a system would tend to deteriorate the style most deplorably. Unless none but artiata were employed, it would in a short time become a mere parody of the original—maximised, barbarous, and not to be beheld without “anguish of soul,” by those who have any feeling for the original itself. No! the present negative style of our street architecture is infinitely preferable, inasmuch as no smell at all is better than a stink. Dull and monotonous as they are, the walls and holes in them for windows which form our streets, are preferable to what the author of the “Apology” recommends; there is no more to admire in them—no more design or variety than in the pavement itself, but there is also nothing to offend, nothing that solicits notice merely to disappoint and disgust.

There are, indeed, particular occasions where the pointed style might be applied, not only with propriety and consistency, but with admirable effect, although they have not been referred to by Mr. Pugin—we mean, covered markets, and covered avenues of shops. For the former, an open timber roof would be perfectly in character, while a cloister gives us almost a direct model for a Gothic “arcade,” requiring no further modification than as regards matters of detail. In such cases, while the design could be kept up consistently, without the slightest interference from individual fancies and caprices, there would be nothing to detract from or neutralize the effect of the ensemble—nothing to clash with it—nothing “over the way,” altogether different in physionomy to jar and jumble with it, in preposterous discord. For houses in the country, the Gothic style is sufficiently accommodating; they are generally built for the actual occupants—at least for the family to whom they belong, and allow of greater study being bestowed upon them, and the style being properly kept up; but widely different is the case with houses built by wholesale as mere trading speculations. Supposing that indispensable detail, string-courses, copings, weather mouldings, &c., added nothing to the expense, and that carved decoration could be had for very little, yet family devices, heraldic ornaments, mottoes and legends must be omitted, unless they could be changed with every change of tenant, since otherwise their incongruity—supposing such things to have any meaning at all, might occasionally prove more ludicrous than agreeable. We might further object that the lofty roof and gable shown in one of the specimens for domestic or street architecture at the present day, would be far from being any improvement upon the system of building now in vogue. Undoubtedly such things tend to give character externally, but then it is after a manner almost at direct variance with the normal principle laid down by Mr. Pugin himself—that every building should be natural, without disguise or concealment, and that nothing should be introduced that does not recommend itself by obvious propriety. It cannot, indeed, be said that in this case there is any disguise, yet there is surely the other error of loading a house with a steep roof—the rooms which can evidently be but mere garrets—merely because it produces a better effect. Experience has taught that such pitch is quite unnecessary—at least for mere dwelling houses; therefore, to re-adopt it again, would be somewhat preposterous, since it is certainly attended with increased expense—and perhaps with no considerable increase of danger too in case of fire, unless it be intended that iron should be substituted for timber, because otherwise the flames would quickly extend themselves along a whole range of lofty timber-framed roofs.

If such roofs therefore be, as Mr. Pugin will probably contend, so essential to the true character of the style, that it cannot be properly kept up without such feature, it then becomes a very natural question: “Why seek to bring into general use again a style which is so ill-accommodated to our actual wants and purposes, that it will not admit of being modified according to them?” We hardly know if we are to assume as a matter of course that it is intended the interior character should be in perfect keeping with the external elevations, and not only in regard to the architecture and fabric itself, but fittings-up and furniture. That is a point which Mr. Pugin passes over altogether, without giving us any kind of remark, instruction, or caution relative to it; and yet it is one which calls for all, it being one in no small degree embarrassing. It is true the Gothic knot may be easily cut through, by saying: so that the fronts be of antique and quaint physiognomy, no matter what the inside of the houses be; they may be in any style, or no style at all. We cannot, however, even for a moment suppose that Mr. Pugin himself would consent to get over difficulties and objections in that way, since that would be converting his elevations into mere “pointed masks,” and sham architecture. No one knows better than the author of the “Apology,” that in order that have all in due keeping, furniture and fittings-up require quite as much study as the architecture itself—perhaps more, at least more research first, and contrivance afterwards, there being few models for our express guidance. No one is more alive to the absurdities and “monstrosities,” foisted upon their customers, by cabinet-makers and upholsterers, under the name of “Gothic furniture,” for he has indulged in a good deal of bitter pleasantry on the subject, in his “True Principles.” Nevertheless, he now recommends what would inevitably lead to greater extravagances and absurdities of the kind; for if they have not been avoided where expense has been no consideration, where superior workmen have been employed, and where more than ordinary attention—albeit not directed by intelligence—has been bestowed, it is but reasonable to suppose that abominations still more flagrant would be perpetrated, were it attempted to render such style of furniture universal.

Important, however, as this portion of his subject is in itself, Mr. Pugin treats it so very summarily that all he says on it does not exceed our own comments, in length. We regret this, because we hoped to find and were curious to learn, how the pointed or old English
ROE'S IMPROVED PUMP.

The improvement consists in that part of the pump called the stuffing box, rendering such a box of no utility, and introducing in its stead a joint composed of leather, or any other flexible substance, such as Indian rubber, cloth, webbing, &c. The material employed is cupped sufficiently large to allow the lever of the pump working the piston without any tension whatever taking place.

The joint, it will be perceived from the diagram, is fixed upon the side of the pump barrel, so that when a head is placed on the pump, the head forms an air vessel, and it becomes a powerful fire engine without any extra expense.

A. the leather cup shown on section; B. the handle passing through it; C, C, the part by which the joint is secured to the pump barrel. For deep wells this is an invaluable invention, as it is impossible that any leakage can take place; and all acquainted with the common lift pump will at once see the importance of the improvement. By it, also, much labour is overcome, as in the old method in a very short time the rod works a large space in the packing, and much of the water flows back into the well, which, by the new method, is safely brought to the surface.

A further important improvement is, that friction is by this means removed. Instead of the piston rod being screwed tightly in the barrel, &c., the rod works quite easily in the joint. One of these fire pumps we are informed has been fixed at St. James's Palace and another at the House of Commons.

DREDGING MACHINE.

Sir.—Perhaps you will allow me to make the following observations in your Journal with reference to a letter upon Dredging in your last number, by a person signing himself W. C. And which I think you will more readily do, as it appears to me you have yourself inadvertently misunderstood the improvement intended to be described by W. C.—

You state in your editorial remarks, that "in this new process, a lateral "sweep or circular motion is given to the ladder or bucket frame which "swings upon its upper extremity as a centre," and in its action imitates "that of a scythe in mowing, &c.;" whereas, I do not understand from W. C.'s description that the bucket frame has any such motion with regard to the dredging machine, but that the whole engine moves radially; the length of the head rope (perhaps one or two hundred yards) being radius, and its anchor the centre of motion.—If I correctly understand W. C.'s description, I have to observe that this is no new process at all, that this method was adopted at least 23 years ago by Mr. Cubitt (one of the vice presidents of the Institution of C. E.), in dredging a cut of considerable extent in the Ipswich river, and since that time in a new and more complete dredging engine for the Norwich Navigation. The latter machine having been for some time past under my management, I can vouch for the excellence of its working, and I flatter myself that if W. C. had ever seen such an engine, he would not have said that the civil engineer has made "no advancement in the working of the machine," a well arranged dredging machine being

Whether this method was first introduced by this gentleman, or not I do not know.
THE SELF-REGULATING EXPANSION SLIDE VALVE.

Sir,—In a late number of your Journal, I perceive that there is a communication from Mr. H. H. Edwards, of a plan for working steam engines expansively, by means of a plate at the back of the slide valve, which is regulated in the extent of its motion, by means of arms worked by the governor. It is stated that when the plate is held fast by the arms, the steam will be cut off to the greatest extent. Now a very slight examination of the drawings will show that though the steam is cut off as soon as the port of the cylinder is half open, admitting steam during rather less than one-fourth of the stroke, yet on the return of the valve, the port will again be opened, and will allow the steam to pass into the cylinder during the last quarter of the stroke. The same will take place, in a less degree, in every position of the arms until they are at a distance equal to the width of the small ports from both ends of the plate, which is the only place in which they can be of any service, so that of course the plan of altering them by the governor fails.

I am, Sir,
Your obedient servant.

Glasgow, 19th April, 1843.

THROTTLE VALVE.

FLAX MILL AT CASSANO, LOMBARDY.

Sir,—I observe in your excellent number for April, a slight mistake, in an article headed,—"Flax Mill at Cassano, Lombardy." Mr. Albano, C. E., of London, is therein stated to be the creator of the works, which may be correct, inasmuch as he was the superintendent or the building of the mill. The mechanical work, that is, the water-wheel and mill-gearing, were solely constructed and erected by Mr. Fairbairn, of Manchester; the greatest credit is therefore due to that eminent engineer in regard to the execution of the mechanical part. *Fiat justitia ruat cœtus.*

I am, Sir,
Your obedient servant.

London, Tuesday, April 4, 1842.

S. N. S.

RESPONSIBILITY OF CONTRACTORS.

In the Court of Exchequer, Saturday, April 22, 1843.—Sittings in Bench at Westminster.

TOWNLEY, CRICK, V. COLEMAN.

The Attorney-General moved in this case for leave to enter the verdict for the defendant upon facts found by the award of the arbitrators to whom the case had been referred, or to set aside that award, and for a new trial. This was an action in which the plaintiff, who is a magistrate for the county of Norfolk, sought to recover damages on behalf of the county from the defendant, who is a builder, under the following circumstances:—The magistrates having determined to erect a bridge near Downham, procured certain plans from an eminent architect usually employed on such occasions, and then advertised for tenders. The defendant became the successful competitor for the job, and, according to the usual course, entered into a contract, to which were attached the plan and specifications. One of the conditions of the contract was, that the bridge should be finished within a specified time; and, "kept in repair by the defendant for one year afterwards." When the bridge was completed, the architect and engineer certified that the work had been executed to their satisfaction, and the claim of the defendant was forthwith liquidated by the county treasurer. Little or no repairs were required at the hands of the builder during the early portion of the year, but towards its close the bridge gave symptoms of instability, and just before the expiration of the time, it fell in altogether. When called on to comply with his covenant, the defendant refused, on the ground that the failure of the bridge was owing to the insufficiency of the work executed by him, but to the inherent vice of the original plan, which, as he averred, was of a nature altogether insufficient and dangerous. Not satisfied with this, the present action was instituted, and having been referred to a learned gentleman and two architects, the present award was afterwards made, in which certain facts were found, which fully bore out the above answer of the defendant to the action, and damages were assessed contingently upon the opinion of this Court as to the sufficiency of that answer in point of law. The learned gentleman now at great length urged upon the Court the hardship of attaching to the defendant the expense of repairing a plan upon the shoulders of the builder, who, ex confesso, had honestly and fairly performed his duty. If the plan were of a character which militated against the laws of matter, and was such as to insure its own defeat, it was the fault of the engineer, and not of the builder, whose contract could only be held to extend to a covenant to make good those casual defects which might be caused by wear and tear, or by the insufficiency of his own work. The defendant, therefore, submitted that he was entitled to the verdict on these facts; but at all events he trusted that the award might be set aside, and an opportunity given to him to go down to trial with certain pleas averring those facts on which, he relied, in order that the solemn decision of the court of error might be obtained on the case.

The Court, however, without much hesitation, unanimously refused the rule, and held that the law of the case did not admit to admit of a doubt. The defendant bound himself to keep a bridge in repair for one year, and if it fell down, *Prima facie* he was bound to rebuild it, and the only question was whether that construction could be varied by the context of the contract. The language, however, did not appear on examination to admit of such a solution. The defendant had the plan before him, and saw the specifications too, and though it was probable that he confided in the skill of the engineer, and never for a moment contemplated the possibility of the bridge falling down through the defective nature of the plan, yet if he meant to guard against such a set of things, he ought to have done so expressly. It might be a hard case; but the law was so, and the defendant was bound to make good the bridge. With regard to the second branch of the application, it was enough to say that it could never be listened to except in cases of doubt. Here there was no doubt whatever on the bench as to the liability of the defendant, and it was too late to allow further litigation with such a view of the case on the mind of the Court. For these reasons, therefore, there must be no rule.

Rule refused.

MICROCELLANEA.

NEW HOUSES OF PARLIAMENT.—Mr. Barry, Mr. De la Beche, and Mr. Charles H. Smith, the three Commissioners who were appointed by the Crown in 1838, to examine and report upon the quaries of this kingdom, and to inquire into the best. stone suitable for the New Houses of Parliament, is to be found in our journal, vol. 2, 1839, have received instructions to make another inspection of the quarries of Great Britain, both of stone and British marble, and to report upon the qualities of the stone already used in the New Houses, and as to the durability of the plan before them, and of the stones found on this occasion. It is required that the stone should be clean, hard, and durable, and to this end they are to observe whether in the surface of the stone there be any other stone more suitable than that now used, either for the exterior or the interior. We anticipate much valuable information in this report, which will be equal to the first, and will be received with high approbation by the profession—the three Commissioners have already started on their tour of inspection.

IRON FRIEGATES FOR THE NAVY.—We are glad to announce that Government have given orders for the immediate construction of two iron frigates, one of 900 tons to be built by Messrs. Ditchburn and Mare, of Blackwall, and furnished with engines by Messrs. Marsby, Mitchell, and Field, and the other vessel of 1300 tons, to be built by Mr. Laidlaw of Liverpool, and furnished with engines by Messrs. Fairweat and Co.

STEAM NAVIGATION IN FRANCE.—A letter from Breit states that the five steam frigates which are intended for the trans-atlantic navigation between France and the United States, are ready for sea, and will commence service in the spring; and that the French West India Steam Company are going to have a regular line of packet ships between Havre and the Brazil, besides touching at all the West India Islands. The first packets will commence operations in May next.

THE WEST INDIA MAIL COMPANY'S STEAMER "THE SEVEN."—This vessel is reported to have made a trial trip at Bristol, from King's-road to Hira- canova, and it is stated that it is fitted up in every respect for the West India Mail service.

THE RUN ROVER.—This fine steam vessel which runs between London, Herne Bay and Margate, has undergone a thorough examination, and considerable increase of speed has been obtained; the engines are by Messrs. Brown, Morton, Watt, and Co. This vessel has always proved to be the first character.

NOWICH AND LEIGHAMPTON RAILWAY.—This branch of the Birmingham Railway is about to be commenced and pushed with vigour during the ensuing summer.

THE THAMES TUNNEL.—In the first month after the opening, 45,000 passengers have passed through.

BRIGHTON AND EXETER RAILWAY.—This line will be opened to the public in a short time, at Brighton's Royal Pavilion. Nothing has been said as to the value of Mancro in Large Towns.—A new contract has recently been sig- ed, by which the contractor agrees to give £20,000 per annum for the contents of the cases—pools of the city of Paris, which are at present deposited in the suburbs, but are about to be conveyed by a new drain five miles further from the city.

Sir John Guest and Co. have contracted with the Russian government for 45,000 tons of railway iron, and it is not improbable that this order will be doubled.
The new kind of gas.—The Cenure, of Lyons, states that, at one of the late sittings of the municipal council, a trial was made of a new portable gas, to which its inventor has given the name of “hydrodilaminous.” The apparatus is so simple, and applicable to the smallest candlesticks, as well as to the largest and most splendid candlabras. The light it gives is very fine, and it is so portable that it can be carried about with the common hand candlestick. Nothing is said of the comparative cost of this new light.

The iron colonnade at Manchester intended to carry the Liverpool and Leeds Junction Railway over the valley at Hunt’s Bank, Manchester, is 335 feet in length and 75 feet high, and is made of iron columns, each weighing four tons, carrying 46 main girders, averaging 430 tons each, over these rest the longitudinal girders 88 in number, varying from 21 to 30 feet each, and are placed at the street below. The whole will be fenced off on the side next the prison by a cast-iron screen, eleven feet high, the top of which will be seven feet above the rails. The style adopted, and which is called “the Egyptian,” requires the utmost massiveness, and is a modification of the Egyptian. The columns, with their cast-iron heads, from which springs the favourite reeded capital of Egyptian architecture, stand upon stone bases, which project about one foot above the pavement, and give firmness and stability to the whole appearance. The quantity of iron in the whole structure will be about 1,020 tons.

Bradford water works were let to Messrs. Broke and Hardy, for the sum of nearly £6,500.

A very rich vein of lead ore has been discovered at the Shropshire Bog Mines on the property of Henry Lyster Esq.

The grand staircase now building at Devonshire-house will be entirely composed of Italian marble. The estimated expense is £10,000.

Parrott’s patent gun is now in course of construction at the celebrated Hayle foundry in Cornwall, for the Government of Holland, to drain the Lake of Haerlev, which is of far larger dimensions than any yet built. We have seen a sketch of the engine, which consists of a double cylinder, one within the other, the external cylinder is to 14 inches in diameter and 12 feet high, and to have an annular piston with 4 piston rods; in the centre is a smaller cylinder of the same height 8 inches diameter, with a piston rod 12 inches diameter; in this last cylinder the steam is to be first admitted under the piston at a high pressure, and then allowed to escape into the external or larger cylinder, and act upon the upper surface of the piston, the five piston rods support an immense cast-iron cap said to be weighted to equal 18 tons. The steam cylinders stand in the centre of eleven pumps, each pump is 63 inches diameter, 12 feet 6 inches long, and 10 feet stroke; the present pump rods are suspended to the ends of cast-iron beams 32 feet long placed radially to the centre of the steam cylinder, and the other end of these beams come in contact with the under edge of the steam cylinder, so that the cap descends it depresses one end of the beams and raises the other end, and with it the pistons of the pumps. The weight of water lifted will be equal to 53 tons per stroke, if all the pumps were in work at one time.

Joseph Browne Wilkes, of Chesterfield Park, Essex, Esq., for “improvements in treating oils obtained from certain vegetable matters.”—April 4.

George Johnston Young, of Bostock-street, Old Gravel-Jane, Wapping, engineer, for “improvements in the construction of saw-mills.”—April 5.

Edwin Wolfe, of Walsall, Stafford, for “an improvement in machinery for preparing wicks used in the making of candles.”—April 6.

James Boydell, junior, of Oak Farm iron works, near Dudley, iron-master, for “improvements in manufacturing bars of iron with other metals.”—April 7.

Robert Hawthorne and William Hawthorne, of the town of Newcastle-on-Tyne, civil engineers, for “improvements in locomotive engines, parts of which are applicable to other steam engines.”—April 7.

J. N. Newill, of Caledon, Cornwall, for “improvements in extracting copper, iron, lead, bismuth, and other metals or minerals from tin ore.”—April 8.

James Napier, of Hoxton, Middlesex, dyer, for “improvements in preparing or硬ening or finishing cotton and flax, or other fibrinous materials, for covering roads and the bottoms of ships and vessels, and other surfaces; and for other uses.”—April 11.

Moses Poole, of Lincoln’s-inn, gentleman, for “improvements in the manufacture of ornamented lace or net.” (A communication.)—April 11.

Urash Clarke, of Leicester, dyer, for “improvements in the manufacture of narrow elastic and non-elastic fabrics of fibrous materials.”—April 11.

William Tinsall, of Cornwall, slip owner, for “improvements in the manufacture of candles.”—April 11.

William Runwell, of Bowling-green-row, Woolwich, artist, for “improvements in machinery or apparatus for registering or indicating the number of persons which enter any description of carriage, house, room, chamber, or place, and also the number of passengers and carriages that pass along a bridge, road, or way.”—April 13.

William Henry Smith, of Fitzroy-square, civil engineer, for “improvements in the manufacture and manufacture of plates, masts, and masts, and in fastenings for the same, which may be applied to articles of dress generally.”—April 19.

Charles Taylor, and James Frederick Dupre, of the Vulcan Foundry, Lau- cunay-road, and Hill, of the Vulcan Foundry, engineer, for “improvements in boilers.”—April 19.

James Byrom, of Liverpool, engineer, for “an improved system of connexion for working the cranks of what are commonly called direct action steam engines.”—April 19.

Carl Ludwicke Farwig, of Henrietta-street, Covent-garden, tine-plate worker, for “improvements in gas meters.”—April 19.

John George Bodmer, of Manchester, engineer, for “improvements in locomotive steam engines and carriages to be used upon railways, in marine steam vessels, or for propelling machinery of any description whatever, and also in stationary engines, and in apparatus to be connected therewith for pumping water, raising bodies, and for blowing or exhausting air.”—April 20.

John Rand, of Howland-street, Fitzroy-square, artist, for “improvements in the manufacture of tin and other soft metal tacks.”—April 20.

Richard Prosier, of Birmingham, civil engineer, and Job Cutler, of the same place, civil engineer, for “improvements in the machinery to be used in manufacturing of pipes and bars, and in the application of such pipes or bars to various purposes.”—April 20.

John McFunes, of Liverpool, manufacturing chemist, for “improvements in funnels, for conducting liquids into vessels.”—April 20.

Thomas Oram, of Lewisham, Kent, patent fuel manufacturer, and Ferd- nando James Warrich, of the same place, for “improvements in the manufacture of fuel, and in machinery for manufacturing fuel.”—April 20.

James Johnston, of Willow-park, Greenock, esquire, for “improvements in the construction of steam boilers, and machinery for propelling vessels.”—April 20.

Edward Cobbold, of Wellington, Suffolk, master of arts, clerk, for “improvements in the uses of supporting, sustaining, and propelling human bodies and on the water.”—April 20.

Richard Greville Pigot, of Old Cavendish-square, gentleman, for “improved apparatus for supporting the human body when immersed in water, for the purpose of preventing drowning.”—April 25.

James Munro, of Millbank, Bedford-row, surveyor, for “improvements in the manufacture of bricks to be used in the construction of chimneys and flues.”—April 25.

William Brockendon, of Devonshire-square, Queen’s-square, Middlesex, gentleman, for “improvements in the manufacture of wadding for fire-arms.”—April 27.

William Mayo, of Lower Clapton, Middlesex, and John Warington, of Wandsworth-road, Surrey, gentlemen, for “improvements in the manufacture of averted liquors, and in vessels used for containing averted liquors.” (A communication.)—April 25.

Charles Forster Cotterill, of Walsall, Stafford, merchant, for “improvements in the progressive manufacture of grain into flour or meal, the whole or part or parts of which improvements may be applied to the ordinary methods of manufacturing flour.”—April 25.

John Winpear, of Liverpool, ship-smith, for “an improved mode of reaching certain sails of ships, and other vessels.”—April 27.
ANI CATHEDRAL, ARMENIA.
ANI CHURCH IN ARMENIA.


(With an Engraving, Plate VII.)

By Professor Donaldson, Vice-President.

(Read at the Royal Institute of British Architects.)

AMONGST the ruins of Ani are two churches in an almost perfect state of preservation, upon which Armenian writers have expressed both their censures and praises. We can form a sufficiently correct notion of the extent and character of the monuments mentioned in history. From the enthusiastic manner in which the Armenian authors speak of the metropolitan church at Ani, it would appear that it was considered one of the chefs d'œuvre of Armenian architecture, and that this temple was the type of all the religious edifices afterwards erected throughout Armenia.

At the time that the princes of the family of Pagratides were in tranquillity, they removed their seat of dominion to Ani. Aschol I. received the royal crown of Armenia from Osogian Ysa, in the fortress of Ani, in the year 855 of our era. Ten years later, Sempad, his son, added fresh possessions to his inheritance. He was, however, taken prisoner by the Arabs, carried to Tovin, where he died in torture. The throne of Ani was not, however, shaken by this blow; the Greek emperors signed a treaty with Aschol II., and the Armenians redoubled their exertions to render Ani a formidable station. Its situation was naturally strong, and they added fresh fortifications. I shall now examine in detail the most important edifices of these ruins. So long as Armenia was addicted to the superstitions of the East, she was the more naturally led to borrow from the arts of Persia, the elements of her national architecture. But when the preaching of Gregory the Illuminator had had its due effect, when the Armenians abandoned their ancient faith and adopted with ardor the Christian religion, a breach arose between the two peoples, which was signalised by wars and massacres, which terminated in an interested, if not sincere, alliance between the Armenians and Greeks of Byzantium. Whatever concerned the new religion, became an object of common interest to the two Christian nations. The Armenians had, perhaps, outstripped the Greeks, in their submission to the new law, but the ardent spirits of the latter were not satisfied with a mere speculative faith; they built churches and monasteries in all parts of the country, which came within the communion of the faithfull. It was like a forcible possession, which the reactions of Paganism sometimes shook, but which they could never recover. We may trace in the progress of Byzantine architecture, the gropings of the first Christians to find a temple, which might give as a whole a striking symbol of Christianity. During five centuries, the Christians sought, without appearing to be satisfied. Hence it arises that in the religious monuments of the four first ages, is found the greatest variety, if not taste. They are, in fact, ancient temples, with the porticos closed to form the nave. At other times all the peristyle of the temple is enclosed within an exterior wall, and thus the Pagan edifices becomes an immense basilica. Some bishops built circular churches, or rather, as at Hieropalis, the church is formed of a certain number of beams simply covered by a roof, such as are now used for warehouses and sheds. After the fifth century, light broke in upon the Christian artists, which tradition expressed, saying that an angel had appeared to Justini an, in order to trace out for him the plan for his new temple, which model has been alone imitated, to the exclusion of all others throughout the whole Byzantine empire. There is no trace amongst the Armenians of this natural progress of an original genius. Being always the vassal empire of a foreign people, it yielded unconsciously to the influence of its neighbours, and adopted their arts and literature. We are unacquainted with the style of the Christian art in Armenia during the first seven or eight centuries of our era. The undecided character of the people was evident in all their compositions. Some of them are, however, not devoid of elegance, but in all there is a deficiency of strength and severity of character. The chief defect among the Armenian artists, was their ignorance of what we may call feeling for proportion, and not knowing how to adopt with propriety the ornaments of the masses of which they formed the decoration. Hence it results that the aspect of their buildings presents a cold and mean appearance, for there is no play of light and shade to give value to the large surfaces which only present small columns, without relief, on which the eye may repose.

This defect was not chargeable to the Byzantines, who generally sought in the façades of their buildings to produce striking effects of light and shade, by placing some harmonious relief between the surface of the solids and voids. The delicacy of detail was generally sacrificed to the mass, the proportions of the columns were rather heavy than slight, and they endeavoured to gain the height by raising the semi-circular arch one-fourth of its diameter above the springing. We recognise this character particularly in the edifices of the period of Basilicus and of Constantine Monomachus. The Armenians evidence in their choice of ornaments, more of the Arab than the Roman taste. All their details are executed with great delicacy. The use of columns is very restricted, they are usually engaged and take the place of pilasters. One of the edifices in the town of Ani, in which is found isolated columns, was constructed during the period when the Arabs were masters of Armenia; it is the monument near to which is a minaret, which I consider the principal mosque. Other columns belonging to the porch of a church, also, have capitals of the Arab character.

Upon surveying the circuit of the walls of the town, we recognise the exaggeration of the chroniclers of the times. Matthew d'Edessa thus expresses himself, in speaking of the royal city: "In 1064 the sultan Alp-Arslan, brother of Toghrul Bey, determined to conquer Armenia, and encamped before the royal city of Ani, which was then in the possession of the Greek Emperors. This town contained an immense population, and a thousand and one churches where mass was said." John Atatir, the Arab historian, records the same fact, but only mentions five hundred churches. "Arslan fixes the siege of Ani in the year 1064. This town was protected by two deep valleys; it contained some magnificent monuments, and one might count in it more than five hundred churches." To judge from the present ruins, it would be difficult to conceive that the number of temples dedicated to the Christian religion exceeded fifty, even including the baptistries and the altars of cross-ways with their pictures.

But this people, who never had the instinct for great works, were satisfied with admiring monuments which are useful to study as the history of art, but which must not be compared to the edifices of the East, to the vast Latin basilicae, nor even to the mosques of Islamism, erected by the Turkish or Seldjoukides sultans.

The peculiar character of the religious architecture of the Armenians, is the exclusion of the spherical cupola, which is replaced by a conical ceiling. This species of construction applied to the edifices of Ani, is also found in a great number of Arab tombs, in Cappadocia, which was in the possession of the kings of Armenia for several centuries. As these monuments are of a more recent date than those of Ani, there is reason to believe that the Seldjoukides adopted the spirit of the Armenian monuments.

The plan of the metropolitan church of Ani is composed of a nave, with transepts, in the centre of which is placed a dome, and side aisles. The entire length of the church is 105 feet, and its width 65 feet 6 inches, that is to say, the proportion of the edifice does not exceed those of some of our village churches. The dome is supported by four pillars composed of a group of shafts (fûtécoux) which run up to the impost, and which are carried up so as to form a Gothic arch.

The lateral arches, which separate the nave from the side aisles, have their imposta at half the height of the large isolated pillars, and the higher arches spring from engaged pillars, the shafts and projections of which correspond with the isolated pillars. The choir is composed of a hemicycle, which is decorated with ten small niches, divided from each other by double columns. The altar is placed in
the centre of the hemicycle, as is customary in the Armenian rites. A wooden screen, called by the Greeks Klangelon, extended from one extremity of the hemicycle to the other; it is to this screen that the curtains and tapestries, of which mention is frequently made, are attached. To the right and left of the hemicycle are two small sacristies, one to preserve the gospels, the other to contain the sacred vases; such is the simplicity of the plan of this edifice. Its decoration consists in paintings, which, however, time has destroyed; there now only remains in the choir some traces of the figures of the twelve Apostles. The whole of the interior of the church was covered with stucco, which has fallen off gradually. The central lantern is at this time dilapidated, the fragments have accumulated in the centre of the church; it is possible to recognize the greater part of the exterior decoration, and the system of covering is precisely the same as that of a neighbouring church, of which the lantern is still perfect.

The stucco in falling has laid open the stone used in the construction of the pillars. It is a volcanic tufa, which has the property of hardening on exposure to the air. The courses of the pillars are formed of alternate yellow and black stone, which recall certain constructions of the thirteenth century in Italy. This taste of zones of various colours was very general among the Mussulmen of Syria and Egypt. In Cairo, they are still careful to paint on their mosques horizontal bands with slacked line and red core, but in other towns in the East these zones are made with different coloured stones. The first impression which is produced on entering this half destroyed nave, is a feeling of melancholy, on witnessing the nakedness of the stone and the coldness of the lines. The narrowness of the side aisles apparently increases the thickness of the pillars. But painting formerly enlivened these high walls, and the small quantity of light shed on the nave when the cupola was complete, must have given to the interior of this temple a melancholy and austere tone, which was in harmony with the grave character of the people who frequented it.

Those, who have observed the progress of the arts in the middle ages in Europe, will be disposed to consider this edifice as a work of the thirteenth century; it indeed bears the characteristics: but the date inscribed on the portal proves it to be far more ancient, and that the pointed arch was in use in Armenia at the period when the Roman style was the only one which was adopted in Europe.

The façade of this church, constructed with remarkable simplicity and decorated with great reserve, presents, however, an interesting subject, as it may be regarded as the type of the German architecture of the middle ages. It is easy to explain why, throughout this country, is found the dome with the conic roof peculiar to the Armenian architecture. After the taking of Ani by the Mussulmen, a great number of the citizens abandoned the town. They could not retire into Persia, where they would have been received as enemies. The Greeks in Byzantium, being equally hostile to them as the Persians, it was towards the North country they directed their steps. They were received by the Kings of Georgia, and spread themselves over Moldavia as far as Poland, where they formed different establishments. All these countries, which were still immersed in ignorance, availed themselves of the knowledge brought to them by these new comers. Although a religious spirit was dominant among the Armenians, they were too timid to make any effort to propagate their doctrines. The rising Christianity of those countries borrowed them what they could adapt of their arts, but remained faithful to the ritual of the Greek church. The style of this architecture progressed by degrees towards the North. It was from them that the Russians imbibed their first elements.

The façade of the church is in harmony with the simplicity of the plan. All superfluous ornament is excluded. Slight engaged columns on the face of the walls support circular arches, which are raised a little above their centres. The middle arch, on the contrary, approaches the pointed form. Two semicircular panels to the right and left of the window, present to the eyes of the faithful the image of the cross, placed in the middle of an hexagonal star, surrounded by a foliage of flowers.

The three divisions of the nave are indicated outwardly by a pediment, which adjusts itself with the wall of partition of the cross, and by the two slopes of the roof which cover the side aisles.

This arrangement of the upper part was often employed in the churches of the middle ages in Europe. It is the most simple and logical arrangement. The cornices are composed of slightly projecting mouldings, separated by a rather broad fascia, decorated with a Greek scroll. Below the summit of the pediment there is another bas-relief, in the middle of which is a Latin cross placed in a richly sculptured frame.

This grouping is frequently repeated in various ways on the doors, monuments, and exterior walls. It was not only at Ani that this custom prevailed, the principal towns of Armenia were also decorated in the same manner. Ibn Alather, in his chronicle, makes frequent mention of this peculiarity. The town of Maten Neschin was surrounded by a wall composed of large stones, and ornamented with crosses fixed with lead and iron. The quarries of Ani furnished materials of various colours; they availed themselves of this opportunity to execute crosses in yellow and black mosaic. The façade of the church participated in this polychromatic decoration; but we cannot conceive what induced the builder of the church to work in, in an irregular manner, black and yellow stones promiscuously in the wall of the elevation. The quarries which produced the stones for the church are sufficiently abundant to have furnished all the materials they required. Three windows afforded light to the nave; that in the middle is square, surrounded by a broad framework, the two side windows are hardly wide enough to give light to the side aisles. There is an inscription on one side the door in the Armenian language, which states that the metropolitain church of Ani was built by Queen Grarama, wife of King Zakig, the first successor of Sarpand who laid the foundations of the edifice in the year 1019 of our era.

Hence it appears that at the time the pointed arch was unknown in Europe, monuments of the Gothic style were constructed in Armenia. At Djarbekir there is a very remarkable monument, which is now converted into a mosque, also constructed in the Gothic style. The Armenians call this edifice the palace of Tigranes, and there is nothing to disprove its having been the residence of this prince. The ground floor of this palace is embellished with columns in the Roman style, with Corinthian capitals of tolerably correct workmanship; these columns support a range of Gothic arches. The order of the first story is also Corinthian much enriched; the frieze and cornices are formed upon the principle of the Roman arch in the fourth century; the Gothic arch is, however, mixed up with this architecture, so as to indicate its common use in these countries. Although it is difficult to fix the precise date when the pointed arch was first used in architecture, we cannot form any positive conclusion as to the date of the monument in which it is found. Up to the present time this question is far from being decided, but it is very certain that the pointed arch is of eastern origin, since it may be traced in Mesopotamia long before it was known in Europe.

As to the arch greater than the semicircle, which we are accustomed to regard as Saracen, it is of such rare occurrence in the West, that its eastern origin cannot be contested. It appears certain that it was first introduced into Europe by the Moors, but it may be observed in the eastern buildings, even before the birth of Mahomet. The Armenian church of Dighour presents a remarkable example of this kind of arches, their curve or rather the elevation of the centre above the line of impost is much more decided than in the church at Ani. It bears the date of 1164.

The lateral front of the metropolitan church at Ani is constructed in the same style as the principal front. Thegable end of the cross is enlightened by a circular window, as on the façade; under this window is a kind of tympanum or table with a Gothic arch. This table projects very little, and has no particular decoration. To the right and left of the door there are two very elongated niches, or rather two species of sinkings, which correspond with cavities in the engaged columns. The same adjustment may be observed in the back elevation of the church. But there it is more defined, as it disengages the cir-
cular end of the hemicycle from the two side sacrsties. This disposition is characteristic of the architecture of Ani. It may be noticed in the other church, which is in much better preservation than the cathedral, but which was not so much esteemed by the Armenians. No traces are to be found amongst these ruins of any staircase, nor of any vaults for purposes of sepulture. It was, however, the custom of the Armenians to inter the dead in churches, for we read in the geography of Vartan, that "the body of Gregory the Illuminator was brought from Constantinople, and was placed in a grave under the four columns of the church." The same author mentions a great number of relics found in the churches and monasteries.

One striking circumstance in this architecture is the ingenious manner in which the inhabitants availed themselves of the materials placed within their reach. The roofing is constructed with an art equal to that, which has produced the finest monuments of antiquity. The large tiles made of lava have their edges turned up at right angles, like the tiles of marble used in the temples; these two ends, applied one against the other, are covered by a continuous capping, and the whole is supported upon a stone vaulting. Hence it arises that in the construction of the edifice no wood has been employed; and although abandoned for five or six centuries, the edifices of Ani have suffered little from the effects of time. It is, in my opinion, a remarkable feature in Armenian architecture, to have been conceived in accordance with the materials so immediately within reach. Wood being scarce in the country, the use of it was entirely excluded. As lime is a substance very uncommon in volcanic formations, they learnt to do without it; whilst tufa of different consistence and divers colours were cut, chiselled, and sculptured in walls and capitals, in columns and vaultings, in great variety.

The century which followed that of the erection of the cathedral, witnessed the decline of the town of Ani, which fell into the hands of the Byzantine princes, who already possessed Kars and Erzingham. The church, which was situated close to the river, appears to have been consecrated to the Greek ritual, as they had added before the entrance a portico or vestibule, which was always placed in front of the churches of this communion.

The two lower courses only remain of the lantern, but all the other fragments are heaped up in the nave. The lantern has been restored from these fragments, and from those of a neighbouring church which is exactly similar to that of the cathedral. The dressings of the door are also very little injured; the rest of the edifice is in perfect preservation. The whole of the monument is constructed of yellow and black lava.

ON THE CORINTHIAN CAPITAL.

Observations upon the very marked and varied style of composition exhibited in the capitals appertaining to the Temples of Jupiter Stator, and of Mars Ultor, and to the interior of the Pantheon at Rome.

By A. W. Harewell.

The first and paramount duty of the architect being to select an appropriate form or outline for his building, he next considers the detail, with a view to give to the outline a suitable expression. It is proposed, in the following observations, to take into consideration the subject of detail only, moreover directing attention to one sole feature of ornamental detail, viz., that triumph of human invention, the Corinthian Capital; with a view then to show how bent the ancients were upon giving expression to their works, in order that these, if it may be so expressed, should speak a peculiar and suitable language, it may be well to cite those admirable examples of the Corinthian Capital, left us by the Romans. But prior to entering upon the merits of particular examples of the Corinthian Capital, it may be allowable to refer to the composition itself, commencing with the account of its origin; and here we are indebted to Vitruvius for a simple and elegant story, the spirit of which, it must be confessed, is quite in harmony with the beautiful object to which it relates, and if not taken too literally, but on the contrary, properly entered into, will be found like most of the allegories of the ancients, to contain an important truth.

We are told that a maid of Corinth having died, her devoted attendant seeking consolation in the last sad offices, collected the favorite trinkets of the departed into a gracefully elongated basket, which she carried to the tomb, and secured there, by placing upon it a square tile; it so happened that a young acanthus shot up close to the spot, and entwined its leaves round the basket,

"Flexile around its sides the acanthus wind,

Strikes as a miracle of art the mind."

Theokritus.

that the ends of the delicate stems meeting with resistance from the overhanging stone at the top, bent gracefully down, resolving themselves into spirals, which altogether produced so much of symmetry and variety of form, that the artist Callimachus, who chanced to see the composition, made a representation of it, and reduced it to the Corinthian Capital.

The graceful spirit of this metamorphosis will, of itself, secure to it an abode in our minds, but its utility gives it the greatest claim to our attention; linked as the story is with so masterly an invention in the ornamental department of architecture, it reminds us forcibly that art to be striking, must spring from the contemplation of nature; but not exactly from that species of contemplation inferred by this ingenious tale, which can be viewed in no other light, than as a graceful fiction setting forth the first principles of invention; it is to contemplation of a far more mental and abstracted kind, that we stand indebted for the ingenuity and grace exhibited in the design under consideration; we leave no scope to intellectual vision in this affair, and wholly discard originality, if we view it as a matter of fact; and yet there have not been wanting those who have inserted this story in their works, as a credible manner of accounting for the origin of the Corinthian Capital, whilst others have gone still further, and rendered it ridiculous, by graphically illustrating the subject, presenting us with the whimsical group of Callimachus with his basket of leaves. The inventive faculty requires no such broad hints, nor such palpable suggestions, but suggests powerfully itself, and from the slightest incidents; the primary objects which inspire an artist's thoughts, stand in no nearer relation to his matured conceptions, than do the juices gathered by the bee, to the honey to which she finally converts them.

First principles form the basis of his conceptions, but the power of combing is wholly dependent upon originality of feeling, and when taste and judgment are united to invention, then it is that the objects created assume that natural and easy aspect which prompts us to assign their origin to some production of nature; thus the graceful Ionic capital is said to be in imitation of a peculiar style of female head dress; the groined vaulting in Gothic architecture to the interlacing of the boughs of a grove of trees; and because the Corinthian capital does not exist in nature, we go about to make up a most improbable story, we require a trick, a harlequinade on the part of nature, merely because we are unwilling to admit the truth, and pay just homage to the inventive faculty of man.

While discoursing upon the Corinthian Capital, it may not be amiss to remark upon the simplicity of the design itself—simplicity, that essential quality, the inseparable concomitant of all that is beautiful in nature and art, enters largely into the composition of this graceful work; nothing can be more easily understood than the plan of the Corinthian Capital; two circular tiers of leaves, one tier placed above the other, the centres of the upper leaves, corresponding with the spaces separating those of the lower tier; a stem giving birth to spirals jetting out at each of the four angles, the whole surmounted by a slab, concave on its outer edges, constitute this striking architectural feature; albeit the parts are few, still the effect is great; there is no appearance of effort; this is the result of simple intelligent arrangement. These are the lessons which teach us to value the sentiment so winningly expressed by the poet, when invoking simplicity he says—
progress was a voluntary accomplishment, independent of its support, and not the veritable means of that support itself, determined by the conditions of the case alone. These conditions we have shown to be the weight and superficial dimensions of the suspending plane; and by these conditions, in the present case, observing an inclination of 9°, we are referred to a velocity of 240, or more properly 250 miles an hour. A modification of these conditions, involving an enlargement of the surface or a diminution of the weight, is therefore, and absolutely, the only existing means by which any part of this velocity could be effectually dispensed with; a modification which, moreover, we showed to be equally necessary to its success in another point of view; the accomplishment, namely, of its descent, consistently with the preservation of human life, or even of the integrity of the machine itself. It only remains, on this head of inquiry, therefore, to make a few remarks respecting the particular form which Mr. Henson has adopted for this important portion of his aerial apparatus.

Where so much more is required to be done than can be easily accomplished, and the utmost that we can reasonably hope to arrive at is a very limited reduction of the essential difficulties of the case, a lack of proper economy in the disposition of our resources becomes a previous error, and inevitably leads to the conclusion that chance or mistaken analogy rather than the legitimate inductions of science have had a share in determining the choice. To those who have not considered the matter or made it the subject of actual experiment, it may not readily suggest itself that the really effective obstacle to the accomplishment of an aerial navigation, upon the principle of the plan before us, consists in the difficulty of constructing a rigidly extended surface, of sufficient dimensions and sufficiently light to answer the purpose required of it. Apart from this there is literally nothing that interferes, nothing that has to be overcome: for in the attainment of this object are merged all the obligations in respect of power, which the want of it alone imposes, and which constitutes in its default the existing obstacle to success. The difficulty which is here alluded to, and which, be it observed, is interposed by nature herself, is the essential properties of matter, depends upon the ratio in which weight, or rather, its effects in pressure, increase in respect of the distance at which it is suspended from its fulcrum or point of support, and the impossibility of counteracting these effects by the intervention of any means which do not also add to the forces, by the operation of which their adoption in the first instance was required. The conditions of weight, and consequently the obligations of support, increase, as we all know, in the ratio of the leverage, or horizontal projection; and this with such effect, as very soon to confound the best directed efforts of the most ingenious architect to combine solidity and lightness with extension in a plane of any magnitude that is devoid of extrinsic sources of support. With these inherent and inevitable peculiarities, it scarcely needs to be observed, the main object to be aimed at by these who have occasion to construct a surface in which the qualities in question are required to be carried to their extremest degree, is to have a form for that surface the most compact, in which the largest area is contained within the least required limits; an advantage which the circular alone of all others is pre-eminently calculated to afford. In Mr. Henson's scheme, however, this has been entirely lost sight of, and, for what purpose it would be hard to conjecture, a form has been adopted, in which the smallest extent of surface is obtained in conjunction with the fullest development of all the natural difficulties by which the case is peculiarly beset. The stringency of this observation will be the more readily perceived when we consider that the utmost amount of surface which Mr. Henson has been able to accomplish, (for we will not suppose he has stopped short of his ability in this most essential ingredient of success,) involves an extension of 75 feet on either side the centre of support, within which limits, he had adopted the circular form, he might with equal facility have comprised an area of exactly four times the extent; the very quantity we have already shown to be the least with which it would be possible to enable it to come with safety to the ground.

Besides this, there is another objection to the shape of Mr. Hen-
cillations which are otherwise apprehended to ensue. With regard to the former of these, there is no doubt the conception is just; but a closer consideration shows it to be impracticable. We have no hesitation in declaring that it would be absolutely impossible to construct two planes of sufficient magnitude, sufficiently remote from each other to allow them to be freely impinged upon, with sufficient strength to maintain that position so completely as to form but one object with reference to the power by which it is to be moved, consistently with anything like the lightness that would be necessary to qualify it for the purposes of mechanical flight. With regard to the second, if it is meant to propose as a model the plan, of which a sketch is given in the number of the *Mechanics's Magazine* for the 8th of April, the same objection would apply. It would be quite impossible to construct it, or anything like it, of the proper size and strength, within the limitation of weight required by the essential conditions of the case. To which we would add, that we are inclined to consider the provision itself uncalled for. If a plane could be constructed of any form sufficiently light and large to serve the purposes of flight, it would be difficult to prevent it from assuming of itself a form analogous to that proposed. But we are, moreover, sceptical as to the properties ascribed to it, and the advantages which it is said to hold out. The freedom from oscillation which bodies of that form are stated to display in their progress through the air, and for the illustration of which we are referred to the case of the shuttlecock, we conceive arises partly from the additional distance of the centre of gravity below the plane of suspension, (which its form obliges, but does not restrict,) and partly from the diminished resistance it offers to the descent; no very great recommendation, one would suppose, where that propensity is the main difficulty to be overcome. But in truth, the simplest form in all these cases is the best; and if a circular or elliptical surface cannot be made to answer the purpose required of it, it will be vain to seek for it in a more elaborate construction or a more complex form. And thus much for the suspending plane.

II. The next in order of the parts of Mr. Henson's aerial apparatus which we have proposed to discuss, are the controlling appendages or fun-like expansions, the purposes of which are, as we are given to understand, to regulate the vertical and horizontal movements of the machine, and present an obstacle to the oscillations to which it is expected to be subjected in its course. And first with respect to this latter purpose, the appropriate instrument of which is a vertical web of considerable superficial dimensions, extending from the front to the back of the machine, bisecting the suspending plane, the mode by which it is designed to operate is, we presume, by the resistance to its displacement, which it would experience in the re-action of the surrounding air. Now this resistance, be it observed, is entirely independent of the particular position of the resisting surface, and would have been equally attainable, had it been horizontally instead of vertically displayed; in other words, had the projectors, instead of appropriating to that end a special instrument, made an equivalent addition to the suspending plane. To this must be added, that by a vertical arrangement, an opposition is afforded to the oscillations, which tend to occur in one direction only; whereas, had the latter alternative been adopted, all the oscillations which could occur would have been equally provided against, while at the same time additional efficacy would have been conferred upon that part of the machine where it is most required. To have devoted a large, or any portion, of his resources to the accomplishment of a single purpose, and that of doubtful and secondary importance, when it might have been made equally conducive to another, and that most exigent and essential, argues a great neglect of economy in those particulars in which its unqualified observance is absolutely necessary to success, and a disregard, to say the least, of those principles upon which the operation of the chief members of the machine depends. It is exactly as if a person having only two horses, and a carriage which their united efforts were but just sufficient to move, were to keep one of them always in reserve, for the purpose of attaching it behind occasionally, when the carriage was going down a hill.

By the intervention of the second of these controlling appendages, we are likewise informed, is to be governed the ascent and descent of the machine in its onward course, and the mode in which we are given to understand this is to be effected, is by some disposition of it, similar to that of the tail of a bird, enabling it to regulate within certain limits the horizontal inclination of the suspending plane.

Now in respect of this, the least we can say is, that it is an expedient equally unnecessary and inapplicable with the preceding. The position of a plane suspended in *equilibrium*, is a matter so readily affected, that he must have strange notions of the conditions of the case, who conceives it necessary to make a provision for the purpose in an extensive and cumbersome apparatus. It is not in fact by any modification of construction or application of special machinery that the object in view is necessarily or properly to be accomplished; but by a disposition of the appended weight equally simple and secure. A few shovels full of coal thrown from the front to the back of the fire, or the transfer of any of the aerial passengers from one part of the car to another, would at any time effect a change in the position of the whole floating mass, far more necessary, indeed, and difficult to guard against than to accomplish; and from the smallness of the angle of inclination, more than sufficient for the purposes which could ever in that behalf be required. For it is not, in truth, by any such modification of the position of the suspending plane that the ascent and descent of the machine is to be properly governed, but by a modification of the force with which it is propelled. The suspension of the machine in transit, being the result of the development of a certain amount of resistance in the air opposed to gravitation, which resistance varies with the rate, and consequently with the force under which it is generated at a given angle, the conditions of this suspension, affecting the level of the machine's course, follow the exercise of this power; so that having a force equal to the propulsion of the machine at its highest elevation, its reduction to a lower level is the natural and simple consequence of a reduction in the energy of the force employed, and *vice versa*; any modification in the obliquity of the plane which might be necessary to second this movement, being more than sufficiently attainable by the occasional disposition of the appended weight as before explained.

But the adoption of this device, sufficiently extravagant, even if conceived with a just notion of its effects, becomes doubly preposterous, when viewed in the light of a contrivance, not only unnecessary and inapplicable to the purposes for which it was intended, but absolutely producing its effects in direct contravention of the anticipated results of its operations. For what are the consequences of the modification of the obliquity of the suspending plane, to be brought about by the agency of this caudal appendage, as described by Mr. Henson, in the specification of his machinery, and inadvertently adopted by all those, without exception, who have taken upon themselves the office of enlightening the public upon this interesting subject? Totally overlooking the circumstances upon which the actual suspension of the machine depends, and regarding it as it were a body endowed with the power of following with equal facility any course towards which it might happen to be directed, all alike concur in considering the disposition of the inclined plane as giving (so to speak) the *civ to* the appealed body; so that having attained an elevation in the bosom of the air, all that is necessary to increase that elevation is to augment the angle of inclination; and, *vice versa*, to diminish the elevation, it is only requisite to decrease the inclination of the suspending plane. Now the whole of this reasoning is false, and the consequences in fact directly contrary to what they are here represented. So far from the direction of the plane indicating and controlling the course of the machine in the way described, paradoxical as it may appear, the modifications in question would be productive of exactly opposite results; as will be evident to those who consider the conditions upon which the support of the plane in transit is really dependent. The resistance developed upon the under surface of the plane and resolved in a direction opposed to gravitation, which is the true grounds of its support, following the ratio of the squares of the sines into the cosines of the angles of inclination, while the horizontal resistance, which is the measure of its propulsion, varies as the cubes...
of the sines of the same angles, any alteration in the obliquity of the plane must affect the latter more extensively than the former, and determine a balance in favour of that condition which is most in conformity with the change; if it be to diminish the horizontal resistance (which is the result of a diminished angle of inclination), increasing the relative effects of the vertical, which is the medium of support; and if to increase the horizontal resistance, (which is the consequence of augmenting the inclination) to disperse the vertical resistance, and incontinent subtract from the ascensive powers of the machine. Accordingly, therefore, if the machine be progressing with a given force, and it be desired to rise, this result will be accomplished by reducing the inclination of the suspending plane, and on the other hand, if the angle in question be enlarged, it will immediately begin to descend; the rate in the former instance increasing and in the latter diminishing with the alterations in the obliquity of the plane, and the accompanying alterations in the level of its course.

With regard to the remaining purpose of these controlling appendages, corresponding to the horizontal steering, of the aerial vessel, but little needs to be observed. Having no forces to contend with which operate to favour one direction more than another, except such as may arise from the unequal resistances occasioned by the opposite sides of the machine itself, any amount of artificial resistance beyond what is thus indicated, if properly applied, is sufficient to give a preponderance to any course which may be chosen; the only advantage of a more liberal supply being in the limitation of the space within which it enables the aeromet to effectuate his purpose—an advantage of no great consideration in the abundant regions of the sky. In this respect the ease of the aerial machine is most favourably distinguished from that of the ship at sea, pursuing her course under the influence of the wind; where the force by which she is propelled being frequently oblique, and in a sense adverse to the direction of her route, she requires a given power, not only to obtain a course but to keep it, and the conditions of which are governed by those of the force to be opposed.

It only remains to observe, in answer to the objections of those who imagine that, in the tenuity of the medium, exists an impediment to the efficiency of the rudder, that these objections are founded upon an imperfect consideration of the principles of the case involved. The impediments to the efficiency of any instrument are equally dependent upon the obstacles to be overcome as the means of overcoming them. Where these arise out of the same conditions, there can be nothing in the conditions themselves to influence in either way the success of its operations. And this is the case exactly with respect to the guidance of the aerial machine by means of the rudder. The obstacle to be overcome and the means of overcoming it are the same—namely the resistance of the air; in proportion as the weakness of this condition operates to disperse the powers of the rudder, in exactly the same proportion does it operate to disperse the forces by which the action of the rudder is opposed.

III. We now proceed to examine the third subject of investigation which we proposed to ourselves in the outset; namely, the revolving apparatus, by the reaction of which the impetus is to be maintained, which is to determine the progressive motion of the machine. These instruments may be most succinctly described as both in form and operation resembling the rotary portion of a windmill, only consisting of six arms instead of four, about 10 feet long (the breadth not stated) and inclined to the plane of their revolution at an angle of 45 degrees. Being two in number (one on each side of the centre of gravity) in the same plane, and facing the direction of the intended route, that part of the resistance they are calculated to generate by their forced rotation which is perpendicular to the plane in which they revolve, becomes available to the propulsion of the machine, and constitutes, in fact, the measure and the means of its success. As it is clear, by the obliquity of the impact a certain quantity of the force which is developed becomes resolved in directions not favourable to the object in view, before any thing can be pronounced with certainty as to the efficiency of the means at command, it must be determined how much of these means is really turned to account—how much is realized and how much lost in the process by which it is conveyed from the source to the object upon which it is intended to act.

In determining the efficiency of any system of impinging planes, there are three elements concerned in the constitution of the force developed, which require to be considered—the angle of inclination, the number, and the size of the impinging surfaces.

Of these elements there is one only the actual amount of which is independently determinable—we mean, that does not regard the other conditions of the case, but has its maximum effect assignable with reference to itself alone—and this is the angle of inclination. Whatever this be that may be found to be best suited to the purpose, it will still continue to be the best under all modifications of size and number, rate of motion and condition of medium, which may happen to characterize the case. Now this angle, (that whereof an inclined plane is calculated to develop the greatest amount of resistance at right angles to the direction of the impinging force,) has been already determined, both by mathematical induction and actual experiment, in a strictly analogous case; namely, that of the windmill, in which the conditions both of the object and of the means are precisely the same: for it will not be considered to constitute any difference, whether the plane be impelled against the air or the air be directed to act against the plane. In both cases the object is to develop the greatest amount of atmospheric resistance at right angles to the direction of the impact; and the angle at which this is complete has been established to be an angle of 54° 44'. The arguments, both mathematical and experimental by which this conclusion has been sustained, may be found in most works upon pneumatics; but we abstain from quoting them here, because we have a shorter way, and more open to the comprehension of the general reader, by which the same is ascertainable, and which, moreover, by the almost perfect coincidence it presents with the result deduced from other sources, serves at once to illustrate and confirm the correctness of the general inference. We have already had occasion to observe that the ratio of the degrees of vertical resistance, developed by inclined planes moving horizontally, (which is exactly analogous to that of the conditions of which we are now investigating) follows the ratio of the squares of the sines into the cosines of the angles of inclination. Accordingly whatever be the angle of which the sine squared, multiplied by the cosine, is the greatest, the same must also be the angle most favourable for the production of the required resistance. This actual computation enables us to fix at 54° 46', differing only by two minutes from that otherwise assigned; as any one who pleases may verify for himself by consulting a table of natural sines, and applying the test to the corresponding sines and cosines of the angles, differing only by one minute on either side, taking four places of decimals in the estimation of the quantities concerned. By what process of reasoning Mr. Heath was led to adopt, for his impinging vanes, an angle of 45° we cannot presume to conjecture; unless, observing that in the opposite conditions of perfect parallelism and direct uniformity of plane, answering to the angles of 90° and 0°, no available resistance at all was generated, he came to the conclusion that the proper resting place was the half way house between. Be this how it may, by assigning an angle of 45° as the inclination of his impinging planes, he has exactly sacrificed one twelfth of the whole amount of his resources, as may be seen by comparing the sines squared multiplied by the cosines of the angles of 45° and 54° 46° respectively, which are subjoined in the note below.

With regard to the two remaining elements of the case referred to, the number and size of the impinging planes, the amount of their effects in action being not only governed by an indefinite power of arrangement (being themselves unlimited in extent by any specific terms), but moreover, (in theory at least) entirely subject to the influence of another condition—the rate of their operation, it is clearly

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3 The products of the sines squared multiplied by the cosines of the angles of 54° 45', 54° 46' and 54° 47', are respectively 38483, 38489, and 38477; whence it is apparent that the turning point is the intermediate angle.

4 The sines squared multiplied by the cosines of the angles of 45° and 54° 46° are respectively 35347 and 38488, which is very nearly in the ratio of 11 to 12.
impossible precisely to define the actual quantities or proportions of each which are calculated to produce the greatest amount of resistance available to the purpose in view. But though we are thus precluded from appointing any specific terms to the size and number, in like manner as we have been able to do with respect to the obliquity of the impinging planes, yet are there certain considerations by which these conditions are affected, and under which a rough estimate may be formed of their efficiency or aptitude to perform the work assigned to them. These considerations are drawn from the properties of the medium, and the obligations of speed imposed upon the aerial vehicle by the already stated exigencies of its support. It is well known and easily conceivable, that when surfaces of any specific dimensions are set in motion, a disturbance of the equilibrium of the density of the air must ensue proportioned to the extent and speed of the impinging planes. Now if the system of planes by which this disturbance is effected, should be so constituted as that they come in succession into the same or adjacent portions of the atmosphere before this equilibrium shall have been restored, they no longer operate in or set upon a medium of equal resistance to that by which the other conditions of the case are governed, and upon the hypothesis of which their own effective power has been calculated; and in fact, if this state of things be extreme, so that either by reason of the proximity of the planes or the rapidity of their succession, they pass over the space allotted to them in the same or less time than the air takes to rush into a vacuum (which is at the rate of about 1339 ft in a second) they would no longer have any medium at all to act upon, and consequently be productive of no amount of reaction, however great their number or their size. To mitigate these consequences there are two modes of proceeding; either to increase the distance between the planes, or to diminish the velocity with which they are impelled. Now to the latter of these we are precluded from having recourse by two considerations; first, by the general consideration that, as rate is the condition of impact upon which the actual amount of the resistance of a given plane entirely depends, to subdue this rate is to impair the efficiency of the machine essentially and without regard to any particular disposition of its parts; and, secondly, because a rate of motion the highest, probably (if not indeed higher than any) that will be found attainable, is required by the condition of rate assigned to the aerial vehicle itself, which rate must at all events be equalled by that of the instruments of its propulsion; for it requires no great process of reasoning to perceive that by no appointment of propulsive machinery can a body be induced with a greater rate of motion than that at which the propelling agents are themselves proceeding; so that it will be readily admitted the contemplated relief cannot with propriety be expected from the diminished speed of the impinging vanes. To increase the distance between them is therefore the only available means of sustaining the propulsive energy of the revolving apparatus, which in a construction of prescribed dimensions can only be accomplished by restraining the number; and the only question that remains for our discussion is, whether this condition has been sufficiently regarded in the plan before us. Now this question can be answered satisfactorily by reference to experiment alone; to experiment, with the particular machine in the process of its construction, or to general experience in operations of the same description. To the former of these, of course, we have no means of referring, but to the latter we have happily some pretensions; and in accordance with that experience, we have no hesitation in alleging a very great redundancy in the number of the impinging vanes in Mr. Henson's propelling apparatus, viewed with reference to the special object for which they are designed. Indeed, so convinced are we of the prejudicial influence which even one superficial member in a system of revolving vanes is calculated to exercise over the effective product of their impact, that we feel quite assured that had the number of arms been but three or even two, instead of six, in each compartment, they would have realised under the prescribed conditions of the case, a very superior amount of atmospheric reaction; perhaps the greatest that with an equal amount of surface it would have been possible to have accomplished. We know that to this it may be answered, that in truth the modifications alluded have been tried, and that it was not until the superior efficacy of the larger number had been attested and approved, that the present arrangement was ultimately adopted. But before we admit any force to this conclusion, we must be satisfied that the experiments upon which it is based, embrace all the modifications to which the conditions of the case are liable; that not only has the proper angle of inclination been equally retained throughout, but that the efficacy of the machine has been tested in all cases at its utmost speed, and subject to an equitable distribution of surface according to the varying circumstances of the case; for there is no doubt that with a subdued rate of motion a larger number of the like planes will produce a greater amount of resistance, or that a larger number of planes will produce a greater amount of resistance than a smaller number of the same planes, where the rate of their motion is not such as to require an augmented interval between them to preserve the integrity of the resisting medium.

And here, in concluding this branch of our investigations, we would just briefly warn our readers against a very common and fallacious mode of regarding the operation of this particular sort of instrument, (which may not imply be termed the "aerial screw," by which many are led to overlook or reason away the obstacle here set forth to its success; namely, that this obstacle, arising from a rapid action of the parts in a circumscribed space, would be avoided by the anticipated result of the operation—the progress conferred upon the machine—whereby they would be constantly introduced into fresh portions of the resisting medium; in other words, that the ultimate success of the undertaking will be an efficient means of removing the difficulty by which that success is mainly threatened. The argument is absurd to a degree. It is a petio principii of the most flagrant character; because, not only is the insufficiency of the grounds of the progressive motion of the machine (the impoverishment of the medium) here set forth as the thing to be cured by the result of its own operation, but, the truth is, the very progress of the machine, apart from the operation of the vanes, is itself a main contributor to that deficiency, the effects of which it is expected to repair, in the withdrawal of the medium by the advance of the body within it, imposing fresh obligations of speed upon the agents of its propulsion to enable them to realise the prescribed amount of resistance. It is an argument not merely in a circle, but (if we may be allowed to coin a figure) in a spiral, in which the premises are rendered even less consequential by the conclusion which they are intended to support.

We have now left, of the questions we originally proposed to consider with reference to Mr. Henson's scheme of flight, the power by which the parts are to be inducted with motion, and the principle upon which a first impetus is expected to be acquired. The insufficiency of the one and the fallacy of the other we purpose to expose in our next number.

NEW FLAX MILL AT CASSANO D'ADDÀ, IN LOMBARDY.

(With an Engraving, Plate I'III.)

We give in this number a plate showing a perspective view of the Flax Mill at Cassano in Lombardy, erected under the immediate direction of Mr. Alibano, C. E., of London, and which at present is exciting much attention on the continent. To us it has additional interest, as attesting the wide diffusion of English industry, the whole of the millwright work having been supplied from the works of Mr. W. Fairbairn of Manchester, after the designs of Mr. Alibano. It serves to show at the same time the field of employment open to the English manufacturer, and the resources available to foreign enterprise, who are thus able to carry out their own plans, and to profit by the proficiency and talent of the best factories in the world.

The following description of the manufactory we extract from a report of Giulio Sarti, the government engineer, who with his colleagues surveyed the building at its completion, on the 31st of December last.
survey and fix on the proper site for the establishment, which he did, on the express condition, that the direction and execution of the whole work should be entrusted to him without any interference, and accordingly he completed in Milan the required plans, and obtained full sanction thereto, with ample power to execute the work according to his own design.

To that effect a contract was entered into, the first clause of which stands thus: “With the sanction of B. Albano, Esq., C. E. Directing Engineer of the said Company, &c., the machinery contracted for in the present agreement will comprise the following articles of millwright work, &c., for the organization of the flax and hemp mill of the said company, now in progress of construction at Cassano in Lombardy, under the immediate direction of the said engineer, B. Albano. The whole of the following millwright work apparatus, &c., are to be executed strictly according to the descriptions shown, and dimensions marked, in Mr. Albano’s drawings, Nos. 1, 2, 3, 4, 5, 6 and 7, and the following specification respectively signed by Mr. W. Fairbairn, contracting party, and the above engineer.”

The mere quotation of the clause demonstrates that the merit of the designing and building the whole machinery belongs solely to Mr. Albano, and I may add further, that the whole design is different from the model generally adopted by Mr. W. Fairbairn in constructing mills, as the architectural style, proportions, &c. of the buildings, and arrangement of the water wheel and other machinery, are essentially original and novel, erected under Mr. Albano’s immediate direction, and pronounced by the body of Government engineers (whose report of their official inspection of the mill I beg to enclose) to be replete with great ingenuity, and conferring the greatest credit to the directing engineer.

The directors likewise, highly satisfied with his ability, energy, and personal assistance, from the commencement to the last, testified their gratification on the starting of the mill by presenting Mr. Albano with an elegant and valuable gold snuff box, bearing an inscription to that effect, and in testimony of his care freshly given to the project.

Having so much trespassed upon your indulgence, I shall trust to your kind desire to do justice to all parties, the insertion in your publication of this statement of uncontroversial fact.

Yours obedient servant,
Henry Pagani.

Sir,—My attention has been directed to a letter signed S. N. S. in your last Journal, wherein it is stated that Mr. Albano, C. E. had appropriated to himself nearly the whole, if not the whole of the merit belonging to the erection of the Flax Mill at Cassano.

Now, in justice to that gentleman, I beg to state, that I know nothing of the correspondence to which the letter alludes to, and although I may have assisted Mr. Albano in the mechanical arrangements of the mill, I must nevertheless disclaim any connexion with the original project or designs which were exclusively his.

I am, Sir,
Your very obedient servant
W. Fairbairn.

Manchester, May 17, 1843.

SUBSTITUTE FOR GLAZED FRAMES IN HOTBEDS.

In the Rheinlandische Gartenzeitung is described a substitute for the glazed frames of hot-beds and green-houses, which deserves the attention of florists. Instead of glass the frames are covered with a fine white cloth of cotton. In order to render this more transparent, and enable it to resist moisture, it is covered with a preparation, the ingredients of which are four ounces of powdered white cheese, two ounces of white slaked lime, and four ounces of boiled linseed oil. These three ingredients having been mixed with each other, four ounces of the white of eggs, and as much of the yolk, are added, and the mixture is then made liquid by heating. The oil combines easily with the other ingredients, and the varnish remains pliable and completely liquid. The substitution of glass by this substitute promises the botanist to make such arrangements only to be changed from time to time, according to circumstances. Such a hot-bed does not possess any very particular covering or shade; the atmosphere therein remains quite as much equable as if it were covered with glass, but it remains only to be changed from time to time, according to circumstances. Such a hot-bed is provided with a soil of horse-dung, and a proper thickness of some fertile, finely sifted and mould soil spread thereon, layers of all sorts of flowers, early vegetables, and other plants, may be reared from seeds in it.
CANDIDUS'S NOTE-BOOK.
FASCICULUS XLIX.

"I must have liberty
Withal, as large a charter as the winds,
To blow on whom I please."

I. Many others besides myself have, no doubt, frequently been not a little disappointed, on finding how very poor a building, that has promised tolerably well during its progress, has eventually turned out to be. So long as it was encumbered with scaffolding, and nothing could be made out distinctly, there was room for the imagination to work upon it; but when all is cleared away, then also does the poverty of the design become exposed to view—all faults and defects become apparent; and perhaps you find that when completed, the structure is altogether unfinished. Yet "finish" is one great secret—

and truly a far greater secret than it ought to be, in architectural composition. Nor is "finish" to be confounded with decoration, for there may be the first with little of the latter; and a very great deal of the latter, with nothing at all of the first. Without finish, decoration generally looks trumpery and meretricious, and what is intended for simplicity, shows no better than inconsistent parsimony, and therefore shabby meanness. In fact, finish is essential to simplicity; and of this, Grecian architecture might long ago have convinced us, had we studied it in an artist-like spirit, instead of merely consulting its orders as so many patterns of columns. One rule worth a hundred of those usually given in architectural books, is, never attempt a higher degree of decoration than you can finish up to in every respect; since otherwise, do as much as you will, the ensemble will always be unsatisfactory. There may be both tasteful ideas and beautiful parts—but they will be only parts, causing by their very beauty all the rest to displease. Attention to what seems trifling matters, is a most important matter itself in architectural design, for it frequently constitutes the chief difference between what is excellent and what is poor—between what is of the best intrinsically and that which is dull commonplace. Yet because it happens to be what people call "Only that," little regard is paid to it, although the onliness of it, renders the neglect of it all the less excusable. Oh! if we had but all the "only thus" which people give us to understand they could easily accomplish, did they but think it worth while to attend to such trifles, how very superior we should become in art!

II. Of opportunities in architecture there are two sorts—the most obvious and intelligible one, that of having a building to execute which affords some scope for design or the display of taste—the other, that of being not only permitted but encouraged to treat the subject con amore, and to satisfy oneself. To talk of an architect's being left to satisfy himself—though some, by-the-bye, seem to be very easily satisfied with themselves—may sound strange to those who look upon him as little better than a tradesman—not as a professional adviser in art, but a sort of apothecary, who has merely to make up their own prescriptions; nevertheless, it is so essential an architect should have such liberty granted to him, that he who shows himself indifferent to it, almost forfeits the name of artist, showing himself to be little better than a mere bireling. Of course, this is to

be understood grano salis, according to the circumstances and importance of the case; neither is it to be supposed that employers and their wishes are to stand for nothing in the matter, as if it were of very little moment, whether they were satisfied or not. Let employers explain their ideas, and urge their own particular views, but let them also listen patiently to those of the artist himself, otherwise they show either that they more than doubt his capacity, or that they shrink from listening to arguments that may convict them of ignorance or of obstinacy. Architects themselves, on the other hand, might sometimes profit by the hints and remarks of their employers, and should feel rather inspired—certainly not discouraged, when they find their designs strictly scrutinized, instead of all their merits being detected at a glance; in which latter case it may be presumed the merits are rather superficial and not very numerous. Excellently well it is observed by Chateauneuf: "undoubtedly it is very pleasant to an architect to meet with an employer disposed to give him carte-blanche and permission to follow out his own ideas unrestrictedly; yet it is still more delightful to meet with one, who instead of merely passively acquiescing, asserts from conviction, after deliberate study of the ideas submitted to him, and from the lively interest he takes in them."

III. Whatever the Pecksniff's of mankind may think of the matter, certain it is, that though the more obvious features of a style may be copied mechanically by any one, to give the true and the better spirit of the style itself requires an earnest study of it, and a kind of study which, instead of being to be got out of books, must be brought to them. That such should be the case is rather consolatory than otherwise, since it proves architecture to have some pretensions to rank as a fine art, not only in regard to the works it produces, but to the mode in which it works. In architecture, very much depends upon conventional forms, and conventional as well as mechanical rules; yet though indispensable in themselves, rules are of little more than negative value: they instruct us to do just that which they can teach any one else to do equally well—and no more. They bring us up to the point where the many stick fast, and beyond which only the few can pass who possess within themselves that finer instinct called genius or talent. Though such opinion may appear somewhat paradoxical, by no means does it follow that a building or design which exhibits the more direct and standard features of the style it professes to be in, gives us the spirit of the style itself; for instead of doing so at all, it may fail to manifest any of its better qualities, and of its latent powers may indicate nothing. More correctness and no more, is not much matter for boasting of, the merit attending it, whatever it may be in itself, being but a second-hand one. Much less is it any merit to be correct only in parts—in the commonplace features of the style professed to be followed, while everything else is all but in direct variance with it.

IV. Professor Cockerell has been denounced by Professor Pugin as the man "not" pugnizes in the universities, but there was another pugnizing Professor before Cockerell at work in them—at least at Cambridge—namely Wilkins, the author of that mass of architectural mawkishness, yeled upon Downing College, as which James Wyatt's design would have been as good. Colleges are not built every day, therefore when an opportunity of the kind does present itself, it should be seized accordingly, and made the most of; yet it is lamentable to perceive how often some of the best opportunities have been converted into mere jobs. King's College in the Strand is such an arrant architectural nullity, that its insignificance in that respect shields it from criticism, no one considering it worth while to animadvert upon or even mention so miserable a piece of design.

V. Much as it is the fashion to talk about style and styles, we generally content ourselves with their mere rindings out—with sadly addicted, sickly watery stuff, that has neither flavour nor body in it. Of such quality is most of our modern Anglo-Grecian, and our recent Early English. The original spirit is so weakened and rendered so "wishy-washy" by the insanity poring into it, as to be scarcely perceptible. Yet such dilutions of style are palmed upon us as being quite pure and undiluted, although they are so only insomuch as no other spirit or flavour of any kind has been infused into the style nominally adopted; the consequence of which is that we get only the purity of pure insipidity.

BAVARIA.—MUNICH.—THE POMPEIAN HOUSE.—We mentioned in our last the project of the King to erect a Pompeian House near his residence of Aschaffenburg. This plan advances towards realization; the director of building, Van Gartner, is instructed to employ the drawings brought by Professor Zahn from Pompeii in 1839, for its construction. It was in this house that the beautiful painting on the walls was found, representing Achilles found by Ulysses among the daughters of Lycomedes; also the groups of fauns and bacchantes, on a blue ground; Hyppolitas and Phaedra, Ceres, Hygeia, Venus, and Adonis. All these will be carefully copied for the Pompeian House at Aschaffenburg, with the red bronze altar, marble, and inscriptions found in the house of Castor and Pollux; so that the visitor will find himself completely in the domus of an ancient Pompeian.
THE CIVIL ENGINEER AND ARCHITECT’S JOURNAL. [June,

ARCHITECTURAL DRAWINGS, ROYAL ACADEMY.

A change has taken place this season in regard to the Architectural Room, inasmuch as it has been removed to the “opposite side of the way,” that is, instead of being on the right, it is now the one on the left hand of the staircase; but as both rooms are of precisely the same size, nothing is gained by this arrangement, in point of accommodation, for which we have said so much on former occasions, that we are sick of the subject. Neither is there, we are sorry to be obliged to say, any improvement at all in the general character of the productions exhibited, rather the reverse—and although we have refrained from saying so before, we cannot, on this season, longer forbear expressing our conviction that something is wanted in the management of the Architectural Room, of which we have said so much, and which, in every respect, matters continue nearly in statu quo; for we perceive no improvement whatever in the system of hanging the drawings, of which we have said so much on former occasions, that we are sick of the subject. Neither is there, we are sorry to be obliged to say, any improvement at all in the general character of the productions exhibited, rather the reverse—and although we have refrained from saying so before, we cannot, on this season, longer forbear expressing our conviction that something is wanted in the management of the Architectural Room, of which we have said so much, and which, in every respect, matters continue nearly in statu quo; for we perceive no improvement whatever in the system of hanging the drawings, of which we have said so much on former occasions, that we are sick of the subject.

The architects want old Soame among them again, to give them fill for us to the present Professor of Architecture at the Academy, the walls might exhibit a blank, for it seems, as ought to be. There was not a single design or drawing of any kind of his last season; and it is just the same now. We do not say that this is very greatly in itself, but it is rather lamentable to find that his example is now contagious. It has been followed by Barry, Bassevi, Florio, Burchfield, Ferrey, Smirke, and many others whose names do not immediately occur to us. There is very little to inform us what has lately been done, or what is either actually in progress or about to be commenced. Among other things of the kind we had reckoned with some confidence upon seeing the design for the new Conservative Clubhouse, by Bassevi and S. Smith, but they have not been seen since they were there, among many others, the new Chapel Royal at Bucking- ham Palace, which we are bound to suppose well worth seeing. We should like, too, to have found the design for the façade of the British Museum, which we are told is on the eve of being at length commenced—how we should like the design itself is a different matter—we suspect, not very much; yet, at all events, Sir Robert Smirke has had ample time for studing it, and improving upon his first ideas; nor can he be very well fail to be aware that architectural taste has undergone some change for the better within the last twenty or five and twenty years, and that consequently his once admired “classical purity” is not likely to be at all relished—perhaps hardly endured now, but in very great danger of being voted dull, frigid, and stale common-place. Sir Robert Smirke may be quite as able as ever he was—a rather ambiguous compliment, by the bye—but that won suffice: what was talent yesterday, is not always looked upon as such to-day: if he has been standing still all the while, others have not; and even the public have now got a head of him. Most numerous are the tributes of liberty and of freedom in his designs, —quite equal, with one exception, to Barry’s; but he has frissed them all away; and instead of making, as the latter has done, architectural gems out of small buildings—the Traveller’s Clubhouse, 1 for instance—he has made large ones, very little in manner, and exceeding meagre in taste. This, however, is a sort of par parenthetical, which our present and liberty to skip it, therefore, once gone, the other hand, there are a great many subjects in the present exhibition that we could very well have dispensed with altogether, they being terribly stale, and withal, most unattractive as drawings. Who cares to look at a frame filled with such nothingness as a panel of Corinthian columns, merely because they are called “The Temple of Jupiter Olympius”?—or at an architectural bulletin forming us what was the exact state of the “Erechtheum” last summer? What pretensions, again, have such things as mere architectural portraits—views of buildings in the metropolis, and those tolerably well-known—to be admitted into what professes to be an exhibition of original productions, and which, if not strictly confined to them, ought at least to give us our only unedited subjects? Exceptions might, perhaps, be allowed in particular cases, where a building that has never been satisfactorily represented before, receives for the first time the attention it merits, and the want of positive novelty in the subject is amply made up for by tastefulness of execution as well as mere facility of likeness. This, however, is by no means the case with such things as No. 1157, “Perspective View of St. Pancras Church,” or No. 1284, “Interior of St. Martin’s in the Fields.” If we cannot have what is much fresher and better, far rather would we meet here again with works that look back upon those of the early days of the Academy, and to renew acquaintance with which would be refreshing. So impossible is it to discover any sort of system in the management of the architectural part of the Academy’s exhibitions, that we fairly conclude there is no system at all, but that the whole is left to “Providence” and the porters. That St. Peter is not one of them, is evident enough, for he is the key of the architectural rooms, and no one can be expected to care for the promotion of sound architectural principles than most men have by their works.

2 Speaking of this small but certainly not least work of Barry’s, the Polytechnic Review says: “A niche of the Italian style, the more it is examined, the more it appears the subject of admiration, and to some almost of adoration. Barry has had the good fortune to have his work described by the pen of one of the first architectural critics, by one who is no admirer for any task by the extent of his knowledge than the sound- ness of his judgements; and more by his writings for the promotion of sound architectural principles than most men have by their works.”
studied in its details, so as to be perfectly homogeneous in character, and to combine sober grandeur with richness, and with a far more than ordinary degree of picturesque and scenic effect also. The design, moreover, engages entirely by its own merits, for though carefully and ably executed, the drawing itself is not at all striking or showy, and has not even the ordinary allurement of colour to attract the eye to it. Not always is it that a public structure which is of importance and well satisfied with the workmanship, is not somewhat or one within; but in this instance the whole will be of a piece, and not only as regards the degree of effect, but also the species of it. Of this Corinthian hall, not only is the style of the exterior kept up in regard to the order and decoration, but also in regard to what is a happy novelty in itself, namely, the closing up the lower part of the intercolumnar spaces by a portico.

Of Grecian design we have another specimen in Nos. 1162 and 1322, the former being "A south-west view of the mansion now erecting at Silverton Park, Devonshire, for the Earl of Egremont," the other of the "Central Hall in it," by J. T. Knowles. The first, being placed over a door, is unfortunately too high to allow us to see more than its general composition; but from the drawing itself, the considerable size, the architectural scale is but moderate. Speaking of the mansion, in the last No. of the Gardener's Magazine, Mr. London says, "It is eminently classical, abounding in colonnades and porticos without a single vulgar feature externally;" and that there are colonnades and porticos we can plainly see, but that it is therefore "eminently classical!" we will not decide, because we cannot make anything of it out to be; we perceive a distinct effort to impress us with the quality of the detail. The interior, Mr. L. informs us, he had not an opportunity of seeing, and so far we have the advantage over him in some degree, being here shown what is, no doubt, the most striking part of the interior—perhaps is made rather more so than it ought to be. This "Hall is carried up the height of two floors, and on the level of the upper one has a perspective of Corinthian columns. Taken by itself this arrangement is effective enough, though not particularly novel; but we are of opinion that the general design would have been more classical had the lower order in pilasters been omitted. We do not approve of the introduction of two orders, particularly of two such distinct ones as Doric and Corinthian, in interior composition. To us it looks as if the same striking effect that we perceive in the exterior, would look for in an apartment, and to cause its sides to appear too much like external elevations. We think, too, that in the present instance the Doric pilasters carry with them an air of plainness that contrasts rather harshly with the richly decorated and painted ceiling. The best excuse, perhaps, for the introduction of them is, that they serve to divide the walls on which the upper gallery rests, into compartments, each of which is occupied by a large figure on its pedestal (ten of them in all, or five on each side). Though decoration has not been spared, it strikes us that there is a certain poverty of feeling and poverty of form—perhaps owing to the endeavour to obtain simplicity, in some of the separate parts; the doors, for instance, would have been made more important and richer features.

One of the most pleasing specimens is No. 1197, "Design for an alteration of the National Gallery by effecting, at a small outlay a more imposing elevation."—D. Mozia. The "small outlay" is somewhat questionable, nor is the alteration here suggested so satisfactory, upon the whole, as it might have been rendered by the outlay of a little—by which we mean a good deal more study upon it; still we think it would produce a decided improvement with regard to the portico and centre of the façade, bestowing on that part of the composition greater loftiness and also greater importance in other respects, though the dome is removed; but that is a feature that can very well be spared, because while it contributes remarkably at all to give the front any dignity in regard to height, it is in itself as insignificant as a drawing on a napkin. In order that the portico, the columns are here elevated upon a podium added to the ground story, by which means their capitals are raised to the same level as the cornice now is, so that the entablature of the octastyle would clear that of the rest of the front. Thus the centre would be more conspicuously marked in the general outline, and the pitch of the columns are raised also proportioned and bold aerostas and groups of sculpture being placed above it, so that the height would be considerable, at least as far as effect is concerned. Besides the embellishment just mentioned, the pediment itself is filled with sculpture; and it would, in our opinion, be a further improvement were some enrichment of the kind bestowed on the podium on which the columns rest raised a little more, while it would give the portico a very unusual and here most appropriate view of richness in that situation would show itself to very great advantage, and would serve to give importance and finish to the plain wall or ornamental crownings frieze. Another very considerable alteration here proposed, as regards the portico, is the covering in the ascent up to it on each side, by carrying the steps behind columns so placed as to form wings or loggias immediately attached to the centre octastyle, but retaking the space of an intercolumn. Thus the whole of the centre, if not exactly the portico itself, would thus be greatly extended in breadth, and be rendered a picturesque piece of perspectival composition. So far we are merely suggesting the possibility, and we think that all the alterations of the rest of the façade he has been by no means so happy. Instead of being at all improved, the windows are made little better than bare apertures, therefore, instead of contributing at all to beauty, tend rather to impoverish and impair the general effect. Of this design we have spoken somewhat minutely, because it possesses, for ourselves at least, an interest of a very particular kind, being not merely a work of fancy, but an attempt to correct a rather important public building which is now very unsatisfactory in many respects. What is good in Mr. M.'s project seems worth consideration; we should, therefore, like to see a model of the centre compartment on an enlarged scale.

As regards the subjects we have mentioned, there are scarcely any in the Grecian style, and not very many in the Italian; for Gothic of various kinds, Tudor and Elizabethan, greatly preponderate, and of designs for churches, mansions, almshouses, &c., in those styles we find more than the average compliment: and among those for churches are several interiors, one of the most striking of which is No. 1155, "Mr. S.'s restoration of the Church at Hall," by T. Allom. As may be supposed, the subject loses nothing of its interest by being treated by so able a pencil as that of Mr. A., but it is also an attractive one in itself, and of a character likely to be considered most horribly extravagant by "Church Commissioners." Not knowing what the structure actually is in its present state, we are merely saying what it is like in general, but it is not the work of restoration; we presume, however, that the fittings—pulpit, seats, &c., are entirely so, and they are of a superior kind.

On looking over the catalogue again, and seeing how many names there are of designs for churches, we almost reproach ourselves for negligence in having marked so very few for notice of any kind—either for approbation or the contrary: yet such being the case, it is evident that unless put out of sight, the productions of that class did not strike us as possessing in general more than negative merit—that of being not bad, without being positively good, at least not in regard to any fresh ideas. No. 1247, "Interior of the church about to be erected at Whitstable, Kent," by R. C. Carpenter, is of better character than ordinary, plain, but neither impoverished nor tame; on the contrary, marked by considerable vigour of style, and by much pleasing expression. No. 1274, "Design for a church in the Norman style," Gough and Roumieu, shows some fancy, and as represented in the drawing, is a more picturesque composition than usual. No. 1317, "Interior of the Cemetery Chapel erecting at Cambridge," E. B. Lamb, is, though small a structure, of very superior quality as a design, and withal one that expresses well the idea of the painted window and the inlaid pavement there is little of actual decoration. Although few, the features are so well marked, so well put together and contrasted, as to give value to each other, and produce a degree of artistic effect, that we could wish to find much more frequently than we do where the means for obtaining it seem to have been far more liberally afforded. This design furnishes an excellent idea for a small private or domestic chapel in the same style.

(Sinking of the Caspian Sea.—A communication was lately received at the Academy of Sciences from M. Hommaire-Delob, on the difference of level between the Caspian Sea and the Black Sea; and as some men have been charged by the Russian government to ascertain the level between these two seas; but the results have differed so much that a verification was desirable. This was done at Odessa, where it was found that the level was not until September, 1839, that he could establish his points of survey. M. Hommaire-Delob now reports that 1850 metres is the difference of level between both seas. Results, from the observations made by M. Hommaire-Delob, and by the French Consul at Baku, prove that the upper basins of the different rivers and streams in the steppes of Astracan, and at the sea of Azoff, that the Caspian sea had formerly a much higher level, and that it has been brought down to its present state, probably, in consequence of the Black sea having been raised by a slow process of evaporation; and he adduces proofs of this, which are not correct; but it is already this idea as to the junction of the two seas has been maintained, but it was said that the Black sea had become lower by piercing its way through the Bosphorus, and shedding its waters into the sea of Marmora. The sinking of the Caspian sea has been accounted for by the lowering of the basin, but M. Hommaire-Delob gives an explanation of this, which he conceives more natural, by observing that the Caspian sea has very few tributaries, and that a diminution in the waters of the Oural and the Volga has been a sufficient cause for the lowering of the level of this sea.)
ON THE PERFECT VENTILATION OF LAMP BURNERS.

In consequence of the injury sustained by the books in the library at the Athenæum Club, amounting almost to the entire destruction of the bindings, mention has been made of the unpleasant for oxygen that contains and apart from the atmosphere, contained it will be indispensable to atmospheric, any part, containing atmosphere, occasionally vats, upon indispensable to water; be filled immediately containing atmosphere, and from the atmosphere, one part of hydrogen, taking eight by weight of oxygen, to form water. A London Argus gas lamp, in a closed shop window, will produce in four hours, two pints and a half of water, to condense or not, upon the glass or the goods, as it may according to other circumstances happen. Also, a pound of oil produces nearly three pounds of carboic acid, and a pound of gas, two and a half pounds of carboic acid. Now carboic acid is a deadly poison, an atmosphere containing even one-tenth of it, is soon fatal to animal life. The various accidents from lime and brick kilns, from brewers' vats, occasionally from the sinking of wells, as at Cheltenham, and from the coke damp in coal mines, attest the extreme danger con- tingences. A man breathing in an atmosphere containing 7 or 8 parts of carboic acid, would suffer, not from any deficiency of oxygen, but from the deleterious action of the carboic acid.

M. Leblanc has recently analysed carefully the confined air of inhabited places, and concludes, as stated in his Mémoire, that the proportion of carboic acid gas in such places, may be regarded as measuring with sufficient exactness, the insufficiency of the air; that in the proportion of one part to a hundred of air, ventilation is indispensable for the prevention of injury to the health; that the proportion of carboic acid gas had better not exceed a five hundredth part, though it may rise without inconvenience, to a two-hundredth part. If a lighted taper be applied to the top of a lamp chimney, it will be instantly extinguished or, a glass jar held over it will become immediately filled with air, in which a light cannot burn. Also sulphurous and sulphuric acid, are contained in the water which results from the combustion of coal gas, and are products injurious to metals and articles of furniture.

It will now be understood, that the object sought to be attained in the ventilation of lamp burners, is the entire removal of all the noxious products of combustion. And with this view, at Professor Faraday's suggestion, the gas lights of the chandelier in the library at the Athenæum, were ventilated by pipes dipping into the lamp glasses, and adjoining at a short distance upwards into one central pipe, which carried away all the burnt air out of the room. In this first practical experiment, many things were learned as to the mode of arranging the pipes; the disposal, when the pipes were very long, of the water produced, &c.; but the objects sought for by the ventilation, were at once and perfectly obtained. This principle may be illustrated by a simple experiment, showing the difference between allowing combustion to give its products to the air of a room, and carrying off these products, by the introduction of air. For this purpose, the author placed burning on a plate, a glass jar put over it, and the upper aperture of the jar closed by a globular cork, through which passes a piece of glass tube, about half an inch in diameter, and twelve or fourteen inches long; the tube descending to the top of the candle flame, and being placed just above it. Under these circumstances there will be a steady flow of air past the flame and passing through the pipe, by the tube, to supply all that is needed for combustion, and keep the glass chamber sweet; the consequence is, that in this position it will go on burning for any length of time, and the jar remain quite clear and bright; but on moving the cork a little, so that the tube shall no longer be over the flame; all these results will change, though the air way remains exactly as before. The candle will now give the products of its combustion to the general air of the glass chamber, the glass will immediately become dull, from water deposited upon it, the air itself will become worse and worse; the light become dim, and in a few minutes will go out. But if arrested from doing so by the tube being again placed over it, signs of recovering will appear, the light will return to its former brightness, and after a short time, even the dew will disappear from the glass; all in consequence of the proper ventilation of the light. These effects, though striking, may easily be understood by any one who will think of the difference of lighting a fire in the middle of a room, instead of under, or in right juxtaposition to a chimney.

Then came the desire of modifying the system, by removing the ascending flue from its place over the lamp, not from any deficiency in action, but for appearances sake only; and finding that there was sufficient ascension power in the main part of the metal chimney, to allow of a descending draught over the lamp, the tube, in place of going directly upwards, was made to turn short over the edge of the glass, to descend to the area or bracket, to pass along it, and then at the central part of the chandelier, or against the wall if applied to a single light. To this succeeded another form, which is exceedingly beautiful, and appears to be the perfection of lamp ventilation. It is in fact, a beautiful application of the principle of a descending draught to a lamp burner. The gas-light has its glass chimney as usual, but the glass holder is so constructed as to sustain not merely the chimney, but an outer cylinder of glass, larger and taller than the former; the glass holder has an aperture in it, connected
by a mouth-piece with a metal tube which serves as a ventilating flue, and which after passing horizontally to the centre of the chandelier, there ascends to produce small explosions and carry off the burnt air.

The burnt air and results of combustion, take the course indicated by the arrows, and are entirely carried away by the chimneys. Now with a lamp burning in the ordinary way, the products of combustion issue out as a torrent of aerial impurity from above, but if the above arrangement be applied, on closing the top of the outer glass cylinder by a plate of mica, all the soot, water, carbonic acid, sulphurous and sulphuric explosive, and which the heat, are entirely carried away by the aerial sewage, and discharged into a chimney or the open air, and the air in rooms thus may be kept in the same sweet and wholesome condition, and fit for the purposes of respiration, as if artificial light were not being used.

A curious but important result of the enclosed lamp, is the increase of light produced, amounting from 10 to 20 per cent, according to circumstances, the same quantity of gas being consumed as before. If the current of air through a lamp glass, when the gas is burning in the usual manner, be diminished, the flame rises in height, and the light is increased in amount, but is of a redder colour; the combustion in fact is not so intense, because the access of air is retarded; the particles of carbon which give the light, are not so highly ignited, but are more abundant, and are ignored for a longer time, thereby causing an increase of light.

The advantages of the above plan are many; it is not in the least objectionable in architectural appearance, the ventilation is perfect, the best given to a room is modified and pleasant, and may be either sustained or diminished at pleasure which the lamp, for good philosophical reasons, is increased considerably for a given portion of gas, and increased safety from accidents is obtained; as in the event of any leakage from the pipes, or from a gas cock being inadvertently left open, the gas, instead of mixing with the air of the room, and becoming explosive, would be almost inevitably carried off by the metal tubes.

We understand that Professor Faraday has transferred his right to this invention, to his brother, a gas-into, who has secured it by patent.

**REVIEWS.**

**MODEL DRAWING.**


We have before had frequently to advert to the subject of instruction in design, feeling that we had a double responsibility imposed upon us by our two classes of professional readers; in the first place to advocate the necessity of the proper instruction of workmen, in the next place to warn our readers to the want of instruction of the workshops, a great inconveniency to the professional man—a great obstacle often to the proper execution of his plans, and a knowledge of drawing is essentially requisite in order to enable the mechanic or artist to adequately execute the designs of his employer. The general progress of art and the creation of a true and sound taste for art, are indissolubly connected with the advancement of architecture and its due appreciation. What is the good of the architect throwing pearls to swine, what stimulus can lie have to his exertions from the applause or censure of an ignorant or tasteless mob? The painter, the sculptor, execute their small works for the pleasure of a single individual, or the inspection of a restricted number of visitors; but the architect is called upon to erect monuments which are the delight or disgust of millions. For one man who sees the Loggie or the Sistine chapel, ten see St. Peter's; for one who has the happiness to see Barry's Adelphi pictures, thousands and tens of thousands daily contemplate St. Paul's. The architect, then, has perhaps more at his disposal the means of elevating public taste, than the painter, the sculptor, or even the engraver; it is his lot to convey these general impressions, and to spread the truthful and correct idea of the beautiful. In short, the sculptor are to profit from in their more detailed works. Can we imagine a people living amid the glories of the Parthenon and the other wondrous works of Athenian architecture, without acquiring a deeply rooted sympathy for art—can we suppose men living in sight of the luxuriant monuments of the middle ages, without manifesting a love for beauty of form in every object? We know they did not; we know that the Athenian city, which Pericles built, cultivated every branch of art—we recognize, in the commonest relics of the middle ages, the labours of the artist. When one department of literature is at its height, you have a general profusion, when one department of the arts is in its prime, other pursuits in general are checked. When Shakespeare, then had we Spenser, Milton, Sidney and Drayton—when Milton, Dryden, Butler, and Denham—when Pope, Defoe, Addison, Swift, and Steele. There is an excitement in a multitude, there is a stimulus in a crowded amphitheatre, which brings out the greatest efforts of the mind; and if you wish literature, if you wish art, if you wish science to flourish, you must not seek to nourish one branch, but sublimate all purposes of the arts, and be always in search of anything which so nearly concerns the general interests of art, as the education of the people in design, and the more so at the present period, when an endeavour is at last being made to establish drawing as an indispensable branch of primary instruction.

The work before us is under the authority of the Committee of Council on Education, of which all the schools under their control are to adopt as a normal rule for their guidance. It is drawn up by Professor Butler Williams, C.E., the Director of the Normal Drawing Classes, and describes the course followed in them. It would consequently be well worthy of our examination, if we were only to assure ourselves that the artistic instruction of the country would be properly conducted, but it becomes imperatively necessary to do so, when principles are introduced which appear pregnant with danger to the prosperity and progress of art. With Professor Williams individually, we have on this occasion nothing to do; he seems to have executed the task assigned to him, ably, honestly, and zealously; we shall therefore direct our attention to the work itself.

Among the ancients, drawing was carefully cultivated among workmen, and if we wish to see how extensively and how successfully, we find abundant examples in the unfinished and the complete specimens of the clay vase. Certain it is that the potter of the modern day, is as inferior to his Greek predecessor in artistic proficiency, as perhaps he may be superior in mechanical skill. The use of drawing too was widely spread among the people at large, because among a people instructed in writing, delineation becomes both an amusement and a necessity. The Polynesian thus records memorable events, decorates his war-boat, his weapons and his hut, and amuses himself and his comrades with caricatures on the topics of the day. Thus it must be, even among people more advanced in civilization, we are never led; and if draughts were on account of the caricature only, design would be resorted to. The numerous examples of this to be found in ancient history, and on the monuments of the people, show how general was the practice of drawing, and what a strong hold it had among the people. We trace this also in the middle ages; we see grotesque sculptures even in sacred edifices; we find satire lurking often in the moral and religious pictures; we see caricatured the images of kings and emperors and private persons, not on the walls, but on their garments, but on the whole, last their wonted charm, and with them much of the love of art and of its practice. Certain it is that in the middle ages, art entered more into the pursuits of life than it did subsequently, and into the labours of every artisan. Clothes, weapons, furniture, were more elaborately decorated than they have since been, or than the simpler habits of modern times will ever allow them again to become. It was to this proficiency on the part of the workman, that the medieval architect was indebted, for the luxuriant finish given to his design, and the rich profusion of ornament which sustained the character of the general conception. How rare, how difficult, has it been in those days, to be able to follow in his step; the machine is the only means of enabling us to imitate at home the splendour of the art. The revival of architecture in England by Wren made this want to be strongly felt, and the establishment of a school of design by Mr. Baptist Lens, as detailed in our Journal (Vol. V, p. 53), was the consequence. From that time little progress was made until our inferiority to foreign nations and our economical loss, became so painfully manifest as to induce the establishment of schools for the instruction of the Royal School of Design at Somerset House, it was our duty early to point out the gross and lamentable errors in the system of instruction. We then pointed out the danger of copying from drawings, and the necessity of a greater attention to figure and ornament, if we wished to make the establishment useful to the country or the people capable of competing with foreign rivals. These views of ours and of those who coincided in them, met with the strongest opposition from the Directors of the School, and from artists, and but little attention from the public. They have,
however, finally prevailed, and the result is that in the general system of elementary instruction in drawing, propounded by Professor Butler Williams on the part of the government, the error of copying from drawings is strongly reprobated, and is excluded from the plan. The Professor says:

*Drawing from Copies.*

In the first place we observe, that the pupil is almost universally made to draw from copies. This fails to exercise the judgment. The drawings which serve as copies, exhibit, as it were, a mode of instruction in perspective as in various of tint and shadow duly laid and harmonized; they are imitated mechanically by the pupil without his understanding or reflecting upon the means whereby certain effects are produced. His hand alone is exercised; he fails to acquire a habit of observing and seeing correctly, and is unable, after years of laborious study spent in the copy, to produce correctly the simplest objects. The Chinese cultivate the art of drawing according to this plan; they copy from copies, and produce fac-similes of any work of art; but this is performed solely as a piece of laborious imitation; and their signal failure, when they undertake to design original compositions, is the consequence of the faulty system which aims at training the hand alone to works of the highest skill. High finish in the drawing cannot compensate for glaring inaccuracies of perspective, and even the individual forms, although elaborately brought out, are devoid of expression, exhibiting labour and pains without intelligence, the consequence of following out details without comprehending the scope of the whole design, and of exercising the hand without the guidance of science and understanding.

*Drawing from Copies a delusive kind of industry.*

Sir Joshua Reynolds, in his Second Discourse, says, "I consider general copying as a delusive kind of industry; the student satisfies himself with the appearance of doing something; he falls into the dangerous habit of imitating without selecting, and labouring without a determinate object: as it requires no faculty of invention and disposition, which ought particularly to be called out and put into action, lie torpid and lose their energy for want of exercise. How incapable of producing anything of their own those are who have spent most of their time in making finished copies, is an observation well known to all those who are conversant with our art."

Moreover, the drawings presented to the pupil as models, are not always perfect, having themselves probably been copied from other copies, which may also have been made without direct reference to nature. The drawings of all objects can be executed by man, and thus, a defect in the original imitation is imitated with care by the pupil. Exclusive, therefore, of a certain mechanical facility of touch, the pupil acquires little real knowledge by drawing from copies. After years of study, he will be capable of making highly-finished fac-similes of engravings or drawings; and, if he be endowed with a retentive memory, he will have learned a set of unvarying conventional signs for the representation of natural objects in their numberless variations.

The reprobated, the discarded system of drawing from copies, well represented as "a delusive kind of industry," was that adopted in the school at Somerset House, and tenaciously clung to by the Council. It was by the practice of this mischievous system that our artists were to be brought up to compete with the better instructed workmen of the Continent, and our proficiency in those arts and manufactures which we are so well endowed, was to be obtained, and that, by the hope that was entertained of our being able to do things without invention and disposition, which ought particularly to be called out and put into action, lie torpid and lose their energy for want of exercise. How incapable of producing anything of their own those are who have spent most of their time in making finished copies, is an observation well known to all those who are conversant with our art."

The common practice of commencing the system of instruction by copying from drawings, received its first grand assault from the eloquent pen of Rousseau, in his *Emile*, who proposed, as a substitute, that the child should commence by drawing the human figure from the life. This was considered too bold, and the well-known educationist, M. Jacotot, modified it, by suggesting the study of figures from the antique. Neither of these systems, however, had justice done to it, and M. La Croix, among others, suggested drawing from models of the simple forms. This has been carried out by M. Dupuis of Paris, under whose auspices it has sprung up into a recognized mode of instruction, and the admirable results of an example for the Committee on Education here. This system proposes for models, the delineation of the square, the triangle, the circle, the simple geometrical figures, and solids and assumes the merit of greater success, of greater accuracy and greater simplicity. Now such a system is likely to gain many converts among those who have prepossessions on the subject of art, we shall examine particularly of its relative advantages and defects. It is very well to declaim on this subject, to talk about analysis and synthesis, but the question is of a mental operation and effect, and there, we opine, individual experience and individual imagination can be but of little value. How little by the examination of our own minds have we been able to learn of the mental organization of mankind; how little has the ability and acumen even of a Dugald Stewart been able to effect; and in what a state of uncertainty are the ontological sciences—indeed, what ought to be the highest science of all, is so obscure. This then should teach us the danger of trusting to individual opinions, and induce us to apply to experience, the only proper and trustworthy guide.

Now looking at the matter in every light, we feel ourselves unable to concur with the judgment of those who have adopted the system of model drawing, and as we have no reason to think that we are not convinced it is the safest. If drawing were like writing, if it were an assemblage of conventional signs, we should be willing to recognise the necessity and utility of an artificial process for its cultivation, but drawing is an art of representation which admits of the least arbitrariness, which addresses itself to the representation of nature, and the earliest efforts of which should consequently be directed in the path of future exercise. We cannot understand *à priori*, and the whole of Mr. Butler William's reasoning on this subject is *à priori*—we cannot understand *à priori*, why nature is to be abandoned in the study of drawing; it will be granted that the ultimate end of drawing is to copy nature, why should not its mimetic be so directed. We have nothing more valuable as an exercise of the mind than the loss of no experience of its impracticability, and we think it at least deserved due attention. Not only then do we believe that drawing from nature is the course in which our efforts should be directed, but we have strong grounds for fearing that model drawing is attendeth with serious evils. It is to well that forms in nature are modelled upon the several parts of the body, and the formation of the mind. It should be met with in the luxuriance of creation. The inculcation then of conventional forms, must be pregnant with danger. What is the mischief of the system of copying from drawings—that it perverts the eye, and renders the pupil incapable of adequately seeing natural objects? The study, however, of natural objects, is a great means of training the eye and the mind. What can we expect must be the result of putting a child through a preliminary course calculated to dull his appreciation and beauty, but to stunt the artistic faculty, and render him less capable of estimating the beauties of nature? That such will not be the result of model drawing has not been proved; and even if the danger be imaginary, care should at least be taken to ascertain that it is so, and not run unprepared into a career of mischief. We, however, say boldly, and we speak from experience, that there is no difficulty at all in teaching a child to draw from natural objects, and no plea satisfactorily proved to us for putting it through an artificial course. We believe, moreover, that the mechanical system of the committee of council on education, must tend seriously to the injury of the taste of our artists and the progress of the higher branches of art. At present the nation is uninstructed in art—it is now going to be perverted—and what hope can there be for the development of taste and genius in the mechanical nation, which it is the effect of this system of model drawing to produce? We say, therefore, that on every ground it is well worthy of consideration whether we are to quit the natural method for one not possessing any adequate advantages to compensate for its striking defects. The training of the eye of the pupil, in the first instance, is everything—that is well known—and all that we want is that it shall not have a false bias. To go the full length of recommending at once the study of the living human figure we do not, but we do insist, that if an objection exists to the human figure, on the plea of complexity, there are abundance of simple natural objects of still life, particularly in the vegetable kingdom, affording unobjectionable examples. Why the study of a leaf or of a fruit should be less capable of affording correct instruction to the eye than a circle or a square we cannot understand; and sure we are the most complete model should attend to the natural object than to the wire or cardboard model. Indeed, Mr. Williams is obliged to confess to the power which natural objects have on the uncultivated mind, though he qualifies his admission by depreciating the greater love of the lower classes for luxuriance than for simplicity of form. We consider the system of model drawing as a deplorable instance of the want of understanding of the duty of the government, with the ample means at their disposal, to have tried sufficient experiments on the comparative merits of the several systems of instruction in design. The system, now adopted, we are strongly of opinion, will turn out like that at the School of Design, productive of great mischief, and characterised as a serious but unwise device. If, as in the case of the School of Design, it be remedied in time.
have thought it our duty at this length to enter our protest against the mischief likely to result from the adoption of the system he propounds, and to which we hope the attention of all who desire the sound progress of art, and the proper education of their countrymen, will be directed. In parting, we beg to have it understood that our objection does not extend to the proper application of the system of model drawing, but only to its adoption as the means of teaching design in the first instance. We think that at a subsequent period, as a simple means of teaching practical geometry and the elements of perspective, that it is calculated to be highly useful but it is to the preliminary use we object, as calculated to blunt the mind, instead of to strengthen it, and with such feeling we call the earnest attention of our readers to it.

Now that we possess the advantage of two competent commissions on national art, namely—the Commissioners of Fine Arts, and the Council of the School of Design, we think it incumbent on the public to express their opinion, before further progress is made with the new system.


Egypt is a theme so much wrought upon as a staple for book-making, that we have little temptation to take up a new reclame of this nature. But if we are willing to use pleasure, or any masterly attempt to solve the mystery of its ancient history, but Mr. Watthen’s book gave little promise from its announcement, and bears little fruit on its perusal. An architect may do much in Egypt for the information of the archeologist and professional man here, and Mr. Watthen, we believe, has ability enough, to make a considerable work. Among the merits of the book is a medley formed from the labours of others. First we have a miscellaneous preliminary chapter showing the common relationship of the priests of Memphis, the knights, temples, and freemasons, with a considerable portion of the apocryphal MS. purporting to be a conversation between Henry VI. and some freemasons, upon which Mr. Watthen has based a part of his gleanings. We shall remark that it is a very extraordinary thing that curiosity should have been dormant as to the proceedings of the freemasons from the time of Henry VI. until the end of the 17th century, and that the regal MS. should be brought to light and transmitted for the examination of Lockr, in the time of Christopher Wren. *Turbin. act.*

The language of this document favors very much the suspicion of forgery, and the legend is so suggestive of doubts, that it would be safest to put it down to the account of some Chatterton of the 17th century, who have never been wanting at any day. That Lockr was at all deceive by it is not wonderful, Chatterton and Ireland deceived better antiquaries. The masonic MS. immediately precedes a long article on the chronology of ancient Egypt, in which connexion is worse confused, and although he does give some information, that Mr. Watthen is occasionally right in the new views he propounds, he shows himself so ill-guided for a guide, that we do not like to trust to his leading. We certainly wish he had left the subject alone. The next section of his book treats of the arts and antiquities of Egypt, and contains full accounts of the principal buildings and monuments, but chiefly derived from other sources. We regret this, as Mr. Watthen shows a power of observation, which might have been usefully employed in preparing a book of his own. This section contains, in defiance of order, a kind of journal of Mr. Watthen’s tour in Egypt, which presents many points of interest, and is the only part of the book which he ought to have published. If we thought it worth while to exercise our own abilities, we believe we could do so to the satisfactory disproof of many of his positions, though not perhaps much to the gratification of our readers. As a specimen how little light the author is qualified to shed upon Egyptian lore, we refer to pages 56 and 176, 226 and 230 of his book. While, however, we thus object to his having put into his book what we could better have supplied, we result of his own observations, we are bound to admit that for those who desire information on Egypt in a copious form, and particularly as relates to its architecture, a better book than Mr. Watthen’s can scarcely be chosen. We extract from his pages the account of Karanah.

Next to the Pyramids the most wonderful relic of Egyptian art is undeniably the great Hall of the temple-pace of Karanah. From the inscriptions we learn that it was founded by Menepthah-Osiri, the father of the great Ramses, who was on the throne about the middle of the 15th century B.C. Its superficial area, 341 feet by 164, is sufficiently spacious for a large quadrangle. Majestic in ruin, what must it have been perfect! The massive stone roof is supported by a phalanx of 134 giant columns, ranged in 16 rows. Most of these are 9 feet in diameter and nearly 43 feet high; but those of the central column are not less than 11 ft. 6 in. in diameter and 27 feet high. The diameters of the columns at their widest spread is 22 ft. The walls, columns, architraves, ceilings, and even the piers of the arches, is overspread with intaglio sculptures—gods, heroes, and hieroglyphics, painted in once vivid colours. It is easy to detail the dimensions of this building and the description can convey an idea of its sublime effect. What massive grandeur in its vistas of immense columns! So much so that the effects in the gradations of the chiaroscuro and the gleamings of accidental lights asthrill the aisles! As you move on, new combinations unfold themselves every moment. Wherever the eye wanders it is filled with picture—ramp haunts, granite walls, vista beyond vista. Here your car runs along a pillared avenue and rests upon a vast column at the end, to the basis and thrown against the next—now it is led a wanont chase!” through a labyrinth of columns, which from another point fall into regular succession. The whole is formed of ponderous blocks stretching across the aisles. The three central columns reach to the ground, and the others, to the height of the roof of the remote aisles. Thus while a solemn gloom pervaded through the interior generally—so grateful to the eye in this land of glare and glitter—the nave was strongly lighted and brought into prominence as a master line bisecting the hall; and a fine gradation of shade, passing off thence into the obscurity of the distant aisles, heightened the effect of the perspectives. All the grand resources of Egyptian architecture are exhibited here:—its enormous masses, its long, close files of columns, its deep seclusions, and its rich pervading sculptural decoration. Burke could not have wished for a happier illustration of that part of his theory which refers the sublime in architecture to successions of proportions.

The demolition of some of these masses excites even more wonder than their erection. Solid pylons of enormous bulk are broken up or riven in twain. *Vast built columns seem to have been dragged from their foundations by enormous waves.* Architects many tons in weight, wrenched from their place, now imprisoned over the aisles, suspended by yet heavier masses which have perhaps been thus nicely poised for ages. One might believe they were giants in those days, “Giants of mighty bone and bold empiric!”

But the Hall of Columns was but a part of this wonderful fabric. Immense pylons, half buried quadrangles and halls, granite obelisks, and tremendous piles of fallen massory once formed a range of buildings upwards of 1200 feet in length. The chief entrance was through the gateway of the west front, 63 feet high. Besides these there were other isolated and subordinate buildings. The whole appear to have been separated from the din of the city by an outer peribolus of unburnt brick, enclosing an area about 500 yards in length. A succession of four great propylia lay across this area to the side of the chief structure. The outermost, as it was exposed to the view of the city and first received the advancing procession, was the most magnificent. Its length or base line is about 225 feet, its solid width 40 feet; the central gateway is of the granite of Syene.

An avenue of colossal sphinxes appears to have been continued from Lucifer, and the central colonnade of Karnak. The finest is an eight-storied unmitigated and half interred: but how imposing the effect of such a vista extending nearly a mile and a half over the plain terminated by the great façade of Lucifer! How exactly adapted for the pageantry of processions!

The illustrations, often from the drawings of the author, are of much interest, and we cannot but regret that he has not used his pencil more than his pen.


The establishment of Cemeteries throughout the country, must be gratifying to all who take an interest in public decency and public health, while they possess the extrinsic advantages of the greatest sculptural and contributive fine art. The true design is now to supplant the ancient arrangements of burial with many picturesque and interesting establishments of this kind. Starting from Earl’s Court, the circle is continued by Kensal Green, Highgate, Abbey Park, the Tower Hamlets, Nunhead, and Norwood, each possessing its peculiar beauties and forming an embellishment to the metropolis, of which several of the new plans have been noticed in the present volume. There is much of interest. What more fitting abode for the dead, than looking down on the wide-spread city in which their lives were passed; Hovering, as it were, over the scene in which their loved descendants move, and
awaiting their presence. How much better is this than the Hades of an Egyptian tomb! With the extension of cemeteries, attention has been called to the principles on which they are to be founded, and it has fortunately induced Mr. Loudon to take up the subject. Those who know his accuracy, his minuteness, and his completeness, will be prepared to acknowledge the merit of the present work, which, without wandering into idle and useless details, treats the subject comprehensively, so as to afford every information which is essentially requisite with regards to it. While attending to the professional usefulness of his work, Mr. Loudon, with his usual good feeling, has not failed to call attention to the necessity of any improvements in the mode of interment. He urges most strongly the necessity of no corpse being interred with less than six feet of earth over it, and supports it on every ground of propriety and necessity. He suggests also several improvements in the mode of laying out cemeteries, and remodelling churchyards, and in fine, the reader will pursue his work with interest and instruction.


This work is of the same value with regard to Irish examples of encaustic tiles, as Mr. Bowyer Nichols' is as to those of England, and shows a laudable desire on the part of the sister country, to draw profit from her antiquarian relics.

The Irish specimens of tile are of three distinct kinds. First, impressed tiles; second, encaustic tiles; and third, tiles in relief. Of the first class, Mr. Oldham states, that the Irish specimens are principally of the ordinary red colour of the clay, the surface being coated with an opaque varnish or glaze, generally of a greenish yellow colour, but occasionally of a dark purplish black, and extending equally over the indent pattern. Although similar examples have been found occasionally in England, in which the hollows were filled with a different substance, removable by washing, our author observes, that he has seen no such case in Ireland, and thinks it exceedingly improbable that such ever was the case in Irish tiles. In the encaustic variety, the surface is quite smooth and flat, the pattern being produced by a differently coloured substance inside. The colours are generally bright red and yellow, or purplish black and pearl grey, and sometimes of purplish black and deep red. The third variety has the pattern formed in low relief. To this latter variety Mr. Oldham assigns the later date, considering it referable to the Tudor times; some of the other examples are however as old as the middle of the twelfth century.

Mr. Oldham mentions some curious facts with regard to the Irish tiles. He says, the identity with English specimens is often recognizable. Thus several of the patterns now remaining at St. Patrick's, Dublin, are nearly identical with some from Malvern, in Worcestershire, and it is of additional interest to find, that about the probable date of these tiles, a connection existed between the two places, for in 1123, the year in which St. Patrick's was made a cathedral, the prior and brethren of Malvern the Less, re-granted to it one half of the tithes of Castelknoch, which had been given them in 1221. A kiln, it appears, has been discovered at Malvern, with portions of tiles in the several stages of the progress, and the tiles there used were manufactured on the spot; whence Mr. Oldham conjectures, that some of the Irish tiles were also derived from the same source. The water communication by the Severn and Bristol with Ireland, would favour this idea. Notwithstanding occasional importations, our author is however of opinion that the majority of the Irish tiles were made on the spot.

The following anecdote with regard to the early use of ornamental tiles, is entertaining. The author says:

But if, on the other hand, our supposition that the pavement tiles at Mellifont were laid down at the time of its erection, (1142-1157) by monks from Normandy, be correct, it would then appear more probable, that the first knowledge of these tiles was derived from thence; and bearing in mind that Mellifont and Beccive were both Cistercian establishments; the following notice, obligingly communicated to us by the Rev. Richard Butler, is extremely interesting. In Martin's Thesaurus Anecdotarum, among the *Select statutes of a general chapter of the Cisterian order* is one—*Anno 1210*. Let the Abbot of Beanbee (in Normandy) who has for a long time allowed his monks to construct, for persons who do not belong to the order, pavements, which exhibit levity and curiosity, be in slight penance for three days, the last of them on bread and water; and let the monks be recalled before the feast of All Saints, and never again be lent, excepting to persons of our order, with whom, let him not presume to construct pavements, which do not extend the dignity of the order." These pavements must have been...
either mosaics, (tesselated pavements) or tiles; probably, from the manner in which they are described, the latter. In either case, it proves that ornamental pavements had been a long time in use prior to the beginning of the thirteenth century. Nor should the fact be overlooked of the jealousy with which the use of them was sought to be confined to this monastic order.

Of some of the tiles, by the kindness of the author, we are able to give specimens, and we beg to observe, that the work is a valuable contribution to our knowledge of that branch of art.


To the student this will be found a very useful guide, as far as it goes, but it is not sufficiently extended to be of that benefit the title would us to expect. It does not explain in what manner the student is to set about measuring or estimating a building, in commencing and proceeding from the foundation to the top in brickwork, and from the roof downwards to the lowest floor in carpentry, or the method of proceeding on each floor in the joining, first with the floor, then the skirting, windows, doors, &c.; not in the plasterer's work commencing with the ceiling, then the cornices, partitions and walls; we have just given this slight and hurried sketch to show that there is a system adopted by all surveyors of any practice in measuring a building, and without such a system, the tyro will get himself into a labyrinth of difficulties, and probably omit some important part of the works. We may probably at a future opportunity be induced to some instructions which might have at some time been proposed to lay down rules for that purpose, but none of them appear to us to be of that satisfactory character which we think suitable to the student; however, the work now before us, for the present we recommend, as we consider it the best that has hitherto been published, and will render some assistance in the measuring and making out builders work, and give some insight into the abbreviations, method of entering the measurement, the abstract and drawing out the bill of quantities.

A course of Practical Geometry for Mechanics, by W. Penn. This book contains the principles of Geometry, which the author has condensed very satisfactorily into a small space, so as to render the work both cheap and useful to the student.

The Guide to Hayling Island near Havant, Havant. To the visitors of this watering place this guide will be useful.

PROPOSED EXTENSIVE IMPROVEMENTS IN THE CITY OF LONDON.

At the last Court of Common Council, the Special Committee appointed to report upon the proposed improvements in the city, presented their report, which certainly contains numerous suggestions, but we fear it will be several years before they can be carried into effect; they observe that:

It has long been the subject of public complaint, that Newgate-street, Snow-street, and part of Labour Lane, thence up to the opus of St. Martin's-le-Grand, are all covered by improvements, which would be extremely detrimental to the north-western, and that of St. Paul's Churchyard, Ludgate-hill, and Fleet-street, to the western part of the metropolis, are both quite inadequate to the immense traffic of carriages, wagons, and vehicles of every description which throng in those directions; and the numbers of wagons and cars which convey provisions to and from Newgate-market frequently choke that thoroughfare, creating delays and inconvenience to the mail-coaches, and other impediments to the Post-office, carriage, and trade. The special committee having examined carefully those plans which have been suggested to the Commissioners of Woods and Forests for a new thoroughfare, commencing in the neighbourhood of Leicester-square, through Lincoln's-inn-fields into the city, crossing Farringdon-street by a viaduct, next considered the practicability of forming a street which would connect the end of Cheapside with such a thoroughfare at Lincoln's inn and with a branch diverging into Holborn, which would effectually relieve the great pressure of the public traffic in the thoroughfares alluded to, and at the same time render a viaduct at Holborn-bridge unnecessary. They were of opinion that the formation of a street combining these desirable objects was indispensably practicable, the street to commence at the east end, and continue along Paternoster-row, through Amen-corner, across Farringdon-street to the south-west corner of Farringdon-market in a straight line, the main line to continue across the middle of Fleet-street to the city boundary, and a branch to diverge from the corner of the market to the end of Fetter-lane, at the summit of the hill in the wide part of Holborn. The special committee having had the level in this proposed new line accurately taken, find that the greatest inclination of any part of it would be not more than about 3 feet in 160, and that only for the distance of 370 feet. It occurred to them in pursuing the investigation, that this new line would be still greater improved by the removal of the whole of the houses between the north side of St. Paul's Churchyard and Paternoster-row, from the end of Cheapside as far as Ave Maria-lane, which could be done for the additional sum of £150,000. Should this be effected, that magnificent structure would terminate a vista of upwards of one-third of a mile, and the whole would, in addition to the increased facility and convenience which would be afforded to the growing commercial traffic of the city, form one of the grandest improvements of an architectural character, yet achieved in the metropolis.

The order in which the special committee have chased the improvements which they consider called for, is according to the relative importance of each, and as follows:

A. From the east end of Paternoster-row to Fetter-lane, and a branch street to Holborn, commencing with the houses at the west end of Cheapside, which would have been improved on the plans of the thirteenth century, all between Paternoster-row, St. Paul's Churchyard, as far as Ave Maria-lane, Amen Corner, crossing the Old Bailey, to Farringdon-street, to Shoe-lane, Printer-street, Great New-street, to Fetter-lane to the city boundary; and the branch street from Little New-street, to the north end of Fetter-lane, Holborn, about 3500 feet in length. The great acuteness in the whole of this line will not be more than 1 in 31, and that for only about 370 feet.

B. From the north end of Dowgate-hill to the east end of St. Paul's Churchyard, thence to Earl-street, Blackfriars, through Tower Royal, Little and Great Distaff-lane, crossing the Old Change into St. Paul's Churchyard, about 1360 feet in length, and from the Old Change, through Knight-riders-court, Carter-lane, Guilliman-street, Bell-yard, Addle-lane, to the east end of Earl-street, about 1200 feet in length.

C. Walleting-street, from Aldersgate Church to the west end of St. Paul's Churchyard, about 1055 feet in length.

D. The Poultry, on the north side, to the Old Jewry, and 100 feet of the north side of Mansion-house-street, about 1655 feet in length; from the Mansion-house across Bucklersbury and Sizze-lane to Queen-street, from Walleting-street to the east end of Basing-lane, the east side of Queen-street from Walting-street to Thames-street, about 1400 feet in length.

E. Lime-street, east side, from Culm-street to Fenchurch-street, Leadenhall-market from Fenchurch-street through to the south end of Gracechurch-street, about 800 feet in length; Allgate, south side, from the Sunnec's Head to Jewry-street, and the east end of Leadenhall-street at its junction with Fenchurch-street.

F. Broad-street buildings to the Curtain-road, through Holmiston-street to Sun-street, thence to Skinner-street, and on to Worship-street, about 1550 feet in length.

G. From Aldersgate-street, opposite the end of Jewlin-street to Smithfield, and from the corner of Little Britain across Bartholomew-close, to communique with the above line of street to Smithfield, about 1280 feet in length.

H. Threadneedle-street, north side, at its junction with Broad-street, and south side, from the church of St. Benet Fink, to Finch-lane, about 255 feet in length.


K. Malden-street, north and south sides, about 275 feet in length; Jewlin-street, north side, and south side from the corner Redcross-street to Rochford-street, and north corner next Aldergate-street; Aldermuntry, the west side of the south end; Milk-street, east side next Cheapside; White Rose-court, Coleman-street, and Mason's-alley, Moor-lane, south side, east corner, and north end, west side, from White-street to Type-street, and south end, Milton-street, east side; New Bridge-street, Blackfriars, through Tudor-street to the Temple.

Having thus detailed these improvements, the special committee turned their attention to that part of the reference whereby we were directed to report our opinion as to the best means of accomplishing these objects, and having had under consideration the various improvements which have been carried out during the last 12 years, as connected with the avenues and approaches to London-bridge, ascertained that our expenditure in this respect has amounted to about £150,000, and if the same could be provided for a few years, would enable all the proposed improvements to be carried into effect; and feeling that the Corporation have not the means at their disposal of effecting these improvements, however desirable the same may appear to be, the special committee were of opinion, as Her Majesty has been graciously pleased to appoint a special commission of five members to consider further metropolitan improvements which the commission is now sitting, that a favourable opportunity exists for drawing the attention of the Government and the commission as to the best means to be adopted for raising the requisite funds for these purposes, and recommended that we should be empowered to confer, with them upon this desirable object; and we agree with the special committee in the said report, submit the same to the hon. court.

The report was signed by 21 members.
The Tweeddale Patent Drain Tile and Brick Machine.

Fig. 1. Tile Machine.

Fig. 2. Brick Machine.

These machines, the invention of the Marquis of Tweeddale, have recently undergone very considerable improvements, and are now made to be worked by manual power, and are so portable that they may be removed and placed in any part of the tile sheds or brick fields. Formerly the machines were worked only by steam power, which in many cases was found to be highly inconvenient and expensive, as it was necessary to have the machines fixed and the clay brought to them sometimes at a considerable distance. The new machines, exhibited in the above engravings, can be worked by one labourer independently of the filler and attendants to remove the bricks as they are made.

The machines act with great simplicity, yet with the utmost accuracy. The one used for tile making, Fig. 1, consists mainly of two iron cylinders, over which webs or bands of moleskin, or other suitable cloth, are made to pass. By this arrangement the clay is pressed into a web of uniform thickness, without adhering to the cylinders. It is then carried over a covered wheel, slightly curved on the rim, and begins to assume the bent shape of a draining tile; a tendency which is increased by several inexpensive but effectual contrivances; and the tiles are polished and finished by passing through three graduated iron moulds of horse-shoe form, as seen in the centre of the machine, being at the same time moistened from a cistern on the top of the machine. The tiles are then cut off, with mathematical accuracy, to such length as may be required (fifteen inches being generally recommended as the most profitable and convenient), and then they are conveyed to any requisite distance by an endless web, and from thence are placed by two lads on the drying shelves. Flat tiles, or soles, are formed in precisely the same manner; except that they are partially divided into two portions while passing through the moulds, the quantity of clay required for one draining tile being the same as for two soles. The tile machine will make from 10 to 15 bricks per minute.

The brick machine, Fig. 2, is on the same principle, but varied to suit the different character of the article required. The clay is placed in a receiver or "hopper" above the two cylinders; and it descends between them into a mould or box, in such a way as to become perfectly formed and pressed into the shape of a brick in the transit. By a recent skilful improvement, a series of palate-boards is borne along by an endless iron chain; and the adjustment is so correct that at the exact moment of passing under the mould, each board is lifted to receive the new formed brick as it is emitted from the mould, and separated from the main body of clay; the palate board then drops again into its place with the brick, and is conveyed horizontally along the web just mentioned; hence it is removed on to barrows by the barrowmen.

It is not the least of the merits of both machines that, although acting with the accuracy of clockwork, they are not liable to derangement; and that, while they are suitable for the application of steam or other power when very large quantities are required, yet they are so simplified as to be also within the management of a couple of common labourers, with the assistance of two or three boys to remove tiles, or the like number of men in the case of bricks.

The quantity of articles produced is not limited by the machines, as they will manufacture any number that can be conveniently taken away. The general range is from 15 to 20 bricks or tiles per minute, when hand labour is employed to work the machines.

Several of these machines are now in operation in different parts of the United Kingdom, and on the Continent. The principal portion of the bricks for the rebuilding of that portion of Hamburg destroyed by fire, are, we are informed, made by these machines. One of the machines may be seen at the Company's wharf, Millbank, Westminster, near Vauxhall Bridge.
THE XANTHIAN MARBLES IN THE BRITISH MUSEUM.

Amongst the valuable, though to the public taste not the most attractive, additions to the contents of the British Museum, are the marbles brought from Lycia, and which have been placed temporarily in the two rooms leading to the Elgin marbles. These treasures not being as yet entered in the synopsis, or presented to an ordinary observer striking or remarkable feature, have not yet attracted the public, and hence warrant notice which their importance demands. Still they have not been altogether unnoticed by the crowds of holiday folk who have thronged to the Museum during the last few days, and who seem unanimously to regard them as "very ancient" and "very curious."

These marbles, which were discovered by Mr. Fellowes, while travelling in Asia Minor, in 1838, are said to be the most remarkable and important accession received by any European museum for many years, and have been obtained and brought to England in consequence of the greatest enterprise and self-denial on the part of the gentleman by whom they were discovered, and in consequence of whose representations respecting them that the British Museum. The marbles already secured to the British nation are but a small portion of those that abound in the interesting country from which they have been brought; they are, however, very valuable, and some idea of their quantity may be obtained when we mention that they were brought to England in 78 large and heavy packages.

The Xanthian, or Fellowes, marbles, it has been proposed to have them called, illustrate the mythology, the modes of warfare, and a variety of interesting features in the manners and customs of the ancient inhabitants of Asia Minor, who were originally settlers from Cret. As might be expected, these sculptures do not, as works of art, rank with the Elgin marbles, but they are highly interesting as illustrating the state of sculpture in a much earlier age. They are supposed to include some of the earliest efforts of Greek art which have come down to our times.

The principal objects in the collection are those which Mr. Fellowes describes as the bas-reliefs representing the legend of the daughters of King Pandarus being carried away by the harpies, which were around the high square monument, which was called the harpy tomb. The marbles belonging to this tomb are placed in the central portion of the grand saloon, arranged as they were before being taken down, and the harpies, as far as we can judge, are represented as if hurrying up towards the spout of a shaft 17 feet high, and weighing 80 tons, standing on a plinth 6 feet high. The tomb itself was 3 feet 3 inches in height, surmounted by a cover which weighed from 15 to 20 tons. The central saloon also contains some very beautiful frieze work, representing in bas-relief a bear hunt: all the figures, the horses and horsemen, the dogs, and subsequent arrangements for the capture of the beast, are wrought with such accuracy and skill as to be considered one of the most remarkable and the most highly finished specimens of art. Some of the figures on the harpy tomb, and those placed on the under ledge of the same large framework, bear a considerable resemblance to the figures on the monuments of Egypt; we may mention particularly the gods seated on chairs, one smoking a lily, and another giving a helmet to a warrior. In the anti-room there are several very rich friezes. One represents a sacrifice; the fire is burning on the altar, and a number of persons are approaching with various offerings, both animal and vegetable, and in cases the offering may be readily distinguished. The siege of the walled town forms in itself an interesting subject; the walls are defended by warriors armed with stones, which are also the weapons in general use among all the combatants; on the walls are a number of females, whose countenances indicate great distress, as they well may, for the artist has introduced an escalade, which is sufficiently indicative of the danger of the inhabitants. The friezes and the pediments in this room contain some figures, which, for vigour of design, if not for beauty of execution, may vie with the best of the Elgin marbles. Mr. Fellowes, in his account of the transmission of these marbles to England, remarks that the frieze so accurately illustrates the description given by Herodotus of the capture of the early city, that he could almost fancy that the neighbouring historian had written his history from it, commemorating an event which happened about a century before his era. We understand that a room is to be prepared expressly to receive this valuable addition to the antique sculptures with which our great national collection is enriched.—Times.

DREDGING AND DREDGING-MACHINES.

Sir,—As to working a machine a-head by the engine, although, as you remark in your note to my communication on this subject, in the last number, it is one of the most obvious applications of the engine power, yet it is not equally so under all circumstances. Where a machine is used to keep a harbour dock or navigation clean, the application of the engine power may be most obvious; but in other cases, where it is requisite for the bottom to be dredged out, the advantage is not so great. Indeed, in such a case, it is impossible to apply a constant power to the bow chain in trench cutting, (or the lateral chains in radius cutting,) else the machine would be broken by natural intermissions, such as stones and roots of trees occurring. But if the engine power be applied to a crab-winch, and the chain be brought with about three turns round the winding barrel, so as to give it just sufficient friction to drag the machine under the ordinary resistance to the buckets, and of course allowing the end of the chain to coil upon the deck, an intermittent motion may be had, by which the engine power may be advantageously applied to the machine. And it would, of course, be an object to dispense with the attendance of a man at the crab-winch, or with the ordinary motions of the engine, by placing a barrel on the engine, and then no friction straps or the like could produce such a motion as that given by the man letting the chain slip or lose entire control. A fast and loose gearing would scarcely do, but, with friction cones, it would certainly approximate to a most satisfactory performance.

In my communication last month, I did not say what motive power I would apply to the lateral chains therein proposed, but the above remarks apply equally to them as to a bow chain. Where the motion of the machine (i.e. the progressive motion of the machine or boat to the staff) may be uniform, the application of engine power would be an additional saving, as they would only require an occasional inspection, but in the case where the motion must be intermitted, the method of "radius cutting" reduces the labour of winding so much, that if a man attend to the chains he can also wind them. In a small machine, about 30 feet long, one lateral chain on each side may be sufficient.

The reduction of the number of hands required to work dredging machines must be an object with every engineer whose works require the use of them, in as much as it is creditable to raise the staff at the least expense which local and other circumstances will permit, many ingenious arrangements might be thought of. In those machines in which the bucket ladder is placed in the centre of the boat, there are levers at hand, by which the captain, while taking the soundings in the well, can raise and lower the ladder. In the same manner, when engine power is applied to the crab winches, rods might be brought from their fast and loose motions, so as to all be at one point. Always adapting the machine to the nature of its work, I am unacquainted with any, where the machines are divided and adapted to different sorts of work, which has made me keep this point in view in my preceding remarks.

If each machine be adapted both for light and heavy work, there must be a waste of power; but more on this again.

W. C, C.E.

30, Hope Street, Glasgow, 26th April, 1843.

Paris.—The monstrous elephant which has for 20 years guarded the Place de la Bastille, in memory of Napoleon's Egyptian exploits, is about to be cast in bronze, for the decoration of a grand fountain to be erected in the Place du Trône. The giant animal is already caged, for the purpose, within a system of boardings forming a vast workshop, and at once exciting and baffling the curiosity of the Parisian street hunters. The papers also state, that the commission for erecting the tomb of the Emperor Napoleon has come to a decision, and that the.crypt of the palace will be closed, with its guided cofferments, in the midst of the Invulnables, to the great regret of the public. But the execution of the splendid statues of the Emperor shall be superseded; that the equestrian statue of the Emperor shall be erected on the Esplanade, and not in the Cour Royale, as designed by the architect; and that the figure of the Emperor shall be in his historical dress, and not in the Roman costume. The Minister of the Interior has given commissions for twelve statues, to be placed in the niches of the principal façade of the Hotel de Ville. The following are the subjects—Frochot, Voyer d'Argenson, Etiene Robert, Vincent de Paul, L'Abbe de L'Epee, Robin, Jean Aubry, Hardinon-Massard, Guillaume Bude, Mathieu Mole, Michel Lallier, and La Vaquerie.
### Table: Comparison of Furnaces

<table>
<thead>
<tr>
<th>Name of Steamer</th>
<th>How long since the apparatus was introduced into your Vessel.</th>
<th>Did your furnaces make much smoke before they were altered?</th>
<th>Did they make less smoke since they were altered?</th>
<th>Had you a sufficient supply of steam before the furnaces were altered?</th>
<th>Have you as good or better command of steam since the alteration?</th>
<th>Does the use of this apparatus affect any saving of fuel, and to what extent?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hibernia</td>
<td>12 months</td>
<td>Yes—a great deal of smoke.</td>
<td>Much less smoke, scarcely any to be perceived.</td>
<td>Yes—but not too much.</td>
<td>Yes—a great deal better, and was enabled to blow off coals.</td>
<td>On the average of trips we save at least 3 cwt. per hour.</td>
</tr>
<tr>
<td>Ballinasloe</td>
<td>7 months</td>
<td>Yes—a very thick black smoke.</td>
<td>No smoke is now made except when fires are first lighted, or coals are being thrown on.</td>
<td>No—scarcely enough of steam.</td>
<td>Rather insufficient in steam.</td>
<td>Consumption much about the same as before, notwithstanding about 16 horses power added, and an increase of two revolutions.</td>
</tr>
<tr>
<td>Nottingham</td>
<td>19th April, 1841—say two years.</td>
<td>Yes—we smoked very much.</td>
<td>Only when fires are first lighted, or with bad coal.</td>
<td>No—we had but little except with very good coal — then with great exertion we worked to full power.</td>
<td>Apparatus attached when the present boilers were put in.</td>
<td>We have a plentiful supply of steam.</td>
</tr>
<tr>
<td>Athlone</td>
<td>7 months</td>
<td>Yes—a great quantity of smoke was made previously.</td>
<td>Very little smoke now.</td>
<td>No—sufficient.</td>
<td>Apparatus always attached—plenty of steam at all times.</td>
<td>We are convinced we have, and particularly with good coals.</td>
</tr>
<tr>
<td>Royal Adelaide</td>
<td>10 months</td>
<td>Yes—we smoked very much.</td>
<td>No smoke is made except with very good coal, when these fires are put in good order — a light smoke when men are fringing.</td>
<td>We have always had a good command of steam.</td>
<td>Apparatus always attached—plenty of steam at all times.</td>
<td>Apparatus always applied to these boilers.</td>
</tr>
<tr>
<td>Prince</td>
<td>Always to these boilers.</td>
<td>A great deal of smoke.</td>
<td>Sufficient supply of steam.</td>
<td>Apparatus always attached.</td>
<td>Apparatus always attached.</td>
<td>Without the air pipes we made 16 voyages . . . 371 hrs.</td>
</tr>
<tr>
<td>Princess</td>
<td>9 months</td>
<td>Yes—we smoked considerably—at other times not so much.</td>
<td>We always had a good command of steam.</td>
<td>We have been enabled to blow off steam.</td>
<td>We have a much better supply with the air apparatus.</td>
<td>We save about 1 cwt. to 1 cwt. per hour.</td>
</tr>
<tr>
<td>Leeds</td>
<td>Above 2 years</td>
<td>Going before the wind they smoked considerably—at other times not so much.</td>
<td>No smoke except when firing up or making the fires, and then only a short time.</td>
<td>We have always had a good command of steam.</td>
<td>We have a much better supply with the air apparatus.</td>
<td>From the nature of our service I cannot say. We think we are saving from three to four cwt. per hour. For many voyages our consumption averaged 26 cwt. per hour. It was 30 cwt. previously.</td>
</tr>
<tr>
<td>Birmingham</td>
<td>1 month</td>
<td>At times they smoked.</td>
<td>No black smoke now appears while under way, but sometimes a little gray colour a few seconds after firing.</td>
<td>I have always a sufficient supply of steam.</td>
<td>At all times a sufficient command, and are now enabled to blow off steam.</td>
<td>The air boxes are a great saving, both in fuel and supporting the bridges.</td>
</tr>
<tr>
<td>Mars</td>
<td>9 months</td>
<td>They now make scarcely any smoke after the fires are well lighted.</td>
<td>We were always pretty well for steam when using good coals.</td>
<td>We considered that we have a much better supply with the air apparatus—there is no question of it.</td>
<td>Very much better.</td>
<td>From 15 to 20 per cent. of fuel is saved.</td>
</tr>
<tr>
<td>Oriental</td>
<td>20 months</td>
<td>Yes—we smoked considerably, as much as any vessel of our class.</td>
<td>Much less smoke.</td>
<td>Sufficient.</td>
<td>Sufficient steam now.</td>
<td>Yes, at least one-third.</td>
</tr>
<tr>
<td>Hindostan</td>
<td>Put in on arrival at Southampton steam, much, from both funnels.</td>
<td>Smoke is now seldom or never seen.</td>
<td>Not over abundant.</td>
<td>Much about the same.</td>
<td>Sufficient steam now.</td>
<td></td>
</tr>
<tr>
<td>Shandon</td>
<td>4 months</td>
<td>A great quantity of smoke.</td>
<td>Sufficient.</td>
<td>From 15 to 20 per cent. of fuel is saved.</td>
<td>Sufficient steam now.</td>
<td></td>
</tr>
<tr>
<td>Dædalus</td>
<td>9 months</td>
<td>A great deal of smoke.</td>
<td>Not half enough.</td>
<td>Yes, at least one-third.</td>
<td>Much better.</td>
<td></td>
</tr>
</tbody>
</table>

Since the above was printed, the Queen Victoria (in Liverpool) and the Brauda (in Glasgow) have been added to the list, in both of which the apparatus has been successfully applied.
C. W. WILLIAMS' PATENT SMOKELESS ARGAND FURNACE.

Sir—As the application of Mr. C. W. Williams' Argand Furnace to marine boilers has been questioned, we beg to request your giving room to the accompanying tabular view of its adoption on board several steamers, and to add that the apparatus continues to be applied to such boilers as from their construction are susceptible of improvement.

I am, Sir, 
Yours obediently,
DICKES & Co.

P.S. By the returns in the foregoing table it will be seen that the advantages are greater in some vessels than in others. This difference is chiefly attributable to the construction of their boilers. In marine as well as in engine boats, the arrangement of the tubes frequently renders them incapable of improvement; such arrangement not only injuring the draught, but tending to obstruct, rather than aid, the natural and chemical process of the combustion of the gaseous matter of the coal. In some of the boilers in the above table, there appears to be a considerable saving of fuel where there had been a sufficiency of steam. In others, the advantage of the apparatus is shown by obtaining a better supply of steam from the same quantity of fuel. In all, the great evil of smoke is avoided. Where furnaces are properly attended to, by having the bars kept thickly and uniformly covered with fuel, smoke will be prevented, and more heat generated. Any deviation from this, by having the fire bars too long—by improperly feeding the furnaces or allowing the fuel to burn in holes or irregularly—or by heaping the fresh coals in front, and allowing the back part of the bars to be uncovered or without the full supply of fuel, will be attended, either with the generation of visible smoke, or the escape of the gases unburnt, though invisible, with a loss of heat, and consequently a diminution of steam. It is here to be noted, that the absence of visible black smoke is no test of the combustion of the gases. What is called the "combustion of smoke" is not unfrequently the effect of the mismanagement of the fuel, by which its inflammable gases pass away in an invisible form. Smoke is the result of the imperfect process of combustion of the gases, and as the process cannot be twice performed in the same furnace, the "combustion of smoke" is hence a chemical absurdity. Dr. Ure, writing to Mr. Williams, says, "I quite agree with you in considering the prevention of smoke to be the true mode of curing the nuisance; for when the carbonaceous particles become deposited, it is impossible effectually to burn them, so as to destroy the smoke which they occasion, or rather constitute." Professor Blandy says, "As to the bubbles about burning smoke, it is, in other words, burning what is to be presumed has already been burned, and therefore cannot be burned twice over," &c. "I can see nothing that in the least invalidates your views respecting the prevention of smoke, by the combustion of that which would become smoke, if you would let it!"

NOTES ON THE USE OF SUBLIMATE OF MERCURY AND SULPHATE OF ZINC, AS PREVENTIVES TO DECAY IN TIMBER.

Various attempts have been made by different individuals to render timber indestructible, both as regards fire and the hand of time, also to render timbers of inferior qualities equal in hardness to those of the best description; for the latter purposes a solution of pyrogallate of iron and chloroide of lime have been employed, and for the former, solutions of the sulphates of copper and iron. It has long been known that the saturation of skins of birds and anatomical preparations, in a solution of corrosive sublimate of mercury, tended to their preservation, and it was suggested by Sir H. Davy and also by Mr. Chapman, that the same solution was capable of preserving timber; but it was reserved for Mr. Kyan to bring the subject to be heard in practice. By the end of March, 1831, the first examination of which took place in three years afterwards, and the second in July, 1833, five years afterwards. Since then the use of sublimate as a preventive of dry rot and decay has been termed Kyanizing, after Mr. Kyan, who, in 1829, took out letters patent for "a new mode of preserving certain vegetable substances from decay," and in the same year had some specimens of timber, prepared with the solution, tested in the fungus pits of Woolwich dockyard, which stood the trial satisfactorily. In 1835, the paling of Regent's Park, in London, was so prepared, and in the same year Sir Robert Smirke employed Kyanized timber in the erection of the Oxford and Cambridge Clubs, and Messrs. Grissell and Peto, the builders, erected tanks and purchased the use of the patent, and Mr. Samuel Beazley, the architect, reported, in Jan. 1831, favourably of the paling in the Regent's Park, which had been submitted to the process. The above authorities, I have no doubt, gave the system of Kyanizing an impetus of which it has not yet lost the beneficial effect. Above twenty railway companies used the patent for the preparation of the sleepers of railways, both for cross and continuous bearings: it was used on the viaducts of timber on the North Shields Railway, by Messrs. Green, and also by the Honourable Commission for the repair of the Menai Bridge. The Kyanizing system has been introduced into Holland, where the Commissioners of the Dutch government made a favourable report in May, 1838, and it has also been used for the Austrian railways. A company is now using the patent in England under the title of "The Anti-Dry-Rot Company."

An improvement on mere saturation was suggested and acted upon by Sir William Burnett, in Aug. 1836, and being favourably reported on by the Admiralty, a tank was erected at Portsmouth, being of wrought iron, 52 ft. long, and 6 ft. diameter, and another was erected by the Hull & Selby Railway Company, 70 ft. long 6 ft. diameter, The Anti-Dry-Rot Company, under Kyan's patent, has also a 60 ft. tank and hydraulic apparatus, at their works, City Road Basin. The timber is piled inside these tanks with interstices, and the air is exhausted by a pump to a vacuum of 25 in. of mercury, and the solution then admitted, and submitted to a pressure of 100 lb. by a force pump, by which means the saturated solution is forced into the pores of the wood. Some doubts have been expressed as to whether the proper effect is obtained by this mechanical process, the action being chemical, and time for saturation being required.

The report of the Committee appointed by the Lords of the Admiralty printed by order of the House of Commons, July 9, 1835, contains the following observations. founded upon some experiments made at Somerset House. The solution used for preparing the timber, contains 224 lb. of the corrosive sublimate to 1002 gallons of water, or about 1 lb. to 5 gallons, and the cost of the sublimate 3s. 7d. per lb., and that the solution diminishes in bulk and not in strength by use. Professor Faraday delivered a lecture at the Royal Institution on dry rot, in Feb. 1835, Dr. Birkbeck at the Society of Arts, Dec. 9, 1834, and Robert Dickson, Esq., at the Institution of British Architects, April, 1837, and a pamphlet was published by J. C. Adlard on Kyan's process, all approving of the process, which show the prominence this subject has assumed within late years.

The following is the cost of Kyan's process as first promulgated in January, 1836—

- Licence per load of 50 cubic feet .......... 5
- 1 lb. of corrosive sublimate to 10 gallons of solution .... 5
- Labour to load of timber, filling and emptying tank, and unloading ...... ........ 5
- Risk and profit, 25 per cent. .......... 5
- Cost of a load of 50 feet .......... 20s.

Deals require to lie in the tank three days, and an extra day for every inch in thickness.

The first tanks for mere saturation that I have any account of, were erected for the Great Western Railway Company, at Bull's Bridge, near West Drayton, under the direction of the engineer to the Company. These tanks were 9 ft. deep, and of an oblong trough shape, the size at the top was 84 ft. by 10 ft., and at bottom 60 ft. by 12 ft. 8 in. The sides were of 4 in. plank. American pine, supported on sills 12 in. by 10 in., and upright framing 10 in. by 10 in. and with sloping diagonal braces, 8 in. by 8 in., of which framing there were 9 sets in the length of the tank. The whole was sunk into the ground nearly level with the surface, the uprights standing about 2 ft. above the sides, to which were attached transoms to keep down the timber in the solution. The tendency of the timber to float was so great, that notwithstanding the bearing was only 10 ft., and the transoms 15 in. by 12 in., they were cambered or bent upward an inch and a half, and in one instance the whole tank was disturbed from its seat; the thickness of the sides being only 4 in. plank, the solution escaped, and ran into a ditch which communicated with a fish pond at a distance of about 600 yards from the tank; and notwithstanding the reduction in strength, the fish in the pond were killed. The sublimate was dissolved in hot water, and added to the water in the tanks, the hydrometer being used to test its strength. At the end of the tank a mast was erected with a trawling boom, so as to be used as a derrick in filling or emptying the tank of timber. As a test whether the solution
had penetrated to the centre of the timber, hydroxysulphate of ammonia was used, and if the solution had penetrated sufficiently into the prepared timber, being touched with the test a black stain would soon become apparent, although I must say I have not seen it act successfully when the timber was split far from the surface.

The preservation of timber from the dry rot is at the present moment attracting considerable attention, in consequence of Sir W. Barnett's process having superseded Mr. Ryan's in the good opinion of the authorities of the navy. The United Service Journal for April has an article on naval improvements in the 19th century, but lack of space causes the following account of Burnetizing. It appears that Sir W. Burnett, Physician General of the Navy, knowing that the precipitate caused by Kyazinization was soluble in sea water, substituted water saturated with the chloride of zinc, with decided and beneficial effect; and "we trust," says the editor of the Journal, "the day is not far distant when no load of timber or a bolt of canvas will be used in her Majesty's service without Burnetizing." The principle of Burnetizing was reported upon by the Master of Woolwich Dockyard and his assistant, 15th July, and by the Admiralty, 26th July, 1841. Tanks are established at each of the dockyards, at Portsmouth, Plymouth and Chatham; at that at Portsmouth is 6 ft. diameter, and 22 ft. long, and proved to a pressure of 200 lb. on the inch. In consequence of the successful results of all the experiments, Sir William was induced to take out a patent. In the above named Journal, amongst the correspondences, is a letter from the letter from the Liverpool Registry of Shipping stating that rock salt filled between the timbers of the frame of a ship, is a preventive or cure for dry rot, even after it has made its appearance. In the Mining Journal, March 18, 1843, from a letter by J. Murray we learn that he applied sulphate of iron and a partial vacuum, caused by steam injection, to assist the penetration of the solution, 10 years before Ryan's process: through the same channel, he also states that salts of copper will coagulate albumen as well as chloride of mercury. The tanks of the Hall and Selby Railway, previously noticed, are more fully described in Vol. 5, page 202 of the Journal, being an account of the meeting of the Institution of Civil Engineers, March 8, 1840, where it is stated that 50 out of 70 of the prepared sleepers, used at the West India Dock warehouses, after being down for five years, were rotten, they had been prepared by simple immersion or saturation; and it is also stated, that some tanks of the Anti-Dry-Rot Company, in which the solution was kept, had decayed, and that the action of corrosive sublimate would be prejudicial to the use of iron bolts in Kyazinized sleepers.

In the application of Kyazinization to railways, Mr. Giles was the first to apply it to the Southampton Railway; and of its application to building, Mr. Robert Smirke at the Temple in 1833, also at the Custom House, Bristol, the Oxford and Cambridge Club, and the British Museum; also by Mr. Wilkins, in the erection of the National Gallery, and by Mr. Barry, at the College of Surgeons, in 1834, and in the same year by Mr. Abraham, at the Westminster Bridewell; and it has been also employed at Ramsgate Harbour by Andrew Turnbull, C. E. The above enumeration of works, in addition to the attention bestowed at the meeting of the Institution of Civil Engineers, is, I think, evidence enough to show that Kyazinization has not been superseded in public estimation by Burnetizing without a fair trial of its merits. Both processes, I think, will fall into desuetude, not from any defect in principle or not answering the end in view, but from the first cost of the tanks, the delay in time, the vessel not being capacious enough, and the extra delay and expense in delivery and carriage of the materials from place to place, or from the tanks to the works where the materials are required. This, I know, that the Kyazinization has signally failed in taking root in the provinces, and I could specify at least ten places where it has been given up. With respect to a railway with two lines of road where it is used, the cost per mile will be as follows: where cross sleepers are employed, each sleeper contains from 2 to 3 cubic feet, and costs from 12d. to 14d. each for Kyazinizing, exclusive of carriage from the place of delivery to the Anti-Dry-Rot station, and from thence to the works where they are required for use. The cost of sleepers of Scotch fir is about 4s. each, and of larch 6s.; price of course, is ruled by the locality, taking, however, the cost of Kyazinizing and carriage at 1½d. per sleeper, and a double way, and placing the sleepers 3 feet apart, (although recently they are placed only 2 feet 3 inches apart,) and there being 1760 yards in a mile, the total cost of Kyazinizing will be £152 per mile, which on some of the long lines amount to the sum of £250,000, an amount which ought not to be too rashly entered on without severe consideration.

In conclusion, I beg to be allowed to state that I was engaged in the use of the Kyazinization when Messrs. Grisell and Petoe employed it; also, in the erection of the tanks of the Great Western Railway Company, and in the superintendence of the process, when performed by local establishments, or the Anti-Dry-Rot Company. I state this, to show that my opinion is not rashly formed, when I say that Kyazinization is grown into disuse, and that probably Burnetizing will also share the same fate, perhaps, without having so long a trial. With the concluding remarks of the Lecturer on Engineering at King's College, as given in a late number of the Journal, I cordially agree, viz., "it's use alone that sanctifies expense." Although this paper may not possess the merit of being thoroughly original, yet I think it may be of some use in showing the property of becoming of the merits of this question of preventive to decay in timber. To yourself my thanks are especially due, for your liberality and censure in noticing my previous efforts, as a correspondent to your valuable periodical, amongst the general notices, as being the results of labour, and as valuable communications, but more especially for the particular notice in Vol. 5, page 397, where my efforts are designated as "practical and of great utility."

Your kindness has given my study and reading an object, which is to employ my leisure profitably in the advancement of knowledge, and becoming of practical utility to my fellow men.

St. Ann's, Newcastle-upon-Tyne.

O. T.

NEW PROCESS FOR MANUFACTURING LIME, &c.

A Patent has been granted to William Edward Newton, of Chancery Lane, for "improvements in manufacturing lime, cement, artificial stone, and such other compositions, more particularly applicable to working under water, and in constructing buildings and other works, which are exposed to damp." (A communication.)—Sealed the 3rd of April, 1841.

This invention consists, firstly—in the formation, by certain new processes of lime, of being hydraulic, or becoming under water hard and solid, when under water, or exposed in damp situations. Secondly—in the application of the same principles to the hardening of soft stones, for the purpose of making hard artificial stones. Thirdly—in the employment of this process for hardening wood, and preserving iron from the effects of damp, &c.

The following is the principle upon which the invention is founded, and the methods employed for carrying it into effect: The property which certain sorts of lime possess, of being hydraulic, or becoming under water hard and solid, is caused by a certain combination of the lime with silicea, alumina, and sometimes also with oxide of manganese, and oxide of iron. The object then of this invention, is to facilitate the combination of the lime with these oxides, by means of agents not hitherto employed. Thus, in operating by the dry method, as is generally the case, instead of calcining the lime-stone or lime with sand and clay, the inventor, in order to facilitate the combination of the silica and alumina with the lime, introduces a small quantity of potash or soda, in the state of carbonate, sulphate, or chloride, or other salt of potash or soda, or of a mixture of the same or of a silicate, when such calcination takes place. The quantity of potash or soda, the quantity of which varies from three to six per cent. to the quantity of lime, is employed in the state of solution, so as to penetrate and mix better with the alkaline salts, and thus prevent chalk or slaked lime. Calcination effects the rest, in the ordinary manner.

In order to combine or incorporate more equally, by the dry method, the alumina, and the oxides of manganese, and of iron, with the lime, the sulphates of these bases are first decomposed by the slaked lime, by making a paste with a solution of the sulphates, mixed with the lime. This paste, into which the sulphates in question enter, in the proportion of from six to ten per cent. of the lime, is then calcined, in order to produce an hydraulic lime. All sorts of lime are made hydraulic, by the humid method, by mixing slaked lime with solutions of alum or sulphates of alumina; but the best method consists in employing a solution of the silicates of potash, or of soda, called liquor of flux or soluble glass. An hydraulic cement may also be made which will solidify when dry, by a process which consists, by making a paste of pulverized chalk, and a solution of the silicate of potash, or of soda: in working with this plaster, it becomes much harder than ordinary plaster.

These true silicates of potash or soda, dissolved in water, will also harden chalk, or soft and porous stones, and transform them, artificially, into hard stones. In order to do this, these soft stones, either rough, or cut into their proper forms, must be soaked in a solution of the silicate, either warm or cold, and left to remain there a longer or shorter time, according to the degree of hardness which it may be necessary to give them; after which, they must be taken out and left exposed to the air. At the end of a few days, stones, thus prepared, will have acquired a hardness equal to that of marble. I have given this quality to the above statement, for if, for the purpose of polishing, the outer coat or surface be removed, the inner one, which at first is not so hard, will harden in its turn, by exposure to the air. This takes place as far as the silicate has been able to penetrate. A more superficial hardness is obtained, by applying the solution of the silicate
of potash or soda, by means of a brush. It is in this manner that walls, constructed of chalk and mortar, may be hardend. Sculpture, and various other ornamental effects on the exterior, are made of plaster, which is afterwards served for decorating buildings, and other purposes, without the fear of their becoming injured by frost or damp. Chalk, hardened in this manner, may also be used as a substitute for the stones now employed by lithographers. The silicate of potash or of soda may also be hardened, by placing them, for some time, in a solution of the silicate; but it would be still better to add a portion of the solution to the paste, at the time of making the model, or using the plaster. The silicate of potash or soda is prepared by fusing one part of white siliceous matter with from one to one half two parts of potash, and then wearing down the mixture repeatedly with water, and allowing it to dry in the air, the metal is preserved from oxidation. By soaking wood many times in this solution, and allowing it to dry in the open air, every time after it has been placed therein, it becomes so much penetrated with silica, that it acquires a considerable density and degree of indestructibility. The solution of the silicate of potash is not the only substance which, by being injected into porous bodies, tends to harden them. A mixture, made from a solution of bicarbonate of ammonia, and of chloride of magnesium, may be successively employed; or a mixture of the solutions of ammonium and chloride of calcium may be used. In these latter cases, instead of having siliceous injections, they are either magnesia or calcareous. Soft and porous stones may also be considerably hardened, and defended from the action of damp, by first well drying them, and then dipping or steeping them in sulphur, or some natural or artificial resins or bituminous substances, rendered liquid by heat.

Some of the claims of the patentors, namely,—the application of certain new means, to change or convert all descriptions of lime into hydraulic limes and cements, or such as become hard under water, or when exposed in damp situations, by combining these limes and cements, with silica, alumina, the oxide of manganese, or the oxide of iron, either by the dry or humid method. Secoundly—the manufacture of hard artificial stones from chalk, plaster, and all porous stones in general, by injecting into them, or imbuing them with silica, or the carbonates of magnesia or lime, by any of the above-described processes; or by causing them, by virtue of their porous nature, to absorb either neutral sulphur, or bituminous, resinous, or fatty matters, properly liquefied by means of heat. Thirdly—in the employment of the silicates of potash or soda, for making or forming a stony plaster or coating upon a variety of substances; thereby preventing iron from becoming rusty or oxidized, and rendering wood and other organic matters harder, and not liable to decay.—[Reported in the Petty Bag Office, September, 1811.].—London Journal.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

INSTITUTION OF CIVIL ENGINEERS.

February 3.—The President in the Chair.—(Continued.)

The Thames Tunnel.—Sir M. Isambard Brunel presented a design intended to illustrate the mode of securing the poling-boards of the shield of the Thames tunnel. The poling-boards, shown in the drawing, he described as being intended to close the whole area of the excavation in the front, as the side and top staves were intended to secure the sides and top of it. The shield (weighing nearly 180 tons) in passing over the ground, served materially to compress it, and make a firmer foundation for the tunnel. When it was considered that the mass of ground removed weighed 63,000 tons, while the brick structure by which it was replaced weighed only 20,160 tons; some idea of the lengths and difficulties of the difficulties of the undertaking, and of the probability of the progress of this undertaking. It would be seen by reference to the early reports, that 540 feet of tunnel had been made in the course of sixteen months, viz., from the 1st of January 1826, to the 27th of April 1827. At that period the miners and bricklayers struck, without securing the work. In this emergency, after standing still a week, new hands were engaged; the result was, that on the 11th and 12th of May, the ground showed symptoms of giving way, and on the 18th the river broke in and completely filled the tunnel; the length of brickwork then completed was about 550 feet. He was convinced that no injurious would have occurred, but for the desertion of the men, for at no previous period had so much work been done; the average progress being 12 feet per week for sixteen weeks, and having at that period the advantage of his son's services and those of experienced assistants, the work might have been finished in about four years. After this intrusion, an advance of only 50 feet was made within the period of the year 1827, and in consequence of a second intrusion, the work was totally abandoned. In the year 1836, after a lapse of seven years, being liberally assisted by the Govern-

ment, a new shield was provided, and the work was resumed in the beginning of March 1836. The work, however, proceeded very slowly as compared with what had been done in a previous period. Sir M. Isambard Brunel continued to trouble the works for six weeks. Having succeeded in repelling this attack, the progress for the whole year amounted to 117 feet. Foreseeing that he should at some future period, have to account for the causes of this slow proceeding, he made out a series of distinct sets of records for every branch of the service and materials, as well as under-ground, in order to place beyond doubt, the circumstances which might not otherwise be credited. These registers enabled him to give the minutest details of the work, and would, he hoped, be found useful in any future similar undertaking. Through the whole of the year 1837, the progress was only 28 feet 4 inches, a rate which hardly exceeded that of a fortnight of the year 1827. Two irriguous took place within the range of eight feet, owing to the looseness of some portions of the strata, which were so fluid, that the ground was a mass of clay, through which no circulation of the polings with the screws. The frequent bursts of gas at that period, and in 1838 and 1839, had moreover such an effect upon the men, that some of them fell senseless at their post. There was therefore great risk of the poling boards falling down, as had been the case before, and causing a total disruption of the ground. In this dilemma, the expedient of connecting the poling boards with each other by hooks was resorted to, for by this means a complete panel in the face of each of the 36 cells of the shield; the top poling being suspended to the head of the cell, the panel could not be disturbed even with a cavity in front of it; there was likewise an additional means of supporting the polings, by iron spurs resting upon the floor-plates and going into the ground. Notwithstanding the apparent increase of labour occasioned by the employment of the poling-boards, good progress was not made, amounting to 249 feet in the course of twelve months, and the hoisting was found so safe in its service and its results, that were another tunnel to be constructed, Sir Isambard stated, that he would make the system of attaching the poling-boards, an essential part of the organisation of the shield, being convinced that it might by this means, be worked through the worst ground, with a certainty of safety and success.

February 14.—The President in the Chair.

"Description of Mr. Clay's New Process for making Wrought Iron direct from the Ore; as practised at the Shire Works, Kirkintilloch, Scotland." By William Neale Clay.

In this communication, the author first describes the various stages through which the metal passes between the removal of the ore and its arriving at the state of malleable iron, by the ordinary mode of manufacture; and then he explains the process which he has invented, and introduced practically at the Shire Works.

By the ordinary system of iron-making, the ores are reduced into the state of carbur of iron, and then, by refining and puddling, the metal is decarburated, thus making it malleable iron by a number of processes, which are recapitulated—

1st. Galening the ore.
2nd. Smelting in a furnace, by the aid of blast, either cold or heated, with raw coal, or coke, for fuel, and limestone as a flux.
3rd. Refining the "pig" into "plate" iron.
4th. Puddling, shingling, and rolling, to produce the "rough," "puddled," or "No. 2" bars.
5th. Cutting up, piling, and rolling, to produce "merchant," or "No. 3" bars.
6th. A repetition of the same process, to make "best," or "No. 3" bars.

Seeking to diminish the number of manipulations, by the new process of dry Ulverstone, or other rich iron-ore (Hemaitite) is ground with about four-teenths of its weight of small coal, so as to pass through a screen of one-eight of an inch mesh. This mixture is placed in a hopper, fixed over a preparatory bed, or oven, attached to a puddling furnace of the ordinary form. While one charge is being worked and bailed, another gradually falls from the hopper, through the crown, upon the preparatory bed, and becomes thoroughly and uniformly heated; the carbured hydrogen and carbon monoxide, contained in the different layers of the coal, the decomposition of the mineral, while by the combustion of these gases, the puddling furnace is prevented from being injuriously cooled. One charge being withdrawn, another is brought forward, and in about an hour and a half, almost ready for the "pig." Here it is left to cool, and ready for shingling and rolling. The cinder produced, is superior in quality to that which results from the common system; it contains from 50 to 55 per cent. of iron, and is free from phosphoric acid, which frequently exists, and is so injurious in all the ordinary slags: when re-smelted, it produces as much as No. 1 and No. 2 cast-iron, and of suitable quality. The cast-iron produced from the slag (amounting to one-third of what was originally contained in the ore) is mixed with the ore and coal in the puddling furnace; and thus, while nearly all the iron is removed, the slag, tough, and sooty, is introduced in a given time, and at the same cost of fuel, as by the old system. The first process, producing puddled bars of superior quality, is consequently on a par with the fourth stage of the old system, as it avoids the necessity of the preceding separate manipulations. From the absence of all delcetions mixture, by once piling and reheating the rough
productive industry of the country. His invention was in some degree based upon the old Catalan fire, wherein malleable iron was produced direct from the ore, although by a considerable expenditure of fuel: by his process the ore was also reduced at one operation into the state of malleable iron, by combination with a large portion of carbonaceous matter: and as the deoxidation of the ore could proceed simultaneously in an aluminaeous state, like the old Catalan fire bed, through which the flame of the puddling furnace traversed, there was necessarily a great saving of time, labour, and fuel in the production of the metal, while the quality was at the same time improved. He argued, therefore, that if the system was generally adopted, a large portion of the capital now sunk in the expensive constructions of blast furnaces, blowing engines, &c., would be dispensed with.

Mr. Taylor observed, that the process appeared to be only applicable to the rich qualities of iron ore, which were now used in comparatively small quantities, as a coal field, from the clay ironstone of the coals from which such iron was generally produced in this country. There existed large quantities of haematite in Great Britain, equal in quality to that of Nassau, or of the Harz mountains, from which so much iron was made, for converting into steel. The mines of Llwydstone alone now produce 60,000 tons annually, and at least 25,000 tons more could be shipped from Cornwall; and if a demand existed, there was scarcely a limit to the quantity that could be raised. He apprehended that the iron made by this process could be converted into pig-iron; this was very desirable, as it would possess the limestone independent of Sweden and Russia, whence nearly all the steel-iron was now imported.

Mr. Heath had examined Mr. Clay's process of iron-making, and found that the wrought iron produced from a mixture of Scottish pig-iron and haematite ore, was of a superior quality, bearing severe tests without injury. The iron made by this method, from India pig-iron and specular iron ore (per-oxide of iron) from Devonshire, which was identical in quality with the celebrated Elba iron, when converted into cast steel, by Mr. Heath, he had accidentally discovered, possessed the quality of welding like steel, without any of its defects. The method he alluded to, was to combine manganese with the cast steel in the crucible, and when drawn out under the tilt hammer it could be steeld and welded to iron, like steel. The consequence of this discovery was, that the latter quality of steel was almost abandoned for cutlery, and the former was now generally used, as it did not exhibit the laminated appearance when polished, which steel iron frequently did. The metal made was sounder, and fewer casters were made. The haematite contained manganese, and there was little doubt that, by selecting the proper kind of ore, malleable iron might be made in Great Britain by this process, as good for converting into steel as any of the Swedish iron.

There was abundance of specular iron ore on Dartmoor, equal to the Elba iron, and which would (he had little doubt) produce as good iron as that from the Dannemora ore.

Dr. Faraday remarked, that the process invented by Mr. Clay was founded on sound chemical principles. It was desirable to abandon the use of charcoal as a flux; it was proved that the pig-iron made from the haematite nearly one-third more iron, of as good a quality as is usually obtained by the six processes of the old system. The iron thus produced bears a high polish, is very uniform in its texture, is ductile and fibrous, having more than an average amount of tensile strength, and at the same time appears to be more dense, as it possesses a peculiar sonoroussness, resembling that of a bar of steel when struck. It has also been converted into steel of a good quality.

The paper is illustrated by a drawing of the furnace necessary for the process, and by specimens of the iron and steel produced.

Remarks.—Mr. Clay contended that the ordinary method of making iron was neither so scientific, nor so practically good as there was reason to expect it would have been, when iron formed so considerable an item in the
Indian iron, although difficult to work, stood better than other kinds when once reduced into form; this he attributed to the purity of the magnetic ore from which it was produced; there was not the slightest trace of phosphorus, arsenic, or any deleterious foreign matter. He was convinced that, with a mixture of Indian pig-iron (which could be produced very cheaply) and Devonshire ore, by Mr. Clay's process, iron could be made of excellent quality for converting into steel at such a reduced price as would render the introduction of Swedish and other foreign iron unnecessary.

Mr. Taylor believed that improvement in the quality of steel, rather than reduction in the price, was the object to be sought. In the large quantity used in the mines under his direction, the dearest steel was found to be the more economical. He had seen as many as 12 dozen borers used to make one blast hole, and unless the tools kept their points well, the labour of the men was thrown away.

February 21.—The President in the Chair.

Mr. Giles presented a plan and sections of London Old Bridge, made from his surveys of it in 1829, by order of the Committee of the Bridge Lands, with descriptive notes.

The plan represents the stirrings, piers, parapets, and roadway of the old London Bridge, its low-water channels, called locks, with the soundings through the locks. The sections represent an elevation and levels of the stirrings, piers, arches, roadway, and locks, with levels of the tides observed at the bridge in September and October, 1829; the datum to these levels being the Trinity High-water mark of London, which is recorded on a stone let into the lower external wing of the Hermitage entrance of the London Docks. 1

From the plan it appears that—

The aggregate waterway between the piers above sterling height was

\[ \text{Pt. In.} = 521 + 2 \]

The width occupied by the piers

\[ 406 + 10 \]

Making the total length between the abutments of the bridge

\[ 931 + 0 \]

The aggregate waterway below the stirrings at low-water was

\[ 239 + 11 \]

And the aggregate distance occupied by the piers and stirrings at low-water was

\[ 700 + 1 \]

The aggregate distance occupied by the bridge

\[ 931 + 0 \]

The level of the tides shows—

The extraordinary high-water mark of springs to be

\[ 20 \text{ of datum.} \]

The average high-water mark of springs between

23rd September and 25th October, below bridge

\[ 9 + 6 \text{ under datum.} \]

The same above bridge

\[ 1 + 2 \]

Making the high-water of springs above bridge

\[ 2 + 5 \text{ inches} \]

Making the high-water of springs below bridge

\[ 1 + 3 \text{ inches} \]

Making the average high-water mark

\[ 4 + 3 \text{ inches} \]

And the average high-water mark

\[ 4 + 3 \text{ inches} \]

The average level of low-water mark above bridge was

\[ 14 + 5 \text{ inches} \]

The average level of low-water mark below bridge was

\[ 16 + 6 \text{ inches} \]

The average level of spring-tides low-water mark was

\[ 18 + 9 \text{ inches} \]

Thus the average fall of water through the locks of the bridge at neap-tides was 2 feet 1 inch, and the same at spring-tides was 4 feet 4 inches. But an extreme fall of 5 feet 2 inches was observed through these locks on the occurrence of a high land fluid, and a spring-tide ebb.

Having completed the surveys of old London Bridge, Mr. Giles subsequently took the levels of the tides from thence to Teddington lock, and found that in the absence of high winds and land fluids, the high-water of spring-tide on the upper side of London Bridge attained its level or height at all the London bridges, also at Battersea, Putney, Kew, and Richmond bridges, and at Teddington lock.

"Account of a series of experiments on the comparative strength of solid and hollow Axles." By John Oliver York, Assoc. Inst. C. E.

The author first describes the causes of fracture in railway axles, which he attributes to the sudden strains and injury produced by concussion and vibration. Those resulting from concussion are chiefly ascribed to a defective state of the permanent way, any sudden obstacle opposing itself to the progress of the train, and the severe shocks arising from the wheels coming in contact with the blocks and sleepers when thrown off the line. The force of vibration and its certain effect to produce fracture in a body so rigid as a railway axle, is then fully explained; the evil arises from the impossibility of diverting from the axle the continued series of slight blows or vibrations to which it is subject, or of causing a free circulation of them through its entire length, since the naves of the wheels being fixed tightly on to the axles, form a point on either side for the vibrations to cease, and the particles of iron composing the axle at this point become dislocated by the continued and unequal strain, and ultimately break; the same action is described as taking place in the journal of the axle, and hence the fact that an axle seldom breaks excepting at the journal, or at the back of the nave of the wheel. The twisting strain to which railway axles are subject is next considered, and a calculation entered into, to prove that upon a circle of only a few feet in diameter and assuming a first-class carriage on four wheels to weigh six tons, the strain resulting from this cause is so slight as to be unworthy of consideration in the inquiry. The paper next proceeds to point out, how and why the hollow axle is better able to resist the strains before referred to, than the solid ones now in use.

First, by the process of manufacture, by which the crystallization of the iron is avoided, and it is left in a better state for sustaining sudden strains and continued action. Secondly, by the position of the metal composing the axle, since the comparative strength of axles are as the cubes of their diameters, and their comparative weights only as their squares, consequently, with less weight there must be increased strength; and thirdly, that the vibration has a free circulation through the length of the axle, no part being subject to an unequal shock from the vibration, and the axle would therefore receive much less injury from this cause. In conclusion, it is submitted that a railway axle should possess the greatest degree of rigidity between the wheels, to prevent it from bending or breaking from concussion, combined with the greatest amount of elasticity and freedom in the particles of iron within the axle itself, to prevent the injurious effects of vibration.

The details of a numerous set of experiments are then given, to prove the superiority of the hollow axle in all these respects, the average of the whole of which is thus stated. As regards rigidity to sustain a dead weight. The axles being supported at the ends, and the weights applied in the middle.

<table>
<thead>
<tr>
<th>Hollow Axle</th>
<th>Solid Axle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>Deflection</td>
</tr>
<tr>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>

As regards its capacity to resist a falling weight. For a weight of 3 lbs., 6 tons, falling from a height of 16 feet on to the centre of the axle.

<table>
<thead>
<tr>
<th>Hollow Axle</th>
<th>Solid Axle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter</td>
<td>Hollow Axles</td>
</tr>
<tr>
<td>Weight</td>
<td>1 cwt. 2 gns. 20 lb.</td>
</tr>
</tbody>
</table>

The paper is illustrated by specimens of the broken axles, both hollow and solid, and by diagrams of the mode of manufacturing the two kinds of axles.

Remarks.—Mr. Geach presented a series of specimens of ends broken off solid axles, made by the Patent Shaft and Axle Company, Wednesbury, they have borne severally 886, 148, 263, and 278 blows of a sledge hammer, weighing 38 lb. before they separated from the body; above twenty more ends had been broken off, the weakest requiring 138 blows. The diameter of these journals was 2½ inches. An axle was exhibited which had been bent nearly double under an hydraulic press, with a pressure of 20
tens: the journals (2½ inches diameter) were also best in opposite directions, by repeated blows of the sledge-hammer, without any signs of fracture being perceptible. The firm, which Mr. Grach represented, had made upwards of 5000 axles, and in the course of rough machinery some had broken; but they almost uniformly found them of good quality, which might be attributed to the mode of manufacture. Around a centre bar of iron were placed eight bars rolled to a proper form to complete a circle; they were then welded together by a blow of a hammer finishing them; and when the iron, it was contended, was thus worked, and remained in its most favourable position. He was not opposed to the principle of hollow axles, but he wished to prevent any unnecessary prejudice against solid ones by inferences from any one set of experiments, for in the manufacture of tools and machines there should be made between the relative strength of the two kinds of axles, for which he would contribute the necessary number of solid ones.

Mr. York described the manner in which the solid axles had been selected for the purpose of experiment. Having obtained General Falsley's consent to be present on the occasion, he ordered axles from the Patent Axle Company, and another eminent maker, and selected several other axles supplied by the Patent Axle Company to the London and Birmingham Railway; these were never having been dismantled in any way, he contended that the result of the experiments afforded a fair specimen of the axles generally in use, and were such that the public were in the habit of riding upon. The axles which had since been made by the Axle Company, and which had been ordered from it, he thought could not surpass: if this was the usual quality made by that company, it still more forcibly proved his position as to the uncertainty of manufacturing solid axles, for while one specimen took a great number of blows to weld at the junction of the halves, another was so welded without any blow by making them to have a considerable uncertainty which he proposed to avoid, and he contended that it was inseparable from the method of making axles described by Mr. Grach, for in passing the faggot through the rolls to weld the bars together it frequently happened that the only blow that would make the joints of quarters of an inch, hence it was to a certain extent hollow, and partially avoided the injudicious effect of hammering; if, on the contrary, they were perfectly welded, the iron became crystallized, as in any other solid axle; this fact proved the advantage of the experiment; he stated that the solid having been broken by very little force, and the unsound ones requiring a great number of blows to produce fracture. In the experiments, the hollow axles had broken under a different number of blows, but this was owing to their having been made of larger diameter, and from the same cause (but with only an equal quantity of metal in them) and afterwards turned down to the same diameter, which left them of unequal thickness and too thin for a fair test; still, however, with less metal than in the solid ones, they were stronger; this might be accounted for by the mode of manufacture, and the retarding effect of the centrifugal force of the body and more distributed in the hollow one; he recommended this investigation to some of the mathematicians who were present; the result of their inquiries might materially aid in the development of truth from the practical experiments.

February 28.—The President in the Chair.

"Description of the Roofs over Buckingham Palace, covered with Lord Stanley's composition." By Mr. Pugh, Assoc. Inst. C. E.

The mixture invented by Lord Stanley, and used by the late Mr. Nash, for the flat roofs mentioned in the former part of this paper, is described in the paper as being composed of Stockholm tar, dried chalk in powder, and sifted sand, in the proportions of three gallons of tar, to two bushels of chalk, and one bushel of sand, the whole being well boiled and mixed with one part of blacklead. The mixture is then spread on a well-dried flange, and covered with two coats, each about three-eighths of an inch in thickness, squared slates being imbedded in the upper coat, allowing the mixture to flush up between the joints the whole thickness of the two coats, and the slates being about an inch thick. The object in embedding the slates in the composition, is to prevent its becoming softened by the heat of the sun, and sliding down to the lower part of the roof, an inclination being given of only 1½ inch in 10 feet, which is sufficient to carry off the water, when the work is carefully executed. One gutta-percha water course, is made as near to the centre as possible in the solid body to prevent any tendency to shrink from the walls, and also that the repairs, when required, may be more readily effected. It is stated, that after a fall of snow it is not necessary to throw it from the roof, but merely to open a channel along the water-course, and that no overflowing has ever occurred; whereas, with metal roofs it is necessary to throw off the whole of the snow on the first indication of a thaw. These roofs have been found to prevent the spreading of fires, and it is stated, that on one occasion, to test their inflammability, Mr. Nash had a bonfire of tar barrels lighted on the roof of the house, and the disadvantage of the smoke was not perceptible, the fire being confined to the composition, the tar of which the composition offers, as if a leak occurs, it may be scarred and rendered perfectly water-tight, by passing a hot iron over it; and when taken up, the mixture can be melted, and used again. The author proposes to obviate the disadvantage of the present weight of these roofs, by building single brick walls at given distances, to carry slates, upon which the composition should be laid; instead of filling the spandrils of the arches with solid materials, as has been hitherto the custom.

The scattered failures of neatness and other defects of covering at Mr. Nash's house in Regent Street, and in other places, are accounted for by the composition having been used in one thin coat, laid upon an improper foundation of laths and tiles. The durability of the roofs, which were carefully constructed
In no slight proof of the energy with which Mr. Cooke followed up his great object, in contradistinction to the proceedings of others who had been experimenting with the subject for many years, that within three weeks of his first conceiving the idea, he had constructed at Frankfurt two galvanometer telegraphs, capable of giving 26 signals; he had also invented the detector, which involved the wire carrying the current from water. Fracosta, in fact, were readily traced, an instrument which Mr. Cooke still retains in constant use; and without which, indeed, an electric telegraph would be impracticable: he had also invented the alarum, on the same principle as one of the most prominent of all his days.

But the leading feature of the invention at this early period, and which still most strongly distinguishes it from that of Messrs. Cooke and Wheatstone’s telegraphs, and all others since exhibited in this country, consists in this, that the telegraph did not merely send signals from one place to another, but included a reciprocal system, by which a mutual communication could be practically and conveniently carried on between two distant places; the requisite connections and disconnections being formed by pressing the fingers upon keys similar in their action, and the signals being exhibited to the person sending as well as to the person receiving the communication.

This was and still is effected, by placing a system of keys permanently at each extreme end of the circuit of wires, and by providing a draw-bridge by which the circuit is completed for the electricity to pass when signals are received, but which is withdrawn when the signals are to be sent.

This united and reciprocal property is the basis of the electric telegraph, and inseparable from the practical system, and must be borne in mind when the operation of these instruments is explained. Mr. Cooke has since extended this instrument to any number of intermediate instruments included in the same circuit—as on the Blackwall line, where there are two sets, of five telegraphs each, working together—and also to the portable telegraph to be carried by the trains, and temporarily introduced into the permanent line of communication when required.

By Mr. Cooke’s telegraph, eight simple signals can be given, and a sufficient number of compound ones, to admit of the 26 letters of the alphabet being used; in addition to which, by further conventional signs, those letters are made to represent figures, and by a mixture of both systems, as was shown, a mixed sentence, consisting of passages from a code, spelling and figures, could be telegraphed together.

Mr. Cooke first adopted the plan of laying the telegraph wires in iron tubing on the Great Western Railway, and afterwards laid down a double line on the Blackwall Railway, and others on the Leeds and Manchester, and Great Midland and Glasgow Railways. This plan, though perfectly successful, was extremely costly and difficult to repair when injured, though by aid of an instrument, the detector, less difficulty than could be supposed offered itself to the detection of the injured part, though buried and out of sight. More recently, Mr. Cooke invented, after extensive experiments at his own residence, and carried out on the Great Western Railway, a plan of suspending the conducting wires in the open air from lofty poles. Its leading advantages are—1st. Diminished cost; 2nd. Superior insulation; 3rd. Facility of repair. The old plan consisted of laying copper wires, covered with tinfoils, bundles of soft iron, and iron tubing; with the new plan, the conductors are two cables, each consisting of six wires of soft iron, and one of iron, insulated and laid down on the ground or fixed to the towers, or connected by the earthen bed, or earthen裘 immediately under the rails.

The cost of the original plan stands nearly as follows.

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepared 2 tube, varnished within and without</td>
<td>£297 6 0</td>
</tr>
<tr>
<td>6 copper wires covered and varnished, at £6.15s. per mile</td>
<td>£115 10 0</td>
</tr>
<tr>
<td>Labour and carriage, per mile</td>
<td>£27 0 0</td>
</tr>
<tr>
<td>Iron fittings, boxes, &amp;c.</td>
<td>£12 6 0</td>
</tr>
<tr>
<td>Tar, pitch, paint, coin, and sundries</td>
<td>£15 0 0</td>
</tr>
<tr>
<td>Posts and rails, at £3 10d. per foot, including fixing</td>
<td>£77 0 0</td>
</tr>
</tbody>
</table>

The total cost of the original plan per mile £297 6 0

To which a per centage for casualties, profit to the contractor, and the price of raw materials remains to be added.

The cost by the present plan of suspension may be estimated thus.

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drawing posts, with winding apparatus, per mile</td>
<td>£48 0 0</td>
</tr>
<tr>
<td>Earthworks, with insulators, (22 in a mile)</td>
<td>£52 0 0</td>
</tr>
<tr>
<td>Labour in fixing and maintaining, &amp;c.</td>
<td>£11 0 0</td>
</tr>
<tr>
<td>Anti-corrosion paint and tar</td>
<td>£13 0 0</td>
</tr>
<tr>
<td>Carriage, tools, and sundries</td>
<td>£13 0 0</td>
</tr>
<tr>
<td>Contingencies</td>
<td>£149 6 0</td>
</tr>
</tbody>
</table>

Making a reduction of about 50 per cent, in favour of the present plan—

and a still greater advantage in favour of the permanency of the work.

The present method of proceeding in laying down the telegraph, is first, to lay the ground in the earth, at every 300 or 600 yards, strong posts of timber from 16 to 18 feet in height, by 8 inches square at bottom, and tapering off to 6 by 7 inches at top, fixed into stony hills and properly strutted. Attached to these posts are a number of winders for stretching the wires, corresponding with the number of connecting conductors to be employed; and between every two of such posts, upright wooden standards are fixed about 60 or 70 yards apart. A ring of iron wire, (No. 7 or 8,) which has been formed by welding the short lengths in which it is made together, is then placed on the ring of the winder, in order to maintain the wire stretched when the winder is at any other position; if the winder is disengaged, the post to which it is attached, is extended to the adjourning winder, and fixed to its corresponding winder at that post; by turning the pin of the ratchet wheel with a proper key, the wire is tightened to the necessary degree; and thus, by fixing the wires up till they hang perfectly parallel with each other. To sufficiently insulate the wires so suspended at the point of contact with the posts, is an object of indispensable importance, as the dampness of the wood during rainy weather would otherwise allow the electric fluid to pass off freely into the earth, or into the adjoining wires, and thus prevent the electric fluid from reaching the distant terminus at which the telegraphic effect is to be produced. To effect this object at the draw-posts, wooden boxes are employed to enclose that portion of the post to which the winders are attached, and small openings are left in the front of the walls, so as to draw the wires up from the risk of any contact with the outer box. The standards are furnished either with covers parted off by an overhanging fillet between each wire, and again between the lowest wire and the earth, or by a series of metal shields. An eye of metal, with a slit on the upper side, forms a hook to support the wire, and to insulate the wire from the hook, which is bared where the contact is made. The dampness within the wood, a split quill is slipped over the wire on which it rests. The whole is then carefully painted with several coats of anti-corrosion paint; or asphalt varnish may be employed for the wires. When the wires are suspended in the open air, a coating of varnish, or of any soft and conductive iron varnish, is applied to the wires, and lowered to nails temporarily fixed to receive them toward the bottom of the posts. A painter furnished with a can of paint, hangs on his shoulder, a brush, and a piece of felt, takes each wire and rapidly coats it, which in common is known as the rose varnish. This is the simplest and cheapest method now adopted. But for long distances Mr. Cooke employs earthenware or glass for his insulation, and cast iron standards and posts with ash tops for drawing and suspending the conductors, which, instead of single wires, will be strands of 6 or more wires twisted together; for very great distances, when very superior conducting power will be needed, a copper wire will be placed in the centre of the strand, and whilst it adds but little to the weight, it will more than double the conducting power thereof, the iron wire still giving the necessary strength to resist the destructive power of the weather. The insulating coat of rose varnish is nearly as seven to one. Various methods are adopted in passing under bridges, which answer the purpose of draw-posts, the winders being fixed to a piece of wood partly let into the brickwork to avoid damp, the greatest enemy to electric conduction. These earthenware insulations are introduced between the winder and wire. Mr. Cooke also intends to use caps or boxes of earthenware to surmount the iron standards. At Slough, for half a mile in approaching and passing by the station, cast iron standards and draw-posts are employed, the effect of which is remarkably light and elegant, and consists of six copper wires, running in a parallel line, with a car-ridge shed immediately opposite to the station, the wires are stretched over a length of 348 feet without any intermediate support, and so accurately are they arranged, that no difference is perceivable in their parallelism: the drawn wire at this instance is half a mile apart, although the line is slightly curved. In passing over the river from London to Slough, crossing the railway, lighter standards are employed, which abruptly lift the wires to the height of 25 or 30 feet in order to clear objects passing below. In the latter case lighter wires are employed, that the tension out of the direct line of the wire may not draw down of the earth from the risk of any contact with the wires.

The last advantage which need be noticed in connexion with this very important step in the invention, arises from the very perfect insulation from the earth. This allows of the employment of the earth as half of the conducting system, without the necessity of using iron, or connecting it through some imperfectly insulated point. For nearly two years Mr. Cooke has tried this plan successfully on the Blackwall Railway, and since on the Manchester and Leeds Railway; but where, as in these instances, the wires are enclosed in an iron pipe, there is always danger of a contact, either from dampness from a few drops of moisture, or parted wire. Failure is a constant menace to the safety of the wire and pipe touching, in which case, as before observed, the electricity takes a short course instead of performing its entire circuit, and no signal is given at the distant terminus, though appearing very strong at the point where it sets out. By burying the wires, the risk of contact is small; and two advantages spring from the employment of the earth as a conductor. 1st. one wire is saved in each circuit, thus diminishing complexity and cost; and 2nd. the earth acting as a great reservoir of electricity, or as some think as an excellent conductor, the resistance offered to the conduction of the electricity is vastly diminished, and the battery is able to work through a much greater distance with a smaller conducting wire. It is thus that the apparatus exhibited can be made to work with two wires only, and that by the introduction of the telegraph upon moving the handle the poles of the battery are instantly brought in contact with the extremities of two wires, one of which passes forward to make coils around the galvanometer frame, in which the magnetic needles are suspended, and then proceeding to the distant apparatus to make similar coils there;
the other branch goes in the manner I explained to the earth. Thus, supposing the electricity really to find its way through the earth, it enters the corresponding branch at the distant apparatus, and passes into the wire which makes coils around the magnets, returning to the battery by the conducting wire, and producing the same divergence of the magnetic needles in both galvanometers, and indeed in as many, and wherever situated, as the electric fluid encounters in its course. When the handle is in the position of repose, the ends of the conducting wire and branch wire to the earth, are always in contact, forming a bridge for the electricity to pass from one to the other; but when the handle is turned the bridge is broken, and the wires are pressed in contact with pins connected to the battery poles; upon re-storing the handle the battery is disconnected, and the bridge restored for the passage of the electricity from the other end. By reversing the movement of the handles the previous contacts with the battery are also reversed, the current passes in a contrary direction, and the needles change their deviation. The simple signals are given by the movements of the needles either singly or combined; if both converge upwards A is meant, if downwards the stop. These signals are the same as in Professor Wheatstone's diagram, the remaining signals are additional. The left-hand needle moving to the left gives E, to the right I; the other needle gives O and U; both pointing parallel W and Y. The consonants most in use are given by two movements of the needles, and those very rarely required, such as Q, X, Z, by three movements. C is used for K.

The following is a reduced diagram of the dial now in use upon the Great Western Railway, between Paddington and Slough. It has been proved to be capable of giving the twenty-six letters, numbers and various conventional signals at the rate of thirty per minute, it is worked by two handles in the centre between the two needles.

<table>
<thead>
<tr>
<th>Up Train</th>
<th>Down Train</th>
</tr>
</thead>
<tbody>
<tr>
<td>A B Z</td>
<td>R S</td>
</tr>
<tr>
<td>L O</td>
<td>M U</td>
</tr>
<tr>
<td>P P</td>
<td>Q Q</td>
</tr>
<tr>
<td>T T</td>
<td>X X</td>
</tr>
<tr>
<td>W W</td>
<td>Y Y</td>
</tr>
<tr>
<td><strong>E</strong></td>
<td><strong>X</strong></td>
</tr>
</tbody>
</table>

The Patent Street-cleansing Machine of which we gave a detailed account in our April number, has continued in daily operation in Regent-street. All parties express themselves perfectly satisfied with its performance, and anxious to see it generally introduced. A public company is now forming for working the machine in the metropolis and its vicinity.

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**METROPOLITAN BUILDING ACT.**

We refrained last month from offering any opinion on the Bill now before the House of Commons, entitled "A Bill for the better regulating the Buildings of the Metropolitan Districts, and to provide for the drainage thereof," in consequence of not having had sufficient time to peruse it with that attention which such an important Bill requires. We have since carefully perused the whole of the Bill, and maturely considered its various clauses, and we cannot otherwise than at once pronounce it the most monstrous interference with public convenience and private rights, which was ever attempted by members of the English legislature, and if it be allowed to pass in its present state, we say fearlessly that it will be a disgrace to the architectural profession, for we understand that the Bill is the production of some half-talented architects, to whom it was submitted to draw a new Bill to supersede the present Building Act.

This Bill appears to have been studiously framed to see how far the builder might be trammeled with expense, difficulties, fines and penalties; it not only contemplates enormous additional costs in the terracing the buildings, but also taxes them with exorbitant fees to be paid to district surveyors, and a new fangled board to be called official referees, together with numerous other charges which we must submit in detail as we proceed with an analysis of the Bill. We shall not follow the Bill exactly in the order as the clauses stand, for they do not appear to be properly connected, but must connect them in such a manner as appears to us most desirable for the purpose of a proper understanding of the Bill. The number of the clause we have placed at the commencement of the observations, and those words within parenthesis, in italics, we propose to introduce, instead of the words previous.

4. The Bill proposes to extend the present district of the Building Act to the suburbs of the metropolis, and will comprise the following additional districts:—Fullham, Kensington, Hampstead, Horsey, Stoke Newington, Stratford, Poplar, and Bromley, in Middlesex; in Kent, Woolwich, Chariton, Greenwich, Deptford, Lee, Lewisham, and Plumstead; in Surrey, Wandsworth, Tooting, Streatham, Clapham, and Battersea.

110. The magistrates to appoint the new surveyors, as heretofore, but the surveyors must not be less than thirty years of age; the present district surveyors to retain their present appointments.

15. There are to be three official referees to be appointed by the Secretary of State for the Home Department, for the purpose of determining the questions of classification directed to be settled by the determination of any two of such referees shall be binding on all parties; and if the parties agree, may be referred to one of such referees only, whose decision shall be binding in all respects.

It proposes to alter the present method of rating the size of the building, and instead of allowing the superficial contents of the building of dwelling houses, to regulate the rate, they are to be governed by the heights of the walls and the number of stories they contain, which part of the Bill, with some alteration, will be superior to the present absurd system of ascertaining the rate by the plan.

5 and 6. There are to be eight rates of buildings, and the floors of all buildings are to be counted from the foundation inclusively, but exclusively of the rooms in the roof (if any), and the height, except in 5th and 7th rates, shall be measured from the surface of the lowest or first floor to the top of the wall or parapet of any one of the fronts thereof.

Here we must distinctly object to the rooms in the roofs of dwelling houses being excluded in the clauses, as it will keep up the present very equivocal mode of building by introducing cumb roofs, which are nothing more than an evasion of the present art. We therefore propose that the rate of dwelling houses should include the rooms in the roof, and that an additional story, and a few feet in height, be added to each of the four following clauses; the alterations we propose are in italics.

7. First Rate.—Dwellings containing more than four (five) floors, and fifty-seven (sixty) feet high and not seventy (eighty) feet, and other buildings, not dwellings higher than 40ft. and not 50ft.

8. Second Rate.—Dwellings containing more than four (five) floors, and forty-five (fifty-three) feet high, and not fifty-seven (sixty) feet, and other buildings 30ft. high and not 40ft.

9. Third Rate.—Dwellings containing three or four (five) floors, and thirty-three (forty) feet high, and under forty-seven (fifty-three) feet, and other dwellings of a lower height with more than three (four) floors, and other buildings higher than 22ft. and not exceeding 30ft.

16. Fourth Rate.—Dwellings not having more than three (four) floors, and less than thirty-three (forty) feet, and other buildings not higher than 22ft.

11. Fifth Rate.—Every building not a dwelling, brewery, distillery,
with good materials, has been, it is contended, fully proved at Lord Palmer-
ston's house, which was covered with the composition in 1808; Lord Ber-
el, who occupied it in 1810; Sir James Langham's, in 1821; and Sir F. P. W. S.,
in 1816 and 1823; and nearly the whole of Buckingham Palace, in 1826
and 1829; the latter roofs are stated to be in perfect order at the present
time, and have scarcely demanded any repair since their completion.

The paper is illustrated by a drawing, showing the mode of constructing
the roofs, the improved method propounded by the author, with specimens
of the composition, with slates imbedded, taken from the roof of the palace
during some recent alterations.

Remarks.—Mr. Fowler presented a drawing of the mode of shaping the
poises, which was, we believe, the eye of Sir J. B. St John of St John's,
he stated somewhat differently from those given in the paper. Three mea-
sures of ground chalk, dried and sifted very fine, were mixed and kneaded
up with one measure of tar; these ingredients were melted in an iron pot,
and in such a manner that the slime should not impinge too violently upon it.
The composition was "scumbled"* coast of the covering being laid on of a thickness
of 2-inch, the finishing coat was composed by adding to the former mixture
three measures of hot sifted sand, well mixing the whole together; the com-
position was laid on with a tool similar to a plasterer's trowel, but much
stronger. Mr. Nash, when he first tried the composition, found that the
surface became disintegrated by exposure to the weather; he therefore added
the slates imbedded in the second coat, and subsequently never used the
mixture without them.

Mr. Nixon, in reply to questions from the President and other members,
stated, that he was employed under Mr. Nash when the palace roofs were
executed, and he could bear testimony to their durability and soundness.
The roofs at East Cowes castle, which were covered with the composition in
the year 1808, and those of the pavilion at Brighton, in 1816, were now in
good order, though they were then in use as living quarters. In Regent Street,
 arose from the roof having been originally composed of mastic, which soon
cracked. One coat of the Stanhope composition was spread over it, to stop the leaks, but it was insufficiently done, and ultimately Mr.
Nash, when he had tried the composition, and had associated with it, had
remained sound to the present time. The price of these roofs, when well constructed by the person who did those of the palace,* was about five gourds per square.

Mr. Hogg observed, that the chalk was only exposed to such a heat as
would evaporate any moisture it contained. The weight of the two coats of
Stanhope composition, including the slate imbedded in it, was about 12 lb.
per superficial foot.

Mr. Slaney considered Seyssel Asphalt, when carefully laid, preferable
to any other composition for a similar purpose; he had used it extensively, and
was well satisfied with it, both for roofing and paving.

Mr. Hogg objected to the use of asphalt for roofing, as it was liable to
injury, being of a brittle nature; it was not elastic, and it shrunk from the
walls, thereby causing leaks. Lord Stanhope's composition did not possess
these faults, and he did not consider that it was superseded by asphalt.

Mr. Moreland had covered the roof of the tread-mill at Gipsy Street
Cooper with asphalt, and had found it answer perfectly. It was laid on
in a thickness of ½-inch upon roofing boards, ½-inch thick, with canvas nailed on
at the edge, with an entire fall of only 9 inches; there was not any appearance
of leakage.

Mr. Davidson had caused a school-room to be floored with asphalt, four
years ago, and up to the present time there was no symptom of wearing
down. He had been informed, which were the plan of the asphalt, the desks,
&c., were considerably abraded. He believed that the only failure of the
asphalt had occurred from the use of inferior ingredients. Gas tar had
been used instead of vegetable tar, and in those cases the result had not been
successful.

ON BRIDGES.

At the ordinary general meeting of the Royal Institute of British Archi-
tects, held on Monday evening, the 15th May last, Professor Hocking illus-
trated and explained his proposal to improve the design of arched bridges,
by the introduction of a transverse arch, groined into the longitudinal arch,
or by some modification of that principle. He showed the effect of this and of other suggestions
he has made for the improvement of bridges, in a design for re-modelling
Westminster Bridge.

Mr. Hocking began by stating that the closely attentive consideration of
the subject of bridge designing and building, rendered necessary by his en-
gagement with Mr. Weale to supply a practical treatise for the extensive
work on the Theory and Practice of Bridges, now lately published, gave rise
to some suggestions of improvements in design and construction, which he
believes to be novel, and knows to be (as far as he is concerned) original.

Mr. Hocking, in the course of his paper, illustrated the more im-
portant suggestions he had made, that they might not be misunderstood
and might be more extensively known than they were likely to become
whilst they rested within the covers of a professional library book.

Mr. Hocking had made some remarks upon the subject of bridge building generally, and had argued that the piers of bridges
were built of much greater substance in thickness than was necessary for
either safety or agreeable effect; that they might therefore be greatly re-
duced in bulk both for economy and for their effect upon the water way, and
with the saving of two spacious abutments. He had shown that at that time
by some of the members—with the too common fault of archi-

dets, who would sacrifice use to effect, instead of compelling the useful
to be effective—that his proposal tended to destroy the due proportion
in appointment of the piers and the span of the arches. The eye that had been accustomed
to the bridges upon the Tiber, or in the opening. The eye that had been accustomed
to the bridges upon the Tiber, or in the opening. The eye that had been accustomed
to the bridges upon the Tiber, or in the opening. The eye that had been accustomed

3 Mr. Millwood, No. 6, Frances Street, Tothill Fields, Westminster.

29
at Cantara, the Pons Palatinus or Ponte Rotto upon the Tiber at Rome, the ruins of Augustine’s Bridge at Neufchâtel, and in fact of the whole of the middle ages, point the style of architecture, and every arched cloister, furnishes another instance to the same effect.

Another question may arise as to the sufficiency of the area of the bearing surface upon the piers at the springs of the arches, for very much less is allowed for this purpose than one half the area of the arches resting upon the piers respectively. In the supposed case, the weight of the superstructure, as compared with Perronet’s, is diminished by the introduction of the perforation in the arches, longitudinally of the bridge, and the being supported, in this instance, by the stonework placed by Perronet, in a much greater degree than the difference of their specific gravities would indicate; the substance of the arches built of the stronger stone, may be relatively reduced. These circumstances operate to such an extent, that the weight of the superstructure is reduced, as compared with Perronet’s work, nearly, if not quite, one-fourth; and as twelve times the sufficient strength is, besides, very much more than enough for the extremest contingencies, it is not too much to assume that the area of bearing surface of the arches at the springs, or on the piers, may be taken at one-fifteenth the area covered by the two half-arches. In justification of this assumption, it may be added that, without the same reason for it, but with flatter arches, certainly, than at Neufchâtel, Perronet made the area of the bearing surface upon the piers at the springs of the arches in the Bridge of St. Maxence, nearly the same; and in the case of the seventeenth area in horizontal section of the space covered by the two half-arches.

But the granite used in London Bridge, is of considerably more than twice the strength of the Sallaurcourt freestone, in the bridge at Neufchâtel, and hence, it is evident, which Perronet’s experiments were made; and therefore the area of the bearing surface of the arches at the springs, may be one-thirtieth the area in horizontal section of the space covered by the two half-arches resting upon any pier.

This is the proportion allowed in the case supposed, and the area of bearing face is upon the calculations regarding Neufchâtel Bridge, and having reference to the different powers of resistance of the two kinds of stone, more than enough for ten times the load it would be called upon to bear, leaving reference to the greater quantity of its material in the same. Thus, although the height in the central pillars of some of the cathedral chapter houses, it may be safely concluded that experiments upon small pieces of stone give results much within the strength of the material in the block; so that having counteracted the tendency of the stone, and the bridge, to inclination in the structure by the introduction of the deep transverse arch, groined to the flat longitudinal arches; it is believed that the bearing surface at the springs of the arches, and consequently, the piers under them, might be reduced, not merely with perfect safety, but with great advantage, very much beyond what he had now endeavoured to justify, in the example before the meeting.

Mr. Hosking then proceeded to explain the advantages of corbeling out the parapets on bridges, according to the method he has proposed in his treatise on Bridges; and read some passages in explanation of them, from that work; and showed, by diagrams, the manner in which the work might be composed constructively, and as to decoration, either plainly corbelled or enriched faces to the parapet. He then resumed his remarks, and stated that in order to explain the arrangements and advantages of arching bridges, he could not avoid noticing a pressing instance of an important work, within the personal knowledge of all who live in, or have ever visited London, rendered by circumstances which have grown up around it, altogether unfit, both in its design and arrangement, for the position it occupies. In September last he wrote, in the Treatise on Bridges, as follows —

“It is difficult to close a Treatise on Bridge Architecture, without remarking the increased usefulness of the present superstructure of Westminster Bridge. The arches spring at a level very little above that of low water, whereas the old bridge from London to Westminster was nearly 50, or about one-sixteenth less at the height of ordinary spring tides, than at the level of low water in the river. The arches contract the way for navigation much more than it is at all necessary they should, even upon the lowest level of water. The height from the soffits of the arches to the level of the roadway, than there need be; the parapets are alike offensive, by their great height from the roadway, and by their ugliness in detail, and injuries by the drafts induced by the perforations of the arches. Meanwhile, the solid center of the bridge, and the groups and columns, and their inclosed and cupolated heads, add needlessly to the weight upon the piers. The bridge is unfortunately near to the magnificent buildings of Parliament, and its great height renders this proximity more injurious than it might have been. In all probability, more than one half of the great height of the bridge, and one half of the works now (1812) in hand for securing the piers, and doubtless the same sense which opened a view of the river from Blackfriars’ Bridge will open the magnificent prospect of Westminster Bridge can command, by substituting parapets, which shall be truly so, for the perforated walls which now hedge in the road-way, but the arches will still continue to render the navigable water-way narrower and more inconvenient than even the multiplicity and thickness of the piers, that the height of the arches, and the grouping together of the same, is still remain consistent with its position at Westminster. It ought, therefore, to be completely remodelled. As the piers are now in process of being repaired and secured, and so as to be free from any danger, founding new piers is out of the question, and the piers cannot be reduced in number without involving additional works, and with the piers remaining as at present, the original defective founding, and the badness of the original structure forbid. The whole of the superstructure might be removed, however, and the piers being carried from the level of the present springing to that of high water, of the substance which the cutwaters now show within that range, flat pointed arches might be sprung at that level, and the whole superstructure re-constructed in accordance with the prevailing style of the Abbey, Hall, and Palace of Westminster. The longitudinal central groining has been one of the most important features of that bridge, and the lightening the thrust of the arches, and greatly economizing the reconstruction, as the old stone would work in well for this purpose, whilst the faces and main vaults were of new. The widening of the water-way by the removal of the springings of the arches out of the way, would allow characteristic abutments to occupy the space now taken up by the two first arches of the series of thirteen, as well as the site of the two small land arches, without affecting the current injuriously; and as the flat pointed arch would give much more freedom to the navigation than the semi-circular arch affords, independently of the increased lateral space in every bay, the vertical head-way might be taken at an average of that now afforded by the central group. Moreover, the increased space at the approaches obtained by obliterating the useless land arches would allow the accesses to the bridge from the low ground on either side to be greatly improved; and the ascent eased by dividing them to the right and left over the abutments, and so to distribute the rise over a longer space, and give the means of dividing the going and coming traffic.

Mr. Hobson, concluded Mr. Hosking, coinciding in a very remarkable degree, with those upon the same bridge, in the report lately presented by Mr. Barry, to the Commission on the Fine Arts, in connexion with the Houses of Parliament. It was true that his suggestions stood alone in the particulars in which it was almost certain they would be peculiar; as it regards the introduction of the new transverse arch groined to the flat longitudinal arches; the increase of the span of the arches upon the same piers, (for he did not understand Mr. Barry’s report to contemplate that) and in widening, widening and dividing the approaches for the double purpose of use and defence. To Mr. Barry’s report, the superstructure, before the middle of last year, and — with the wood-cut illustration of the subject which appears with the text — printed in October, though not published until February of this year, he might claim some credit for having taken the same view of the subject that had already, he doubted not, presented itself to others of the eminent contemporary, whilst it might be held to strengthen, in some degree, the view they had both taken, that it had occurred to both Mr. Barry and himself, without communication or knowledge indeed, of each other’s efforts, to support it by the same train of argument.”

ELECTRIC TELEGRAPH.

Mr. Weshaw, the secretary, read a paper at the Society of Arts, on Wednesday, May 17, explaining Messrs. Cooke and Wheatstone’s telegraph.

The practical electrical telegraph for electric purposes was invented by the “Galvanometer, which acts by the deflecting power of galvanometer coils on magnetic needles,” and "The Mechanical form which gives its signals through the agency of the Electromagnet on Mechanism." Every instrument yet employed may be classed under one or other of these heads; and it is only fair to Mr. Cooke to observe, that he had, previous to his acquaintance with Professor Wheatstone, worked out in detail, and made several instruments of both descriptions, and that he has alone thoroughly worked out the entire system on which these instruments are arranged, for the purpose of making the art act reciprocally.

Mr. Cooke, by profession a military man, having served in our Indian armies several years, was in March 1836, engaged at Heidelberg in anatomy. There he was in the midst with the interesting pursuit of modelling his own dissections from nature, for the embellishment of his father’s museum, a professor of the Durham University. In this self-taught art he had been engaged several months. An occurrence about this time gave, however, an entirely new direction to his thoughts. Professor Moinecke of Heidelberg, had invited Mr. Cooke to witness experiments with a simple apparatus intended to illustrate the idea of giving signals by electricity—an idea, by the way, which had at that time been before the scientific world for several years. So powerful was the impression produced on Mr. Cooke’s mind by these experiments, and the possibility of applying electricity to the practical transmission of telegraphic intelligence, that abandoning his other pursuits, he devoted himself from that hour to the present moment exclusively to the practical realisation of the electric telegraph with that success, let those judge who have seen it working on the Blackwall Railway, for the last three years, or as now extended, and yester-
1843.]

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*STEAM NAVIGATION.*

HER MAJESTY'S ROYAL STEAM YACHT "VICTORIA & ALBERT."

The launch of this singularly beautiful and magnificent steam vessel took place at Pembroke, on Wednesday, 28th April. The following are the principal dimensions:

<table>
<thead>
<tr>
<th>Foot.</th>
<th>Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length, extreme</td>
<td>225 0</td>
</tr>
<tr>
<td>Length on deck</td>
<td>205 0</td>
</tr>
<tr>
<td>Length between perpendiculars</td>
<td>185 0</td>
</tr>
<tr>
<td>Length of keel for tonnage</td>
<td>181 2</td>
</tr>
<tr>
<td>Breadth outside paddle boxes</td>
<td>50 0</td>
</tr>
<tr>
<td>Breadth for cargo</td>
<td>35 0</td>
</tr>
<tr>
<td>Breadth moulded</td>
<td>31 11</td>
</tr>
<tr>
<td>Depth in hold</td>
<td>22 0</td>
</tr>
</tbody>
</table>

Burthen in tons, 1,049. She is divided into five water-tight compartments, and her engines by Messrs. Maudslays & Field, are of 520 horse power.

Her construction is entirely novel, and according to designs prepared by the Surveyor of the Navy; she is considered by competent judges to be superior, not only to the largest, but the greatest in the other description of steam vessel ever produced in this country. Some idea may be formed of the novel and peculiar style of her construction, as well as of her great strength, when it is stated that she is built only with plank; the first two layers being of oak 1½ inches thick, placed across each other diagonally at an angle of 45 degrees, the outside plank being of larch three inches thick, lying longitudinally or with the sheet of the ship, and the whole being bound up with vertical and diagonal iron bands. Between each layer of plank, the surface is covered with thick tarred felt; the vessel therefore cannot leak, nor be in the least degree damp inside; and being divided into fire compart-

MISCELLANEA.

PAINE'S PATENT for preserving timber from the ravages of the dry rot, insects, &c., is now likely to be brought into extensive operation; the process consists of impregnating timber with a solution of the sulphate of iron, and afterwards with the nitrate of sodium, with the liquid of the root of the rod, and forms an insoluble chemical preservative, and by this process adopted, impreg-

The Screw Propeller.—The Mermaid, ( lately fitted with Messrs. Steene's Screw Propeller,) has made several experimental trips down the river, in order to ascertain her speed which was found (at the measured mile Long Reach) to be equal to 12½ miles per hour. The vessel, after entering the Medway, was turned for the mouth of the river, and was there put alongside the Red Rover, (Bourne Bay Steamer,) which is used to go 13½ miles through the water, but in running her from Long Reach Tavern to Gravesend (almost 10 miles,) the Mermaid gained about 900 yards on her opponent. These experiments fully prove that the "Screw" is a very great improvement, not only in respects to the paddle-wheels. The engines of the Mermaid are of the nominal power of 50 horses each, her immersed midship section about 8 ft. 6 in., and the engine has been calculated to do an average of 9 ft., for going 12½ miles per hour; in fact, when she was built (4 years since,) she was not considered a fine form for speed.

THE SPOOL PROPELLER.—See we by the Liverpool paper, that Messrs. Mather, Dixon, and Grantham, have been very successful with an iron vessel, the "Liverpool Screw," fitted with their patent improvements. The screw is worked direct without the intervention of spur wheels by the aid of a steam engine and boiler on the locomotive principle, consisting of two cylinders 13 in. diameter, and 18 in. stroke, and when light the screw makes about 55 revolutions per minute, the pressure of the steam in the boiler is about 50 lbs., and is used expansively. The vessel is 3ft. long, 12½ ft. beam, and drafts 3½ ft., the trials of her power in comparison with other vessels is said to be most satisfactory.
LIST OF NEW PATENTS.
(From Messrs. Robertson's List.)

GRANTED IN ENGLAND FROM APRIL 29, TO MAY 27, 1843.

Six Months allowed for Enrolment, unless otherwise expressed.


Moses Poole, of Lincoln's Inn, gentleman, for "improvements in making directions of coffee and other matters." (Being a communication.)—April 29.

James Rossford, of Great Bolton, Lancaster, millwright, for "improvements in the manufacture of certain bars and rolls."—May 2.

Jasiah Longmore, of Regent-street, Kennington, silversmith, for "improvements in pens, pen-holders, and pencil cases, part of which improvements is applicable to other useful purposes."—May 4.

Edward Morewood, of Thornbridge, Derby, merchant, and George Rogers, of Chelsea, gentleman, for "improved processes for coating metals."—May 4.

Francis Danieli, of Camborne, Cornwall, assayer master and analytical chemist, and Thomas Hutchinson, of Rosewarne, in the same county, esquire, for "certain methods of obtaining or manufacturing lime from a substance or substances not hitherto made use of for that purpose."—May 4.

John Turnbull, of Holywell Mount, Shorehite, card-maker, for "improvements in the manufacture of horse-shoes."—May 6.

James Roost, of Westmoreland, Stafford, for "an improvement or improvements in the mode or method of manufacturing welded iron tubes."—May 9; two months.

William Edward Newton, of Chancery-lane, civil engineer, for "improvements in machinery for the construction of boxes for the asylum and estates of locomotive engines and carriages, and for the bearings or journals of machinery in general, and also improvements in oiling or lubricating the same." (A communication.)—May 15.

John Tappan, of Fitzroy-square, gentleman, for "improvements in machinery for preparing and spining hemp and such other fibrous materials as the same is applicable to." (A communication.)—May 15.

Robert Alexander Kennedy, of Manchester, cotton-spinner, for "improvements in machinery for grinding and sharpening cards used in carding cotton or other fibrous material."—May 16.

John Lucena Ross Kettle, of Upper Seymour-street, Portman-square, esquire, and William Prosser, junior, of Shaftsbury-terrace, St. Pancras, gentleman, for "improvements in the construction of roads, and in carriages to run therein."—May 16.

Joseph Burch, of the City-road, engineer and machinist, for "improvements in machinery for printing on cotton, silk, woollen, paper, oil-cloth, and other fabrics and materials, and certain apparatus to be used in preparing the same and casting surfaces for printing, and for certain modes of preparing surfaces previous to the design being delineated upon them."—May 16.

William Mills, of Foster-lane, glove manufacturer, for "improvements in fastenings for gloves and other wearing apparel, and in the mode of attaching the same."—May 16.

John Thompson, of Albury, near Guildford, doctor of medicine, for "improvements in bedsteads and couches for invalids."—May 16.

Joseph Mazzini, of King's-road, Chelsea, gentleman, for "improvements in typographical printing, combining the advantages of movable types with the stereotype process by means of a single impression, and of a new and particular kind of press, by means of a pneumatic machine for casting, and a uniplane machine for composing." (A communication.)—May 16.

John Winter Walter, of Stoke-under-Ham, Somerset, glove manufacturer, for "improvements in the manufacture of gloves."—May 16.

Robert Walker, Jun., of Glasgow, merchant, for "improvements in propelling ships and boats."—May 18.

Charles Maurice Eilzea Sautter, of Austin-friars, London, gentleman, for "improvements in the manufacture of bobs."—May 22.

Charles Nicolius, of York-road, Lambeth, gentleman, for "improvements in the manufacture of fabrics made by lice machinery."—May 22.

Alfred Poole, of Mornington-place, Camberwell, New-road, for "improvements in drying meal and grain."—May 25.

Moses Poole, of Lincoln's-inn, gentleman, for "improvements in the disposition of certain metals, and in apparatus connected therewith." (A communication.)—May 25.

John Gillett, of Brailsford, Warwick, farmer, for "an improved machine or apparatus for cutting or chopping timber."—May 25.

John Lushby Gibson, of Newchurch, Chester, esquire, for "improvements in the manufacture of salt."—May 25.

Eliegh Galloway, of Seymour-street, Euston-square, civil engineer, for "improvements in the machinery for propelling ships and other vessels."—May 25.

John Alexander Bain, of Colgate-street, mechanist, for "improvements in producing and regulating electric currents, and improvements in electric time-pieces, and in electric printing and signal telegraphs."—May 27.

Richard Henry Billiter, of Maze-pond, Southwark, oil merchant, for "improvements in filtering oil."—May 27.

Arthur Hill, of the Lid Parsonage, near Stroud, Gloucester, clergy, for "an improved shower bath."—May 27.

THE VARIATION OF THE COMPASS.
Observations made at the Royal Observatory, Greenwich.

G. B. Airy, Astronomer Royal.

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<th>Mean Magnetic Declination</th>
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The Civil Engineer and Architect's Journal. [June,
manufactory or warehouse, containing only one floor, and not exceeding 12 ft. above the footings to the top of the wall, shall be taken.

It will be seen hereafter, in consequence of the additional thickness of walls required in this fourth rate buildings to what they now are, that it will be a very serious detriment to the construction of small houses with only two stories, of which there are many thousands in the vicinity of London, and which we consider far better for the poorer inhabitants than having several families huddled together in one house containing numerous rooms; we therefore propose to meet this class of dwelling, and should have them rated on the fifth class of buildings, for which purpose we propose to add to this clause the following words:

"Every dwelling house which shall not have more than two floors, and which shall not exceed the height of 20 ft."

12. Sixth Rate.—Every building 20 ft. from any street or alley, and detached from any house, or building, or ground, not in the same possession, 50%. The walls or inclosures (except chimneys) may be built of any materials, but if of brick or stone, shall be built according to their height, of the thickness required for the five preceding rates.

13. Seventh Rate.—Every building for the purpose of trade, the collection of toll, detached, 14½ ft. from any other building, and which does not cover more than 100 ft. square of ground, and is not higher than 12 ft. from the ground to the highest point of the roof, may be inclosed with any materials except roof and chimney.

14. Eighth Rate.—All churches, chapels, and places of public worship, theatres, exhibition-rooms, and other buildings whether included in the aforesaid rates or not, used either solely or at stated periods for purposes of public business, instruction, debate, diversion or resort, and also all breweries, distilleries, manufactories or warehouses which shall be more than 50 ft. high, and 15 ft. in thickness, which shall consist of any thing from footing to the undersized of the roofs or floors or seventy (eighty) feet high; all such buildings to be built with party external walls 1½ in. thicker, and when the carcase is built, the owner shall give 21 days' notice to the surveyor and to the official referees, who shall survey the said building, and require the owner or occupier to certify their having been built, and if used before the certificate is satisfied, the owner or occupier shall, on conviction before two justices, forfeit not less than five pounds, nor exceeding five hundred pounds daily (1) until the filing of the record of such certificate. Provided always, "that if within 20 days from the assessing of such penalty such certificate of satisfaction shall not have been filed as aforesaid, such house or building shall be liable to be abated as a nuisance, under the powers in this act contained."

(129.) The surveyor's fee for surveying such building, in addition £ s. d.

To a first rate fee 

First rate fee 

To each of the referees who shall have assisted in the supervision, and signed the certificate £10 10s. (three referees)

49 7

And it is doubtful whether the official referees could not claim a farther fee, for clause 130, says,—

"They shall in addition to the fees before mentioned have, and be entitled to, the following fees"

For every survey

For every certificate

For every foot, and for the amount of the fees being at present left blank. We have now enumerated the leading features connected with this previous piece of legislation, regarding the eighth-rate of building, and we know not words strong enough to express our disapprobation of clauses most monstrous, whether we regard the exorbitant penalty of £500 a day, or the litigious spirit which breathes through all the clauses, or the chaotic preamble, and also dwelling-houses which shall contain more than four stories, stands, it contemplates every school, literary institution, beer shop, public house, or tavern, all being places of public instruction, diversion or resort; banks, insurance offices, or in fact the offices of any joint-stock company, coming, it is to be supposed, under the class of buildings and also dwelling-houses, are all to be charged within this rate of building; and it will be difficult for any surveyors to give an opinion on what is not a building for public business. Although the district surveyor is appointed to inspect the works as they proceed, and stop them if they be not constructed to his satisfaction, yet when the building is covered in he has still, in conjunction with the referees, the power of ordering any part of the building to be taken down. If we are to have district surveyors, we must suppose them to be persons capable of performing their duties, and if so, why have the two special surveyors? They were made at the time of covering in the building, and when it is finished? They may be sensible of the expense the surveyor or referees to file their certificates with the clerk of the peace, and we cannot, therefore, think that any part of the clauses regarding the eighth rate of building will be allowed to remain in the bill, but be expunged in toto, as they ought to be, for the clauses of the rates and thicknesses of building, the objections to which we have raised, and the public have a right to expect for their protection; besides that, the proposed clause entails a delay of nearly, if not quite, two months in giving notice and waiting for the certificates. The effect of this delay in the case of a railway station will be palpable to our readers, very often entailing the postponement of the opening of the line until another season. As to the fee of 4½ d., what the church commissioners, the national school society, and the friends of education will say to it we scarcely know; 500l. is often the extent of the money which can be expended on a place of worship, school, or literary institution, and a tax of 10 per cent. on this amount is to be imposed. Where the architect often is not paid, and always insufficiently; it is rather too bad that money should be wasted on surveyors.

16. Attached buildings to be separately rated, and the external walls to be of the rate of which such attached building would be, if not so attached, but so far as regards the party walls, shall be held to be of the rate of the building of the highest rate to which such party walls shall adjoin when such attached building shall be completed.

The case relating to what is rather ambiguous, we suggest, that those words in italics be omitted, and that the words "on either side of" be introduced, instead of "to which."

THICKNESS OF WALLS.—It must be recollected, in reading over the number of the floors, that the 4½d. is to be added to the first rate for every thick 2½, or remainder of a thickness from the 2½ feet of the roofs of dwellings shall be counted, we suggest that the party walls above the upper floor of the first and second rate buildings need not be so thick as provided, we have therefore given in italics our own propositions, and also this can be carried out for the thickness of the party walls of buildings.

49. FOOTINGS OF EXTERNAL AND PARTY WALLS.—Footings to be nine inches thicker than the walls above, and four courses high, and the top twelve (six) inches below the surface of the lowest floor, or six inches below the surface of the lowest floor of the building.

50. First Rate external walls, 1 ft. 10½ in. thick, from footings to undersize of the fourth floor, and 1 ft. 5 in. from thence to the top of the gutter plate, and the remainder 8½ in.

51 and 32. Second and third rate external walls from footings to the undersize of the second floor, 1 ft. 1½ in. thick and from thence to the gutter plate 13 in. and remainder 8½ in.

53. Fourth rate external walls from footings to top of gutter plate of upper room floor 13 in. and remainder 8½ in.

54. Fifth rate external walls to have 2 course of footings, 1 ft. 6 in. and 1½ in. thick, and above the footings 8½ in. thick.

79. Party walls of first or second rate from footing to the undersize of the second floor, 1 ft. 10 in. thick, and thence up to the top of (the upper room floor) of 1 ft. 5 in. (and thence up to the top of such party wall 1½ in.) and party walls above of the remainder of the fourth (third) floor 1 ft. 5 in. and from thence to the top, 1½ in.

80. Party walls of fourth and fifth rate to be 1½ thick above the footings, excepting in a warehouse of the fourth rate, when it is to be 1 ft. 5 in. thick to the ceiling of the lower floor. MATERIALS OF EXTERNAL AND PARTY WALLS.—To these classes we must call the special attention of our readers. They are to be built solid, of good sound well-burnt bricks or good sound stone, excepting such iron work as may be required for bonds and corbels, and excepting the ends of girders and bressums, or tiers of door cases to warehouses, and the frames of doors and windows in external walls, all of which shall be fixed at the distance of 4 in. from the external face of such wall; and excepting such wood and iron work in the lowest or first floor and in the ground floor as may be required for harness and other parts of the same, the ironwork, thus, and such iron work as may be required to carry the ends of girders, bressums, trimming joints, and principal timbers of roofs, and the ends of all such girders, bressums and other timbers (in party walls) shall be carried upon iron shoes or stone corbels, built into the wall and6. In the place of the words used till the brickmakers will have produced the necessary improvements. By in dispensing of them, and must therefore increase the price ofock bricks. We consequently suggest the insertion of the words in
clause 56 and 58, “place bricks may be used internally above the third floor of the first and second rate—and the second floor of the third, fourth, fifth and sixth rates of building.” Neither can there be inserted into either party or external walls any timber for bond, lintels, plates, wood bricks, nor the ends of joists, or in fact any timber whatever, excepting as hereafter mentioned. The consequence is that the ends of joists, &c., must be notched on or framed into plates, and the plates must be carried by iron shoes or brackets, which will cause the plates to project into the rooms below the ceiling line; and it is a well known law that timbers which are fixed at their ends, as when let into walls, will bear double the weight, as when the ends are left open. This whole consequence is that the walls be laid on the plates, clear of the walls; nor are the plates so strong on brackets as when they are bedded into the walls, or the walls so securely tied in; we must therefore have an exception for the insertion of all necessary timber, for bond, plates, lintels, ends of joists, and wood bricks requisite to fix the joiner’s work; but no such timber shall be inserted in the walls within four inches of the face of the wall, or within 12 inches of any flue, or inserted in any party wall more than five inches beyond the face; and by clause 47 above enumerated, for the purpose of supporting the ends of girders there must be a projection into the rooms under for the story posts or piers, which in dwelling houses will be a great eye sore.

65 and 66: Chimneys.—No part of the chimney breast or stack will be allowed to overhang or over صال all any lower part of the brickwork, either on the front or sides thereof, excepting a single chimney above the ceiling of the fifth floor of a first and eighth rate; or above the ceiling of the third floor of the second, third, and fourth rates; and it is also provided that no chimneys, back or front, or chimney back, or of with of every flue shall be built at least 6 in. thick, and all the insides rendered or pargetted. The effects of these two clauses will cause nearly the whole height and height of party walls to be at least three bricks thick, as the party wall on the upper story is generally filled with chimneys and flues; these clauses must be altered and a proper inserted that chimneys shall not overhang more than 12 in. on the side in each story, and that the thickness of the flues be reduced to 4 in., and also that they be rendered or pargetted both internally and externally where they are below the roof, the rendering them externally we consider a far safer mode against fire than the increased thickness.

43, 44, 45, and 46. We have four clauses regulating the strength of the party walls; and these joists, required in the building, in the same possession, any trade or business such as of that of a soap-boiler, tallow-melter, slaughterer of cattle or horses, blood-boiler, bone-boiler, fellmonger, oil-cloth painter, manufacturer of gunpowder, detonating powder, inferno maker, gas works, chemical works, fire works, or any other trade or business which it is considered by two justices to be dangerous as regards fire, or dangerous or offensive or obnoxious as regards persons, more especially those persons living or passing in the vicinity thereof; nevertheless it shall be lawful for all such trades to carry on their profession or business in the smallest (one) house, and on the smallest (least) premises that they may be conducted without any risk of fire, or the pernicious effects of fire for any person who may be convicted of two justices of carrying on such dangerous or offensive trade, shall forfeit any sum not exceeding fifty pounds, as the said justices may determine.

We pronounce this clause to be the most unconstitutional one which was ever submitted to the English parliament. We have the power of magistrates to determine what is an offensive business. Every baker, butcher, fishmonger, oil shop, and many other trades that pernicious may be in the vicinity of any litigious person, may, without notice, without summons, without a hearing, or without the power of appeal to a jury or to a quarter sessions, be ruined, their business stopped, and a fine inflicted of 50l. by two justices,—who may meet in their own private parlour, or in the house of some influential person who may demand their services, and expel any business which they think proper. That part of the clause given in italics must be omitted, and the other part altered.

We must now offer some observations regarding the magisterial clauses; the interpretation clause says:—“Two justices of the peace shall mean two justices of the peace for the county within which the building or other subject matter is situated.” It does not provide in any part of the Bill that they shall be in petty sessions assembled, which we consider most essential, otherwise cases may be heard at their own private dwellings, or on any premises, and any person whom we consider against the law of this city or our subject matter, we would rather, that if the house be within the district of the metropolitan police offices, that the case should come before one of the stipendiary magistrates in the public police courts; for here we have some responsibility, and a person by education brought up for judicial decisions. Upon to adjudge thou intereting time matter, and many of them are most enormous, but which no doubt will be altered. Nor is there provision that the parties committing an offence shall be first summoned.
OSCILLATING MARINE ENGINE.

Patented by Messrs. Mather, Dixon & Grantham, of Liverpool.

(With an Engraving, Plate IX.)

We have given a drawing of a pair of marine engines, on a plan lately patented by Messrs. Mather, Dixon and Grantham, of Liverpool, for an improved method of driving screw propellers; and we shall endeavour in a future number to add another arrangement showing nearly the same form of engine, but suited to vessels having a deeper hold than is required for the engines we now present to our readers.

Fig. 1, shows the half-side elevation of the engines, with one air pump and condenser.

Fig. 2, shows the other half elevation, with the engine turned round, representing the side opposite to the air pumps.

Fig. 3, is a ground plan of the whole arrangement, the cylinder on one side being removed.

It will be readily understood that these engines have oscillating cylinders, placed at right angles and opposite to each other, the piston rods being each attached to one crank. In the annexed drawings the cylinders are represented as working downwards, the object of this evidently being to allow the propelled shaft to be placed near the bottom of the vessel.

The engines are constructed with a foundation plate to which are attached the side frames that carry the cylinders; the pedestal of the main shaft is attached to the bed plate having the condensers cast on it; a small counter shaft is employed to work a beam which gives motion to two air pumps; one guidewheel of the beam rests on one of the side frames of the cylinders, and the other is supported by a small standard rising up from the condensers. It is intended to have short stroke engines, and to work them faster than is usual in sea-going steam vessels, but not faster than is now usual on the Thames; by this means we shall presently endeavour to show that high velocities may be obtained without employing multiplying gearing.

It is unnecessary to enter into a more detailed description, as in all minor points nothing new is contemplated, the proportions and mode of working, which is found favourable with engines driving paddle wheels, will be equally applicable to these engines, excepting that the makers prefer having two air pumps with a short stroke instead of one.

As the advantages which may be expected from the employment of the screw propeller are of very great importance, and as the plans, which we are now considering, seem likely to remove many of the obstacles which have hitherto impeded its progress, we shall not hesitate to present to our readers some additional particulars of the plan by which Messrs. Mather, Dixon and Grantham propose to carry their project into effect, as well as an account of what they have already effected in a small vessel built by them, which has for some months been at work on the Mersey. It is from these results that they have founded their calculations of what may be effected in vessels of large dimensions.

We gave a brief notice of this vessel in our last number, and are promised the particulars of some accurate experiments which it is intended shall be made with her. We need only now say that she has more than realised the expectations of the builders, and from their report it appears to be the most satisfactory trial yet made on the screw as a means of propelling vessels. The propeller employed was patented by Mr. Woodcroft, in 1836. We hope in another number to be able to give a description of this also.

The mode of constructing the screw, supporting the shaft, the apparatus for regulating the outward pressure of the shaft, and other details, will come under our notice as we proceed. All, in our opinion, being matters of deep interest and importance to those concerned in steam navigation, when on the eve, as we firmly believe, of a great improvement to this truly national question.

We will now only add a few remarks on the principal features of

the improvements here proposed, to show that it will not be necessary to introduce any system of working that has not under other circumstances been advantageously applied before, although not in the same combination. From the results given by the "Liverpool screw," it is stated that the advantage over paddle wheels, is fully 25 per cent, when under the most favourable circumstances for the latter, but that in towing and in rough weather, the gain by the screw when applied, as now proposed, is found to be nearly 50 per cent. It is therefore presumed that for general purposes two-thirds the engine power only will be requisite for the screw, that is necessary in paddle-wheel vessels, to give a certain speed. It is also found that if the pitch of the screw is made 2½ times its diameter, a very reduced amount of slip varying from 5 to 10 per cent, will take place; and that it is probable for light vessels and high velocities the pitch may be made three times the diameter of the screw. It is also clearly established that no disadvantage results from placing the screw one-third out of water. The steering is not perceptibly injured by it, and the loss from slip not increased, and it is expected that instead of its being an objection, it will be found more convenient for ordinary practice than when the screw is entirely immersed. This point we shall discuss when we describe the construction of the screw itself.

THE AERIAL TRANSIT MACHINE.

Analysis of the projected Aerial Transit Machine, and of the principles involved in its construction and employment.

(Concluded from page 191.)

Throughout the preceding portions of this inquiry, which have appeared in succession in our last two numbers, our purpose having been to illustrate the operation of the parts, rather than to determine the efficiency of the whole, we have taken a view of the case simplified in a manner which, if it were the true one would, however apparently exaggerated the obligations, represent the object as nevertheless within the reach of art to accomplish, even with the means, be they ever so moderate, which the projectors might have at his disposal.

The unlimited declension of the force by which the machine, regarded as a mathematical plane (indefatigable of generating any resistance but that which belongs to it as such) would be opposed in its horizontal progress, in a degree proportioned to the angle of its inclination, would, however remote, still indicate a point at which this obstacle would have been so far reduced that any power, however feeble, would be adequate to the accomplishment of the rate necessary to produce the desired result. In theory it is perfectly true that a mathematical plane of any proportion of weight and dimensions hypothetically assignable, could, by the exercise of any amount of progressive energy (sufficient to overcome the friction of the parts) be made capable of sustaining itself in the air; a rate of motion equivalent to the production of a vertical resistance adequate to its support being as surely attainable at some angle of inclination, as any effect is surely consequent upon its cause where there is no force in operation to prevent it. But the difficulty of the matter lies here—the machine is not a mathematical plane, nor by any mode of construction could ever be rendered so; and the interference of its solid parts, in the resistance they experience in the air, however restricted by the contrivances of art, introduces a new ingredient of opposition, which, not following the same rule of reduction, but on the contrary, increasing with the process by which the former is nullified or avoided, puts a limit to the extent to which that process with its attending advantages may be carried, and thus removes the case out of the category of results necessarily attainable by the exercise of art. Before, therefore, anything can be positively concluded with respect to the success of any particular scheme of flight upon the principle of the plan before us, we must be satisfied that a power is at command competent to the production of a velocity equivalent to the support of the machine, restricted by this new element of resistance—the interference of its solid parts.
IV. And this brings us to the consideration of the fourth subject of our inquiry; namely, the power of steam which Mr. Henson purposes to employ for the occasion. It is not our intention in this analysis to enter into any examination of the particular construction of machinery by means of which Mr. Henson has sought to apply this power to his present object. This has been sufficiently largely done in other publications, as well as more particularly, in the specification of his plans drawn up under his own authority. Upon this point we would merely observe that the main difficulty, to the removal of which Mr. Henson's efforts have been principally directed, is the reduction of the weight of the engine in relation to its effective force. In all modes of developing power, the nature of the process imposes upon the machinery by which it is elicited a certain degree of weight proportioned to the force to be developed. Wherever there is a tendency of pressure, there must be of necessity a counter-pressure or resistance in the parts of the generating apparatus; resistance cannot be experienced without strength of material, and strength of material cannot be had indefinitely without weight; and it is in the relative reduction of this weight that Mr. Henson's ingenuity is presumed chiefly to display itself.1 Whether this has been done successfully, that is to the extent claimed, consistently with the retention of the necessary degree of strength, it is impossible for any one to determine apart from actual experiment. According to the published accounts, Mr. Henson's engine has been constructed to produce a resistance equal to the power of ten (some say twenty) horses, within the limits of 600 lb. weight. If this be true, he has certainly accomplished a very considerable abatement of that which has hitherto constituted a main obstacle to the establishment of a successful aerial navigation; and taking it for granted that such is the case, our intention here is to deal with the question upon these premises, and endeavour to test the applicability of the power so claimed to the purpose for which it has been designed.

We have said that a solid body cannot be moved through the air without experiencing a certain amount of resistance. Now this resistance has been determined to follow the ratio of the squares of the velocities under which it is generated; and a table has been constructed upon experimental data, in which the effects of this force upon a given extent of plane surface perpendicularly impinged upon, are set forth in terms corresponding to different assigned rates of motion, varying from one to one hundred miles an hour, with, of course, the power of extending the scale indefinitely, subject, however, to a consideration which we shall disregard for the present, but if taken into account would only magnify the exigencies of the case, which we are endeavouring to define; namely, that at high rates of motion, this resistance increases even more rapidly than the ratio of the squares of the velocities otherwise assignable. Without regard to this qualification, however, we are enabled to ascertain that, at the rate of 240 miles an hour, prescribed to the machine as necessary to its support at an angle of 3° of inclination in the suspending plane, every square foot of plane surface perpendicularly directed, or equivalent amount of oblique surface, would experience an opposition equal to a force of 285 lb. avoirdupois; so that if we can conceive such a machine constructed so as to present to the impact of the air no larger extent of surface than what would be equal to 10 square feet perpendicularly exposed, the aggregate resistance it would experience to its progress at the rate in question, would amount to 2850 lb. the horizontal resistance belonging to the plane as such, and which we have stated in round numbers to be, for that rate and degree of obliquity, about 150 lb.2 Unless therefore the power at command be adequate to the development of a reaction equal to this resistance, the machine could not be impelled at the rate with the angle prescribed; and we should be driven to adopt either a slower rate of motion at the expense of an increased angle of inclination, and of the increased horizontal resistance by which the plane itself, at that increased angle would be encountered, or else a more rapid rate of motion due to a reduced angle of inclination, at the cost of the increased resistance due to the solid proportions of the machine with this additional impulse—whatever should be found to be productive of the least amount, in the aggregate of this resistance.

To apply this with mathematical accuracy to the illustration of the case before us, is clearly impossible, because we are entirely unpri

1 The improvement of the machine in this particular does not merely regard the reduction of the weight of the engine itself, but also of the means whereby its energy is maintained—the water and fuel necessary for its use. In the modifications by which a saving of these may be effected, a further step is gained in the same direction, which, however, more properly concerns the question of the duration of the flight when it shall have been accomplished, than its abstract possibility.

2 These numbers are not strictly correct. They should have been stated at 223 miles an hour for the rate, with a horizontal resistance equal to 137 lb., as subsequently represented in table. The difference arises, partly from the omission of the cosine of the lesser angle in determining its pro-portion of vertical resistance, and partly from the adoption of a rate in round numbers, 12 miles an hour, as that at which a plane surface generates a resistance by perpendicularly impact equal to two-thirds of a pound to the square foot, instead of 11-660, which is its true denomination. The results in the table further on are all based upon the actual quantities, and are mathematically exact.

3 The reader is scarcely necessary to observe that in mechanical operations a resistance to be encountered is the same thing with a weight to be raised; the rate of development in the one case being exactly analogous to the rate of elevation in the other.
would be rendered attainable, have been observed in the appointment of the propelling apparatus in Mr. Henson's machine, we shall not stop to inquire, (though from a consideration of their apparent dimensions and the angle of their impact, we should conclude most assuredly otherwise) but, giving them full credit for their competency to that effect, proceed to show that even so, with a measure of resistance the least assignable, or a rate of impact the least under which it could be raised, the power in question would be utterly incompe-
tent to enable the machine to maintain its elevation or continue its course, even for a single moment, at any angle of inclination at which it might be disposed. This we shall do by means of a table calculated for several angles of inclination, exhibiting at a view the several rates at which a machine of the proportions of weight and surface assigned to Mr. Henson's, would have to proceed at the corresponding angles of inclination, in order to generate a resistance opposed to gravity equal to the support of its weight, and the amount of horizontal resistance it would experience (considered as a mere plane) at each degree of the scale so impelled, expressed in pounds avoirdupois. In another column is shown the resistance which the solid parts of the machine would develop at the corresponding rates, supposing them to be so contrived as to expose an extent of surface not more than equivalent to a plane of one square foot perpendicularly im-
pressed upon. In the next column are given the products of these last two quantities multiplied by the velocity assigned in miles per hour, representing the actual forces developed, reduced to the same standard, and consequently, the proper measure of the power comen-
surate with such results. This last column contains the expression of this force in horses, or, the number of horses which it would take to answer this demand, according to the conventional mode of calculat-
ing the force of steam; that is, reckoning the power of a horse to be equal to a resistance of 3200 lb. at the rate of one foot in a mi-
ute, or 36 lb. at the rate of one mile per hour.

| Obliquity of plane. | Velocity in miles per hour | Horizontal resistance to plane. | Dito extra for one square foot. | Total dito reduced to a common standard. | Equivalent horse power.
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Upon reference to this table it will be seen that the conditions of flight which, under the circumstances prescribed, would be attainable with the least expenditure of power, are those which attach to an inclination of about 10 degrees; and for this a force would be requisite, equal to the power of above 100 horses. At any other angle of inclination, a greater amount of horizontal resistance in the aggregate would be experienced, and the requirements of power be propor-
tionately enhanced.

V. In order that it be observed that the opposition which is here set forth as the measure of the propulsive power of the machine, is not a force only concerned in the friction of its motion, which might be expected to vanish or become less inflammatory if its first efforts had been subdued, like the passive resistance of matter, weight, the viss inezter, or the resistance of adhesion, which when once suspended or overcome ceases to affect, but a force always in operation, always the same under the same conditions, and requiring always the same amount of power to compete with while it endures. And with this observation we might have been content to let the matter rest, as in-
controvirtably determined, were it not that a principle has been set up, implied in the proposition of a certain contrivance, which strikes at the very root of our conclusions, and, were it correctly conceived, would equally invalidate any inference that might be deduced in de-
rogation of the scheme, from the consideration of any deficiency of power, however extravagant, that might be alleged against it. Sensible of the inadequacy of their means, in the abstract, to the whole effect which it is intended to produce, and under the impression that this deficiency might be supplied by the intervention of a force not inherent in the means themselves, a part of their plan, upon which the greatest reliance has been placed, which has been put for-
ward with the greatest pretensions, and which has elicited the greatest share of the public admiration and approval, is to invest the ma-
chine at its first starting with a certain amount of velocity or mo-
mentum, by means of a preliminary descent down an inclined plane, which, however unable to originate, its inherent power, it is expected, will be sufficient to maintain. And this obliges us to devote a few lines to the consideration of the principle involved in this contri-
vance, which is the afffis and last point to which in the outset we pro-
duced to direct our inquiries.

This table may be made available to determine the conditions of flight assignable to any machine upon the same principle, whatever the proportion of its weight to the dimensions of its suspending plane, subject to the following considerations. In the first place, the velocity necessary to effectuate its support depending upon the relative and not the actual quantities, any weight may be assumed as a standard, and the modification necessary to maintain the proportion, referred to the size of the suspending plane. In the case, therefore, be reduced to the standard of weight ascribed to Mr. Henson's plane, namely 3000 lb., and the surface determined accordingly. Now as the resistance, cetere paribus, varies in the simple ratio of the areas of the im-
pinging surfaces, and the squares of the rates of impact, the rates, cetere paribus, vary inversely as the squares of the angles of elevation. If, therefore, the velocity assigned to any angle in the table above be multiplied by the square root of the area of Mr. Henson's plane, the product divided by the square root of the newly assigned surface, will give the rate at which it must be propelled in order to effectuate its support, as by a common rule of three. The horizontal resistances, depending upon the real quantities, may be de-
duced in like manner from those ascribed to Mr. Henson's plane at the same angles, by simply substituting the new rate assigned, in the ratio of the squares of the velocities, and the true surface, in the simple ratio of the di-
mensions, and thus all the conditions of flight and the least necessary to its support at an angle of 10° would be

\[
\frac{67.7 \times 67.082}{45000} = 19.45006
\]

This necessary to its support at an angle of 16° would be

\[
\frac{67.7 \times 67.082}{45000} = 21.68688
\]

The horizontal resistance in this case, the weight being the same, would stand as in the table, at the same angle of inclination; the rate of development diminishing exactly as the surface is increased. If to this quantity be added the perpendicular resist-
ance due to the square foot to the newly assigned rate = 2.244 lb., and the sum be multiplied by the rate in question, we shall have 11371.715 lb. as the representative of the whole resistance to be encountered; which, divided by 363, the power of a horse in steam at the same rate, gives upwards of 31 as the number of horses, or the measure of horse-power, which would be requisite to enable it to accomplish or maintain its elevation in the air.

30.
Were it not that this principle and the mode by which it is intended to be applied, had got hold of the public mind by some of those fatigues, by which the most preposterous opinions occasionally get disseminated and established, we should not have held ourselves justified in administering a formal refutation to a position so exceedingly absurd, that a reference to the first rudiments of the physical sciences is more than sufficient to overturn. For what, after all, is the principle which this position is calculated to uphold? Simply, that a body can be sustained in motion against a given amount of opposition by a less degree of force than what is actually required to establish it. That this is a true statement of the principle which is involved in this hypothesis, and that it is utterly fallacious and insane, we trust we shall not be at much pains to demonstrate; and the mode we propose to adopt with this view, is to examine the forces which are inherently concerned in the establishment of a given motion, and those concerned in its continuance, to show that a perfect equality exists between them, and consequently that nothing less than what is required for the former would satisfy the exigencies of the latter. These forces, by which the induction or continuance of motion in any degree or direction, are solely affected, are reducible to four heads: the attraction of gravitation—the *vis inertiæ* of matter—the friction of the parts in contact—and the resistance of the medium in which it is moved.

1. Of these forces, the first, assuredly, opposes no impediment to the induction of motion which it does not equally oppose to its continuance. Acting in one direction only, and (appreciably at least) with equal force in that direction at any elevation attainable by man, it is clear that whenever it interferes at all, it can never operate with less force in one than in another stage of the same proceeding. To initiate, therefore, or establish a given motion even in direct opposition to gravity, not a particle more force is exerted than is required for its continuance. In an *horizontal* direction, however, with which we are here more immediately concerned, the attraction of gravitation literally interferes with no obstacle whatever to the induction or perpetuation of motion to any extent in any body, however ponderous and inert. This might, indeed, have been concluded, without reference to principles, from a simple consideration of its effects; as in a vertical or upright direction gravity opposes the induction of motion with its whole power, and in a contrary or descending direction it forces the same in exactly the same degree, so in a direction which partakes of neither, but is intermediate between both, it follows as a matter of course, it can really exercise no influence at all.

The weight of a body has in fact nothing to do with the difficulty of imparting to it an *horizontal* motion, except in so far as it increases the friction, in regard to the medium of its support; a property which, as the weight is not altered by its translation, it must exert with equal efficacy in the ultimate as in the preliminary stages of its progression. So far, therefore, as the attraction of gravitation is concerned, it is certain that the exigencies of the aerial machine in respect of power, are not a whit less for the *maintenance* than the *establishment* of the motion which is sought to be conferred upon it.

2. With regard to the second of the forces enumerated, the *vis inertiæ* literally opposes, of itself, no *definite* obstacle to the induction or continuance of motion in any direction whatever; and literally requires no *definite* amount of power to overcome. Every body which is pressed against by another must reciprocate the pressure, and, unless restrained by some extrinsic impediment, must participate in the motion which is the measure of the force applied; the only condition affecting the establishment of a *given rate* of motion, so far as this property is concerned, being that a certain *time* must elapse before the operation be completed. In all transitions from quiescence to motion, or from motion to repose, a certain *time* is due to the transaction in respect of and proportionate to the quantity of matter which is the subject of the change; and the only obligation which is imposed upon the force employed, so far as regards the *vis inertiæ*, is that it be *continuously* applied. With this reservation, there is no limit to the effects which can be produced, however great the mass to be moved, or small the force employed to move it. A fly attached by a human hair to a top of marble, would not only invest it with motion in an horizontal direction, if it were possible to suspend it free from all friction, but, presuming the absence of atmospheric resistance, bring it up, by continuous effort, to any rate of motion at which it could itself proceed; may, the mighty globe of the earth could be propelled round the universe by an infant as fast as its legs could carry it, if it could find a path to walk on, provided the pressure was continued a sufficient time to allow all the particles to be induced with motion at the rate required. These results in relation to the hypothesis illustrated by Mr. Henson's scheme, may be conveniently and familiarly illustrated by the case of a man towing a heavily laden barge in still water: where the counteracting forces, friction and the resistance of the medium, being indefinitely assignable, and the impulse in an horizontal direction, the *vis inertiæ* is free to display its peculiarities without ambiguity or interference. Here is no question as to whether the strength of the individual be sufficient to enable him to set his load in motion, or bring it up to that rate in which his own powers shall be equal to the extrinsic forces developed in the operation. As soon as he begins to pull, the boat begins to move, slowly at first, and increasing gradually until it reaches that point at which the friction and resistance it develops is equal to the power he is able to employ: nor would he accomplish anything by obtaining additional assistance in the commencement, which he would not immediately forfeit by its discontinuance, except a *more speedy* attainment of the same result. No one, not even the most unthinking of bargee men, ever dreamt of being able at any time to drag his boat at a greater rate than he could, by his own unaided efforts, have brought it up to; or with less difficulty at the same rate, because he happened to have had the assistance of a friend to enable him to begin. And yet these are only the conclusions which the adoption of Mr. Henson's hypothesis requires us to admit. All, in fact, that the mediation of any extrinsic temporary force can effect, is to dispense with a part of the *time* that would otherwise be required to produce the result due to the inferior power alone; and it is the forced limitation of this element of invested motion that are to be ascribed those appearances in certain familiar cases which have been so triumphantly referred to as affording illustrations and attesting the correctness of the hypothesis upon which Mr. Henson's scheme and the hopes of his friends are founded. The circumstances of the horse straining to drag into motion a heavily laden cart, which he afterwards appears to draw with the utmost facility, of the railway train and steam vessel, with so much difficulty seemingly set ageing, and ultimately proceeding with so much apparent ease, together with others of the like description, are all owing to the neglect of this consideration in the attempt to invest large bodies with motion at a given rate, in less time than is due to the proportion between their masses and the forces employed to move them. The conclusions, therefore, which have been drawn from these premises are utterly fallacious. Not a particle, absolutely, more power is required to initiate or establish a given rate of motion in any body than is requisite to compete with the extrinsic forces, the friction and resistance, developed at the rate in question; neither in the beginning, nor subsequently at any stage of the proceeding, there being anything over to be accounted for on the score of, or by which to measure the effects of, the *vis inertiæ* in respect of the motion so superinduced and established—a certain proof that, so far as this also of the forces enumerated is concerned, no more power would be required to produce, and, therefore, no less would suffice to maintain, the rate of motion assigned to the aerial machine as necessary to its support, than what is due to the extrinsic forces, the resistance and friction, developed at the rate required.

3. Now the friction, it is well known, is a force in no way affected by the rate under which it is developed; but is just as great in a state of quiescence, however strange this may appear, as under the extreme condition of velocity. So far, therefore, as regards the question before us, this may be considered as a neutral element; interposing no more obstruction to the establishment of a given motion than to its continuance, and requiring, therefore, exactly as much power to keep in subjection, if we may so speak, as originally to subdue.
4. But if friction be a force which does not regard the condition of motion, such is not the case with the resistance of the medium, which yet remains to be noticed. Unfortunately, however, for Mr. Henson’s hypothesis, this force really pursues a directly opposite progression, being absolutely none or of no effect in the first induction of motion, and increasing in intensity and requirement of power in proportion as it is more fully developed. It needs no laboured comment, therefore, to point out how little colour the consideration of this force is calculated to give to the principle which Mr. Henson’s contrivance is intended to set up. And this completes the list of all those elements of opposition which are called into play in the process of investing a body with a given rate of motion. There are, it is true, other forces, or as they may be more properly termed, accidental conditions, by which a body may be detained at rest against the exercise of a greater power than would be competent to continue it in motion after they had been overcome. If a cart heavily laden, for instance, be left standing for some time upon an imperfectly hard foundation, the wheels will create for themselves a rut out of which they will require to be extracted with a degree of force, the necessity for which is then immediately dispensed with: or if it has to be dragged over such a kind of road, the retardation of its course affected by the depression of its wheels, which is greater the slower the rate, indicates the necessity for an accession of force to bring it up to a rate of motion in which this condition is overcome, when it may, without prejudice, be discontinued. Again, an object may be so circumstanced as not to be able to exercise its means of propulsion to equal advantage in the beginning as in the subsequent stages of its progress, and may therefore require the employment of a greater degree of power to acquire than to maintain its destined condition of velocity; as exemplified in the case of the larger birds labouring to ascend from the ground, where the height of their bodies not permitting the full action of their wings, they are obliged to make up the deficiency by the more forcible and frequent repetition of the stroke, producing that appearance of disproportionate exertion which has contributed to maintain, if not to suggest, the delusion implied in Mr. Henson’s expedient to supply the inherent deficiency of his moving power. These, however, are all obstructions of a kind which do not enter into the constitution of the forces with which the aerial machine upon Mr. Henson’s principle has to contend. These forces, with which alone we have any concern, are simply those enumerated above, of which we have seen there is not one that offers any more opposition to the induction or establishment of a given rate of motion than it does to its continuance, and consequently imposes no obligation in respect of power to begin with, that it does not equally exact during the remainder of its career.

Had we had to deal with the contrivance proposed by Mr. Henson alone, we should not have had occasion for all this elaborate investigation in order to prove its insufficiency for the purpose ascribed to it. The force acquired by a descent, however accomplished or applied, must be assuredly inadequate to the production of any effects that could extend to a condition of elevation superior to that from which it had originated; as might be concluded at once from a consideration of the properties of the pendulum, which, in so far as regards the influence of gravity in communicating motion, is a parallel case with that which we are supposing before us. But here the parallelism ends; nor can any inference be drawn, as so confidently contended for (see Mechanic’s Magazine, &c.) from the continuance of the motion in the one case to its continuance in the other by the instrumentality of a power inferior to what is required for its original establishment. The pendulum is not, in fact, kept in motion by a power at all less than that by which it has been started, as a little consideration will evince. The force which puts the pendulum in motion is that employed in raising it to a certain height, from which it is allowed to descend by its own gravity. In this descent it acquires a force which would be equal to the original, and by which it would be carried up to an equal height on the other side, and thus reciprocate the movement without extrinsic assistance, were it not for the resistance of the air it encounters, and the friction of the parts in contact by which a part of it becomes expended or consumed. This portion is supplied by means of a spring. But it is not the spring that maintains the movement of the pendulum, but the attraction of gravitation conjointly with it, which together are exactly equal to the original impulse. Here, however, is nothing analogous to the case of Mr. Henson’s machine, acquiring a momentum by means of a single descent down a plane, not to be repeated, and unprovided with a power equal to the counteracting forces, the friction and resistance of the air, with which it has to contend.

Having now conducted our readers through the maze of this intricate, but we trust not uninteresting nor profitless inquiry, we would conclude with a few observations touching the prospects of that “consumption so devoutly to be wished for,”—the establishment of a successful mode of navigating the skies. One thing is clear: that, upon the principle of the plan we have been investigating, it is totally out of the question. The obligations imposed by the necessities of support, are of so exaggerated a character, that by no modification of construction, or application of new resources, can it ever rationally be expected to fulfil them. In an early part of this analysis we had occasion to point out the conditions in subservience to which these obligations are imposed. We there showed that the circumstance upon which the difficulties of the case really depended, was the relation of the weight of the machine to the superficial magnitude of the suspending plane, whereby alone the rate of progression was ascertained, to which all the requirements of power are ultimately referable. By a reduction of the one or an enlargement of the other, therefore, is this principle solely improvable to the attainment of the success; and that, to an extent which a retrospect of past experiments and a general consideration of the nature of the case alike evince to be far beyond the reach of art to accomplish. Referring to the process by which the calculations in the preceding table may be applied to determine the conditions of flight assignable to other machines of the like principle, as detailed in the note annexed, it will be seen that the smallest sized surface which could be made effectual to support the weight of Mr. Henson’s machine, with the exercise of Mr. Henson’s power, taking it at the greatest, would require to be upwards of 100,000 square feet in extent; or somewhat more than 22 times the area which Mr. Henson has provided for the purpose. Nor can any argument in contravention of this conclusion be drawn from the proportion between the weight and superficial magnitude of the wings of birds, upon which so much reliance is wont to be placed by those who have hitherto written upon the subject. There is, in truth, no analogy whatever between the cases; neither consequently can any inference be legitimately drawn from what is effected in the one to what is possible to be effected in the other. The weight of birds in proportion to the size of their wings, may or may not be as great or greater than that attainable by art as between the weight of the aerial machine and the superficial contents of the suspending plane. Their purposes are entirely distinct, and accomplished through the intervention of essentially distinct properties. The bird possesses a power of infinitely increasing the reaction of its wings by their voluntary impact, which the rigidly suspended plane is devoid of, and which, by affording a compensation for any deficiency of size, neutralizes all arguments founded upon a consideration of the relative proportion of weight, and removes the case out of all analogy with the machine constructed upon the principle of the plan before us.

Disappointed, therefore, in our expectations of success in this quarter, it may be asked, whether are we to direct our attention in order to discover the means of solving this perplexing but still interesting problem? The answer will most naturally suggest itself from a consideration of the circumstances to which the failure of all the attempts to navigate the atmosphere by mere mechanical impulse, the present among the rest, is entirely to be ascribed. These circumstances we have already specified in the exaggerated nature and amount of the obligations of support, occasioned entirely by the tenuity of medium and the force of gravitation; in the depth of which we feel no hesitation in declaring our opinion, no process founded upon simple mechanical reaction ever can succeed; for even
if it were possible to contrive and construct a system of machinery by which the force required could be accomplished and applied, the violence with which it would have to operate in order to effectuate its purpose, (admitting its practicability,) would be such as to preclude the possibility of its employment.

To the balloon then, as affording the legitimate and only probable means of grappling with these difficulties, are we naturally referred; and that, by its means, success could be attained to such an extent, as to satisfy the scruples of the most incredulous, we are fully prepared to prove; not by the proposal of any crude and complicated contrivance, the operations and effects of which are neither defined nor definable, neither adjusted by the strict laws of science, nor reconcilable with practice, but by a mode at once simple in the extreme, susceptible of an examination as critical and close as that with which we have been sifting the scheme before us, and above all, answering the obligations imposed upon it by means so far within the limit of its attainments, as to leave no doubt as to its ultimate success, in some degree corresponding with the purposes which it might be expected to subserv. Thus, should our readers still continue to feel an interest in the subject, we may take an opportunity of laying before them upon a future occasion.

A SIMPLE METHOD OF COMPUTING THE SPHERICAL EXCESS, WITHOUT THE AID OF LOGARITHMS.

By OLIVER BYRNE, late Professor of Mathematics at the College for Civil Engineers; author of "The new and improved System of Logarithms," "The Doctrine of Proportion," "The Practical, Complete and Correct Gauger," &c.

Although Professor Dalby’s rule for calculating the spherical excess is simple, yet in many instances it is inconvenient, especially when logarithms are not at hand, or when the tables are limited; moreover, when the radius of curvature at the place of observation is greater or less than 365154-6 X 57-2957795 feet, a more appropriate constant logarithm than that given by Dalby might be used. However, it will be found in practice, that the spherical excess can be determined in all cases, by the method here explained, in one half the time usually employed to find the corresponding difference to the logarithms mentioned by Dalby, (of which we shall speak by-and-bye,) and therefore the trigonometrical surveyor will in this particular calculation economise one half his time, at least.

The following table will be sufficient from 90° down to -831. of a second, and can be increased or decreased at pleasure by multiplying or dividing by 10, if this range be not extensive enough; the change is easily effected by increasing the number of perpendicular lines to the right and left of those already drawn. Such an alteration may be necessary in speculative inquiries, but can never be required in practice. This method of calculating the spherical excess, which depends on the succeeding table, may be better explained by a few examples than by a written explanation.

EXAMPLES.

I. The area of a triangle is 1764724375 square feet; what is the spherical excess in seconds?

<table>
<thead>
<tr>
<th>Area</th>
<th>1764724375</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nearest in the table</td>
<td>1697710640</td>
</tr>
<tr>
<td>Remainder</td>
<td>67013735</td>
</tr>
<tr>
<td>Next nearest in the table</td>
<td>63664149</td>
</tr>
<tr>
<td>Remainder</td>
<td>3349586</td>
</tr>
<tr>
<td>Next from the table</td>
<td>2122138</td>
</tr>
</tbody>
</table>

Therefore the spherical excess = 0° 831.

II. Suppose that in the trigonometrical survey of Ireland, under the superintendence of Colonel Colby, the county of Wicklow, which occupies 2106496558 square feet, to be taken up with one large triangle, what would be the spherical excess?

<table>
<thead>
<tr>
<th>Area</th>
<th>2106496558</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nearest in the table</td>
<td>2122133506</td>
</tr>
<tr>
<td>Tenth of seconds</td>
<td>5651183582</td>
</tr>
<tr>
<td>Hundredth of &quot;&quot;</td>
<td>128472092</td>
</tr>
<tr>
<td>Thousandth of &quot;&quot;</td>
<td>1143754</td>
</tr>
</tbody>
</table>

The area is therefore determined.

III. The lengths of the chords of a spherical triangle on the surface of the earth are 18, 14, and 15 miles respectively; the area of the triangle formed by these chords is 2341758504 square feet, (which may be taken as the area of the corresponding spherical one, on account of the sides being very small compared with the radius of the earth.) The three angles of the plane triangle are 53° 7' 45" 338, 59° 29' 23" 136, and 67° 22' 45" 506, required the spherical angles.

<table>
<thead>
<tr>
<th>Plane angles</th>
<th>53° 7' 45&quot; 338</th>
<th>59° 29' 23&quot; 136</th>
<th>67° 22' 45&quot; 506</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>2341758504</td>
<td>2122133506</td>
<td>1143754</td>
</tr>
<tr>
<td>Tenth of seconds</td>
<td>5651183582</td>
<td>128472092</td>
<td>1143754</td>
</tr>
<tr>
<td>Hundredth of &quot;&quot;</td>
<td>128472092</td>
<td>1143754</td>
<td></td>
</tr>
<tr>
<td>Thousandth of &quot;&quot;</td>
<td>1143754</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1° 108 seconds</td>
<td>2341758504</td>
<td>2122133506</td>
<td>1143754</td>
</tr>
</tbody>
</table>

In this example the excess is distributed equally among the angles, because there is no reason to believe one of them to be more erroneous than another. But if one of the angles be suspected to be less correct, or less to be depended on than the others, to this angle must be applied a greater or less portion of the whole correction, according as it is thought to be in excess or defect.

Dalby’s Rule.—From the logarithm of the area of the triangle taken as a plane one, in feet, subtract the constant logarithm 932077377, and the remainder will be the logarithm of the excess above 186°, in seconds, nearly. By this rule let us work the second example just given:
Logarithm of 21986496588 = 10.3421561
Constant logarithm = 9.3567737
Logarithm of 10^7 = 1.0153824

Daly's rule, from the simplicity of the wording, and from the few figures exhibited in the operation, appears to be more convenient in practice than the one which we have given as an improvement, but this is not the case: for to find the logarithm of 21986496588, or the number corresponding to 10153824 from a table of logarithms, will employ more time than the complete working of the problem by the method here proposed, which may be thus investigated.

Let E be the area of a triangle in square feet; \( r = \) the radius of curvature at the place on the earth's surface where the triangle is situated, and \( A, B, C \) be the angles of the triangle considered as spherical, reckoned in degrees and decimal parts of a degree. By the well-known theorem of Gerardi, \( 2E = 4 \pi r^2 \left( \frac{A + B + C - 180}{360} \right) \) (A)

Suppose the triangle to be one employed in the trigonometrical survey of England, then the length of a degree may be considered equal to 60859.1 x 6 feet, without involving much error. Therefore the circumference of the globe to which this triangle is supposed to belong = 360 x 6 x 60859.1, and \( r = \frac{360 \times 6 \times 60859.1}{2\pi} \)

\( 2E = \frac{360 \times 6^2 \times (60859.1)^2}{2\pi} \times \frac{A + B + C - 180}{360} \)

\( 2E = \frac{360 \times 2E}{A + B + C - 180} \), which we shall call \( \pi E \), or the spherical excess in degrees and decimal parts of a degree, which when reduced to seconds will stand thus:

\( 3600 \pi E = \frac{3600 \times 2\pi E}{(60859.1)^2} = 180 \times (60859.1)^2 \)

\( \pi E = \frac{E}{(60859.1)^2} = \frac{E}{(21986496588)^2} \) (B)

but \( 182577.9 = 15707963 \)

It is evident that Daly's rule is in error when half the length of a degree is greater or less than 182577.9 English feet in the place where the triangle is measured; for by putting (B) into a logarithmic form we have Daly's rule. But the constant divisor or its logarithm can be readily attained by substituting (B) for 182577.9 feet, half the length of any other degree in feet. However, the difference must be very great when the spherical excess is effected, of such triangles as occur in practice.

LIFE OF SIR DAVID WILKIE.

Poon Allan Cunningham! he had a poetical imagination and a grateful heart. He never forgot an obligation, and felt every kindness so warmly, that it was natural he should overestimate his friends who were interested in his welfare; he loved Sir Walter Scott, he adored Chantrey, and believed Wilkie (if the truth were confessed) to be greater than Raphael. The basis of biography is fact, bare, naked, disinterested, unqualified, undistorted, unpoeticized, unexaggerated fact. Unless all the facts connected with the character described be correct, the conclusions must be false, and confidence destroyed. I fear the manufacturers of reminiscences, conversations, and biographies of late years have not been remarkable for adherence to this essential principle.

"When Foote tells me a story," said Johnson, "it makes me laugh, but it passes from my mind from its falsehood; when Reynolds tells me anything, I have an idea the more, for I know it to be a true representation of nature." Let every biographer print these words in letters of gold over his study door, and let him read them with attention whenever he feels inclined to give his imagination the reins at the expense of his understanding.

It may be said of all Cunningham's lives of artists that there is scarcely an anecdote told of any of them which happened in my time, which is not so poetically treated as to amount to a misrepresentation, though nothing was further from his desire or his principle. In the very first volume he states Wilkie was refused admission into the Academy of Edinburgh by Mr. George Thompson, and I, as well as others, felt the injustice as well as ignorance of Mr. Thompson. Now Mr. Thompson is alive, and luckily he is so, and he has given, in the Morning Chronicle, a flat contradiction to the assertion, and says it is "not true." Sir George Beaumont told me Boswell would race the town for days to ascertain the correctness of yes or no; as Mr. Thompson was alive, it was Mr. Cunningham's duty to have ascertained the fact, before he made so unjust an attack on a very worthy person.

No, 8, Norton Street, says Cunningham, was Wilkie's first residence, then a coal shed; now it was not a coal shed at the time, 1806, but a little front parlour! Wilkie's bed-room, sitting-room, and painting-room, and there he painted the Village Politicians.

He says again: something of Wilkie's reputation preceded him to London, for Jackson wrote to Haydon, &c. then in Devonshire. We never heard a word of him till he came to the Academy, and when he came, Jackson wrote to me. "Touched with Jackson's letter, Haydon came to London and went to the Academy. Wilkie, the most punctual of mankind, was there before him," says the author. Now Wilkie did not come the first day at all, and the next day not till near one—one hour and a half after his time! Because he painted to get his living, always before he came to the Academy, and Jackson, whom Lord Mulgrave maintained, and my father maintaining me, enabled us to be much more punctual than Sir David.

"Haydon," says Cunningham, "is an admirer of the grand style; but Wilkie, with a wider reach of mind, used to argue, "that though the rose excelled in beauty all other flowers of the field, we were not to despise the daisy, which had a loveliness of its own." Very like Wilkie's conversation. I imagine my dear old friend at that time, pale, thin, shrewd, legal, unpainted and cold, talking in the prose of Fifeshire, severely understood in Auld Reekie, alluding in a strain of poetical language to the comparative beauty of the rose and the daisy! A wider reach of mind, too! So that I, who was devoted myself to see nature in the abstract, to clear the essential from the superfluous, and restore man, woman, and animal, to the essential properties in form of their respective species, as their great Creator sent them forth in Paradise to increase and multiply; I—who was thus fitting myself first, to master them as a species, and second, to put them in actions and expressions, to convey high moral lessons, to inspire the youth or elevate the country—was not of so wide a reach of mind as David Wilkie, who took man, woman, and animal as accident, disease, or dress had distorted them, painted them as they were in their humblest moments, without reference to moral objects at all, without relation, without abstraction, without choice!

He talks, too, very much of the smart pert students of the Royal Academy of that time. Except one poor fellow who is now insane, there was not a pert or smart student there—and the most loquacious, the most whispering, the most disturbing arguing student that ever lived, to whom we were all obliged to cry "Silence" repeatedly, was Sir David Wilkie. Wilkie was remarkably fond of loud whispering arguments, touching away with his port-crayon as he talked. "In my mind's eye, Horatio, I see him now." As to pertness, who was pert? Were Collins, Jackson, Mulready, Hilton, Pickersgill, Etc, and myself, were we pert?—we were the students, and our present station is an answer to such absurdity.

Page 76, Vol. I., he says, "Haydon was invited to breakfast; he knocked—a voice said 'Come in'; and he found Wilkie partly
naked, drawing his left knee." The fact is, I found Sir David stark naked as ever he was bared, sitting on the edge of his bed, with a glass, drawing. "Wilkie," said I, my heavens, where am I to breakfast?" Without making a reply, he put his port-crayon to his mouth to wet his chalk, and said without moving, "It's just copical practice, let me tell ye." "I'll take a walk," said I; and after a walk I found the room aired and bed turned up, and a good breakfast. It is astonishing how remarkable men are for particulars to impress you with an idea they are exceedingly correct, when they are not sure of it. The left knee! why not the right, why not both—and half of the right ankle—and four of the toes!

So idle and loquacious was Wilkie sometimes, that one evening when there was nearly dead silence, Fuseli reading and nothing heard but the scraping of charcoal, Wilkie sent over to me some verses on his friend Crotch, the whole gist of which was doggerel rhyme such as,

My dear Mr, Crotch,
Your name I won't pock-at.

I added a couple, and it went nearly all round, and before it got half way, the students were chocking with laughter. Fuseli looked up two or three times with the light shining on his white lion head, in a suppressed fury. We went on drawing in an hysterical agony, to keep up with which our lips, and keep our faces sedate, I nearly burst a blood vessel. I believe I have the verses now. It is such nonsense, for biographers to talk as if their hero had none of the follies of life.

All the account of the journey to Devon, 1809, is a perfect absurdity. It seems Cunningham must have skimmed the journal in his usual careless manner. The facts of this journey are as follows. Whilst we were dining at the Admiralty, Lord Mulgrave, the first lord, asked as how we were going? I replied by sea. His Lordship said, Would you like to go in a man-of-war? We were delighted, and he told General Phipps at table, as he knew Curtis, the portrait-Admiral at Portsmouth, to give us a letter to put us on board any man-of-war sailing to Plymouth! Away we went in high glee, to Portsmouth; we dined with Admiral Curtis, a fine old veteran, of the siege of Gibraltar; there we met our friend Colin Mackenzie, then agent for Russian prisoners. As the Walcheren Expedition was collecting at Portsmouth, the men-of-war were coming up, so there was no chance, and we took our passage in a coaster; but just as we were going, Admiral Curtis came to the inn, and said, "all ye put up with a cutter?" "Certainly; a cock-boat in her Majesty's service," said I and Wilkie. "A cutter is now under weigh," said the Admiral; "I'll telephone her." In a few minutes, Moody, the commander, was in the Admiral's office, and Wilkie and I were put under his charge, as two very great men. Wilkie lay on his back in horror all the way, and so insensible at times, that a Firondo was fired over his very face, and he never heard it.

We arrived at Plymouth, my native town, in great glory, from whence I had issued five years before, an obscure youth, and were Landed by Moody, in full state, as if we were bullion for the treasury! Happy days! Moody was afterwards drowned, a gallant British seaman. I remember Sir David, hearing us all laughing, put up his head through the hatchway; he had a red nightcap, which with his pale face, was a picture; but before I could sketch him, he dropped, as if shot, below, nor did we see him after!

Cunningham says, he visited the Haydon, the Eastlakes, the Northeaters. Nonsense! He was my guest at my father's for a month; I introduced him to the Eastlakes. The author calls Sir William Elford, Sir Richard, but that is nothing. Wilkie made beautiful drawings of my father and my sister—Cunningham says, it was only of my sister, but that is nothing.

It is a curious instance of Wilkie's caution—I never knew he kept a journal, and he told my sister he did not. I have travelled with him, lived with him on the most intimate terms one man could live with another—he saw me at Paris put down my thoughts on art every night before going to rest. Wilkie told me he did not see its use, and after shaking hands and wishing me good night, must have gone to his own bed room, and done what I did not do, put down his remarks on me, and kept his journal of what his friends said or did.

It is extraordinary, also, to see how completely he agreed with me on the nature and evil of modern colour. He sneers, in his letters, at the pink and raw reds and yellows of the season—he asks what colour is the go for the spring? Page 300, vol. II, when speaking of Titian's superb Pietro Martyre—"this being the day on which the exhibition opens, one can scarcely view this great work but in contrast, being almost an example of all that is the object of an artist to avoid when painting for that arena." 310—"One year is very like another at Somerset House! What Sir Joshua wrote and Sir George talked was right—and I am not now to be talked out of it." Again—"With us, you know, every young exhibitor, with pink, white, and blue, thinks himself a colourist like Titian." "I saw at Florence his Venus, his flesh (O! how my friends would stare) is a simple that, completed with red velvet." 417—"Reynolds' portrait at Florence has never cracked, and has never been varnished." At vol. III, page 12—"I painted up at once, a custom quite denied in modern art." Would any believe that I have painted up at once all my life while wet—that I had prepaid this doctrine to Wilkie all my life—that he did it at first, gave it up, then went abroad, began it again, and talked of it as a discovery! Thus, after going to Italy, he comes to the same conclusions as Sir Joshua, Sir George, and Gainsborough, on the evil of want of tone.

To conclude as I began, on the exaggerations of this life; the author says, page 484, vol. III, the artists gave Wilkie a dinner in 1806, in honour of the Politicians—that one of the set made a speech, and said "let us do honour to genius, but before, we must honour justice and cease justice be honoured, while England groans from side to side? I give the toast which will set all right, a full, free reform of the House of Commons." "Ah, but very moderate," said Wilkie, and empred his glass. It was long remembered in Wilkie's protest. What are the facts as follows: First, no dinner was given to Wilkie in honour of the Politicians' fame. It was in 1810 this was said, and not 1806, at my table, when John Scott, Mr. Otley, and Wilkie dined with me, and when all were in high glee; John Scott said, "let us drink Reform." Wilkie said, "No, no—I mustn't," we appealed to his courtesy, and Otley filled Wilkie's glass; he drank his wine to the dogs, and "success to Reform;" but frightened out of his life, turned round, and in a subdued tone said, "Very moderate, remember." We plagued him the whole night; and Otley threatened to write to the ministers, which put him in perfect horror. It was all joyful fun, knowing the man. This is the way lives are written, and facts perverted—speeches invented, and absurdities told.

With all these careless inaccuracies, which could have been all remedied by proper inquiry and revision, and which the author would have done had his life been spared, it is a most interesting life and ought to sell well. It has occurred to me as a curious question, why Vasari's lives are sold throughout Europe better than any other painter's lives, and the reason is, they are not exclusively professional, though a whole code of technical practice can be ascertained from his occasional technical allusions, both on fresco and oil, execution and colours; but I will venture to say if these utilities had been their only merit, they would have been unread, except by artists all over the world. Not so Vasari; he had more sense. Every man can read his lives and be amused, because he mixes up all the vices, virtues, follies, and tricks, characteristic of each artist. We know Michel Angelo, and Raphael, and Jusepe Romano, and Titian, as well as if we had lived with them; he tells us all sorts of anecdotes of their private lives. Fuseli used to say to me, "What have we to do with their private lives?" I used to reply, "Every thing." It is these touches of human character in every painter, the humour of Buffalmacco—the violent temper of Michel Angelo—the savvy of Raphael—that interests the unprofessional man, the general reader, and have kept Vasari the very Bible of painting, and ever will. Whereas in the lives of Fuseli, Laurence, Reynolds, and Wilkie, each in succession, is but a dry detail of professional correspondence, from which one retires harassed, disgusted, and sick; and after being published by
bookseller at a great expense, lie on our shelves after the first excitement, and are never referred to either for instruction or entertainment. Every painter’s life could be made as delightful as a novel.

In spite of all these defects, this life contains a great many useful things. Sir David Wilkie greatly overrated the value of going abroad—did serious injury to himself, and injured two of his friends, who got into a style, neither English or foreign, to the ruin of either style; he was apt to have serious hallucinations of mind, and whilst they lasted he was perfectly sincere, but if he seduced inferior minds to follow him for the time, it was likely, before the next season, he would startle them by running down with equal enthusiasm what the year before he had so earnestly worshipped! But he was a kind friend, a good brother, a dutiful son, and a high moral character. He founded our domestic school; and if ever man left this world fit to appear instantly before his Maker, it was David Wilkie.

B. R. Haydon.

LONDON AND BIRMINGHAM RAILWAY.

ROOF OVER THE LOCOMOTIVE ENGINE-HOUSE, AT BIRMINGHAM.

(With an engraving. Plate X, drawn to a scale of 2 inches to the foot, and the enlarged parts 1-inch to the foot.)

This building was erected about five years ago; it is a polygon of 16 sides, and was originally covered by a roof having an open area in the centre; but this being found not to afford sufficient protection, from the inclemencies of the weather, to the men employed about the engines, the roof was removed during the autumn of last year, and replaced by another, the construction of which is shown in the accompanying engraving: it is simple, and at the same time an excellent combination of timber and iron.

The ring of columns and connecting girders, (shown in enlarged part C,) used in supporting the old roof, was retained for a similar purpose in the new one. On reference to the engraving, it will be seen that the roof is supported upon this ring, and upon the exterior walls of the building. The thrust upon the walls is neutralized by the tie rods c, which connect the head of each column fig. C, with the shoe of the opposite rafter fig. A. Upon the head of the column is fixed the stanchion b, which carries the curved brace c, these, together with the strut d, all of which are of cast iron, form the point of support for the rafter.

The heads of the rafters meet in a cast iron curb f, shown in the enlargements E, upon which the lantern F, is erected; this curb is cast in eight portions, and firmly bolted together. The plan of soffit of the lantern is shown at G, and the junction of tie bars at the foot of the ring bolt at H.

The cost of the roof is as follows:

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1795 cubic feet of Mamelur, edges chamfered, at 4s...</td>
<td>359 0 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1104 squares of 1-inch deal boarding, the edges shot, underside coloured in distemper, at 40s...</td>
<td>221 10 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1094 feet run of hip roll, at 4d.</td>
<td>15 4 8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>640 feet super. gutters and bearers at 1s.</td>
<td>32 0 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1248 feet super. 2-inch bevel bar sky-lights, glazed with British sheet glass in large squares, at 3s.</td>
<td>187 4 8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>160 feet super. 2-inch wrought boards, at 1s.</td>
<td>5 0 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>134¼ squares Duchess slatting, copper nailed, at 30s.</td>
<td>201 15 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 tons of lead, at £25.</td>
<td>232 0 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 tons of cast iron, fixed, at £10.</td>
<td>250 0 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>44 tons of wrought iron, at £22.</td>
<td>99 0 0</td>
<td></td>
<td></td>
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<tr>
<td>1103 yards painting four times in oil, at 1s.</td>
<td>58 3 0</td>
<td></td>
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CANDIDUS’S NOTE-BOOK.

FASCICULUS I.

"I must have liberty
Withal, as large a charter as the wind,
To blow on whom I please."

I. Our Note-Book is getting old—it has reached its Fiftieth Fasciculus; no matter—provided it has not actually fallen into its “sere and yellow leaf,” and does not begin to exhibit symptoms of dotage. No doubt there is a good deal of repetition in it—much that is nearly, the same in substance has been touched upon again and again; yet not, I conceive, needlessly so, because it is only by their frequency that similar “morsels of criticism,” can be expected to make such impression as to be of real avail. It may, perhaps, be said that the criticism itself becomes in time a bore; and so, indeed, it would, were every one else also to deal in it after the same fashion, and just in the same strain. But people have no reason to complain as yet of being overburdened with architectural criticism, except of a respectively tame and stale kind.

II. What a sad pity it is that Klenze did not come over to this country and take a lesson from the Hanging Committee at our Royal Academy, before he fixed his plan for the arrangement of the busts in the Walhalla. They would have shown him how feitly he might have packed together as many thousands of them as there can now be hundreds, by having a row of them upon the floor, and piling up the rest upon shelves to the very ceiling. No matter whether seen or not, provided the things be but there. Our Academy seems to be of opinion that the nearer the ceiling the further out of harm’s way, and out of the reach of criticism; and it would be well were some of them to exalt their own works so high aloft, that the most lynx-eyed critic could never make them out. Turner, for one, would show great judgment in doing so, because then we might fancy there was some meaning in his daubs and blotches. By the bye, what does Turner do with such things? he can hardly make use of them as waste paper yet some of them look very much like it.

III. Would that columns could be melted down as well as cannons, because were that possible, something might yet be made of the gigantic stone post, stuck up in Trafalgar Square, and which now seems to be sticking quite fast. The Athenaeum tells us “it is still intimated that it will one day be completed,”—perhaps at the Greek calamities, for that day does not seem likely to come in a hurry. In the interim, therefore, the scaffolding might as well be taken down, in stead of letting it rot to pieces, as it undoubtedly will do, if kept up until the work is completed, for by that time the column will probably have become a venerable piece of antiquity. In its present state, it is quite monument enough—a sufficiently significant one, and strikingly indicative of the sort of intelligence and taste which presided over the whole affair. If a column was deemed the most preferable form, upon the whole, for the monument, it should at least have been one of original and imposing character—a fine conception, treated in a noble style, whereas the thing now stuck up will inevitably have a puny look, and will be both lanky and top-heavy, the mass of the Corinthian capital being especially unsuitable for a detached column which has nothing to support—and considered with reference to the shaft and capital, the statue becomes tantamount to nothing, except there be some latent and malicious meaning in it, intended to make evident to us the littleness of the greatness that is stuck up above the heads of the rest of the world. If we had had nothing of the sort before, a column of the kind might have been welcome as a novelty—and for that very reason, perhaps, would have been protested against, as something remarkably fanciful and strange; but we have already so many examples of them stuck up all over the country, and all pretty much on a par as to insipidity, that it would be more desirable to get rid of some of them, than to add to their number. What all those bits of architectural trumpery may have cost it would be fearful to compute, but no doubt as much as we have had sufficient to erect one or two edifices that would really have been genuine monuments of art—an honour to the nation and to the age.
IV. Who is this "Aunt Elion," who has just started up as a female professor of architecture, in the hope, it would seem, of being able to lecture ladies into a love for the study of the art? The idea itself—which, by the bye, she seems to have borrowed, or rather stolen without acknowledgment, from Wightwick, is surely a most preposterous one, since what occasion can women possibly have for understanding anything of architecture? or are they even capable of attaining to any intelligent knowledge of it? Are all our studies to be invaded by the present Amazonian race of females? or is their ambition insatiable? Already have they mastered all our <i>olgies</i> and all our <i>onomies</i>, and now, forsooth, they must attack what we have considered an impregnable forte—architecture—though, to confess the truth, it is not every one who has displayed any particular <i>forte</i> in it. Surely the ladies might be content with the plunder they have got from us—among the rest, geology, a study remarkably amusing, and to them most particularly useful. But architecture!—oh no! we must not allow them to come poaching upon that preserve. What would become of us <i>he-creatures</i>—professors and all, should it be discovered that women could attain to any competent knowledge of architecture as a fine art—and perhaps be able to design a classical portico just as easily as they can be a handkerchief? No, instead of admitting women, we rather want to get rid of some of the "old ladies" of the male sex, who are actually in the profession. Still it must be admitted that a very great deal may be said on the other side of the question; nor is Aunt Elion's idea so very preposterous after all. Women, it may be presumed, are fully capable of appreciating what, in its quality of a fine art, apart from the science and mechanical skill required for the practice of it, addresses itself so much both to the eye and to the mind, and exercises the judgment as well as the fancy. They ought to be able to feel all its harmonies of proportions and combinations, and to note all those delicate minutiae and subtle coquetries of the art, were they but sufficiently instructed to understand them, and know in what they consist. At present, indeed, such is not the case, because architecture has a language of its own, which must be studied before its productions can be read or relished. If there be such a thing as all as poetry in architecture, <i>that</i> surely can be felt, and not only felt but as distinctly and with as clear a perception of the immediate causes of it, by one sex as well as the other.

For my own part I am inclined to think that those ladies but to apply themselves to the study, they would in general make far better critics in all matters of architectural taste, than men do. Hardly would they pardon those negligence and that slovenliness which are now so frequently drawbacks on what are in other respects designs of considerable merit.

What an encouragement, too, it would be to architects themselves to know that their works could be intelligently appreciated by judges of the other sex—whose suffrages, as matters are now, they consider quite valueless, and their praises merely empty compliments, flattering to the ear, yet meaning nothing. Let the study of architecture be taken up by ladies, and by educated persons of the other sex, and instead of being as at present considered an exclusively professional one, it would acquire a degree of popularity that would have a most beneficial influence on the art itself. To say that because such persons can study it only partially—<i>only</i> as a fine art and for its history as such, that they therefore ought not to attempt to study it at all, lest they should be sneered at, perhaps, as mere dabblers and pretenders, is manifestly absurd; or at any rate it ought not to be expected by professional men, that non-professional people should encourage it at all, since what can it matter to them whether the taste shown in it be bad or good? Why, in the name of common sense, should people be reproached for not paying due regard to, and not encouraging what they themselves are discouraged from attempting to study and endeavouring to understand? Even the ignorance of the general public may, however, have its advantages, and one of them is that a "<i>Pechant</i>" or a _______ will do quite as well for such a public, as a Charles Barry.
perfected throughout—must there almost always be something to operate as a drawback on our satisfaction, and to mar our enjoying what we might else admire? To mention economy in such cases by way of excuse, is no apology at all;—it is like buying a costly picture-frame and hanging it up empty, because you cannot afford or else begrudge the money to purchase a painting to put into it; and though it is done every day, it is a very strange kind of economy that induces people to spend their money merely, it would seem, to convince the world that they lack either the means or spirit to do handsomely what else there is no occasion to do at all.

Possibly, however—and we are willing to hope that such will be the case, it may still be intended to complete what is here begun, and that as a screen has been added to the house, a house will in due time be added to the screen—that is, a façade on this side, of corresponding character. If not, we can account for what has been done, only by supposing that the noble owner has built chiefly for the gratification of his own eyes—not so much with any idea of improving the appearance of his house—which now looks more insignificant than before, as for the purpose of providing a beautiful architectural object to be seen from his own windows, so that in fact he may be said to have followed Lord Chesterfield's advice, and erected a front "over the way" for himself to contemplate.

That the effect of the screen as beheld from the house must be very striking, and form quite an architectural picture, there can be no doubt, and not least of all when lighted up by gas at night. But then, besides that such consideration does not reconcile us to so much being left undone, by carrying out the ideas suggested by the screen, the whole space between that and the house might have been rendered a highly ornamental, though rather small court, whereas at present, it has no architectural character, or no more than what amounts to a sort of apology for something of the kind. Indeed, if nothing further is now to be done, it becomes a question whether it would not have been better to make the screen more of a screen than it now is, by filling up the intercolumns, for about half their height, with metal work of the same pattern as the gates. In this there would have been novelty, and certainly no inconsistency. There were, besides, many other ways by which the same purpose could have been accomplished, and as one of them we may mention that of adopting for a design of the kind, an order of square pillars instead of columns, raised not on a stylobate but merely a socle, with inter-columnar screens of masonry between them carried up to the level of the imposts of the archways: in which case the lamps would be placed on those screens, and these last might be embellished with bordered sunk panels (in the manner of those now over the two doors at the ends,) with reliefs, not in stone but bronze.

We have said nothing as to the absurdity imputed to the idea of a row of pillars or columns employed merely as a wall—at least as a wall with openings in it. The objections urged against it as being such, appear to us pedantical and hypercritical. Columns, we grant, were not originally intended for such purpose, but it does not therefore follow that a different application from the one originally contemplated must necessarily be bad in itself. Were such the case, we must abandon much that is now considered perfectly legitimate, and is tolerated, if not always admired. If, too, absurdity there be in using columns that support nothing but their own entablature—which then becomes the top or coping of the perforated wall described by those columns—how much more extravagant, and remote from the original purpose of columns must it be to employ them singly: and without their having anything at all to support, except it be a "black image" perched upon the top of the capital, yet not looking so much as if it had alighted from heaven, as if it had ascended from the infernal regions. If, therefore, we can endure absurdities of that kind, merely because antiquity has left us some precedent for them—of which, however, our modern copies fall very far short indeed—we may surely reconcile ourselves to what, while it is a degree or two less absurd and a less preposterous conceit, can hardly fail to produce a strikingly picturesque perspective effect, let the design itself, considered apart from such effect, be what it may.

CONSTRUCTION OF A BÉTON BRIDGE.

Description of a Bridge of Béton,1 constructed at Griselles, in the Department of Tarn-et-Garonne, in France. By M. Lebrun, Architect of Montauban.

Translated for the Journal of the Franklin Institute, from the "Bulletin de la Société d'Encouragement pour l'Industrie Nationale," for July, 1842, by Elwood Morris, Civil Engineer.

Living in a region where suitable building stone is scarce and expensive, and where brick masonry alone is used, M. Lebrun, guided by the works of Tavares, and applying to hydraulic limes, conceived the idea of substituting for this masonry the béton, which the Romans used with so much advantage.

In consequence, he submitted, in 1839, to the Minister of Public Works, the project of a bridge entirely of béton, which he offered to construct on the lateral canal of Garonne, to be traversed by many of the lines of communication and departmental services. This offer having been accepted, under certain conditions, M. Lebrun commenced his work in June, 1840.

The line was of the hydraulic quality, burnt in perpetual kilns, by pit coal. The sand was clear of all earthy particles, of fine grain, and pretty uniform. The gravel stones, of the size of a hen's egg, came from the river Garonne. The lime was slaked alternately in two lins, joined together. For this purpose, we poured at first, in one of the basins, a quantity of water proportioned to that of the lime which we wished to slake; we then put in sufficient quicklime for the water to cover it; then we left the lime to slake freely without disturbance, except by taking care to prick it, from time to time, with a stick, to introduce more of the water in the basin where the dissolved lime was dry. When the fermentation had ceased, we stirred up the lime in every direction with an iron hoe, in order to mix the paste, and render it homogeneous; we left it then in this state, not to be used for twelve hours after slaking.

The proportions observed by M. Lebrun for béton destined for the construction either of walls or arches, were, in every two parts composed of two parts of lime in paste, three parts of sand, and five parts of gravel stones, or pebbles.

For making the mortars, we placed, on a paved surface, two measures of the slaked lime, which, after having been well beaten with pieces of cast iron, softened again by yielding up a part of the water with which it was charged, then we placed beside it three measures of sand, which we mixed, little by little, with the lime, always having the aid of the pestles, and stirring the whole with the shovel and hoe, in order that all the parts of the sand should be well incorporated, observing not to put any water into the mortars, but, if the sand was too wet, we mixed it, a few moments before mixing. As soon as the mortars were sufficiently well mixed, and manipulated, we added five measures of gravel stones; the whole was then long and forcibly mixed and pounded, until each part of the gravel was sufficiently enveloped by mortar; then the bétons were taken in quantity, to wait for the moment of being used. We took care to make only what we could employ in a day's work, without which precaution it would have lost its cohesion.

The 15th of June, 1840, the excavation of the foundations of the two abutments being done, we commenced laying the béton, taking care, each time that a layer, or course, was finished, to cover it up immediately with wet mats of straw, to prevent a too rapid drying by the heat of the sun. By means of this precaution, the new course connected itself more intimately with the one below. We continued

1 The French béton is nearly identical with the English concrete, the main difference being in the manipulation; thus béton is composed of lime, sand, and small pebbles; or broken stone, taken separately, and successively mixed together, the mixture being then cast while green, and usually formed of lime, mixed directly with gravel, containing naturally about the due proportion of pebbles and sand; proper quantities of water being used, and the mixture thus strewing or walking on both being in effect the same. Béton, or concrete, has before been used in retaining walls and other constructions, and, as is stated by General Pasley, of H., B., & M. Corps of Engineers, in his admirable description of the parts of the Charenton Bridge (Chesson's Cements,) it was also applied experimentally to build a military casemate near Woolwich, of which the arch had 18 feet span, 2 feet rise, and 6 feet depth at the crown, and which, when erected, was distinguished for its freedom from damp, as the vertical change of 13 inches shells, loaded to weigh 200 lb. each, resisted both with success, and, contrary to expectation, was less injured by the latter, than by the former.

We must, however, observe here, that the failure of the concrete walls, at Woolwich and Chatham, in consequence of tidal exposure, and the necessary protection of the concrete sea wall at Brighton, with woodwork, to guard it from the action of water, mass, (as described by General Pasley,) points out the necessity of applying the construction of concrete to buildings, within reasonable and proper limits.
the masonry all of \textit{beton}, (the backing of the arch and abutments keeping pace,) until reaching the height fixed. The outer face of the abutments (not next the earth,) and of the walls, were formed by some planks strongly fixed, against which the \textit{beton} rested. These planks were removed, two or three days after, and the faces of \textit{beton} remained exposed, and were very well preserved.

At the height of the springing of the arch, we laid five courses of bricks placed on the faces of the abutments, to serve as perpendicular faces for the centre to fit up against, and enable it to detach itself easily.

\textit{Fifteen days after the laying of the last \textit{beton}, we commenced the construction of the centre, composed of many courses of bricks, laid flat, in succession, from the springing towards the crown, following the curve of the arch at the intrados, built partly with plaster, and partly with cement, or hydraulic mortar, and supported at the springing by projecting masonry, or by a timber for that purpose. The centre was formed of four courses of brick (in thickness, or depth, say nine inches; the three lower were laid with plaster, and the upper course with cement, to shelter the plaster from the dampness of the \textit{beton}. The upper bricks of the centre were covered by a bed of mortar or clay, in order to model perfectly the intrados of the arch, and to hinder the \textit{beton} from forming one body with the bricks.}

The construction of the centre being finished on the 17th of August, we established, three days after, the masonry of the two heads of the arch of brick, (in lieu of quoin stone,) which were completed on the 26th of the same month.

Immediately after the construction of the two heads, we brought them into the general mass of \textit{beton}, forming the arch; this operation was finished on the 5th of September, with the exception of the backing up, which was accomplished, on both sides, the 11th of the same month. The \textit{beton} of the arch was composed in the same manner as those of the abutments, and manipulated by the same process: but we added to it 2\textperthousand cubic feet of cement for every 3\textperthousand cubic feet, or 2\textperthousand of the mass, to augment the strength of the mortars of the body of the arch. This construction was made without following any regular order, and the \textit{beton} was cast up, upon the centre, to the thickness of two feet, which formed the first general bed, or layer, on the development of the arch. This first bed being finished, we formed the second in order to reach the thickness of three feet at the key, the spandrel backing, and the abutments being levelled up. A copying of hydraulic mortar was then placed over the whole extent of the arch, and covered immediately with a layer of clay, strongly beaten.

All was left in this state until the 25th of January, 1841; we then proceeded to the operation of the striking of the centre of the arch. The 25th of January, the centre of bricks was taken away, and the intrados of the arch a foot higher than in all its parts. After three months, it manifested not the smallest settlement in its masonry, and, since then, the bridge has stood through the summer, without incurring the least degradation capable of affecting its solidity. This bridge has a clear opening of 38\textperthousand feet between the abutments; the middle is placed in the axis of the canal, which has two towing paths; its breadth is 103 feet between the heads, or faces, of the rings; and the arch is formed of a segment of a circle of 39\textperthousand feet chord, and 32 feet rise, or versed sine.

The entire mass of a segment of the abutments is of \textit{beton}, except the four angles on the sides of the towing paths, which are of large stone, rounded on the jaws, on account of the rubbing of the towing lines. The arch is also of \textit{beton}, as are the faces of the tippets, or spandrels, and the intrados with the exception of the arrises of the soffit, or quoin of the heads, which are of brick.

M. Lebrun has joined to his memoir, along with a plan of the bridge of giradles, many certificates, from the mayor of this commune, and from the engineer of the lateral canal of the Garonne, proving the complete success of the works, and the solidity of the construction, which has endured the proof of the passage of loaded carriages, and the numerous influences of heat, and some very severe frosts, without having suffered the least degradation.

\textbf{OLD LONDON WALL.}

\textbf{A LETTER FROM MR. GEORGE GODWIN, F.R.S., &c.}

"Some there are who cry down the study of antiquity with much contempt, as too curious a search after what is past; whose authority as I shall not altogether slight; so I shall not much regard their judgment."  

\textbf{CAMDEN.}

On the west side of a vacant plot of ground in George Street, Tower Hill, and behind the houses in Trinity Square, stands one of the most considerable remains of Roman masonry (at least in consequence of the commencement of the fourth century,) and which for some time was considered of the utmost importance, and kept constantly repaired. As, however, the number and power of the citizens increased, they outgrew their shell, (it was but a small one,) and the inscriptions of barbarians ceasing to be frequent, this protection was considered of less and less consequence: until at last, as Camden observes, the Londoners slighted fenced cities, as fit for nothing but women to live in, and looked upon their own to be safe, not by the assistance of stones, but the courage of its inhabitants. Year after year has witnessed the gradual destruction of the remains of this ancient enclosure, until, with the exception of a bastion in Cripplegate Church-yard, the portion behind Trinity Square, of which I am about to speak, a continuation of it forming the back wall of Mr. Atkinson's hemp warehouse in Cooper's Row, and a few inconsiderable fragments to be found in the street to which it gives its name, it has been entirely swept away.  

The portion in question is also now threatened with destruction; and the object of this communication is in aid of other efforts which have been made, to induce those who have authority to reconsider the matter, with the view of avoiding this objectionable step if possible. It is intended to build a church on the vacant ground in George Street, with the special object of affording accommodation to the masters, officers, and seamen of the ships in the docks and the river: and it is considered that the site of the old wall is essential

\textsuperscript{1} For interesting particulars of the old wall, see Stow's edition of Strype's "Survey," chap. II. p. 7. Also Knight's "London," vol. I. p. 160.
for the satisfactory completion of the church." A memorial was presented to the Common Council from members of the Metropolitan Churches Fund, in February last, praying them to "grant permission for the removal of the materials of the wall, and to convey to Her Majesty's Commissioners, for building additional churches, the wall on which the wall now stands." This the Common Council granted; so that the fate of the wall is decided, unless those gentlemen in whose hands it is placed can be led to regard the subject in a fresh point of view. Their object is unquestionably an excellent one: far be it from me, even for the least impediment in the way of the wall's being taken to the Committee. The gentlemen who are interesting themselves in reflecting it are of undoubted character and worth, and I cannot help concluding that the proposal to destroy the wall was made in the first instance without serious consideration, and that now public opinion has been strongly expressed on the subject, other means will be taken to obtain the desired end. It is probable, that the plan of the tower of the old church will be altered so as to adapt it to the land already in their possession.

The length of the wall is 45 feet, irrespective of a part of it which forms the end of some adjoining premises: the height next Trinity Square is from 20 to 25 feet, and the thickness, as nearly as can be estimated, about 6 feet. In times less eminent for the preservation of ancient monuments than the present day, it was coped with brickwork, and strengthened at the northern angle, and is consequently in a tolerably good state of repair. It is faced on both sides with masonry in courses, (the interior being of rubble work) and shows occasional layers of Roman bricks. On the west side the facing is of brick, and the alternate courses are of a mixture of old and new, and the Roman bricks are few in number and very irregularly placed, so as to lead to the belief that it was reconstructed perhaps in the Norman period. On the other side, however, some vaults which adjoined the wall having been destroyed and the ground cleared away, a considerable portion is exposed to view—which is doubtless the original Roman wall, probably not less than fifteen hundred years old, yet still quite sound and perfect. The masonry is of broad squared stones, systematically bonded; and there are two or more continuous double layers of Roman bricks, agreeing precisely with other remains of the original wall described by various writers. Dr. Woodward, who examined part of the old wall in 1707, when some houses were pulled down in Breadalbane Street, measured the bricks in it very accurately, and found them 17½ in. long, 11½ in. broad, and 1½ in. in thickness. The bricks in the wall now in question, measured without remembrance of Woodward's dimensions, I noted as 17 in. long, and 1½ in. thick. The double layer, including the mortar between the bricks, measures altogether 4½ in. From the top of the lowest layer, or that next the ground, to the layer above it, the masonry measures 3 ft. 6 in.; from the top of this up to the next double layer, the masonry measures 2 ft. 7 in.

Of the value of this interesting relic of antiquity, the desirableness of preserving it as a portion of the past for the service of the future, I would speak strongly. Monuments of this description become of less esthetic value, naturally, as they are found to be of the greatest service when tracing those changes in our state and manners which time is constantly effecting. They are links in a chain which connects the present with the past—awakens of sentiment, silent teachers—of whom we have never been entirely without much after regret and condemnation.

"Past and future are the wings.
Upon support, harmoniously confused,
Move the great spirit of human knowledge.

The importance of the study of antiquity, notwithstanding some few apparent proofs to the contrary, is now very universally admitted. "It is the custom of men generally, and of that writer (if he has elsewhere ventured to remark,) to reward the labours of the antiquary with ridicule and contempt—to consider the investigation of a ruined building, the preservation of a piece of pottery, or the noting down of the manners and customs of past ages, as the mere idilities of a rather rare and ancient, and not very interesting kind of study. Such, indeed, have been the views of many, who, in their papers on ancient things, have purposely alluded to it merely as a matter of improving time. The value of the works of this class of men, is now, however, better understood, and therefore more duly appreciated. Through the exertions of these "mussy" antiquaries, the civilized world is able (if we may so speak) to look back upon itself, and contemplate its past greatness, its achievements, its actual strength, which has endured, the sciences which were understood, and its consequent position of the people, at various periods of its age; and that, too, not merely in the accounts of contemporary and succeeding writers, but in the very results of these arts so practised—in the coins used; the dresses worn; the furniture employed in their houses; and the buildings raised for ecclesiastical, for warlike, or for domestic purposes." 2

The architecture of a people especially, offers important evidence, in the absence of written records, towards the elucidation of their manners and customs. As on this point the French and British, however, are most important—for it speaks plainly of the state of society at each particular period, and hints at the degree of knowledge possessed by individuals, or by the people at large. As the comparative anatomist can from one bone determine the size, the shape, and the habits of an animal, which he has neither seen nor heard of, so may we almost discover, from the ruined buildings of a people, their prevailing habits, their religion, their government, and the state of civilization to which they had arrived.

Not to digress, however, from the immediate subject of this communication. The proposed demolition of the remaining portion of London Wall affords another instance of the advantage that might result from the establishment of a public board for the preservation of our ancient monuments. If we were possessed of such a board, it is probable that the cases of Wadhurst Castle, the Lord Mayor's Hall, and the Council House, would be well understood, and it is to be hoped that such a representation will consequently be made to the excellent gentlemen with whom the fate of the wall now rests, as to lead to its preservation whole and uninjured. Whether so or not, the writer feels he has but performed a duty in raising his feelings in protest against the destruction of a most valuable and interesting memorial of the early history of the city.

GEORGE GODWIN.

ARCHITECTURAL DRAWINGS, ROYAL ACADEMY.

(Concluded from page 195.)

By the same architect, or one or two others of great merit; No. 1165, "Forest Cottage, the shooting residence of the Marquis of Breadalbane," answers perfectly both to its title and its purpose, having a look of most comfortable homeliness, and an air of genuine rustic picturesqueness in its ensemble, without any of that "make-believe" and affectation which frequently cause "genteeel cottages" to appear strangely finical, and to remind us of the "tea garden." No. 1394, by the same, "Model of Wadhurst Castle, showing the alterations now nearly completed," also shows what a judicious piece of embellishment the case was in the hands of the architect, who has since been metamorphosed, so as to be now a very pleasing and well combined design, marked by a good deal of expression in its details; whereas originally there was nothing whatever of the latter, while taken as a whole, the house was a mere insalubrious heap, unvarying in appearance, in whatever direction it may have been viewed. Such is by no means the case now, there being a very great deal of picturesque play—of movement, fore-shortening, contrast—a merit that confers varied interest on a building, and which renders the design we are speaking of, a very suitable subject for a tapestry. Architectural models, however, do not seem to be in much favour with the Royal Academy, for instead of making suitable preparation for them, if history; perhaps we may say too much, or rather better than lumper, that may be indulged together any how. Whether it ever turns away any things of the kind, we know not, but we certainly have seen many that have never been exhibited there, probably because it is pretty well known to architects that they would be considered unwelcome guests. But we must not say too much, or rather too little, of what the Academy permitted accommodation in models, by fixing up a shelf for them, on each of the rooms, at about a foot from the ceiling.

We have already observed that there are this season fewer subjects than usual which afford us any information as to public works or improvements actually in progress—with the exception of churches, charitable, or accommodated union workhouses. Two drawings, however, there are which show us the additions now making to the buildings of two of the imps of court; viz. No. 1252, "South-east view of the hall

"The Churches of London," vol. II.
and library, Lincoln's Inn," P. Hardwick, R. A.; and 12:2, "View of
chambers now erecting in the south court of Staple Inn," Wigg and
Pownall. The first of these will be a handsome structure, somewhat
similar in style and character to Middle Temple hall, and will, like
that, be of red brick and stone. The building at Staple Inn, which is
now considerably advanced, is also of the same materials, but there
the colour of the brick is white, owing to which there is certain flat-
ness and want of relief, the difference as to colour being just enough
to disturb uniformity without producing decided and intolera-
table contrasts. The buildings at Fleet Street are a case in point—some-
what too much so, and so as to lose some of that character which is
what chiefly recommends that style for imitation at the present day.
In this instance we think it would have been an improvement had the
lower windows been made slightly projecting bays, since that would
have preserved something of the variation, and would have produced a sort of balance as well as contrast with the circular bow-windows over the doorways.

No. 1332, "The Amicable Life Assurance Office, about to be
erected in Fleet Street," S. Beazley, makes us acquainted with
another improvement, but one so small a scale that it is not likely to
produce so much show of magnificence, by its mere vague pantomime
even so seen, it is what would be passed without notice, but for the
information relative to it contained in the catalogue. The new build-
ing at the corner of Water Lane, on the same side of Fleet Street, is
a very much better piece of design, yet even that is so mere a piece in
itself, that it looks so better than the commencement of a façade inten-
ded to continue it and repeated hundreds of yards, that it is a mystery
how it has been done, and had it not been for the manifestation, we
should have produced a sort of balance as well as contrast with the circular bow-windows over the doorways.

The self-regulating expansion slide valve.

Sir—In the description of my self-regulating expansion slide valve,
inserted in the Journal for February last, I inadvertently committed
an error, which your Glasgow correspondent has very properly pointed
out: this circumstance having given rise to a mistaken notion as to
the efficacy of the principle on which this valve is constructed, you
will, I hope, permit me to correct my former mistake, and to make a
few additions to the plate I, as stated, the plate I is, only just made
long enough to cover the space existing between the passages on the back of the valve, and if the tappets are made so
as to prevent that plate from moving with the valve, the steam
would be cut off, it is true, at \( \frac{1}{16} \) of the stroke of the piston, but it would
also be re-admitted into the cylinder, when the piston had got within
\( \frac{1}{16} \) of the end of the stroke, and this imperfecton would continue to
a lesser extent during every other degree of expansion. The plate
I, should be sufficiently long to cover half of both passages on the back
of the valve.

The following example of a valve as made will fully explain my
meaning.

The orifice of the steam part on the face of the cylinder, is three
inches, the passage through the valve \( 1\frac{1}{2} \) inches, and the moveable
plate I, made so long, that when placed in the middle of the valve,
it half covers the two passages; the caps or tappets are so regulated
as never to approach within \( 1\frac{1}{2} \) inch of each end of the moveable
plate I, as stated, the steam would be cut off from the cylinder, and on its way back, the plate I, will cover the pas-
gage through the valve, until the valve itself covers the steam port in
the face of the cylinder.

For the above valve the stroke must be six inches, and supposing
the engine to be on her centre, the slide valve will be in the middle
of its stroke.

As long as the tappets remain in the position assigned to them
above, the plate I, will cover the passage when the valve has made
one half of the remaining three inches of its stroke, which will be
affected by the crank pin having described an arc of about 29° 30', or
nearly one-sixth of its half circumference, when the piston will have
travellled through \( \frac{1}{6} \) of its stroke, the motion of the valve being as the
size, and that of the piston as the revolved, of the arc described by
the crank pin. Therefore, under the above circumstances, steam will be
admitted during \( \frac{1}{6} \) of the stroke of the piston, and as the distance
between the points of the tappets is increased by the action of the
governor, the quantity of steam admitted to the cylinder be
also augmented.

When, therefore, the plate I, is made of the length above-men-
tioned, the steam may be cut off at \( \frac{1}{6} \) of the stroke of the piston,
but as it is seldom required to cut the steam off so soon, the portion
of the length of the stroke during which the steam may be admitted,
can be augmented by diminishing the length for the plate I—as
for instance, if it is desired to cut the steam off at one-sixth of
the stroke, it will suffice that the plate I, should be made long enough
to
cover only one fourth of the passage at each end of the valve; and for any other portion between one-sixth and one-fourth of the stroke, during which it may be thought requisite to introduce the steam as a minimum, the plate I. must be made of a sufficient length to cover some intermediate portion of the passage, between one-fourth and one-half.

Under all circumstances, the distance between the points of the tappets at their nearest approach to each other, should be equal to the length from outside to outside of the two passages that run through the slide valve, and the greater Mr. Gurney wished, while he give to each tappet, a stroke equal to one-fourth of the total stroke of the slide valve.

Your Glasgow correspondent says that *a slight examination of the drawings will show that though the steam is cut off as soon as the port of the cylinder is half open, admitting steam during rather less than one-fourth of the stroke of a cylinder of about 18 inches in diameter would be 15 per cent.* If you allow of the cylinder being so cut off as the port of the cylinder is half open, it would only be admitted into the cylinder during about one-fifteenth of the stroke of the piston, instead of something less than one-fourth.

It is quite possible in their respective communications the large rings, the diameter of which is 11 inches; this light, the whole church very beautifully, and so perfectly, that the congregation is able to read in the shadow near the pillars supporting the galleries. In Christ church, Albury-street, a more perfect illumination has been produced by two burners than by the 72 Argand burners previously used there. But one of the most important advantages of this light is, that it proves a most perfect ventilator. It is always fixed high up in the room with a large escape pipe over it leading to the chimney, or externally entering, which carries off all the products of combustion of the gas and thus prevents the danger of explosion which this pipe it is not considered that London churches can be pleasantly warmed.

1843.]
THE CIVIL ENGINEER AND ARCHITECTS JOURNAL.

THE BUBE AND BOCCUS LIGHTS.

During the last month two of the Wednesday Evening meetings of the Society of Arts, in the Adelphi, were occupied with the reading of interesting papers describing the Bude and Boccus lamps and their advantages. On the first evening the large room was splendidly lighted from one gas lamp, suspended from the centre of the room, the Bude principle, when Mr. Bethel read a paper and described its principle. On the following Wednesday the room was lighted in a similar manner with the Budeus light, when a paper describing its advantages was read by Dr. Atkin. We have here given a full description of each light by the respective authors of the papers, and leave it to our readers to judge of their respective merits. They both appear to be deserving of encouragement and the patronage of the public.

THE BUBE LIGHT.

The Bude light is the invention of Goldsworthy Gurney, Esq., of Bude, in the county of Cornwall, and has been called The Bude Light, a name given to it at the Trinity House, to distinguish it from Mr. Gurney's former invention. Mr. Gurney has, for the last twenty years, been experimenting upon the best means of producing the most powerful and beautiful light. In 1822, he invented the light called the Oxy-hydrogen Light, which he fully explained in his lectures delivered in Cornwall in 1822, and published in his book on chemistry in 1823. This light was the result of his experiments with the oxy-hydrogen blow-pipe. The combustion of the two gases, oxygen and hydrogen, issuing from two distinct jets in certain proportions, produces no light, and only a small blue flame, giving off very great heat; but when a small cylinder of lime is placed behind the jets, the most intense and beautiful light is evolved. Some years afterwards Mr. Gurney invented another powerful light, produced by passing a stream of pure oxygen gas through the wick of an oil lamp, whereby a most intense and beautiful light was formed. This light was put up at the Trinity House, where it was seen by Mr. H. H. Edwards, the carpenter, who subsequently introduced it to the notice of the House of Commons, and it was subsequently adopted for lighting that house. Difficulties occurred in the practical working of this light, and Mr. Gurney determined on still further prosecuting his experiments. The result was, the production of what may be called The Atmospheric Bude Light.

The mechanical principle by which the light is produced, consists of a series of horizontal concentric rings of tubing perforated on the upper part for the escape of the gas placed at definite distances from each other, and so arranged as to regulate the quantity of atmospheric air, and to communicate by conduction and radiation sufficient heat to raise the temperature of the gas to a given point, so as to effect the separation of its carbon immediately as it leaves the burner, and then by an arrangement above to bring fresh atmospheric air to the proper points of the flame. A perfect lamp will deposit the carbon in the flame the instant it passes the jet. If it imperfect as to deposit too soon, carbon will be found in the rings; if too late, then the flame will be dirty. The present known facts of the subject that the principle has determined. This mechanical arrangement brings about a series of chemical changes involved in the evolution of light and heat, which are very interesting. The rapidity of chemical union governs the respective quantities of heat and light. We may as a true potential produce heat alone, and no light. It has been found by careful measurement, that little or none of the light given off by the inner rings is lost, but that it all passes through the outer rings of flame. By the concentration of a mass of light, a powerful illuminating effect can be diffused over the whole apartment, and may be sufficiently done by globe shades to any intensity, and tinted, if desired, with any colour. It has been found in the shops in London, where this light has been used, that its effect on coloured articles is very different to other artificial lights, as all colours—particularly blue and green—can be as distinctly seen as by daylight.

Its economy has been proved to be very great. The evidence given by the scientific gentlemen examined before the committee of the House of Commons, they proved that for the same quantity of light used in that house, there is saving by using the Bude Light, the Home Secretary stated, that the Atmospheric Bude burner used had 3 concentric rings, and was supplied with street gas. Its light was equal to 68 wax candles, and consumed 20 cubic feet of gas per hour. The Argand gas burner used by him was equal to ten wax candles, and consumed 5 cubic feet per hour. The Bude Light consumed not quite four times the quantity of gas which the common gas burner did, whilst the light given by it was 1½ times more intense, thus giving an economical advantage of the Bude Light over the gas light of very nearly double.

In comparing the two systems of lighting, the Home Secretary stated that the saving effected upon the lighting of the house by the introduction of this light, was 1845. of 9e. per session. The light has given the greatest satisfaction. Its intensity combined with its softness, has delighted all the members of that house. Its effect in the different chapels where it has been placed is most excellent. Our large church is lighted not by one light, but by two large rings, the diameter of which is 11 inches; this light, the whole church very beautifully, and so perfectly, that the congregation is able to read in the shadow near the pillars supporting the galleries. In Christ church, Albury-street, a more perfect illumination has been produced by two burners than by the 72 Argand burners previously used there. But one of the most important advantages of this light is, that it proves a most perfect ventilator. It is always fixed high up in the room with a large escape pipe over it leading to the chimney, or externally entering, which carries off all the products of combustion of the gas. It is not considered that London churches can be pleasantly warmed.

THE BOCUS LIGHT.

The burner of the Bocuss Light consists of one or several concentric rings; when more than one is employed, the inner ones rise to a higher temperature than the outer, as the annexed engraving, which is perforated with numerous minute holes, in about the proportion of 60 to a circle of an inch in diameter. The inner are supplied with gas from the outer, and to make up for the diminished supply, the holes in the inner are rather larger. Above the burner at a given distance, two concentric metallic chumins (D), are placed, whose diameter is regulated, in great measure, by that of the outer ring. The chimins are supported by three wires (C), upon the glass holders, and surrounding the whole, a glass funnel (F), proceeding from the level of the burners to the top of the metallic chimins. The glass is in the burners is perfectly straight; in the larger ones, slightly bell-shaped at the bottom. When the gas is turned on and lighted, the lower part of the burner—that is, the rings (BB), and crust (A), become to some extent heated, and communicate a portion of their heat to the ascending air; the amount of heat is from the construction (accuracy having been attained by experience) so nicely adjusted, that no carbon is deposited in the ring; but the warm gas escapes, ready to deposit its solid matter on a slight increase of temperature. The cold air, too, in rushing between the cruches and rings becomes heated, and the hot air, no air being admitted except from the bottom; it, of course, produces but a very insignificant cooling effect on the flame. The chimins, especially the inner one, robs the ascending current of a great portion of its heat, which it in turn communicates to the upper part of the flame, and thus keeps the flame at an intense temperature, and gives them ultimately to unite with oxygen. The quantity of air entering is so regulated by the size of the separate openings, that it produces nearly a perfectly cylindrical, instead of a conical flame. From some cause or other, the temperature of this flame is very high, but the satisfactions which thus results from separation of combustion are separated from one another, and appear at different positions. The ascending current of air between the glass and outer chimney supports combustion, as of a taper; when placed between the two chimins the taper is extinguished, and it only remains that the flame of this arrangement of this lamp are the rising concentric rings and the metallic chimins. We have in the engraving represented a large double ring burner in the centre; the diameter of the outer ring is 5 inches; and of the inner, 3 inches. This size burner will consume about 95 feet per hour, and be equal to 52 Argand burners, consuming 5 feet per
hour, or 110 feet; the saving is, therefore, one half. These burners have been subjected to the most severe scrutiny; they have been examined and tested by some of the most expert experimentalists, and have passed the ordeal; and all who have had an opportunity of examining and proving them, concur in awarding to them the highest praise. The Boccius light has been introduced in the Birmingham Gallery, where both the features and statues were better seen by a clear than an obscured light. The students there (and, perhaps, on such a point their evidence is of value), state they can draw as well by the aid of the Boccius light as with daylight, the shadows being as perfect as those produced by sunshine. Mr. Moxon's Hall of Commerce in Threadneedle-street, is illuminated with this light. It has also been erected at Charing Cross for some months, where it brilliantly illuminates that great thoroughfare for a considerable distance. The advantages which the patentee proffers to the public, and proves his light to possess, are, 1st. Obtaining the greatest quantity of light from the least quantity of gas, 2nd. From the small quantity of gas consumed, the trifling amount of deleterious gas produced. 3rd. From the same cause the comparatively small amount of heat generated. 4th. From the complete combustion, the impossibility of escape of the noxious inflammable gas into the air. 5th. The complete absence of soot and smoke. 6th. The durability of the apparatus, and the ease with which it is managed. 7th. The possibility of applying with success, the principle to burners of all sizes, from one consuming 1 foot, to another consuming 100 per hour. 8th. The easy mode of ventilation it affords, either by placing a ventilator in the roof immediately above the light if it communicate with the air. The light may be seen at any time at the office of the patentee, 14 Duke-street, Adelphi.

The improvements in laying down carpets, and other materials upon stairs and steps, and in the construction of stairs and steps, and for which Mr. Tupper has obtained a patent, may be arranged under two heads: the Nosing and Stair Rod. In staircases in present use, and where landlords will not go to the expense of having new nosings, Mr. Tupper proposes cutting through the tread obliquely close to the nosing, as shown in Fig. 1, and in the slit so made the carpet passes through. To insure support, it is proposed that the stair-rod be made of an arch-like form, as shown in Fig. 2, with the apex placed under the nosing; it will be the means, also, of preventing the stair-rod from bulging and getting out of the "eyes;" these arch-stair rods are capable of being ornamented to any extent.

Fig. 3. The separate nosings can be made not only of wood, as wainscot, mahogany, &c., but also of or-molino, iron, brass, &c., and these can be applied to stone and wooden stairs. As regards the fixing, Mr. Tupper proposes using a wrought iron stud and plate; but this can be effected, also, by screws, bayonet joints, rings, grooves, &c. to which the carpet, &c., can be either placed, and the nosing applied over it, or the nosing moving on hinge, can lift up and the carpet be placed as usual. The nosing so applied, not only preserves the carpet from the wear caused by the attrition of the feet, but also takes up less of the fabric used, as there is a saving of about 2 inches of carpet upon every stair; this method also prevents the carpet from "wallowing about," and here it is especially useful in winders and angular stairs. In these moveable nosings two or more pieces of metal can be attached, which can be ornamented to any extent, and fastened in such a manner, as, when the nosing is fixed in its place, the carpet is firmly clamped by these "stays," doing away in this case with stair rods and eyes. It is presumpted that the appearance of a staircase will be greatly improved by this method, as the nosings can be ornamented and decorated in various ways; for instance, if a mansion is of the Elizabethan age, the nosings, as well as the bannister and handrail, can be arranged in the beautiful style of that period.

An enlarged model showing a variety of methods of forming the nosing, is exhibited at the Polytechnic Institution.

LAUNCH OF THE STEAM-FREGATE "INFERNALE."—WOOLWICH, June 1.—This beautiful first-class steam-frigate was built on the same slip in the dockyard as her sister, the Deventer, which has given such great satisfaction, owing to her seaworthiness and other qualifications, and was launched on the 31st of May.

The following are the dimensions of the Infernal:

<table>
<thead>
<tr>
<th>Description</th>
<th>Feet</th>
<th>Inches</th>
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<td>Length between perpendiculars</td>
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<td>8</td>
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</tr>
<tr>
<td>Burden in tons, old plan. 1658</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Burden in tons, new plan. 1657</td>
<td></td>
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ON THE DECORATION OF THE NEW HOUSES OF PARLIAMENT.

[The following article is an abridgment of a paper which appeared in Fraser's Magazine for May last.]

The destruction of the ancient edifice was felt to be a national calamity. The rebuilding another upon its ruins is the greatest architectural work of modern times; and now, that it advances towards completion, we naturally turn our thoughts on its embellishment.

With this design the House of Commons appointed a committee in 1841, and, on the 24th of November following, commissioners were nominated for the purpose of inquiring whether advantage might not be taken of the rebuilding of the houses of parliament for promoting and encouraging the fine arts.

The commissioners have now published their first report. It is composed of care, and contains valuable information. Yet, in their projected plan of decoration I see, with regret, that the commissioners have stumbled over the very threshold of their duty.

Justice to those gentlemen demands, however, that their plan should be stated in their own words.

They say:—"We beg to report our opinion that it should be expedient that advantage should be taken of the rebuilding of the houses of parliament for the purpose of promoting and encouraging the fine arts of the United Kingdom."

With this view we have, in the first place, directed our attention to the question, whether it would be expedient that fresco-painting should be employed in the decoration of the new houses of parliament; and, in the second place, whether it would be practicable to give ourselves the advantage that the art of fresco-painting has hitherto been sufficiently cultivated in this country to justify us in at once recommending that it should be employed. In order, however, to assist us in forming a judgment on this matter, we propose that artists should be invited to enter into competitions of cartoons.

"As fresco-painting has not hitherto been much practised in this country, and as, therefore, candidates for employment in that mode of painting, whatever their general skill may be, will probably find it necessary to make preparatory essays, her Majesty's commissioners think it expedient that the plan which they have resolved to adopt in order to decide on the qualifications of such candidates should be announced forthwith."

"Three premiums of 300l. each, three premiums of 200l. each, and five premiums of 100l. each, will be given to the artists who will furnish cartoons which shall be respectively deemed worthy of one or other of such premiums, by judges to be appointed to decide on the relative merits of the works. The drawings to be executed in chalk or in charcoal, or in similar material, but without colours."

"The plan which may be adopted in order to decide on the merits of the candidates for employment as oil-painters, and as sculptors, will be announced at a future period."

Further, the commissioners determine that the subjects of these cartoons shall be chosen from English history, or from the works of Shakespeare, Milton, or Milton.

In the consideration of this plan, I do not presume to instruct the architect, the sculptor, or the painter, but I address myself to the public's feeling, taste, and sense, by which this plan, with the works executed under its authority, must eventually be approved of or condemned.

The royal commissioners were nominated for two objects: first, to consider of the decoration of the houses of parliament; and, secondly, of the promotion of the fine arts of the United Kingdom.

Let us then examine how these objects are to be attained by the plan proposed.

The first and principal end is undoubtedly the adornment of the seat of the legislature by works worthy of the edifice, the nation, and the age. While instrumental and auxiliary to this, the fine arts of the country were to be employed, and by employment, to be encouraged.

Now the plan proposed invites this design, for it forgets what is due to parliament in its eagerness to introduce a special branch of art. It gives "the first place" and consideration to painting in fresco, while it admits this art not to have been sufficiently cultivated to justify its immediate employment.

In the useful, no less than in the ornamental arts, we see by daily experience, that the less the attempt, the more the risk of failure.

But in this mode of painting hitherto unpractised, where every part has yet to be learned, and can be learned in no other way than by long experience and repeated trials, failures in the beginning are not merely probable but unavoidable.

Are the walls of parliament a fit place for the trial of a new art? Are the 'prestige hands of painters to be employed, where nothing
ought to be admitted but what is of the highest excellence our arts have attained to?

"Is parliament, I demand, to be made the "experimentum in corpore sedis"?

This were to sacrifice the end to the means—the embellishment of this national edifice to the patronage of a new art—certain to disgrace when it went to adorn them.

The second object of the commission was to promote the sculpture and painting of our country.

Consider, next, how this "Plan" can promote them. It attempts to introduce a branch of art practically unknown, or known only by some poor failures.

"Would the "first consideration" have been given to. To this are offered premiums and employment. Meanwhile, all other branches of art are to be postponed, and the "Plan" as to them is to be announced at a future period.

Now how can this unknown mode of painting promote those wherein our artists practically excel?

If the preference be given in the hope that, with the advantage of fresco-painting, historical painting will follow, then the plan overlooks an essential condition, namely, that such a result must be the work of time—probably of ages. Whereas, the commissioners were nominated for a special purpose—the decoration of the new houses of parliament, now in progress towards completion.

With the plan, then, to prove that in which we actually excel for so distant a doubtful result? Or do the commissioners expect artists of established reputation will take up a new branch of painting, beset with difficulties, even in the material on which they are to work?

What man of sense would risk a well-earned fame by a public exposure to failure is certain.

The preference, therefore, given by this plan to fresco-painting, will tend to exclude men of distinguished merit, and thus narrow competition to such as have yet a name to gain; possibly modest men of skill, more probably, bold adventurers ready for any job.

It may exclude entirely our native artists, to throw employment in the hands of foreigners, eagerly on the watch to grasp at the occasion.

Still the contradictions between this "Plan" and its professed purposes are forgotten in the absurdities that mark its manner of execution. The commissioners evidently mistrust their favourite project.

They are not satisfied that fresco-painting has been sufficiently cultivated to justify them in recommending its employment.

"They admit that artists, whatever their general skill may be, will probably find it necessary to make preparatory essays."

Here is a difficulty, indeed, and how do the commissioners get over it?

They offer £2000 divided into eleven premiums, for the best cartoons or drawings "in chalk or in charcoal without colours." These drawings are to serve the double purpose of "preparatory essays," and to enable the commissioners, or those they shall nominate, "to judge of the qualifications of candidates."

Let us pause here for reflection. Have the commissioners ever seen a work of any art introduced and brought to such eminence as should fit it for a great national work by mere "preparatory essays"? Have they forgotten that this very art of painting in fresco attained its excellence in Italy by the genius and labours of successive generations? Do they not see that they are setting artists to work without masters to show them where they will encounter, and how they are to overcome, the endless difficulties that beset the fresco-painter at every step?

The commissioners strive at what is unattainable. For no branch of painting ever has attained excellence, without genius to invent, labour to execute, masters to teach, models for imitation, schools for the principles, and practice, and time, that in art extends through ages to the accomplishment.

In the place of all these stand "Preparatory Essays." What, then, are those preparatory essays that are to work such marvels, whereas £2000 are to be expended, at once designed to teach artists how to paint in fresco, and the commissioners to judge of their ability? Are their supposed paintings in fresco? No. For this very impracticable, unless walls had first been built, and plastered to practice on. Are they to be paintings at all? No: they are to be merely "drawings in chalk or in charcoal without colours."

Now will the commissioners condescend to inform the public how are to be "drawings upon paper or canvas are to teach the art of painting on plaster"? The drawings may possess every quality of design, yet their designers be utterly incapable to paint them in fresco. Suppose, for instance, that Raphael's cartoon of the "Schools of Athens" were placed in the hands of an unpractised artist, is there any one so

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simple as to believe that, presently, he would be invested with ability to paint the famed fresco on the Vatican? It is true the drawings will show the choice of subjects and manner of treating them, but they will show no more. They cannot prove the artist's power to transfer, embody, and permanently fix his colours into a material so unstable and capricious as a plaster or a fresco... Whoever, like himself, has watched the slow progress of a fresco-painting, from the "tracing" to the last touch, knows well that it is a process beset with difficulties at every step, unknown in other branches of the art, and to be learned and overcome by years of patient labour. Yet upon this false notion the commissioners have resolved to rest the judgment, and exchanged their £3000 for works of magnitude, the three last, panel, canvass, and stucco, have superseded the rest. They were simultaneously used. But in the early times of oil-painting, panel was preferred, not only for its durability, but because it enabled the painter to enrich his figures with inlaid jewels, pearls, and gold, agreeable to a custom transmitted from remote antiquity. Though subject to rend, to warp, and to be worm-eaten, panel is the most durable of these three substances. The oldest works in the best preservation are those on panel. Many are yet extant, on which 300 years have wrought no visible decay. Canvas possesses many peculiar qualities as a ground for painting. It is strong, yet so light and flexible that, even if it were stretched in a manner that demands the transporth, for we must not forget that paintings form an article of commerce. It may be stretched if shrink, and what is truly admirable, when rotten or worn out, it may be severed from the painting, and replaced by new; an invention that has bestowed upon canvas painters the dignity of those on panel, and has already saved from crumbling to dust many precious works. Light, then, as the fabric is, canvass paintings have lasted for centuries; and if frescos are older, it is not that stucco is fitter to preserve them, but because painting in oils was an art invented or recovered in later times. Having these substances in daily use, the question then returns, what modern artists, who have in painters have the most persistent men to paint on stucced walls, while some are said to have preferred them.

Let us next proceed to the inquiry, in what manner sculpture and painting may be most suitably employed in adorning the magnificent seat of our legislature, by works worthy of its destinies, of the empire, and the age. Whosever will be at the pains to duly reflect upon this subject will find himself drawn to the conclusion, that these objects are not to be attained otherwise than by the employment of those branches of the arts wherein we have already attained to excellence. Now the sculptors and painters of our country possess unrivalled pre-eminence throughout the length and breadth of the United States; and are yet unassisted by that indulgence, which elsewhere has been the means of their prosperity. But when the question comes, are statues and portraits the most suitable decorations for the houses of parliament? We shall find the answer in the customs of mankind. No custom wherein the fine arts have borne a part has been more anecdot or generally established, than for halls of council to be adorned with the effigies of illustrious men.

In the free states of Greece this custom served as the memorial, the reward, and the incentive to noble deeds. In Rome it rose to the dignity of a political institution, placed under the jurisdiction of the senate. Whence it was copied by the municipal councils of that empire. The nations who formed kingdoms out of its conquered provinces preserved the usage where their arts would permit. The Italian republics gave the custom the sanction of law. Undoubtedly, then, such ornaments must have been in harmony with the feelings of free nations. Still more is required. The custom ought to be congenial to the habits of England. Let us recall what we possess in this sort. We see in Westminster, in the cathedrals, even in the parish churches, how rich England is in monumental statues, and how charmingly they harmonize with architecture.

In our ancient cities where is the council-chamber without portraits of honored citizens? Where is the college-hall adorned with the likenesses of poets and heroes? Where is the ancient mansion without its family gallery? The custom, then, is truly English. Shall we use so honoured, interwoven with all we hold dear, and no place in parliament, where are concentrated the ranks, intellects, and feelings of the country? Shall we give up the illustrious beholders of antiquity, whose attunement in the fine arts we are now vying to equalize, our bow, not to own to prefer the memorials of departed worth to the projects of unknown men?

In sculpture and painting it will be found that the likenesses of the renowned dead affect the feelings more deeply and lastingly than the loftiest creations of fancy, even when their subjects are chosen from actual events. A comparison taken from the highest works of art will best explain this principle. Whatevler has resided at Rome may have seen the frescos of Raphaelle in the Vatican, and probably passed onward to the gallery of statuary where are arranged the sages and statesmen of Greece. In the frescos are seen the designs of the loftiest genius expressed with consummate art. In the statues are seen in the cold marble the features and expressions of those mighty men of old who have been familiar to us from boyhood, whose fame still fills the world, pernance whose intellect may have guided our own. The paintings charm and excite, the statues calm the feelings, and lead the mind onward through grave trains of thought. Which of these conditions is most suitable in senates and courts of justice? Nor is this difference due to the contrast of painting with sculpture, to substitute portraits for statues, and we may observe a similar effect. Both are triumphs of simple truths long treasured in our minds, over the utmost powers of invention.

And here I cannot let slip the occasion to remark, that France and Germany are now employed in reviving this wise and noble custom of antiquity, of applying it to our present conditions. France has devoted the deserted palace of Versailles to place the statues and portraits of her illustrious men, and by this act the present generation have done their utmost to repair the ravages of the last. The plan is admirable for comprehension and arrangement. There are seen the kings, warriors, statesmen, presidents of parliaments, and who has been renowned in times authentic and known, all classed and arranged.

The Walhalla, erected by the king of Bavaria, is a similar design to commemorate the renowned men of Germany. I do not cite these national works as models to be followed by England, but as proofs how the spirit of antiquity still lives in modern times.

These principles stated, I submit the following outline of a plan for an outline is all that can be offered, yet distinct enough for precise ideas, which failing to satisfy the judgment may perhaps hereafter serve for some happier suggestion.

1. The subjects for sculpture and painting should be chosen from the constitution of parliament itself, and in a manner to illustrate its history.

By a gallery of the kings of England represented in statues of marble, arranged in the order of time.

For in all ages, in fact as in law, the sovereign has been the "principium et finis" of our patriot and his respective conditions. France has proposed the vanished palace of Versailles to place the statues and portraits of her illustrious men, and by this act the present generation have done their utmost to repair the ravages of the last. The plan is admirable for comprehension and arrangement. There are seen the kings, warriors, statesmen, presidents of parliaments, and who has been renowned in times authentic and known, all classed and arranged.

The Walhalla, erected by the king of Bavaria, is a similar design to commemorate the renowned men of Germany.

I do not cite these national works as models to be followed by England, but as proofs how the spirit of antiquity still lives in modern times.

These principles stated, I submit the following outline of a plan for an outline is all that can be offered, Yet distinct enough for precise ideas, which failing to satisfy the judgment may perhaps hereafter serve for some happier suggestion.

1. The subjects for sculpture and painting should be chosen from the constitution of parliament itself, and in a manner to illustrate its history.

By a gallery of the kings of England represented in statues of marble, arranged in the order of time.

For in all ages, in fact as in law, the sovereign has been the "principium et finis" of our patriot and his respective conditions. The series should begin with Alfred, as founder of the English monarchy, by union of the Saxon states under his sole dominion; and as his memory is revered, for the wisest and best of that long illustrious line by his successors to the throne, who claim him as their common ancestor. The series should include the whole of the Danish and Saxon kings, most of whom are known only by name, a selection should be made; and Athelstan and Canute merit to be preferred. For the former, by arms and treaties, united Great Britain under one supreme sovereignty, leaving the more distant provinces under the immediate rule of their native princes and laws—an event that imperial Rome had contended for in vain during 300 years. And the latter was the most powerful monarch of his age; under him the rival races of Saxons and Danes were united by equal laws.

From the conquest until the reign of her present majesty, a statue should be erected to each sovereign.

3. I propose that an historic gallery be formed in portraits of the most distinguished members of the House of Peers, arranged in the order of time, less to commemorate individuals than to illustrate the institution—in former ages, the guardian of public and private rights against the usurpations of monarchy; in our own, against those of the populace; holding the balance between custom and change, principles that contend for the government of society.

3. I propose a similar gallery of portraits of those who have been the most distinguished members of the commons.

The series must begin with the reign of Elizabeth.
THE FRENCH AND BELGIAN RAILWAYS.

We are indebted for the following interesting and valuable paper to Mr. Flamang, a young engineer of considerable talent, who has of late had much practice in Belgium and France, in estimating and superintending engineering works; it is a document which shows with what minuteness the continental railway engineers prepare all their details, and likewise gives some idea of the cost of railway works on the continent. The scale of prices is low, as the tender which was accepted only allowed half per cent off the schedule.

The method of proceeding with contracts for public works in France and likewise in Belgium, is in the following manner. The engineer of the line prepares his contract drawings, which are executed with great minuteness—he then prepares a schedule of prices in detail, and the quantities of the works necessary to be done on the line as per numbered list. Tenders are then advertised for. The parties tendering have to state what per centage he will take off from the schedule of prices, not upon any individual price but upon the whole; this method is analogous to the form of tendering for works to be done for the Ordnance and Government in this country. After the tenders are received they are immediately taken into consideration, and the party whose tender is accepted is called in and informed of the result; an appointment is then made with the engineer and contractor to go over the country of the proposed line of railway, which the engineer describes to the contractor, and at the same time furnishes the latter with a bill of quantities priced out according to the schedule of prices; after the line is surveyed, the contractor is allowed from ten to twenty days to examine the quantities, and if no error greater than one-sixth can be discovered the contract is considered binding, but if any error is discovered an allowance is made; but after the contract is concluded, at the end of the fourteen or twenty days as the case may be, it is binding upon the contractor, notwithstanding any error may be found out afterwards. We should also state that the contract is subsequently sent to the minister of public works, who has the sole power of rescinding it if he thinks proper.

In this translation the French measures and currency have been retained. They may easily be reduced to their respective values in this country by taking in round numbers the cube metre as equal to 12 cubic yard and the franc as equal to 10d.; thus the first figure in the decimal part represents as many pence as it has digits. The linear metre is nearly 3 ft. 5½ in.

BASIS OF THE PRICES.

WAGES PER DAY.

Not including Including tools & profit tools & profit of contractor of contractor.

<table>
<thead>
<tr>
<th>Description</th>
<th>France</th>
<th>cents</th>
<th>France</th>
<th>cents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navigator for getting and filling</td>
<td>2 25</td>
<td></td>
<td>3 25</td>
<td></td>
</tr>
<tr>
<td>Navigator for wheeling</td>
<td>2 15</td>
<td></td>
<td>2 48</td>
<td></td>
</tr>
<tr>
<td>Stone cutter and setter</td>
<td>4 00</td>
<td></td>
<td>4 62</td>
<td></td>
</tr>
<tr>
<td>Assistant stone cutter and setter</td>
<td>3 00</td>
<td></td>
<td>3 47</td>
<td></td>
</tr>
<tr>
<td>Ordinary mason</td>
<td>3 00</td>
<td></td>
<td>3 47</td>
<td></td>
</tr>
<tr>
<td>Labourer</td>
<td>2 30</td>
<td></td>
<td>2 89</td>
<td></td>
</tr>
<tr>
<td>Superintendent of masons and betons</td>
<td>3 00</td>
<td></td>
<td>3 47</td>
<td></td>
</tr>
<tr>
<td>Carpenter, Sawyer, and Joiner</td>
<td>4 00</td>
<td></td>
<td>4 62</td>
<td></td>
</tr>
<tr>
<td>Paviour</td>
<td>4 00</td>
<td></td>
<td>4 62</td>
<td></td>
</tr>
<tr>
<td>Assistant paviour</td>
<td>3 50</td>
<td></td>
<td>4 04</td>
<td></td>
</tr>
<tr>
<td>Smith</td>
<td>4 30</td>
<td></td>
<td>5 20</td>
<td></td>
</tr>
<tr>
<td>Assistant smith</td>
<td>4 00</td>
<td></td>
<td>4 62</td>
<td></td>
</tr>
<tr>
<td>Painter</td>
<td>3 50</td>
<td></td>
<td>4 04</td>
<td></td>
</tr>
<tr>
<td>Slater</td>
<td>4 00</td>
<td></td>
<td>4 62</td>
<td></td>
</tr>
<tr>
<td>Assistant Slater</td>
<td>2 75</td>
<td></td>
<td>3 18</td>
<td></td>
</tr>
<tr>
<td>One horse and cart including</td>
<td>7 00</td>
<td></td>
<td>8 09</td>
<td></td>
</tr>
<tr>
<td>Two horses dito</td>
<td>12 00</td>
<td></td>
<td>13 86</td>
<td></td>
</tr>
<tr>
<td>Three horses dito</td>
<td>17 90</td>
<td></td>
<td>19 64</td>
<td></td>
</tr>
</tbody>
</table>

1st Division.—Earthwork.

The earthwork to be measured in the cuttings per cubic metre.

No. 1.—Getting and Filling: or one spade's throw every kind of soil and every inch over 1 c. m.

In transverse section, No. 1 to 4: 65
Ditto 44 to 108
Ditto 108 to 256
Ditto 256 to 470
Ditto 470 to 981

N.B. These prices for getting and filling will be applied without any exception, and without its being in the power of the contractor to demand any other classification than the above.

No. 2.—Wheeling for each relay or run of 30 metres on a level, or of 20 metres on an incline of 1 in 10, per c. m. 0 12
No. 3.—Carting for the 1st relay of 100 metres on a level, or of 75 metres on an incline of 1 in 20, per c. m. 0 42
No. 4.—Carting every relay after the first, of a 100 metres on a level, or of 75 metres on an incline of 1 in 20, per c. m. 0 11

If the centre of gravity of the cutting is on the same level, or higher than that of the corresponding embankment, the distance between the centres of gravity will be taken for the distance of carriage; if the centre of gravity of the cutting is lower than that of the embankment, it will be considered that the difference of level has been surmounted in ascending inclines of 1 in 20 for carts, and of 1 in 10 for hovars, and that then the carriage has been completed on a horizontal plane. The length of lead is taken in the vertical plane passing through the two centres of gravity. It is only when the distance between the centres of gravity is such that it is necessary to divert in order to obtain inclines of 1 in 20 for carts and of 1 in 10 for hovars, that such diversions will be paid for.

The fractions of relays will be counted by 3.

No. 5. Carriage by Wagons.—The price will be determined by the following formula:

\[ x = \frac{2.50 \times 3 + 3.75 \times r + 2.50 \times c + 500 + \frac{0.0000555 \times (1 + 1.50 \times c + 300) + 0.00389 \times 0.122}{m} \]

in which,

- \( l \) is the length of the cutting,
- \( D \) is the length of the embankment,
- \( R \) is the length of the embankment,
- \( m \) is the cubic quantity of earthwork, measured at the cutting, to be tipped,
- \( l \) is the horizontal distance between the centres of gravity of the cutting and embankment.

The value of the letters which enter into this formula will be fixed for each cutting.

No. 6.—Spreading of a cubic metre of embankment in beds of 0 15 m. to 0 20, including trimming and dressing of slopes. 0 36
When wagons and temporary railways are used, no price will be allowed for spreading, as it is included in the price allowed for the embankments formed in this manner.

No. 7.—Running or Paving the embankments in beds of 0 15 m. to 0 20 thick, when the engineer considers it necessary, will be paid for per c. m. 0 14

Previous to running, the soil must be properly watered.

The rammer must weigh 4 kilogrammes (9 lbs.), and must strike at least four times the same spot.

The engineer reserves the right of having the ramming done at the direct expense of the administration, by day work.

No. 8.—Refilling, per c. m. 0 20

No. 9.—The picking out and laying aside the rubble and gravel found in the cuttings will be paid for per c. m. 0 25

2nd Division.—Paving the Crossings and their Approaches.

No. 10.—Silicious gravel for roads, and broken to the required dimensions.

Compensation for land 0 25
Picking and breaking the large stones 1 70
Filling 0 17
Carriage to the distance of 2000 metres 1 64
Laying aside in heaps 0 16

Tools &c. per c. m. 3 910
Profits of contractor, per c. m. 0 196

Price per cubic metre 0 416

Per cubic metre 0 516

For the required dimensions of 0 06 m. in every direction 0 330
Tools &c. per c. m. 0 17

Profit per c. m. 0 367

Per cubic metre 0 037

No. 12.—Making macadamised roads, including the dressing and ramming of the bed. 0 40

No. 13.—Sand from the sand pits of Brennil le See and de l'Equeipe, to be used between transverse sections, No. 1 and 250. 10

Price at the sand pits 0 50

32°
<table>
<thead>
<tr>
<th>Description</th>
<th>Price per thousand</th>
<th>Price per supercilious metre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filling &amp;c.</td>
<td>0.30</td>
<td></td>
</tr>
<tr>
<td>Carriage to the average distance of 1000 m.</td>
<td>2.21</td>
<td></td>
</tr>
<tr>
<td>Tools, &amp;c. $\frac{1}{2}$</td>
<td>3.045</td>
<td></td>
</tr>
<tr>
<td>Profit $\frac{1}{4}$</td>
<td>0.152</td>
<td></td>
</tr>
<tr>
<td>Per cubic metre</td>
<td>3.39</td>
<td>3.32</td>
</tr>
<tr>
<td>No. 11.—From Erquinville, to be used between transverse sections 250 and 330</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Price at the pit, filling, &amp;c., as in preceding</td>
<td>0.80</td>
<td></td>
</tr>
<tr>
<td>Carriage to the average distance of 6 kilometres</td>
<td>0.94</td>
<td></td>
</tr>
<tr>
<td>Tools, &amp;c. $\frac{1}{2}$</td>
<td>4.84</td>
<td></td>
</tr>
<tr>
<td>Profit $\frac{1}{4}$</td>
<td>5.98</td>
<td></td>
</tr>
<tr>
<td>Price of a cubic metre</td>
<td>0.011</td>
<td></td>
</tr>
<tr>
<td>No. 15.—Sand from the pits of Blaincourt, to be used between transverse sections 320 and 581</td>
<td>3.33</td>
<td></td>
</tr>
<tr>
<td>Price at the-quarters</td>
<td>0.80</td>
<td></td>
</tr>
<tr>
<td>Carriage to the average distance of 1300 metres</td>
<td>3.13</td>
<td></td>
</tr>
<tr>
<td>Tools, &amp;c. $\frac{1}{2}$</td>
<td>3.93</td>
<td></td>
</tr>
<tr>
<td>Profit $\frac{1}{4}$</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>No. 16.—Paving stones per thousand, from the quarries of Blaincourt, to be used between transverse sections No. 1 and 83.</td>
<td>4.51</td>
<td></td>
</tr>
<tr>
<td>Price at the-quarters</td>
<td>1.32</td>
<td></td>
</tr>
<tr>
<td>Carriage to the average distance of 10 kilometres</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>Tools, &amp;c. $\frac{1}{2}$</td>
<td>3.93</td>
<td></td>
</tr>
<tr>
<td>Profit $\frac{1}{4}$</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>No. 17.—Paving stones from the quarries of Gannette, to be used between transverse sections No. 85 and 581.</td>
<td>59.38</td>
<td></td>
</tr>
<tr>
<td>Price at the-quarters</td>
<td>11.3</td>
<td></td>
</tr>
<tr>
<td>Loading and lacing them aside</td>
<td>6.07</td>
<td></td>
</tr>
<tr>
<td>Carriage to the average distance of 10 kilometres</td>
<td>131.7</td>
<td></td>
</tr>
<tr>
<td>Tools, &amp;c. $\frac{1}{2}$</td>
<td>297.7</td>
<td></td>
</tr>
<tr>
<td>Profit $\frac{1}{4}$</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>No. 18.—Paving between transverse sections 1 and 83. 18 paving stones at 15.35 per thousand (see No. 18).</td>
<td>349.39</td>
<td></td>
</tr>
<tr>
<td>Price per supercilious metre</td>
<td>9.49</td>
<td></td>
</tr>
<tr>
<td>No. 19.—Paving between transverse sections 83 and 230. 15 paving stones at 15.39 per thousand (No. 17).</td>
<td>6.28</td>
<td></td>
</tr>
<tr>
<td>Sand as in No. 18</td>
<td>0.88</td>
<td></td>
</tr>
<tr>
<td>Labour, dressing and running the head, tools, and profit of contractor</td>
<td>0.35</td>
<td></td>
</tr>
<tr>
<td>Price of a thousand stones</td>
<td>317.6</td>
<td></td>
</tr>
<tr>
<td>No. 20.—Paving between transverse sections 230 &amp; 330. 15 paving stones as in preceding.</td>
<td>317.6</td>
<td></td>
</tr>
<tr>
<td>0.25 of sand at 5.59 per cubic metre (No. 11)</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>Labour, &amp;c. as in preceding</td>
<td>0.35</td>
<td></td>
</tr>
<tr>
<td>Per supercilious metre</td>
<td>7.51</td>
<td></td>
</tr>
<tr>
<td>No. 21.—Paving between transverse sections 330 &amp; 581. 15 paving stones as in No. 19.</td>
<td>8.03</td>
<td></td>
</tr>
<tr>
<td>0.25 of sand at 7.51 per cubic metre (No. 19)</td>
<td>8.03</td>
<td></td>
</tr>
<tr>
<td>Labour, &amp;c. as in preceding</td>
<td>0.35</td>
<td></td>
</tr>
<tr>
<td>Per supercilious metre</td>
<td>1.13</td>
<td></td>
</tr>
</tbody>
</table>

Labour, &c. as in preceding

Per supercilious metre

No. 22.—The taking up of a paved road, including the carriage of the old paving stones to the new road to be formed, and the picking and dressing of these stones will be paid for per supercilious metre

3rd Division.—Works of Art.

No. 23.—Oak, including carriage, dressing, waste tools, and profit of contractor per cubic metre

No. 24.—Cradle of oak, plans of 0.13 by 0.03 to 0.05, dressed on the banks, and used in the platform of bridges, exclusive of spikes, per cubic metre

No. 25.—Oak, capping piece for cradle.

Sawing oak

Loading, carriage, and unloading

Dressing and fixing under water

14 spikes, weighing together 0.90 kilogramme at 1.30

Tools, &c. $\frac{1}{2}$

0.995 of oak (see No. 23) at 8.3 fr.

No. 26.—Piles. Preparing the head, fixing the shoe, and cutting off the pile

Tools, &c. $\frac{1}{2}$

Profit of contractor $\frac{1}{4}$

Each pile

No. 27.—Oak waling-piece for the cradle.

Sawing, sawyer 1 hour

Loading, carriage and unloading

Dressing it, and fixing it under water to the piles by bolts

Tools $\frac{1}{4}$

Profit $\frac{1}{4}$

No. 28.—Iron forged into a chain for suspension bridges. Iron wire dipped twice in linseed oil including the making of the chain, and two coats of paint, the first to be of red lead, adjusting the chains, every thing included per kilogramme

No. 29.—Oak short piling with herring bone joints, not including driving.

Sawing oak

Loading, carriage, unloading, &c.

Preparing the head of the pile, and joints, fixing the shoe, and cutting off the pile

Tools $\frac{1}{4}$

Profit $\frac{1}{4}$

0.12 oak at 85 fr.

Price per cubic metre

No. 30.—Centres of oak, including the fixing of the centres and all labour, the oak being returned to the contractor, per cubic metre

No. 31.—Every time after the first that the same timber is needed, per cubic metre

No. 32.—Carpentry of oak fixed and dressed, per c.

No. 33.—Cast iron per kilogramme (2-1/2 lb.) cast iron (No. 2) in bridges, &c.

No. 34.—Tiles of grey cast iron No. 2, of the dimensions prescribed, including fixing, joints, &c.

No. 35.—Iron for shoes of piles

No. 36.—Wrong iron railing, &c.
| No. 37. | Iron for bolts, spikes, nails, &c. | fr. | c. | 1;20 |
| No. 38. | Laxol used for leading, including charcoal, labour, &c., per kilogramme | ... | ... | 1;20 |
| No. 39. | Sokker per kilogramme | ... | ... | 0;55 |
| No. 40. | Hydraulic lime per c. m. | ... | ... | 50 |
| Quick lime at the works, per c. m. | ... | ... | 50 |
| Slacking, whatever be the method employed | ... | ... | 1;60 |
| Price for 1/3 of laid line | ... | ... | 51;60 |
| Or for one cubic metre | ... | ... | 38;90 |

**No. 41.**—A cubic metre of mortar between transverse sections 1 and 230.  
1 m. of sand at 3;52 (see No. 13.) | 3;52 |
0;35 of hydraulic lime, at 38;80 (see 10.) | 30;58 |
Labour including tools, profit, &c. | 2;00 |

**No. 42.**—Mortar between transverse sections 230 & 330.  
1 m. of sand at 4;54 (No. 15.) | 4;54 |
0;35 of hydraulic lime (see No. 40.) | 3;58 |
Mixing, &c. | 2 |

**Per cubic metre.**  
Price | ... | ... | 21;17 |

**No. 43.**—Mortar between transverse sections 330 & 581.  
1 m. of sand at 4;54 (No. 15.) | 4;54 |
0;35 of hydraulic lime (see No. 40.) | 3;58 |
Mixing and profit | 2;00 |

**Per cubic metre.**  
If it be found necessary to use between transverse sections 230 and 581, the above will be the price allowed, making the price of the mortar alone vary according to the place.  
**No. 45.**—"Sand bed" between transverse section No. 1 and 230.  
1 m. of sand at 3;52 (No. 13.) | 3;52 |
0;15 of hydraulic lime at 38;80 (No. 40.) | 3;82 |
Mixing, carriage, ramming, &c. | 3 |

**Per cubic metre.**  
This will be the price allowed on the whole length of the canal, changing only the price of the sand according to the place where the bedon is wanting.

**Stone per cubic metre.**  
**No. 48.**—Ashler for the two viaducts over No. 7 and No. 8, and the bridge No. 12 over the Breche.  
Stone at the quarry of St. Maximin, including the use of tools, and profit of contractor | 33 |
Loading and carriage, average distance 21 kilometres | 22 |

**No. 47.**—Viaducts 27 and 28.  
Stone at the quarry of St. Maximin | 35 |
Loading and carriage, average distance 37 kilometres | 35 |

**No. 48.**—To be used between transverse section No. 1 and 330  
Stone (Vergelé) at the quarry at Mello  
Loading and carriage, average distance 24 kilometres | 10 |

**No. 49.**—To be used between 1 and 330.  
Stone at the quarry La Gache  
Loading and carriage, average distance 10 kilometres | 14 |

**No. 50.**—Between 1 and 330 (Vergelé)  
Stone at the quarry La Gache  
Loading and carriage, as in preceding | 11 |

**No. 51.**—Same between 330 and 190.  
Stone at the quarry, as last  
Carriage, &c., average distance 25 kilometres | 12 |

**No. 52.**—Between transverse sections 330 and 490.  
Stone at the quarry Blancfossé  
Loading and carriage, average distance 12 kilometres | 30 |

**No. 53.**—Between transverse section 190 and 581.  
Stone at the quarry  
Loading and carriage, average distance 10 kilometres | 30 |

**No. 54.**—Between transverse section 330 and 490.  
Large hard stone for foundations, at the quarry Blancfossé  
Loading and carriage, as in No. 52 | 30 |

**No. 55.**—Between transverse section 330 and 490.  
Stone for foundations at the quarry Gaches  
Loading and carriage, average distance 11 kilometres | 20 |

**No. 56.**—Between transverse section 1 and 80.  
Hard rubble stone, at the quarry Bethancoast  
Loading and carriage, average distance of 3500 m. &c. | 4 |

**No. 57.**—Between transverse section 80 and 330.  
Hard rubble stone, at the quarry Agnetz  
Loading and carriage, average distance of 8 kilometres, &c. | ... |

**No. 58.**—Between transverse sections 330 and 490.  
Hard rubble stone, at the quarries Blancfossé  
Carriage, average distance 12 kilometres, &c. | ... |

**No. 59.**—Between transverse sections 490 and 581.  
Hard rubble stone, at the quarries Falaise  
Carriage, average distance 10 kilometres, &c. | ... |

**No. 60.**—Hard rubble stone, from between transverse sections 245 and 390.  
Hard rubble stone, at the quarries St. Just  
Carriage, average distance 4 kilometres, &c. | ... |

**No. 61.**—Between transverse sections 490 and 581.  
Hard rubble stone, at the quarries Vimont  
Carriage, average distance 10 kilometres | 20 |

**MASONRY.**  
The price of stone for ashlar is in the following items.  
No. 62 to 69 is calculated from the prices No. 46 to 51, with 1/16 or near 4 added for waste.  
No. 62.—For the viaducts No. 7 and 8, and the bridge.  
1/16 of stone, St. Maximin, at 35 fr. (No. 46) | 63 |
0;11 of mortar, at 19;10 fr. (No. 41) | 2;10 |
Labour, including use of tools and profits | 9;50 |

**No. 63.**—The viaducts No. 27 and 28.  
1/16 of stone, St. Maximin, at 68 fr. (No. 47) | 78 |
0;11 of mortar, at 21;17 fr. (No. 42) | 2;33 |
Labour, &c., as No. 62 | 9;50 |

**No. 64.**—Between transverse section No. 1 and 330.  
1/16 of stone (Vergelé) Mello, at 34 fr. (No. 48) | 48 |
0;11 of mortar, at 20;14 (No. 41 and 42) | 2;22 |
Labour, &c. as No. 62 | 9;50 |

**No. 65.**—Between transverse sections 1 and 330.  
1/16 of stone (face) La Gache, at 44 fr. (No. 49) | 51;04 |
Mortar and labour as No. 64 | 11;72 |

**No. 66.**—Between transverse section 1 and 330.  
1/16 of stone, La Gache, at 25 fr. (No. 50) | 30;16 |
Mortar and labour as 64 | 11;72 |

**No. 67.**—Between transverse section 330 and 190.  
1/16 of stone, Blancfossé, at 47 fr. (No. 52) | 54;52 |
0;11 of mortar, at 29;12 (No. 43) | 2;21 |
Labour, &c. as 62 | 9;50 |

**No. 68.**—Between transverse section 490 and 581.  
1/16 of stone, Falaise, at 45 fr. (No. 53) | 52;20 |
Mortar and labour as 67 (No. 45) | 11;71 |

**No. 69.**—Between transverse section 330 and 190.  
1/16 of stone (Vergelé) from La Gache, at 37 fr. (No. 51) | 42;92 |
Mortar and labour as 67 | 11;71 |

**MASONRY, with the beds and joints worked fair, per cubic metre.**  
No. 70.—Between transverse section 1 and 330.  
Stone, (La Gache), &c. (No. 63) | 62;26 |
Additional dressing all the beds and joints | 15 |

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1843.] THE CIVIL ENGINEER AND ARCHITECT'S JOURNAL. 289
The following prices of stone in articles Nos. 74 to 79 will be seen to be calculated from the prices of stone detailed in Nos. 56 to 61, and 1/3 added for waste.

<table>
<thead>
<tr>
<th>No. 71.</th>
<th>Between transverse sections 330 and 490.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stone of Ganne, &amp;c., as No. 66</td>
<td>41:68</td>
</tr>
<tr>
<td>Dressing the beds and joints, including use of tools, profit of contractor</td>
<td>30:00</td>
</tr>
<tr>
<td>Profit</td>
<td>15:00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. 72.</th>
<th>Transverse sections 480 and 581.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stone of Falaise, &amp;c., No. 68</td>
<td>63:01</td>
</tr>
<tr>
<td>Additional dressing all the beds and joints, including use of tools, profit, &amp;c.</td>
<td>15:00</td>
</tr>
<tr>
<td>Profit</td>
<td>78:21</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. 73.</th>
<th>Between transverse sections 330 and 490.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ashler stone, mortar, labour, (Blancfosses) &amp;c. as No. 67</td>
<td>66:23</td>
</tr>
<tr>
<td>Dressing all the beds and joints, profit, &amp;c.</td>
<td>25:00</td>
</tr>
<tr>
<td>Profit</td>
<td>91:23</td>
</tr>
</tbody>
</table>

**Rubble Masonry, per cubic metre.**

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**Profit:**
- The contractor's profit is included in the prices of the materials provided.
- The profit is calculated as 50% of the total cost of materials.
- This includes the cost of the labour, tools, and equipment.

<table>
<thead>
<tr>
<th>Description</th>
<th>Price (fr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ashler stone, mortar, labour, (Blancfosses) &amp;c. as No. 67</td>
<td>66:23</td>
</tr>
<tr>
<td>Dressing all the beds and joints, profit, &amp;c.</td>
<td>25:00</td>
</tr>
<tr>
<td>Profit</td>
<td>91:23</td>
</tr>
</tbody>
</table>

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**Rubble Masonry, per cubic metre:**

**Stones for Macadamised Roads:**

| No. 88. | One cube of rubble stones, average price | 8:55 |
|---------|----------------------------------------|
| Carriage, labour, tools, profits, &c. | 0:95 |
| Per superficial metre | 50:70 |

**Stones for Macadamised Roads:**

<table>
<thead>
<tr>
<th>No. 89.</th>
<th>Between transverse sections 330 and 581.</th>
</tr>
</thead>
<tbody>
<tr>
<td>720 bricks at 41:50 the thousand</td>
<td>20:68</td>
</tr>
<tr>
<td>0:23 of mortar at 20:12 (No. 13)</td>
<td>5:03</td>
</tr>
</tbody>
</table>

**Ashlar, per superficial metre:**

<table>
<thead>
<tr>
<th>No. 90.</th>
<th>For covering arches with a layer 0:01 m. in thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>6:00</td>
<td>5:75</td>
</tr>
<tr>
<td>No. 91.</td>
<td>Ditto for footways, the thickness being 0:015 m. including profits, &amp;c.</td>
</tr>
</tbody>
</table>

**Rubble Masonry, per cubic metre:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Price (fr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ashler stone, mortar, labour, (Blancfosses) &amp;c. as No. 67</td>
<td>66:23</td>
</tr>
<tr>
<td>Dressing all the beds and joints, profit, &amp;c.</td>
<td>25:00</td>
</tr>
<tr>
<td>Profit</td>
<td>91:23</td>
</tr>
</tbody>
</table>

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**Ashlar, per superficial metre:**

| No. 96. | Cutting, per superficial metre, the cradles serving as coffer-dam, including profit, &c. | 0:014 |
|---------|----------------------------------------|
| No. 97. | Pitching, per superficial metre | 0:50 |
| No. 98. | Tarpointing, of bituminous cloth, the thickness of the coating being 0:0065 m., per superficial metre | 4:61 |
| No. 99. |Remains composition (galipot) consisting of one part of grease with 2 of resin, per kilogramme | 0:65 |
| No. 100. | Ditto per square metre, including labour and one kilogramme of "galipot" | 0:95 |

**Masonry, per superficial metre:**

| No. 101. | Painting in three coats for all colours, on wood and iron, per superficial metre | 1:20 |
|---------|----------------------------------------|
| No. B. | The first coat on iron to be in red lead. | 2:70 |

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**PROCEEDINGS OF SCIENTIFIC SOCIETIES.**

**INSTITUTION OF CIVIL ENGINEERS.**

February 28.—The President in the Chair.—(Continued.)

Account of the Victoria Bridge, erected across the River Wear, on the line of the Durham Junction Railway. By David Brenner, Associate Inst. C. E.

The district through which the Durham Junction Railway passes, for the purpose of completing the connexion between the city of Durham, with the towns of Newcastle, South Shields, and Sunderland, is extensively underlined by coal-workings, and great caution was requisite in the selection of a spot which suited the level of the railway, and where a foundation could be formed sufficiently sound to support such a structure as the bridge described in the paper. The advice of Messrs. Walker and Burges was therefore sought by Mr. Harrison, the engineer of the line, and their design was adopted; but subsequently several alterations were made, either to favour the locality or from motives of economy.

The bridge is 810 feet 9 inches long, and 21 feet wide, between the parapets. It is, with the exception of the quays of the main arches, built of freestone, from the Prusher quarries; there are three semicircular arches, of 141 feet, 100 feet, and 66 feet span respectively; a centre arch of 160 feet...
span, with a radius of 72 feet, and three arches of 29 feet span each at either end, forming the abutments. The main pier is founded upon rock, 24 feet beneath the bed of the river; and the height from the foundation to the top of the parapet is 156 feet 6 inches; the under side of the main arch, at its centre, is 212 inches above the bottom of the sluice.

The paper describes at length the nature of the building materials employed, the dressing of the stones, the composition of the mortar, the general detail and dimensions of the construction, the centering of the arches, with its precautions adopted in striking them, the mode of the traveling and other cranes employed in the construction; these are stated to have been very efficient. The north arch, of 100 feet span, containing about 980 tons of stone, was entirely turned with two of the cranes, in 28 hours, giving an average weight of 172 tons of stone laid by each crane per hour.

The perseverance and practical skill of Messrs. Gibbs, of Aberdeen, the contractors, are particularly mentioned, as the difficulties attending the getting down the foundations, especially that of the main pier, were very great, and the arches were encased and covered with water. The detail is given of the precautions taken with the coffer-dam, in which at one period a steam-engine of 20 h.p., working two pumps of 18 inches diameter each, was insufficient to keep down the water, and it became necessary to drive a range of sheet piling all round withinside the dam, before the leakage through the bad strata above the rock could be stopped.

By calculation it appears, that the pressure on the foundations of the highest pier in the bridge is about 37 tons on each square foot, exclusive of the additional weight of the passing coal-trains, which frequently weigh 120 tons each.

The bridge was commenced on the 17th of March, 1836, and was finished on the 28th of June, 1838, occupying about 74 working days, and cost, with the extra works, nearly £40,000.

The paper is illustrated by three drawings, showing a plan and elevation of the bridge, in several stages of its construction, and when completed; the details of the centring, hoists, and cranes, the coffer-dam, engine, pumps, and of the foundations of the whole structure.

Mr. Vignoles had examined the bridge very minutely, and had been much struck with it, at Alcantra, which was adopted by the engineer; he was quite in accordance with the beauty and simplicity of the original design; it was an extraordinary example of care and attention on the part of the contractors, and did infinite credit to all engaged in it; yet with all this, it had cost less, in proportion to its dimensions, than any similar structure in this country.

The Professor in several that the structure first proposed was to have been of cast iron, but when he and his partner, Mr. Burgess, were consulted, they advised the employment of the freestone from the adjoining quarries, on Lord Londonderry's estate, and they furnished a design, based upon that of Trajan's bridge, at Alcantra, which was adopted by the engineer; and subsequently an alteration was made, by introducing three small arches in each abutment, which, in his opinion, had injured the design; that was the extent of his connexion with the bridge; the merit of the construction must be given to the engineer and the contractors, and he must corroborate the statement of the superior manner in which the work had been executed.

The bridge had been placed nearly at the spot marked out by Mr. Telford, for the Great North Road to cross the Wear, and as the railroad would now form part of the line between Newcastle and Durham, Mr. Telford's plan would be virtually executed, although with the difference of substituting a railway for a turnpike road.

"Description of the American engine 'Philadelphia,' made by Mr. Norris of Philadelphia, North America, for the Crooked River and Glasgow Rail-way." By G. D. Bishopp; communicated by Captain W. S. Moorison, ASS. Inst. C. E.

The engine described in the paper, was made in the year 1810, and has been in regular work for upwards of two years as an assistant engine upon the Leckey inclined plane, which rises at an angle of 1 in 37 1/2, and is 2 miles 4 chains long. Its construction is what is termed a "bogie" engine, having a four-wheeled truck, to support one end of the boiler, while the other end rests upon the driving wheels. It has outside cylinders, inclined so as to clear the bogie wheels, over which they are placed, and it has inside framing.

The boiler is cylindrical, 9 feet long and 3 feet 4 inches diameter, of plates 3/8-inch thick. The fire-box attached to it has three of its sides square, and the front semicircular, with a spherical dome on the top, and the area of the grate about 10 square feet; it was originally constructed of iron, with a copper lining. Its construction is what is termed a "bogie" engine, having the usual manner; but it was destroyed in about eight months, and has been replaced by a copper fire-box, of plates 3/8-inch thick, with a tube plate 3/16-inch in thickness. The tubes are 94 in number, 8 feet 11 inches long, and 2 inches in diameter; the tubes were originally of copper, but were replaced by brass tubes when the new fire-box was fixed. Midway between the two end plates, is a third plate through which the tubes pass, so as to serve as a support, and to prevent them from sinking in the middle. The total internal area of these fires is 58 square feet, and the grate area 15 square feet, externally, by 13 feet 10 inches high from the rails, and has not any damper. The framing is entirely of wrought iron, with the axle guides, &c., forged upon it. The "bogie" frame is also of wrought iron; it is attached to the smoke-box by a centre pin, and is carried by two pair of wheels, 2 feet 6 inches diameter, made of cast iron, chilled, and without tires. The driving wheels are 4 feet diameter, also of cast iron, but with wrought iron tires; they are firmly fixed upon a straight axle, as the cylinders are outside. The cylinders are 12½ inches diameter inside, with a length of stroke of 20 inches.

Minute dimensions are given of the steam passage and valves (the "lead" of which is 1-inch, and to the eduction pipe nearly 1-inch, the motion of the slide extending 1 1/2-inch on either side of the centre line); the steam chests, the regulator, the gearing, and feed-pumps, and all the other parts of the engine and connections.

The general summary of the work done (the details of which are in the archives of the Institution of Civil Engineers) shows that with a maximum load of 22 tons wagons and 20 men working a weight of 255 tons behind the tender, the engine ascended the Leckey inclined plane at a speed of between 8 and 9 miles per hour. That with 6 wagons, or 39½ tons, the speed was between 10 and 11 miles per hour; that with 5 wagons, or 33½ tons, the speed was about 12 and 13 miles per hour, and that in assisting the ordinary trains, with 7 passenger carriages, the usual speed had been 13½ miles per hour. There are three engines of this class kept at the Leckey inclined plane for assisting the trains in their ascent, but one is generally found sufficient for the daily service.

The communication is illustrated by seven drawings of the engine and its details of construction, which have been communicated through Captain W. S. Moorison, ASS. Inst. C. E.
by the exigencies of the peculiar locality where the engine worked. The economical working of the engine was due partly to the attention and skill of the driver, who had become better acquainted with the capabilities of the machine, had a better knowledge of the locality, and was stimulated by a previous reputation of the engine. He worked the coal and other fuel consumed, but was principally to be attributed to the judicious alterations that had been made in the construction. There had not been any reduction of the men's wages.

The usual pressure of steam was between 60 lb. and 66 lb. per square inch. The temperature of the water varied considerably; at one end of the engine, the steam was generated faster than it could be consumed by the cylinders, and thrown off by the safety valve, the pressure continued increasing. It should be understood that Bury's engine, aluded to in the experiments, was intended rather for conveying trains at higher velocities, than for moving a precipice, with a heavy load, it was therefore labouring under a disadvantage. The steam ports in the American engine were very large, and although steam was thereby wasted, that arrangement was of material assistance, in the peculiar duty for which the machine was intended.

Mr. Brathwaite observed, that the quantity of coke consumed appeared to exceed materially that upon other railways; he understood that an engine recently constructed by Messrs. Rennie used about 18 lb. per mile, and that on the Liverpool and Manchester line the consumption was much lower; 14 lb. per mile was understood to be the rate. It appeared to him that the real questions were, the absolute duty performed with a given quantity of fuel, and at what cost? and also whether the greater adhesion of the driving wheels was due to the weight imposed upon the engine, or the additional friction of the water tank upon the boiler, and the coke boxes upon the foot-plate of the engine, which were generally more imposing than in the case of the American engine.

Mr. McConnell replied that the peculiar duty of these bank engines required the steam to be kept up for about 16 hours daily, during which period they made eight trips, amounting in the whole to about 10 miles, of which, during 20 miles only actual duty was performed, so that the greater portion of the coke was consumed while the engines were at rest. When they were running with luggage trains on the line the quantity of coke consumed was very small. The difference of cost, in consequence of the various alterations that had been made in the improved mode of working the engine, was very great. In January 1842, the cost per trip on the incline was 17s. 5d., but in January 1843, it only amounted to 7s. 13d.

The average weight of the luggage trains was about 60 tons; two assistant engines were used to press the cars, and in case of the wheels slipping; otherwise one of the "Bogie" engines could perform the duty alone, as with the passenger trains, which were always conveyed up the bank engine alone.

Captain Moorsom said that the main object in the view of this investigation was to ascertain whether curves and steep gradients could be worked with the greatest economy, security, and economy; he would, however, in the present case suppose the two former positions to be equal in both cases, and would inquire only into the economy.

Mr. McConnell referred to the statement of the London and Birmingham Railway Company, that the annual cost of working the Enston Square incline plane, which was 1½ mile long, with an average angle of 1 in 98, with stationary power and an endless rope, was-

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1840</td>
<td>£2350</td>
</tr>
<tr>
<td>1841</td>
<td>£1756</td>
</tr>
<tr>
<td>1842</td>
<td>£1213</td>
</tr>
</tbody>
</table>

On the Edinburgh and Glasgow Railway, the expenditure upon the Glasgow incline, which was about one mile in length, at an inclination of 1 in 42, also with stationary power, was £1536 in 1842. He understood (but he was not prepared to produce evidence for his statement) that, on the Great Western Railway, the cost of working the Box tunnel incline alone, was in 1841, about £3500; and in 1842 it had been reduced to nearly £2500; that was worked by locomotive power. Taking into consideration the number and weight of the trains, their speed, and the relative length and the angle of the inclines, he believed that the Enston Square incline might be said to perform about half as much work as that on the Licky.

Mr. McConnell presented drawings of the locomotive after being altered, of the detaching catch, and of the improved boiler. The engine was then described some improvements in the construction of the engine as well as into its details, as the substitution of a different description of fire-bars and fire-frame, under an arrangement by which a considerable saving had been effected in the consumption of fuel. He stated that, for several reasons, but chiefly to increase the adhesion of the driving wheels, the coal had been increased. A large tank constructed to be carried on the boiler of the engine. It was made of the best plate iron, 3 inch thick; its length was 8 feet 9 inches, breadth 3 feet 3 inches, depth 3 feet 8 inches at the sides, and 1 foot 11 inches at the centre. The tank was placed entirely underneath the engine, the engine being so arranged as to require a space of about 10 feet wide, upon a coating of thick felt; it was held in place by four wrought-iron straps passing round the boiler. Advantage had been taken of the waste steam, by introducing a copper pipe from the top of the fire-box dome, into the upper part of the tank, carrying it to and fro, from one end to the other, with an open extremity to allow the escape of the steam into the water; this pipe was furnished with a stop-cock; in addition to this a number of pipes were introduced from the smoke-box into the tank, by which arrangement, the water in the tank was maintained at the boiling temperature, previous to being pumped into the boiler, which, in addition to the above, proved advantageous in diminishing the breacking of the tubes and stays, arising from the sudden contraction by pumping in cold water, when the steam was shut off while descending the incline. The tank contained upwards of 400 gallons of water, a quantity sufficient for the engine over 18 miles, and goods' trains had been taken the whole length of the incline (by the American engines) without benefit of water. The supply of coke was carried in sheet-iron boxes, each containing about 10 lb., and of a size to fit the fire-door of the boiler, ranged on platforms on each side of the foot-plate, which platforms were fitted with boxes, to hold the necessary supply of coke required to be burnt for the ascent of the incline.

Mr. McConnell then described a powerful and efficient description of brake, which he had constructed to act upon the driving wheels, it was so arranged that the whole weight of the fire-box end of the engine could be thrown on the wheels; one brake had been found quite sufficient to stop the engine on any part of the incline; from their position they were very easily brought into action; the end working upon the fore part of the wheel, was connected to a stout made fast to the framing of the engine; the other end was worked by a screw 1½ inch in diameter, passing through a bracket fixed on the boiler, which served as a nut. The main spring-plate of the brake was rendered flexible by the wood blocks being in short segments, thus enabling their entire surface to be brought into close contact with the periphery of the wheel.

A form of catch, employed for detaching the engine from the train, was described, it was stated to be managed with facility, and at the same time was perfectly secure. The principal advantages of these engines were, he believed, the economy in the consumption of fuel, and the increased adhesion of the driving wheels, which, he supposed, upon going up ten miles (of 10 lb. at 18 feet change,) in the case of the then existing engines, nothing but the highest powers could have hitherto been given; the most accepted reason being, that the fusible texture of malleable iron assumes gradually a crystallized structure, which being weaker in a longitudinal direction, gives way under a shock that the same iron when in its fibrous state would have sustained without injury.

The author contends that it is difficult to prove that an axle which, before, shall be found of a crystallized texture, may not have been so originally at the point of fracture, although, at other parts the texture may have been unchangeable.

He then proceeds to show that a gradual deterioration takes place in axles without their losing the fibrous texture, and that it does not arise from the cause to which it is usually attributed. From among a large collection of faggoted axles which had been selected, and on which the deterioration had been sustained, five specimens were selected, of which drawings are given, representing the exact appearance of the metal at the point of fracture, which in each case occurred at the re-entering angle, where the journal joined the body. The fractures appear to have commenced with a smooth, regularly-rounded, minute fissure, extending all round the neck of the journal, and penetrating on an average to a depth of half an inch. They would appear to have gradually penetrated the iron from the surface towards the centre, in such a manner that the breadth of the fracture, or the width upon running across the body, of the axe was concave, until the thickness of sound iron in the centre became insufficient to support the shocks to which it was exposed. In all the specimens the iron remained fibrous; proving that no material change had taken place in its structure.

Mr. McConnell then proceeds to argue, that the breaking of these axles was owing to a tendency of the abrupt change in thickness where the journal met the shoulder, to increase the effect of shocks at that point; that owing
to the method of manufacture the fibres did not follow the surface of the shoulder, but that they penetrated straight into the body of the axle; that the power of a fibre to resist a shock being in the compound ratio of its strength and extensibility, that portion of its strength which is within the mass of the body of the axle will have less elasticity than that in the journal, and it is probable that the fibres give way at the shoulder on account of their elastic play being suddenly arrested at that point. This he contends would account for the shock being imparted to the solid axle, and it is probable that the surface of the fracture was always convex in that direction. It is therefore proposed, in manufacturing axles, to form the journals with a large curve in the shoulder, before going to the lathe, so that the fibre shall be contended, and that when the required rigidity is to be made efficient in adding strength to the fibres without impeding their elasticity. Several axles having one end manufactured in this manner, and the other by the ordinary method, were broken: the former resisted from five to eight blows of a hammer, while the latter were invariably broken by one or two. This would appear to be the result of the wheel being then considered, and it is contended, that at the place where there is an abrupt change in the extent of the oscillations of the molecules of the iron, these molecules must necessarily be more easily torn asunder; and that in the improved form of journals, as the power of resisting shocks is increased by the contiguity of the superficial fibres, so is the destructive action of the vibratory movement prevented by the contiguity of form.

The paper is illustrated by five drawings, showing the section of the journals of broken axles, and their appearance at the moment of fracture.

Remarks.—Mr. York agreed with Mr. Rankine in several points, and stated, that since the last meeting he had made a series of experiments, which confirmed his opinion relative to the vibration in solid railway axles being arrested when the wheels were keyed on. In all such cases, where the wheel was keyed and the axle vibrating, it was contended, but unlikely to ensue, but with hollow axles there was very little difference of sound when struck, and no diminution of strength after keying on the wheels; this he attributed to the regular distribution of the molecules in the metal of the hollow axle. Mr. Parkes.

Mr. Parkes coincided with Mr. York's opinion, and he believed that hollow axles would eventually supersede solid ones, particularly if they had sufficient rigidity for resisting fixture. Their faculty of transmitting vibration more readily was in their favour; it was well understood that in pieces of ordnance and mortar barrels great regularity of proportion in the metal was requisite, in order to insure the equal transmission of the vibration, caused by the sudden expansion of the metal at the moment of the explosion, unless the vibration was regular the barrel would burst or the ball would not be correctly delivered.

Mr. Greener, of Newcastle, among other experiments, turned the outside of a musket barrel to a correct taper, and fixed tight upon it at given intervals several rings of lead 2 inches in thickness; on firing a charge of 4 drachms of powder he found that all the rings were loosened and had all expanded regularly in their diameter. It was a well-known fact that cannon seldom or never burst from continuous firing; such accidents, unless they arose from peculiar circumstances, generally occurred in consequence either of inequality in the nature of the metal or irregularity in its distribution; to the latter Mr. Greener attributed the fact of 'Mercurius moustrae,' before Ansower, and of a large gun which was proved to have been manufactured with great care, since; this latter gun burst at the third discharge, after delivering the ball better than on either of the previous discharges; it was evident that the fracture did not occur under the explosion of the powder, but on the reentering of the revolution of the projectile; as the gun was afterwards measured, it was found to be 

March 14.—The President in the Chair.

"Description of a method of laying down Railway Curves on the ground." By William John Macquorn Rankine, Assoc. Inst. C.E.

The method described in the paper depends on the well-known principle, that the angle subtended at any point of the circumference of a circle, by a given arc of that circle, is equal to half of the angle subtended at the centre by the same arc. The position must be ascertained beforehand as the same in every other method of laying down curves, namely, the number of degrees, minutes, and seconds in the entire arc of the curve; and the length of the two equal tangents; either of which three quantities can be the vibration from the other two. The commencement of the curve A, its termination B, and the directions of the tangents D, are marked on the ground as usual. It is supposed that the centre line of the railway is marked by stakes drawn at equal distances—say of 100 feet. Let E represent the last stake in the portion of the line immediately preceding the curve, the distance A F from the commencement of the curve to the first stake in it will be the difference between 100 feet and E A. The angle at the commencement of the curve E F A must be calculated, and a dedicate theodolite having been planted at A, this angle is to be laid off from the tangent. The telescope will then point in the proper direction for the first stake in the curve, and its proper distance from A being set off by means of the theorem, the position of the subsequent stakes will be determined at once. The angles at the circumference subtended by A F + A F + F 400 ft., &c, being also calculated, and laid off in succession, will respectively give the proper direction for the ensuing stakes G, H, I, &c., which are at the same time to be placed successively at uniform distances of 100 ft. by means of the theorem. It is scarcely necessary to state that the accuracy of the computation between an arc of 100 ft. and its chord, on any curve which usually follows the railways, is too small to cause any perceptible error in practice, even in a very long distance; but should curves occur of unusually short radii, it is easy to deduce the direction of each stake from the next, instead of 100 ft., the length of the arc. When the instruments were turned to a distant view from any three stations to lay down the entire curve from them, any stake which had already been placed in a commanding position will answer as a station for the theodolite. By this method the operation of laying down a circular curve of any radius is made exactly analogous to that of laying down a straight line with the assistance of the telescopic sights of a theodolite. It is stated that by this method the curve is laid down with accuracy at the first operation; that any accidental error in the position of a single stake, with which it has been practised, and that it has been a practice that the progressively increasing errors of the old method are entirely avoided.

Remarks.—Mr. Gravatt observed that a well-made theodolite** was a convenient instrument for setting out curves for railways, and that it had been used by him and his assistants for this purpose for several years. The common theodolite was not, however, amenable universally applicable without some further contrivances for accommodating it to this particular service. He stated that the circular arc (used, he believed, almost universally on railways) was not the true curve for a line of rails; as might be proved by considering the action of a rope of string, where there was no tendency to wind viewed in the cross section, whilst on a curved road the outside rail required to be raised, in order to resist the tendency of the engine and carriages to fly off the rails in going round the curve. Where a straight line was joined on to a circular arc, the before-mentioned condition would require an instantaneous and vertical rise of one of the rails, which was a condition that could not be fulfilled. In curves of contrary fixture, if composed of circular arcs, the difficulty was increased; for the outer rail, which ought to be the highest, suddenly became the inner and the lowest, so that an instantaneous elevation of the central rail, and a corresponding reduction of the left one was required if the curves were of the same radius, the alteration would be of double the extent to that required when passing on to the same arc from a straight line. Therefore as the outside rail must be in all cases the highest, the circular arc, which required the manifestly false condition of an instantaneous elevation, could not be the true curve. He had several years since demonstrated that the true curve was one, which commenced with an infinite radius, decreased in a regular manner, in advancing on the curve, when the radius might be constant for some time, and then increased again to infinity, before the middle point, and the outer rail was raised by a small amount. He had fixed upon the elastic curve, which complied with all the conditions required, but other curves were also applicable. His late assistant, Mr. W. Froude, had found that arcs of a cubic parabola, whilst they complied with the exigencies of the curve, were not so conveniently used in practice; the equation and its fluxions, or differential coefficients, being very simple and easy of application. Mr. Froude had also applied other properties of that curve, so that, with the assistance of a few calculated tables, the process of setting out a true curve was rendered as easy in practice as setting out a circular arc. For any curve there was considerable practical difficulty in finding the direction of the tangents, the radii of curvature, and the position of the curves upon the ground. Mr. Gravatt used what he termed a skeleton plan, of several stakes driven into the ground nearly in the course of the intended line; from these their positions were determined, and then the two co-ordinates; thus obtaining a numerical accuracy far greater than that of any drawn plan. By using a table of sines and co-sines, a few hours' calculation would save many day's labour in the field, besides ensuring an accuracy not otherwise to be obtained.

On Horse Power.

"Results of the application of Horse Power to raising Water from the working shafts of the South-Eastern Railway, in 1842." By Frederick William Simms, Inst. C.E.

This tunnel is driven in the middle of the lower green sand, between which and the surface of the ground is interposed only the upper bed of the same stratum; but in sinking the eleven shafts for the work, it was found that at the level of the top of the tunnel the ground assumed the character of a sand-marl, and being saturated with water could not be reduced by manual labour. Under these circumstances horse gins were erected for drawing the water by barrels, containing 100 gallons each, weighing when full about 1310 lbs. The engineer's intention was to drive simultaneously from these shafts, in
the direction of the tunnel, an adit or heading, to carry off the water; but the earth, which was sand mixed with fine particles of blue clay, was so filled with water as to become a mass of semi-fluid mud, great exertions were therefore necessary to carry off the water, without erecting pumps. At first this was accomplished by making each horse work for 12 hours, and then for 8 hours per day, allowing one hour for food and rest; as the water increased it became necessary to work night and day, and the time of each horse's working was reduced generally to 6 hours, and sometimes to 3 hours. At all the horses were hired at the rate of 7s. per day, the author, who had the direction of the works, ordered a daily register to be kept of the actual work done by each horse, for the double purpose of ascertaining whether they all performed their duty, and also hoping to collect a body of facts relative to horse power which might be useful hereafter. This detailed register, which was kept by Mr. P. N. Brockedon, is appended to the communication.

The author gives as a proposition, "That the proper estimate of horse power, would be that which measures the weight that a horse would draw up out of a well; the animal acting by a horizontal line of traction turned into the vertical direction by a simple pulley, whose friction should be reduced as much as possible." He states that the manner in which the work was performed nearly approached very nearly to these conditions; and after giving the principal dimensions of the horse gin, he analyzes each set of experiments, and by taking the mean of those against which no objections could be urged, he arrives at the following results:—

The Power of a Horse working for 8 hours = 23,412 lb. raised 1 ft. in one minute.

Ditto .. 6 = 24,539 ditto.
Ditto .. 4½ = 27,056 ditto.
Ditto .. 3 = 32,243 ditto.

Of these results he thinks the experiments for 6 hours and for 3 hours alone should be adopted as practical guides, all the others being in some degree objectionable. As a means of comparison, the following table of estimates of horse power is given:—

<table>
<thead>
<tr>
<th>Name</th>
<th>Pounds raised 1 foot high in one minute.</th>
<th>Hours of Work.</th>
<th>Authority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tredgold</td>
<td>27,500</td>
<td>8</td>
<td>Tredgold on Railroad. p. 69.</td>
</tr>
<tr>
<td>Desagulier</td>
<td>41,000</td>
<td>8</td>
<td>Dr. Gregory's Mathematics for Practical Men, p. 183.</td>
</tr>
<tr>
<td>Ditto</td>
<td>27,500</td>
<td>Not stated.</td>
<td></td>
</tr>
<tr>
<td>Sauver</td>
<td>31,000</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Moore, for Society of Arts</td>
<td>21,120</td>
<td>Not stated.</td>
<td></td>
</tr>
<tr>
<td>Swanton</td>
<td>22,000</td>
<td>Not stated.</td>
<td></td>
</tr>
</tbody>
</table>

These are much higher results than the average of his experiments, and were nearly in agreement with the extremes obtained by him; but under such excessive fatigue the horses were speedily exhausted, and the result was, that in ten months nearly 1000 horses were employed, 7 of them were of good quality, their average height was 15 hands 1 inch, and their weight about 10½ cwt, and they cost from 20£ to 40£ each. They had as much corn as they could eat, and were well attended to.

The total quantity of work done by the horses, and its cost, was as under:

| Registered quantity of water drawn 104 feet, the average height, 28,220,800 gallons | = 128,500 tons. |
| Ditto, earth 3,500 yards, 1 ton 6 cwt. per yard. | = 4,550 |

Total weight drawn to the surface 133,955.

The total cost of horse labour, including a boy to drive each horse 1,585 15 3.

Or, 2.93 pence per ton, the average height of 104 feet.

As soon as the adit was driven, all the water was carried off by it, and the works were stated to be perfectly dry.

Remarks.—Mr. Palmer said, it should be understood, that in stating 33,000 lb., raised one foot high in a minute, as the measure of the power of a horse, Bolton and Watt had not intended to fix that as the average weight which horses were capable of performing; they had taken the highest results of duty performed by powerful horses, in order to convince the purchasers of their steam-engines that they received all that had been constructed for. He had made some experiments on the amount of work performed by horses tracking bosts on canals; on the upper end of the mast of the boat a pulley was hung; over this the tawing rope was passed, with the means of suspending to its extremity gives weight, so as exactly to balance the power exerted by the horse. The results arrived at by these means were so various, that he could not deduct any average conclusions; as the power exerted varied between 30 and 120 lb. The power diminishing as the speed was increased: he thought that 21 miles was too high an average estimate, and that it should not exceed 2 miles per hour.

Mr. Field remarked that in all estimates of horse power, the speed was considered to be at an average of 2½ miles per hour, and all experiments were reduced to that standard.

Mr. Hawkins said, that some years since, he had made numerous inquiries respecting the work done by horses in carrying the heavy loads of the roads, and found, that four good horses could draw an ordinary stage coach, with its complement of passengers, 8 miles a-day at the rate of 10 miles an hour; that if they ran stages of 10 miles in the hour, the horses must rest one day in seven each week; that in fifve years, each horse drawing about half a ton; he had been informed by workmen, that good horses would walk, at the rate of 2½ miles per hour, for twelve hours out of the twenty-four, making 30 miles a-day, and that they would continue to do such work, day by day, each horse drawing one ton, for many years, provided they had been worked hard when young.

Mr. Gravatt observed, that although there might exist some hesititation in receiving these results of work actually performed, as a general measure of horse power, yet as engineers frequently required to know what could be performed by horses, when employed for short periods, in works of haste or difficulty, he thought that the experiments were useful, and would form good data for reference. He was sorry to observe, that in too many cases to idea was present, that it was cheaper to work a small stock of horses to death, than to keep a large number and to work them fairly; the results which he had been enabled to arrive at, were perhaps not a fair value of a horse's work, continued for any length of time, at the best rate of economy, for both the contractor and the employer.

The President believed that however, in cases of emergency, which he allowed did occur in engineering works, the forced system of labour mentioned by Mr. Gravatt might be tolerated, he was convinced that it was not the most economical, but on the contrary, humanity and economy would be found much in hand. It would be desirable to know the average speed at which the different rates of work had been performed; this was essential in order to find any calculation upon the results given. Coach proprietors calculated, that at a speed of 10 miles per hour, a horse was required for every mile going and returning, so that one horse was kept for every mile of the coach's journey. He thought an average horse could weigh 1 ton 6 cwt., the load for each horse was 10 cwt.; whereas in the case of a horse drawing a cart, the gross load frequently amounted to 2 tons, but the speed was reduced to 2½ miles per hour, at which pace he conceived that 16 miles per day might be considered a fair day's work; this therefore was double the distance with four times the load, or eight times the coach-work, but with a heavier horse. The law that the quantity of work done, was as the square root of the velocity, or, as the cube root of the velocity, in equal times, was confined to work upon canals, or bodies moving through water.

Mr. Rennie had tried some experiments on the force of traction of the horses of the Grand Junction Canal. The towing rope was attached to a dynamometer which had previously been tested by weights. The horse, although urged at first starting, was afterwards allowed to fall into its natural speed, which was 2½ miles per hour on the average of 30 miles. The dynamometer indicated an average of 180 lb., which was capable of overcoming the resistance of the loaded barge of 25 tons, being in the ratio of 1:500. The weight of the horse was about 1½ cwt. He had also tried many experiments upon a fast boat, sent to him in 1833 by the late Colonel Page. These experiments were principally made in order to ascertain the comparative resistance of vessels moving through water at different velocities, and the Grand Junction Canal afforded a convenient opportunity of undertaking them. The boat was 70 feet in length, 4 feet in breadth, and drew 9 inches of water. The traction indicated by the dynamometer of the following resistance:—

<table>
<thead>
<tr>
<th>Miles per hour.</th>
<th>lb.</th>
<th>Miles per hour.</th>
<th>lb.</th>
</tr>
</thead>
<tbody>
<tr>
<td>At 2½ the resistance was 20</td>
<td>At 6 the resistance was 97 to 214</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>27</td>
<td>7</td>
<td>250</td>
</tr>
<tr>
<td>3½</td>
<td>30</td>
<td>8</td>
<td>336</td>
</tr>
<tr>
<td>4</td>
<td>411</td>
<td>9½-99</td>
<td>411</td>
</tr>
<tr>
<td>5</td>
<td>60</td>
<td>10</td>
<td>375</td>
</tr>
<tr>
<td>6</td>
<td>70 to 75</td>
<td>11½-117</td>
<td>392</td>
</tr>
</tbody>
</table>

Average = 336

One horse was employed in these experiments.

Stakes were fixed near the margin of the canal, so as to ascertain the rise and fall of the wave caused by the boat in passing; and it was observed that when the boat passed with a velocity of from 4 to 6 miles per hour, the rise of the wave was 6 inches, and the fall 5 inches, making a wave of 18 inches in depth; and when the velocity was 11 miles, the rise was reduced to 21 inches, and the fall to 21 inches. Great difference existed in the power of
horses, their weights, and structure; and the large dray horses used by Messrs. Barclay, Perkins, and Co. did a full average duty as was shown by Beeton and Watt; but considering the average power of strong and of weak animals, he adopted 22,000 lb. raised 1 foot as the standard; much however depended on the nature of the work performed.

Mr. Charles Wood remarked that although, on an emergency, it might be necessary to work horses to the extent which had been mentioned, it had been always found more economical to feed them well, and not unduly to force the speed, the weight drawn, or the hours of labour. By the recorded experiments of Mr. Goulton and Mr. Watt, which were at this meeting read by Mr. Pusey, it was shown that any increase of speed diminished the amount of work done, in a greater ratio than it was affected by an increase of the load. In drawing loads the weight of the animal was a point of considerable importance; and when extra exertion and muscular action were required, the nearer horses approached to "thorough bred," the greater was the result.

Mr. Davidson gave the following statement of the work performed by a London brewer's horse per day: the cost of feed of and wear and tear per horse per annum, being derived from actual experience among a large number of horses by Messrs. Truman, Hanbury, and Co.'s brewery. The feed, &c., is supposed to have cost the same per quarter, per truss, &c. each year.

<table>
<thead>
<tr>
<th>Years</th>
<th>Lb. weight drawn</th>
<th>Lb. weight drawn</th>
<th>Average lb. weight drawn</th>
<th>Cost of feed per horse per annum</th>
<th>Cost of straw per horse per annum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1835</td>
<td>5418</td>
<td>176</td>
<td>3442</td>
<td>43 2 d</td>
<td>16 3 d</td>
</tr>
<tr>
<td>1836</td>
<td>5072</td>
<td>176</td>
<td>3389</td>
<td>45 6 d</td>
<td>19 8 d</td>
</tr>
<tr>
<td>1837</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>1838</td>
<td>5077</td>
<td>176</td>
<td>3387</td>
<td>41 8 d</td>
<td>9 15 9</td>
</tr>
<tr>
<td>1839</td>
<td>5267</td>
<td>174</td>
<td>3513</td>
<td>42 9 a</td>
<td>9 17 1</td>
</tr>
<tr>
<td>1840</td>
<td>5756</td>
<td>182</td>
<td>3946</td>
<td>46 11 b</td>
<td>17 12 c</td>
</tr>
<tr>
<td>1841</td>
<td>5311</td>
<td>170</td>
<td>3550</td>
<td>45 1 c</td>
<td>10 16 11</td>
</tr>
<tr>
<td>1842</td>
<td>5263</td>
<td>174</td>
<td>3750</td>
<td>47 9 d</td>
<td>10 9 8</td>
</tr>
</tbody>
</table>

Total 36,924 12,171 54,515 309 19 5 68 3 11

Average for seven years nearly.

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<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5275</td>
<td>1728</td>
<td>3506</td>
<td>44 5 7 9 14 10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mr. Horne stated that Messrs. Tredwell had a contract on the South-Eastern Railway, near which Mr. Simms' experiments were made; they had upwards of 100 horses, whose average cost was about 300l. They worked 10 hours per day, and were well fed, so that their value was little reduced, and they were eventually sold for nearly the same prices as they originally cost. These contractors had about 400 horses on the Southamptou line; 12 horses cost about 25l. each. The same course of not over-working, and feeding them well, was pursued from motives of economy; and they found it answer. It was Mr. Jackson's practice to keep so many horses for his work as not to be under the necessity of working them more than 10 hours per day; he gave to each a peck of corn a day; by this means he has been able to keep up their value. On the Chester and Crewe Railway he had about 300 horses at work, and towards the end of the contract, owing to circumstances over which he had no control, he was obliged to work them 14 or 15 hours per day; and in the course of four months' labour, 1 horse had been lost. On the Tame Valley Canal there had been sometimes between 300 and 400 horses, but as the work was nearly finished many had been sold. Those sub-contractors who worked for a day on the Tame Valley Canal, and who were not required to have their horses in harness more than 12 hours per day, had realized nearly the same prices they had given for them in the first instance. The horses belonging to Mr. Edwards, the sub-contractor for the excavation of Newton Hill, and those of Mr. W. Tredwell, sub-contractor for the Friar Park Farm cuttings, were purchased from the same parties at prices varying from 200 to 35l. The former had been acting on the principle of getting out of the horses all he could, working them frequently 15 and 16 hours at a time; and the consequence was, that all his stock was in bad condition, and he would have been glad to get 60 or 70 a-piece for them. On the other hand, Mr. W. Tredwell, who was an excellent horse-master, and who did not work his horses beyond their strength, would be able to sell them for as much as he gave for them—indeed he had done so already for horses that he had parted with. Having been a good many years in the service of the late Mr. McIntosh, Mr. Horne could state that it never was his system to over-work his horses. It did sometimes happen that there was no alternative, but the principles upon which it was based were, that the horses should be well fed, and worked in the most economical way. Mr. Horne stated that in some respects the work was laborious, and the men were not very well paid; but the advantage of being so situated that the horses were managed in the most economical way, was undeniable. He was not aware that on the score of humanity and economy, the horses were the more valuable servant when treated with kindness.

Mr. Beardsmore said that a case had occurred in a work near Plymouth which he believed would give the fair value of the work actually performed by Messrs. Barlow, and others. For a day of work a dray horse, carrying an average load of stone of 25 tons, was drawn by one horse along a railway 960 feet in length, 260 feet of it being level and the remaining 700 feet having an inclination of 1 in 130; during 48 working days the number of trips was 1,302, or an average of 27-1 trips each day; the time of each trip was about 2 minutes. The weight and cost of the horse was 23,599,600l. Repeated experiments proved, that upon the incline of 1 in 130, the wagons in their ordinary working state would just remain stationary, the friction was therefore assumed to be 162 lb. per ton; by calculation it was found that the horse raised 39,320 lb. 1 foot per high minute of the day, useful effect, or net amount of stone carried, being 21,738 lb. raised 1 foot per minute. This difference between the two worked out, and the useful effect, arose from the necessary difference in strength and weight of the horses. The animal used was a mere Dartmoor or Devonshire cape horse, eight years old, 15 hands high, and weighed 101 lwt:; he had done the same work throughout a whole summer, remaining in good condition; but a lighter horse was found unequal to it.

"Description of Lieutenant D. Rankine's Spring Conductor," By Wm. John Macntron Rankine, Assoc. Inst. C. E.

This paper describes a contrivance for suling the action of the springs of railway carriages to variable loads, so as to give the proper ease of motion to a carriage when heavily laden, and at the same time to be sufficiently flexible for light loads. Its effect is to make the strength and stiffness of the springs in proportion to the load previously impressed on the spring, instead of supporting a shackle or roller, as in the usual construction, carries a small convex plate of cast iron. The form and position of this plate are so adjusted, that when the carriage is unloaded, it bears on the extreme end of the spring, thus allowing it to exert the greatest amount of flexibility; but as the plate is convex, the more the load increases, and the further the ends of the spring descend, the nearer does the point of bearing of the plate upon the spring approach to the centre or fulcrum, so that the convex plate or conductor tends to diminish the virtual length of the spring in proportion to the load, the result of which is to increase the strength of the spring, in the inverse ratio of its virtual length, and its stiffness in the inverse ratio of the cube of the same quantity. The author then gives, in a tabular form, the details and the results of some experiments made on springs of this description, which are similar to those now in use on the Edinburgh and Dalkeith Railway. The springs were 4 feet long, each consisting of ten plates, each ⅛ inch thick, and 22 inches broad. The contractors were cast with a radius of 12 inches, and so constructed as not to act until the load on each spring exceeded 10 cwt., and with a load of 30 cwt. they should have contracted the distance between the bearing points to 3 feet 4 inches instead of 4 feet; by this means the strength of the spring was increased in the ratio of 6 to 5, and its stiffness in the ratio of 216 to 125. The advantages stated to be derived from the use of these springs on the Edinburgh and Dalkeith Railway, and other lines, are, that they afford the same ease of motion to a single passenger as to 40 or 50 in one carriage; they save wear both of carriages and railway track; they produce the strength and stiffness requisite for the maximum load with less weight of metal; they are not more expensive to make or maintain in appearance, indeed they could not be observed unless they were pointed out.

The President's Conversations.

Mr. Walker, the President of the Institute of Civil Engineers, gave his annual conversations, at his residence in Great George Street, Westminster, on Thursday, the 3d of September, at half-past 4 o'clock, to a few of the Officers of the Institute and a few other gentlemen. On the occasion of the 5th of September, he stated the following: Mr. W. Tredwell, who was an excellent horse-master, and who did not work his horses beyond their strength, would be able to sell them for as much as he gave for them—indeed he had done so already for horses that he had purchased.
spacious suite of rooms. On the former evening about 300 persons attended, and on the latter a brilliant company assembled, comprising the most distinguished persons for rank in science or the fine arts, who all appeared to feel the hospitality and attention of the worthy host, who attended by Mr. Manly, the Secretary of the Institution, received the visitors on arriving, and directed their attention to the numerous models and works of art. The upper room was lighted by gas chandeliers, the burners of which were enclosed in glass globes, on Professor Faraday's illuminating principle, (ante p. 106).

Soon after 9 o'clock on Saturday Evening, H. R. H. Prince Albert arrived, attended by Sir E. Bowsher. The President escorted his distinguished guest through the principal rooms, explaining all the objects of note, and then, as H. R. H. passed a much larger and important room, the Secretary attended to afford any explanation which might be needed. H. R. Highness, who has recently become an honorary member of the Institution of Civil Engineers, remained nearly an hour in the rooms, and then proceeded to the Professor's Hall. Mr. Wotton, on being introduced to His Highness, on leaving, expressed himself highly gratified by the reception he had experienced from the President and his guests.

The Duke of Wellington arrived immediately after H. R. Highness' departure, and went the circuit of the rooms, making his usual prompt and sagacious remarks.

Among the distinguished visitors we noticed particularly the Dukes of Wellington and Buccleuch, the Marquis of Northampton, the Earl of Devon, Lincoln and Courtenay, Lords Lovelace, Blayney, Lowther and Blantyre; Hon. C. Wood, M.P., Hon. W. B. Bering, M.P., and numerous members of Parliament, Engineers, Architects and Professors, and several eminent foreigners.

Our limits will not permit us to notice everything, but we must select a few of the most instructive and striking objects. The marble group by Bailey, of great simplicity and beauty, some good sketches by Stanfield, Oliver, Stephenson, Harding, and Kendrick. Clarkson contributed some sporting and military subjects in his usual happy style; some fine bronze from Deville's collection and in all the rooms were to be seen some exquisite specimens of workmanship, carved from the original portraits of Wellington and Belloc. The Bank machine for weighing sovereigns, invented by Mr. Cotton, the governor of the Bank of England; its action was explained by Mr. W. Miller, who has charge of it at the Bank; its delicacy and precision appeared to be fully appreciated. Casts of figures and busts by Bailey, Park and Belloc. Two busts of Mr. Field the eminent engineer and Mr. Davison, of Belfast, by Mr. Jones, were particularly noticed, on account of their faithful simulre to the originals, as well as the artistic feeling they exhibited. It is to be regretted that Mr. Jones does not convert his engineer's office in Cannon Row into a studio, and adopt the career of a sculptor and artist, which he has so auspiciously commenced, and for which his versatility of talent appears so peculiarly to have fitted him. The Duke of Wellington with his usual discernment, made many enquiries about the artist, and appeared much struck on learning that he was an amateur. There was an excellent medallion of Sir Isaac Barrow, by Warrington; Salter some architectural models. Mr. Dent's chronometers, and Professor Wheatstone's galvanic engine occupied the room immediately preceding that in which the mechanical models were placed, and here we can scarcely pretend to particularise from "Pamphlets de richesse." The splendid model of the Great Britain iron steam ship, 320 feet long, now building at Bristol, occupied the centre table; around it were grouped Cooke's electro telegraph at work, copies of Sherwood's street sweepers machine; Palmer's corrugated cast iron roofs for ship building sheds; Tweedale's double brick and tile machines; Rennie's beautiful boat the Mermaid; Clark's miner for sinking wells; the Jacquard loom worked and explained, in his usual able manner, by Mr. Copper; Fairbairn's models of marine steam engines; a planing machine by the Butterfly Iron Company, cutting iron with Mr. Habbage's ingenious tool-holders; Mr. Smith's (Deanston) made jenny, for cotton spinning; tools from Mr. Holtzapfel; models of bridges from Mr. Green of Newcastle, and Mr. Coulthard; an ingenious but simple model for measuring water on a large scale by Albania, adopted at Lombardy; cases of specimens of Mint's beautiful coacoatic tiles. We cannot enumerate more although scarcely half through our list.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

On the Principles of Architecture as Laid Down by Vitruvius.

By W. W. Pocock, B.A., &c., Associate.

Abstract of a Paper read March 6, 1843.

VITRUVIUS begins his first chapter by considering architecture as a science, embracing theoretical and practical knowledge, to the latter of which he devotes the last part of his 1st, and the whole of his 2nd, 7th, and 8th books. In his 2nd chapter he treats of it as an art of design, or the arrangement and composition of the parts of buildings. In his 3rd, on the composition of the buildings on which every architectural composition should be tested, and in the 3rd he adverts to the opus or mechanical execution of the design. The 2nd chapter, which forms the immediate subject of this paper, has been a stumbling-block to commentators and translators more perhaps than any other part of his writings. Barbara, Scamozzi, Philander, Poleni, Perrault, Orsini, Jean Martin, Newton, and Gwilt, have all fallen into errors or misapprehensions in their comments on the 1st and 2nd chapters, and have been misunderstood at, considering the ambiguity of his style arising from the abstract manner in which he treats his subject, and the little knowledge we possess of the terms of art and modes of study of the ancients. The principles of compositional art which he would have us ever keep in mind in the formation of a design are six—ordination, disposition, euthymia, symmetry, decor, and distribution.

Ordination he defines as "the adjustment of the sizes of the several parts to their use, and to the general scale of the building."—Ordinatio est proportione ad modum dispositio, euthymia ad modum distributio, symmetria ad modum decor et distribution. Ordination he defines as "the adjustment of the sizes of the several parts to their use, and to the general scale of the building."—Ordinatio est proportione ad modum dispositio, euthymia ad modum distributio, symmetria ad modum decor et distribution. Orsini, Newton, and Gwilt have quite altered this part of the text of their author, the former confessedly without authority; whilst Martin, Galvani, and Gwilt have been at variance with each other as to what ordinatio meant, though it evidently stands for that principle of our art which teaches us to give to the parts of our designs their appropriate size; for instance, to the several apartments sufficient area for the purposes to which they are dedicated, without making them disproportionately large for the rest of the structure; it requires us to give to our doorways, corridors, stairs, &c., sufficient width for the number of persons likely to frequent them; to our windows size sufficient for the due supply of light; to our supports sufficient but not excessive thickness or strength, &c.

Disposition, or schema, he defines as "a convenient and judicious arrangement of the parts, and a desirable effect in the composition (putting together) of the work with respect to quality." As then ordination proportions their sizes, so disposition arranges them with reference both to their use (opus collocatio), and to the objects of their arrangement (opus dispositio).

Euthymia, or proportion, says it is "a sightly appearance, and a suitable look in the composing of members, (i.e. forming them out of their simple elements,) and is secured when the members are of a height suitable to their width, and of a breadth proportioned to their length, and, in short, when all things are in their natural relations, and all things are in due proportion." "So symmetry," he adds, "is a proper concord of the members of the work itself, and the accordance of any one given one of the several parts to the appearance of the general form." Euthymia thus regards the ratios or relations of the dimensions of any single member, and symmetry the relations of one member to another, or of any given dimension of one member to the corresponding dimension of another. Proportion is therefore of two kinds according to Vitruvius, viz.: proportion of the whole to some part, and proportion of one part to another. The former exists between the height of a column and its diameter; the latter between the height of the column and the height of the entablature, and also between the diameter of the column and the width of the intercolumn. Euthymia proportion obtains between the width and height of a door or of a window, symmetric between the door as a whole and the window as a whole, and between the widths and the heights respectively.

Decor-consistency or propriety, he defines as a "correct aspect of a work composed of parts, approved with reference to precedent or authority, and in which there is no more than the requisites of a good building, as it is generally called. The first translated "station," "circumstance," "stanna," "abitazione," "situation d'un- lieu," "etat des choses," "statu," by Newton, Gwilt, Barbara, Orsini, Martin, Perrault and Galiani respectively is expounded, when tipples to the preceding or subsequent, or to the present or past, or to any other common principle, of art or nature. The term consists in their own attributes, and symbols to Flora, Venus, &c., in the Corinthian style to accord with the tender and delicate natures of these latter divinities. Convention propriety, he says, willows the infringement of usages approved in all ages, for instance the introduction of triglyphs into any other order but the Doric, or of Doric into this.

Distribution, his sixth and last principle, he explains as an "advantageous dispensation of the materials and site, and a careful and rational regard to economy." As a further explanation of his meaning, he adds the Greek term magnificenum as a translation of distribution, a word more nearly equivalent to "stewardship," than to any other expression in our language. From this we may understand that it is the province of architecture under this aspect to furnish all the requisite parts of the design without lavish expenditure, and in such manner and measure as may be best affected by the circumstances of the case.

These are the principles of architectural composition which Vitruvius lays down. Ordination, by which the parts are made of a size appropriate to their use, disposition, by which the several parts are properly and effectually collocated; Euthymia, or the due proportion of the parts, each in itself; symmetry or unity of proportion between all the parts and the whole; propriety, or consistency and distribution or economical provision of all the essential requisites.

In this analysis we scarcely know which to admire most, its completeness and neatness, or the beautifully natural and correct order in which the elements are exhibited. No part is defective—none redundant. Where ordination neglected, the parts would be some too small for their destined uses, and others too large; where disposition too small, the several parts would be toyed with by this one defect; without attention to distribution, it will be rendered equally useless by the inconvenient arrangement of the whole, whilst a disregard to either euthymia symmetry or decor will render it displeasing alike.
to the observant eye, and the contemplative mind. The apartments, though of insufficient area, might be too low or too long for their width to be elegant proportions. But when we consider the original idea, and the requisites of life very ill-proportioned windows; the entrance though wide enough, might be ineluctably low or absurdly high; the vestibule though large enough for mere use and appropriately situate, might not be in keeping with the spacious salons. Yet, a design though correct, might prove to be all but a blunder, be improper for execution, or when executed, useless; because, forsooth! there was no staircase to the upper floors; or, if a palace, no state rooms in which to hold the levees.

That design, however, which gives appropriate size to all its parts judiciously adjusted, and its beauty prolonged by symmetry and proportion without outraging propriety; securing irrationals expenditure, or omitting any of the essential features, is as excellent as the rules of art can make it, and requires only a due infusion of natural talent or genius to render it perfect.

Whereof it follows that the text of Vitruvius in this part, at least, is not as Shultz and others, his pickpockets, have called it, "supsipial twaddle put together by an ignorant compiler," but a beautifully perfect, concise, and consistent exposition of the subject in all the views in which it can be regarded, and worthy of our highest admiration.

THE NATIONAL ADVANTAGES OF FRESCO PAINTING.

Abstract of a Paper by James Thomson, Fellow.

The Institute has been already favoured with two very interesting papers on the subject of fresco painting. One by Mr. Farris (Journal, vol. 5., p. 95.) conveying many useful suggestions on the practical working of it; the preparation of the ground or plaster best adapted to the purpose, and the colours of which the chemical properties and constitution are well combined with the materials to be employed upon them. Another by Mr. Severn (Journal, vol. 5., p. 188 & 310), setting forth in most animating terms the works of the Italian masters. No sooner was the art of fresco painting thus introduced, than Mr. Thomson was led to consider the importance of it to architecture in particular—the art in general, and as he was prepared to show, to the nation at large. He thus continues:—First, its advantages to architecture in particular. In this a great and primary benefit is, that it applies itself to those broad spaces of the interiors of buildings, which, if decorated in one of the other methods, would be too costly and labouring to be indulged in; and secondly, to supplant the multitudinous style of modern decorations. At present embracing these two objects—the filling up of the internal surfaces of buildings, and the exclusion of details that are foreign to the edifice—I would observe: That in simplicity and purity of style of architecture demanding the sober dignity of architectural forms and proportions, and would be utterly at variance with the tawdry patchwork of every day practice. To place a fresco of Michael Angelo's, Raffale, or A. Del Sarto, in a modern gilded frame work, would at once exhibit the impertinence of such an association; and there are special reasons for this. The superior transparency of fresco pictures causes them to reflect light, while oil paintings absorb it; and again, the former in which, simple colours and grand outlines only are allowable, can dispense with such accessories, while the other by its extremes of depth (amending defects by lights and lavis, insons) of colour requires the aid of some such boundary. A gilt framework is almost indispensable to an oil picture—while to a fresco (on account of its own brilliancy) it is not only unnecessary, but almost injurious. I shall illustrate this, the instances of which I have been able to produce...

In three of the most admirable works of the Italian school—and each of them by masters of rival excellence, Michael Angelo, Raffale, and Guido—all gilding has been employed. For instance, in the ceiling of the Sistine Chapel; the ceiling of the Farnese Palace; and the "Aurora" in the Raphael Palace at Rome: in neither of these do we find gilding to be much if at all existing. But there are other points to establish the affinity of fresco painting to architecture, and it is to be found in the necessary proportions of parts to each other, so that they may not only be good in themselves, but as integral parts of a uniform whole; otherwise this might be found its way through the labours of another great painter, A. Carracci, and place his great work at the Farnese Palace, beside the still greater production to which I have before alluded, the ceiling of the Sistine Chapel. In the former we will find that however bold and versatile are the decorations, there is an absolute law of subordination of parts to each other; the oblong forms (intended to be principal) are nearly equalled by the square ones—and the square compartments are almost overpowered by the medallions. There is a struggle as it were for preponderance, even the figures contained in each of the latter panels appear in a second place. Now let us turn to the Sistine Chapel. We here find all the parts, whether panels, pilasters, or figures, to subserve the principal objects. Here are the Prophets seated on pedestals in sober majesty, and they are surrounded by figures in every variety of attitude—and as such they are used. The credit is thus contributed by their subordination to the dignity of the sacred scenes. The side compartments are here decidedly less than the central, and the medallions are comparatively small. And now how charmingly does the artist's eye direct the attention. Some of the figures are 12 feet high, others not more than 3, and the last close beside each other, so as to confound results. One is turned into bronze, another into stone, and the third represents life; but the artist had yet another and another handmaid—perspective and foreshortening, line and figure. Each was taken, and the result was wonderful, not only a mutual beauty, but a mutual adjustment, a result which fresco painting stands unrivalled, what shall we say of its durability? It has been urged that the damp air of this country is unfavourable to it, that our walls swarming with condensated vapours would soon cause the labours of the most skilful artist to become of little value. Now is it possible to oppose this? If fresco was like stucco painting, the objection would hold—the latter lies upon the surface; but as the former is indurated, and becomes a part of the material of the stucco itself, we know that it is liable to no such contingency, but that on the contrary it is the most lasting of any style of painting. It is then evident that we may prove this by past experience and analogy. True it is that the climate of Italy will afford us no criterion—but its fatallities will.

We are all more or less acquainted with the elegant frescoes of Pompei. Through all those years, and many more, from 1800 years, preserved to us in all their pristine freshness; now, it cannot be urged that their buried state was favourable to them, or if it could, it would be to establish another advantage over oil painting. What pictures in oil, whether on canvas or copper, could have stood the test which they have passed?

The advantage of making fresco painting as compared with the present waste by gilding. Adam Smith, in his "Wealth of Nations," says, "in the manufacturies of Birmingham, alone, the quantity of gold and silver annually employed in gilding and plating, and thereby disqualified from ever afterwards appearing in the shape of those metals, is said to amount to more than £50,000 sterling.

It is not here intended to object to the judicious use of gold, but to the abuse of it; nor either to the cost of gilding, but to the actual waste by gilding plaster and composition, and the want of crossless material. But, let it be remarked that the withdrawal of gilding from our interiors should have the effect of throwing large numbers of workmen out of employ, Mr. Thomson proceeded to show that it would be the sure means of giving occupation to hundreds and thousands that now seek in vain for the momentary employment it is impossible for the labours of an oil painter to produce...and the art of Polychromy will be revived; and it will, also, require further aid from the carvers, and sometimes the chasers. Mr. Thomson then proceeded to make some remarks on the vast quantity of gold required for framing, and the number of hands engaged, and then explained by what means fresco should be advanced.

"The first legitimate source," observed Mr. Thomson, "appears to me to be in our churches, because the talent of our countrymen could not be better engaged than in the suitable advancement of their Christian temples. The object is so important, it cannot but be attended to, and our old houses, in their relation to art, are the first of the class, and are the most pressing. For we are the friends of our country, and our Art Unions. They cannot, indeed, draw lots for frescos before they exist; nor can they be ready made as easel pictures for competition, but they can do this: they give encouragement to that lofty branch of art which is capable of being transferred to fresco by engravings, duplicates of the original works, at much less cost. He then explained by what means fresco should be advanced.

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The third Anniversary Meeting of this Society was held on Saturday, the 26th of July, at the Town Hall, Mr. J. Blackham being in the chair. The minutes of the last meeting were read and approved. It was then reported that the "first volume of the society's publications would be ready for the members early in July—that it would contain the Rev. J. E. Jack- son's History of Gritton, and Mr. Britton's Introductory Essay on Topography, with Glossaries to Dumfries, and other Archtological Records, &c.; and that the volume was exclusively for the members of the WILTS AND BERKSHIRE TOPOGRAHICAL SOCIETY.
M. CLEMENT'S NAUTICAL INVENTIONS.

In the Journal for last January, page 28, we gave an account of M. Clement's ingenious inventions, together with some particulars respecting an experiment, made by order of our government, to try their merits; since then more extended experiments have been made in H. M. steam vessel Blazer, which has proved very successful; the results, communicated by Captain Washington, R.N., are to be found in the Nautical Magazine of last month, from which we have obtained the following description and drawings of the instruments.

The name Silomètre is composed of the two French words sillage (headway) and metre (measure), and might be well rendered in English Speed-gauge. This instrument consists of a hollow copper ball O, Fig. 1, about five inches in diameter, suspended under the ship's bottom, nearly amidships, from the middle of a bent lever A C, about five inches long: one end of this lever moves on a joint A, its fulcrum, attached to the lower end of a metal rod which passes vertically through a copper tube carried from the deck through the bottom of the ship near the keel; at the other end of the lever is attached a chain C, which leads upwards and acts upon a second horizontal level E F, on deck. This second lever corresponding to the lower one, gives motion, by means of a spring, to an index which marks on a dial the speed of the ship expressed in knots and tens of a knot.

Such is the whole of the apparatus of the simple Silomètre. It will be readily understood that as the vessel moves through the water, the fluid acts upon the ball, which being circular, always presents the same section, and causes it to move at, thereby depressing the fore end of the lever which by the chain communicates with the dial on deck. The scale by which to graduate the knots on the dial was found by M. Clement after numerous experiments. This instrument in its simple form shows the speed of the vessel, not the amount of distance run.

![Diagram of Silomètre](image-url)

The lower Fig. 1, is a side view. O, Compensation weight. x, Box for oil. Z, Shield.

It was further reported that other works were in progress, and that it was expected, one, two, or more volumes would probably be ready by the ensuing anniversary. The only alteration in the list of officers was the election of A. Caswell in the room of F. Whitmarsh.

KING'S COLLEGE, LONDON.—OPENING OF THE NEW MUSEUM.

The opening of the museum of this noble establishment took place on Thursday the 22d ult. under the immediate auspices of His Royal Highness Prince Albert, who arrived at the college punctually at 12 o'clock; he was received by the Bishop of London and Archdeacon Lonsdale, the principal of the college, and led into the grand hall which contains the paintings of the Laud and Charles II. series, and two large staircases on either side, with a gallery or corridor above. These were all lined with students of the college and of the school, who, together with the counsellors and professors formed rather an imposing cordon.

Among the company we observed the Archbishop of York, Bishops of London, Norwich, and Gloucester, and many other dignitaries of the church; Messrs. Brownlow, Radstock, Sir Robert Ingle, Mr. Faraday, &c. &c.

After the repeated hurrahs and cheers had subsided, Mr. Slater, one of the students, advanced to the Prince and read a Latin speech, and at the close, Mr. Fidahah's pupils, who lined the right hand staircase, broke out and sung our national anthem to "God save the Queen." The Prince, attended by the principal of the college and the Bishop of London, then ascended the staircase for the purpose of opening the new museum. On his way he inspected the Marsden library, so called from the presentation of a most valuable collection of works in the Eastern languages, by Mr. Marsden, and the grand library, which, though small, contains some of the most select classical authors in ancient and modern literature. On His Royal Highness's arrival at the new museum, he was joined by the Crown Prince of Wurtemburg and suite, and was received by Professor Wheatstone, who accompanied His Highness through the museum, and explained the various apparatus, with all of which the Prince seemed well conversant, and much interested. The museum is to be attached to the engineering department, it consists principally of instruments from the royal collection at the Kew observatory, formerly belonging to King George the Third, many of which were of his own workmanship, and it has been since further enriched by royal munificence and by private liberality, in the presentation of Babbage's celebrated calculating machine, models of well known bridges, and of the most ingenious and difficult engineering works, and also a statue of George the Third, by Turnerelli, presented by H. Pownall, Esq., and it is hoped that it will become the nucleus for the formation of a scientific museum, which the manufacturer and man of science will frequent, and where all models and inventions of known utility will be sent for their inspection and approval, and for the publicity that they will thus obtain.

After the ceremony of opening the museum, the Prince proceeded to the great theatre and its ante-room, the one containing a small but choice collection of birds, and the other a valuable present from Her Majesty, of English and foreign insects and butterflies. This theatre, which is the large theatre of the institution, was filled with an assemblage of the highest rank and fashion. The Prince was here attended by the lecturer, Mr. Cowper, who explained various models and drawings. A valuable full length likeness of Jacquard, the inventor of the celebrated Jacquard loom, woven in silk, very much attracted the attention of His Highness, it was scarcely to be distinguished from the finest engraving; the whole was fully detailed by the lecturer, the Prince entering warmly into the detail of a machine whose results had been so beautifully displayed in the specimen before him. The Times printing press, spinning and other models were also severally explained, afterwards His Highness proceeded to the theatre of Materia medica, and the chemical theatre where he was received by Prof. Daniel who explained several interesting experiments connected with the volatile battery, and the decomposition and formation of water, he then adjourned to the terrace of Somerset House where the experiment of letting off a cannon on the top of the shot tower on the opposite side of the river Thames from a galvanic battery on this side of the river was to have been performed; this did not take place, but we could not positively ascertain wherefore: we believe the communication of the wires passing across the river had been destroyed. After parading the terrace attended by the principal, the Prince retired to his carriage evidently much gratified with the expressions of loyalty that he had met with, and, the many interesting experiments he had seen.

We believe we are authorized to state, that the public are at liberty at any time between the hours of 10 and 3 o'clock to visit the museum and other parts of the college.
The compound sylomètre consists of the same mechanism, Fig. 2, with this addition, that the power which moves the index M, is applied at the same time to a watch N, and accelerates its movements in proportion to the intensity of the moving power, or as the vessel quickly makes way. A second watch R, is placed by the side of the first, in order to show how much the former gains upon the latter; and knowing that for every six seconds of gain the vessel will have made a mile, it is easy to know the distance run. It is evident that this compound instrument is very superior to the simple one, but its accuracy depends upon the regular going of two good watches, a result not always to be obtained.

The Sub-Marine Thermometer is a very delicate instrument composed of a ribbon formed of two metals of unequal contraction and expansion, as platinum and silver, and rolled in the form of a helix A, Fig. 3, round an axis B, which turns as the temperature of the water varies. This motion by a train of wheels and pinions is immediately communicated to a pointer B, which describes a helix on a dial, and which may be read off easily to hundreds of a degree.

The whole of this apparatus is enclosed in a metal tube, which passes through the bottom well aft in the run of the ship. The helix or thermometer is therefore always at a certain depth in the water, say five feet below the surface; and it shows instantly every change in its temperature.

As few observations have been regularly made on the temperature of the water at a certain depth, this machine may lead to some novel results.

The Steam Indicator points out the temperature and consequent pressure of the high pressure steam. The helix is formed of a blade of two sensitive metals of unequal expansion, turned in a spiral form; one end is fixed to the tube or pipe in which it is contained, the other connected with a spindle bearing the pointers which indicate the temperature of the steam on a dial on deck, in degrees and tenths of a degree. This instrument is connected by a small pipe with the steam pipe, the water or condensate from the steam turned into the spiral, which instantly causes any variation in temperature to be shown by the dial on deck; in high pressure engines this may be found useful.

The Deictometer is an instrument somewhat on the principle of the sylomètre, and intended to measure the drift of a ship; this is done by a spiral which is continued by the rod with a dial the vane of course takes the opposite position to the drift of the vessel, which is communicated by the turning of the rod to the pointers on the dial on deck.

The Internal and External Thermometer, as its name indicates is a highly sensitive thermometer, so placed against the wall of an observatory or house, as to show the temperature of the air within and without. The two pointers which mark this are on the face of the same dial.

The report and log show that the sylomètre indicated every variation in the speed of the vessel, even the alteration caused by a single spoke of the wheel was perceptible. By the aid of the sylomètre the helm hard over caused the ship to lose half her way almost immediately; as the dial of the instrument is placed on deck, and the index or pointer very conspicuous, the officer of the watch without any trouble may observe it at every turn he takes on the quarter deck; and it is obvious that none but the most inattentive person can fail to have a much more correct knowledge of the rate of the vessel's going than he can from heaving the common log once or twice an hour. The sylomètre will also enable an officer easily to ascertain the best trim of a vessel; the difference caused by shaking out a reef or by making or shortening sail; and in a fleet would enable a ship to keep her station by night or by day with great steadiness; and lastly it impresses very strongly on the minds of all men the absolute necessity of good steering and giving very little helm when in chase or on a trial of sailing, or at any other time when speed is of importance.

The Steam Thermometer has also a dial placed on deck so that the officer of the watch can tell at any moment whether there is a sufficient pressure in the boiler, and can thus check the wasteful expenditure of coal; it would point out to the possible, but highly probable occurrence of no water in the boilers, or an undue increase of the temperature of steam from any other cause. Its chief value however would be shown in a high pressure steam engine when it would give immediate warning of any approach to such a degree of temperature or pressure as might be dangerous.

The Sub-marine Thermometer remains constantly at a depth of about ten feet below the surface of the water, and owing to its being formed of platinum and silver is extremely sensitive, and thus every change in the temperature of the sea will be shown at once on the dial on deck.

As in the Atlantic Ocean and other deep seas, the deep water is said to be warmer than the shallow; it probably would there show, by mere inspection, the approach to shoals, rocks, or land, and serve as an excellent warning. At this season of the year however in the shallow waters of the North Sea we observed no such effect, on the contrary the temperature of the water gradually decreased from 50° Fahrenheit at Woolwich to 44° at about 20 miles to the eastward of the North Foreland, and as gradually increased on our return to the same point.

Possibly as the summer advances this may be different, and in order to discover when the change of temperature takes place, I have directed the instrument to be registered every two hours night and day. Not the thermometer is highly sensitive and may be read off with ease to hundredths of a degree, and agrees perfectly with the best mercarial thermometers, it may possibly furnish some novel results of value to the philosopher as well as to the navigator, since I am not aware of the existence of any continued series of observations on the temperature of the sea at all seasons of the year.

WESTMINSTER BRIDGE.

Report to the Speaker, by Messrs. Walker and Burgis, on the alterations proposed by Mr. Barry.

Sir,—As that portion of Mr. Barry's report to His Royal Highness Prince Albert (on the decorations, additions, and local improvements connected with the new Houses of Parliament), which refers to Westminster-bridge, may naturally lead to the opinion that our plans, made under the direction of the Bridge Commissioners, were confined to the repairing and extending of the foundations, for our superintendence of which he kindly compliments us; we consider it, therefore, a duty to prevent such a mistake, by stating, that the design, estimates, and with Mr. Barry's estimate of the work, the new bridge, the "removal of the present steep and dangerous activities, and the lowering of the parapet and road-way to the lowest possible level" that appeared at the time to be consistent with the safety of the present arches. The second contract with Mr. Cubitt, is for lengthening the piers, which are being carried to above high water level, to receive arches for widening the bridge twelve feet. It will then be of the same width as London-bridge. All, in fact, that we have done to Blackfriars-bridge, is designed and contracted for, to be done to this bridge, with the very important addition of the preparation for widening. The deepest part of Westminster-bridge road-way will, when the designs are executed, be as easy as that of Blackfriars-bridge. That which rises one in fourteen, will be reduced to one in twenty-four, and even this rise will be for only a limited length. To secure the foundations, which were in danger of being undermined by the scour consequent on the removal of old London bridge, has been the first object. The supposed difficulty of doing so effectually was considered by the original engineer, and others since his time, that owing to quicksands, coff-erdams could not be applied; and the commissioners have been desirous of removing all doubt on this point, before proceeding with the spandrels, road-way, or parapet. Five out of the seven cofferdams have been built; so far, we have been completely successful: and while the water was excluded, all the work which was required in repairing and lengthening the piers to above high water, has been done; seven out of the thirteen arches have also been repaired, as the cofferdams gave facility for the scaffolding necessary for doing this. Thus far, therefore, our design proposed to, and approved by, the Commissioners, corresponds with, and has anticipated Mr. Barry's; but the idea of taking down the present semi-circular, for the purpose of substituting pointed arches upon the same foundations, is not ours, and we beg to state strongly, why we do not concur in the expediency of this proposal.

Mr. Barry's first argument for this change is "that the pointed arch with its greater proportion, by materially reducing the thickness of the crown of the arches, within what is considered necessary for arches of a circular form." Now, we consider that the whole thickness of the stone-work and covering of the present centre arch may be reduced to about seven feet, which is the same thickness as Mr. Barry's ribs, arch and covering, measured upon his section: so that, even supposing the principle he states, of the pointed arch requiring less thickness than the circular arch, to be correct, he obtains no reduction in thickness, and only lowers the road-way, by lowering the soffit of the arch. The generally approved theory of arches is

1 The commissioners have power to suspend or supersede the contract in respect of any works not commenced.
chimneys

vation

the work, and, consequently, the Gothic arch is stronger for lofty buildings than the circular; but the circular arch is far better adapted than the Gothic arch for bridges, since the pressure of weights passing over may act upon any part of the arch, not only on the crown.

Mr. Smeaton tells us, in almost the same words, to the same conclusion; and the same can be deduced from the theories of Attic Architects. The circular arch will, therefore, be the best, for in that case the weight of the crown of the bridge will be distributed over the whole length of the bridge, while the circular arch itself will be the most economical. But if the arches are to be circular, they must be made of iron or any other material that can be worked into a mechanical arch, and the increased cost of materials will make the work less effective.

The style of the new buildings must stop somewhere. Can it do so better than at the bridge, which, as we have already said, appears to require a character different from those of the Houses of Parliament? If both faces of the arches are proposed by Mr. Barry to be alike, there would be no want of accordance between the north face of the bridge and the other buildings near to it, and which there is, we presume, no intention of altering? Is a continuance of the same style required for so great a length, as the houses and the bridge together, although the pointed may be the prevailing character of the building? Does not precedent reply to this in the negative, and prove it, by the fact that the periods of original erection and the additions that have from time to time been made to some of our finest buildings may be discovered by the style: the Saxon, the Norman, the Pointed, and varieties of each found in the same building, and yet the “ensemble” not harmonious. We hope, therefore, that the superstructure of the bridge, though it may be different in style from the Houses of Parliament, will not be discordant.

Westminster-bridge has been where it is, and as it is, for a century: it was there when the designs for the new houses were made, and we never heard that to pull down Westminster-bridge to nearly low water, was to be a necessary accompaniment to the adoption of any of the designs. If you and the other commissioners had known that such alterations were contemplated, you would not, we are sure, have allowed the works to have proceeded as they have done, until nearly two-thirds of the whole to above high water had been completed, including the renewal or repair of the archstones.

We may name here an objection to the form which Mr. Barry has proposed for arches, which are not only not the least to lessen the stability of the bridge, but are considered to be better than the semi-circular arch, which presses vertically upon its piers, each pier might be considered an abutment, and that if one arch were to give way, the piers would support all the others. From the great height at which the proposed pointed arches spring from the piers, and their greater lateral pressure, the arches would not be the case. On the contrary, the failure of one arch would, we conceive, cause the destruction of all the arches and piers. This consideration is not to be disregarded in a bridge, the piers of which have been so badly founded, that to support them has been a constant expense, and is at this moment a source of considerable anxiety; and if we have in hand, if as successful as hitherto, will render the piers much more secure than they have ever been; we hope, perfectly so.

On the whole, therefore, we have reason to be pleased, that Mr. Barry approves the various improvements in the bridge which the commissioners have contemplated, and, with one exception, contracted for. The only addition he makes to them is, the substitution of the pointed arch, which, for the reasons stated, we cannot advise. We agree to the advantage, in point of taste and utility, of keeping the roadway of the bridge low; we have designed doing this as far as we can, having regard to the funds of the commissioners, and therefore without disturbing the present arches, the height of the roadway might be reduced below what either Mr. Barry or we have yet proposed, at one-fourth of the expense of his plan (which would, we think, much exceed his estimate), and without lowering the soft of the arch, or diminishing in any way the convenience of navigation; but we avoid entering upon, or committing ourselves to this, until we have considered the subject more in detail, and understand it to be the wish of the commissioners that we should do so; for the works we have already recommended may go as far as their unassisted funds would justify.

We have the honour to be,

Your obedient servants,

23, Great George Street,

31st May, 1843.

The R. T. Hon. CHARLES S. LIEFEBURG,
Speaker of the House of Commons,
Chairman of the Commissioners of Westminster Bridge.

WALKER & BURGES.

[July,
NOTES ON EARTHWORK, &c., UPON RAILWAYS.

The previous papers that have appeared in the Journal on the above subject, have reference to the constructive operation in the formation of Commons, which more or less forms the object of this paper; yet, I am induced, however imperfectly, to give some account of the ways and means by which the necessary funds have been raised, as I know of no work where any information is to be obtained, except in isolated and unconnected passages of various works bearing more or less on railways.

The desire for the public convenience being fully established, and the probable cost of the works ascertained, the number and amount of shares necessary to be raised is then considered, which are proportioned to the magnitude of the undertaking, the liability of calls being limited to the amount of share. The amount of each share has been generally fixed at a low rate per share; the greater or less amount giving the undertaking a more or less speculative character. The legislature require the whole capital to be subscribed to the deed before any step is taken in the execution of works, and in 1386, to check the mania for railways, a standing order was passed requiring 4th of the payable every six months at the bank, and during the 10 per cent. paid thereon, before an application could be made to Parliament for a Bill, which was evaded in 1387 by the Edinburgh and Glasgow Railway Companies, who borrowed the money from their banks, the Company at the same time claiming exemption from the standing order, on the grounds being started before the framing of the Bill. The rate of interest of a call being fixed, Parliament as a general rule allow a third to be borrowed by the executive as a mortgage. In almost every case the capital has been found to be inefficient for the construction of the works, and application to Parliament a second, third, and fourth time, has had to be resorted to, and fresh powers granted for raising more or less, as the case may be, to pay off loans, or to obtain further loans on mortgage, or bond on the credit of the company, by way of loan notes, or promissory notes of the director under the seal of the company, also by debentures, which are mortgage bonds according to act of Parliament, the interest of which has preference of any dividend, and if not paid within 60 days after due date, the company may be dissolved. It has been already stated, that in the second application to Parliament, the companies have been empowered to raise further sums, by issue of new shares, and conversion of bonds into shares. The amount of the shares has been reduced in these cases by the companies, and rendered more speculative in character, perhaps purposely so, by the 100l. share being divided into halves, quarters, thirds, fifths, tenths, and so forth. In such cases the more concern is, that after all means for raising money by bonds or mortgage, and loan on credit of the company, have been exhausted, new shares have been issued at a discount of 50 per cent, and in some instances preference or privileged shares have been created, with a guarantee of interest at the rate of 6 per cent, and bonds have been converted into shares with a guarantee of interest. Many of the shareholders, to be received out of the paid up capital of the company.

In only one instance has a public railway been offered for sale by auction, and this was by the seizure of a line by the Exchequer Loan Commissioners, who can suddenly sell to the detriment of all other lenders of the Company, which is made in an arrangement with Government for the liquidation of the debt, and accruing interest, by instalments during a period of 20 years.

Scrip shares are certificates for shares prior to their legal creation, and pass from hand to hand without registration, and are not transferred by deed, the payment of duty on transfer is thus erased, but registration is necessary to receive a dividend. Privileged or preference shares have a fixed interest or dividend secured upon the paid up capital, in priority of any dividend to original shareholders.

The influence obtained by the possession of a great number of shares, varies in almost every company, but the general average may be about twenty votes for twenty shares, and an additional vote for each further compound. The defaulter is entitled to receive one vote in every call, and to prevent the levying swamping the morgue, no one person is to have more than from 10 or 15 and up to 60 votes; the latter is the greatest latitude allowed in any company. The qualification for becoming a director, is the possession of more than 20 shares, which also differs in various companies. The estate of shares is usually attached, and in the event of insolvency of the owner, is subject to the personal property, and a form of transfer is prescribed, which, however, cannot be acted on until calls are paid, that is during the collection of a recent call; neither can shares be transferred for some days previous to the general meetings of the company. Shares may be forfeited at general meetings, and a power is usually given to the directors, in such cases, to declare the shares transferred or sold, and in the meantime the possession of the shares, and the right to the profits, etc., remain in the hands of the original owner.

The companies may purchase shares to merge into the company, or to be held in trust; when this is done, and held in the name of individuals, a power is obtained very detrimental to the interest of the small holders of shares. The calls are stipulated in the acts of Parliament to be made at intervals of from six days to three months, and in no case has the power been called. The principal amount has been more generally acted on, and money borrowed in anticipation of calls. Notice of calls are to be advertised from 10 to 21 days previous, and the amount of each varies in different companies from 3l. 5s. 10d. to 20l. per share, but the executive have in this case also preferred the smaller amount. The transfer of shares, it is provided, may be made by the company, which is, to be registered in the books of the company, but no time is stipulated within which such registration must take place. This has been taken advantage of by the public, and the deed is completed between the vendor and purchaser, except as to the insertion of the name of the company, and bearing the power of attorney, at the time it passes from hand to hand without the payment of any more duty until a purchaser thinks proper to register; then the transfer is taken to the office of the company, and his name inserted as the purchaser.

This system is connived at by the companies, who, to give an assurance to a purchaser of the validity of a transaction, do not hesitate to give recommendation, under the hand of the secretary, of a long bygone transfer, which, to all intents and purposes, answers fully as well as a recent actual transfer; although the companies prefer giving out a filled up transfer. A transfer with a good stamp is accepted without inquiry. The purchaser, on the receipt of the transfer, can hold it as long as he likes, the seller having no means of becoming a creditor of the company, after he has sold his interest in the company, and without any means of compulsion in his hands whereby he might regain his shares; again, provided he paid the call, the vendor may sell his share a second time, and the second purchaser, upon priority of registration, would be entitled to the share; he, the vendor, is at the same time liable for calls upon his share after his sale, so long as his name is retained on the company's books; also so long as his name is retained, his share is liable to be taken in execution for the debt of any individual creditor, or in the case of bankruptcy his creditors would claim it as part of the general estate, in preference to the title of the first purchaser. These are the legal difficulties that arise from the use of the blank transfer (that is blank as regards the name of the purchaser) in addition to the loss to the revenue of the stamp duty on the increase of the share's value, and on each transaction subsequent; there is also the uncertainty and inconvenience to which the company are put in ascertaining the opinions of their proprietary interest. There is also the difficulty also how to account by the executive of the Companies, so as to increase individual influence. It has been previously stated that no one person is to have more than from 10 to 60 votes, and that 20 shares are entitled to 20 votes, with an extra vote for every five shares in addition, but not to exceed, in all, 60, whatever the number of votes received; quoted in the Railway Times, an individual held 292 shares in a Company, and was registered for only 25, holding the remaining 274 shares in different names in lots of 20 each; by this means his number of votes was increased by 220 votes, in addition to 25 votes which he was entitled to by the act, which in question decided by vote.
of proxy must be obviously "undue influence." Individual influence, and thereby patronage and favouritism is also increased by companies having the power of purchasing shares to merge in the company, which are held not in the company's name, but by directors in trust for the company. This is of immense importance in the appointment, or removal of, the officers of the company. In the management of companies; one recently appointed was carried by a majority of 715 when nearly 8,000 votes were polled. The committee of inquiry reported; the directors replied; the committee answered, and the directors published a rejoinder, and another poll took place, the direction being that the committee by a majority considerably less than that obtained; which thereby the holding in trust in names of directors were openly used and it was at the same time strongly contended that the right to vote was in the share, not the individual; he might be bankrupt, a convict, a felon, or even dead, and being known to be dead, he would be revivified for the day.

Sales or purchases of shares through a share broker, who uses the prefix "share" to distinguish him from other brokers; those of the Stock Exchange generally act as London agents for the provincial brokers, and sometimes the fees on commission are divided between them. For shares under five pounds the commission varies from a shilling, as the circumstances may differ. The following is the usual scale of brokers' commission:

<table>
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<th>Quantity</th>
<th>Rate</th>
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<tr>
<td>1 - 5</td>
<td>1 s.  d.</td>
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<tr>
<td>5 under 20</td>
<td>2 s. 6 d.</td>
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<tr>
<td>20 - 50</td>
<td>5 s. 0 d.</td>
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| 50 - 100 | 10 s. 0 d. 10 per cent. Debentures 5s. per cent.

The stamp duty payable on transfer of shares is the same as the ad valorem duties on assignment of lands.

In addition to the stamp duty, which is paid always by the purchaser, some of the companies make a charge of ls. to 2s. 6d. for each transfer in the company's books, which is charged to the credit of the company, or allowed as a fee to the secretary as an augmentation of his salary. The charge for registration of a transfer which is adopted by some companies, as the Greenwich, Taff Vale, and Newcastle and Darlington Junction and South Eastern Railways, varying from one shilling to half-a-crown, tends also to further the continuance of the practice of using blank transfers and the consequent evasion of the duty, and I apprehend those who adopt the charge do not improve their undertaking in the estimation of the public.

I have noticed to notice that in many of the companies the fifth part of the shares in the first allotment are reserved for the landowners on the line; and that in the creation of new shares, old shareholders have priority, the shares being allotted in proportion to their holdings, and that some companies have been in the practice of paying interest, during the execution of the work, on capital or paid up shares, so soon as one-fourth of the share has been called. Among those who have so acted, that I can call to mind, are the Greenwich, Grand Junction, and New Zealand.

As I said on the commencement of this paper that this subject was not my forte, or in my line, I cannot therefore enter on the zoology of the two animals "bull and bear," or the inexpediency of what are called time bargains to individuals on the Stock Exchange, and their detrimental effects to the undertaking in which the transactions are made. The protection of shareholders parties operating while unnaturally depress the value of the shares, no matter what may be the depressed state of the market, these fine gentry are generally obliged to get out by hook or by crook, and at any sacrifice to themselves and the undertaking. The companies have also to a certain extent adopted the principle of time bargains both with respect to the issue of loan notes and debentures; of the latter mode of proceeding the Eastern Counties is an example, who give the holder of each debenture of St. 7s. 6d. the option in three years of taking a 2s. share of the former; the Croydon company give the option for the same period to the holder of loans, to convert 1s. loan notes into a share of 2s., and the Brighton for a similar period of three years to the holders of their loan notes of conversion into quarter shares at 1s. 6d. each.

A system of leasing the works of one company to another has been, to a certain extent adopted, which was done, I think, first, by the York North Midland taking the Leeds and Selby line for a term of years. The following have also followed the example: The Birmingham and Gloucester have a lease of a portion of the Cheltenham and Great Western from Cheltenham to Gloucester, and the Great Western have a lease of the Bristol and Exeter, and a portion of the Cheltenham and Great Western; the rest of the former being 30,000l. and the latter $600,000. The Midland and Great Western took over the Crompton Railway took up the Gosport Branch Railway, and paid the shareholders 5 per cent, with option after a certain time of joining in a general dividend with the main line, and a similar course has been pursued with the Warwick and Leamington Company, and the Birmingham Company. The system of letting or leasing railways to private individuals has been attempted on the Northern and Eastern and the Brandling Junction Railway; the committee of inquiry, on investigation, recommended that the system be pursued, and not respect to their lines, but no answer yet has been carried into practice.

To conclude this rambling paper I refer to the greatest difficulty that railway companies have to contend with, viz., the closing of capital account in consequence of disputed accounts with contractors, and the excess of capital required over previous estimates, rendering it impossible for the companies to form any opinion as to the merits of an undertaking so situated, with reference to their solvency or otherwise, and the consequent uncertainty of railway stock as an investment for the widow or trustee, and all experience shows that until a railway is finished, and its traffic fully developed, the greatest amount of work is done by the works, however, imperfectly to point out the manner adopted by railway companies of raising capital by shares and loan, also the mode of transferring shares, the amount of share and the consequent liabilities, and the influence of holding, as to individuals and directees in the management of railways and the power of control as to the shareholders at large. At the same time I have pointed out that little or no information is to be had in any work expressly devoted to railways, on this subject, they being more generally devoted to the description of the construction of the more important bridges, &c. on each railway, its course and direction, and the towns in the vicinity. I am nevertheless in hope that this paper will call attention to the subject by one more competent to this work.

One desideratum yet required to give stability to railway property is, the closing of capital account, and the publication of shareholders and the number of their holdings, and the full development of passenger traffic as regards the third class carriages, which ought not to be neglected; that 70 persons are made to stand up without cover or shelter; the principle on which the companies ought to act is, to carry people cheaper than they can walk, as notwithstanding the saving of time, another element in the calculation is money, which is said to be also time; but in the present depressed state, many have time to spare for travelling, but not money also, at least in quantity sufficient for pleasure, even at second class fares. As to goods traffic, I think that as regards general merchandise, that the old system will be able to compete with railways; and as regards coal or other produce, always conveyed in one direction, the local or large holder generally makes a bargain comonson with his own notions. Passengers are the main support of railways; and the safety to passengers is no speculative point. Eighteen millions of persons having travelled by railway in 1842, and only one was killed whilst riding in a train; and there is no doubt that the traffic and returns have also exceeded the most sanguine expectations of the original projectors, as well as the amount of capital required. Railways must ultimately pay, and settle down into one of the most eligible of investments, as the facility with which a transfer can be made in comparison with a freehold, is greatly in their favour.

I have annexed to this paper the different forms of transfer, certificate for a share, and a scrip certificate also of a proxy, and the memorandum given by the secretaries of the shares on a given date were transferred from a certain name to another.

St. Ann's, Newcastle-upon-Tyne.

O. T.

APPENDIX.

No. 1.—London and Paris Railway.

John Doe, of the town and county of Newcastle-upon-Tyne, agent, in consideration of 4100l. paid by the said Richard Roe, do hereby bargain, sell, assign, and transfer to the said Richard Roe, ten shares, numbered 3270, 3280, &c., of and in the undertaking called the London and Paris Railway, to hold to the said Richard Roe, his executors, administrators, and assigns, subject to the same rules, orders, and restrictions, and on the same conditions that the same were entered immediately before the execution hereof. And

Signed, sealed and delivered (being first duly stamped) by the said John Doe, in the presence of —

John Doe.

Richard Roe.

Scribed, sealed and delivered (being first duly stamped) by the said Richard Roe, in the presence of —
No. 2.—The London and Paris Railway Company.

No. 1422.

These are to certify that John Doe is the proprietor of the share numbered 14229 in the London and Paris Railway Company, subject to the rules, regulations, and orders of the said company.

Given under the common seal of the said company, the twenty-first day of June, in the year of our Lord one thousand eight hundred and forty three.

Registered No. 965.

Secretary.

No. 3.—London and Paris Railway.

Certificate.

No. 841.

The holder of this certificate will be entitled to ten shares of £50 each, upon the performance of the several conditions relating to the second and subsequent instalments contained in the resolutions of a special General Meeting of the proprietors of this company, held on Thursday, the 28th of April, 1842, a copy of which is at the back hereof.


Memorandum.

London and Paris Railway Office, 10, Street, London, 6th day of Feb, 1840.

Ten shares in the company, No. 3261 to 3270, were this day transferred from Mr. Richard Roe to Mr. John Doe.

For John Noakes, sen. Secretary.

Thomas Styles.

No. 5.

Form of Proxy.

1. Of one of the proprietors of the London and Paris Railway Company, do hereby appoint of to be my proxy, in my name and in my stead, to vote for or against any or all the bills, acts, or proceedings of the company, in any matter, matter, or thing, relating to the said company, that shall be mentioned or proposed at any meeting of the proprietors of the said company, and shall think proper, according to his opinion and judgement, for the benefit of the said company, or anything appertaining thereto.

In witness whereof I have hereunto set my hand the day of

A TRIP TO BOULOGNE AND BACK IN ONE DAY.

SOUTH-EASTERN RAILWAY.

This railway has been open as far as Ashford only, but it is now completed up to Folkestone, and 18 miles are now enabled to go. The company having purchased the harbour of Folkestone, one of their objects is to establish a steam communication direct from that port to Boulogne, in addition to that which, when the line is completed, will be effected from Dover to Calais. To demonstrate the ease with which this may be done, and at the same time to show the practicability of a trip from London to France and back in a day, an experimental journey was performed on the 24th ult., the result of which was perfectly satisfactory. At 6 o'clock a special train, containing the directors and their guests, started from the London-Bridge station, which arrived at the Folkestone station, a distance of 81 miles from town, in two hours and 40 minutes, having stopped at five stations by the way, losing 10 minutes.

Mr. Wright, the resident engineer of the line from Folkestone to Dover, was in attendance on the arrival of the company, and conducted them to Folkestone harbour, when the “Water Witch” steamer was lying ready to receive them: the period of walking from the railway and embarking occupied 30 minutes. The vessel got under way at 6 o'clock, and made the voyage across the channel in 3 hours and 6 minutes, and arrived at Boulogne at 25 minutes after 12; the company landed and presented to the mayor, who was in attendance. The trip occupied, with the time of that morning, containing the debates in parliament of the previous night. After partaking of a splendid entertainment at Boulogne, and remaining at that place 2 hours and 13 minutes, the company returned on board the steamer, and landed again at Folkestone after a passage of 3 hours and 45 minutes, and with a loss of 45 minutes in landing, and walking again to the railway. The company left the station at Folkestone at 7 minutes after 7, and arrived at London-Bridge at 6 minutes after 10, losing, in 3 stoppages, 10 minutes; thus, the whole journey to and fro, occupied 16 hours and 6 minutes; and deducting stoppages of 4 hours and 7 minutes, the time actually travelling was 12 hours and 45 minutes. A saving in time of at least half an hour will be effected when the proposed branch is made to the harbour of Folkestone. With a fast-going steamer, the trip across might be performed upon a trial, so that the journey direct from London-Bridge to Boulogne, may be completed in 5 hours.

MISCELLANEA.

THE CARTOON EXHIBITION, WESTMINSTER HALL.—We understand the designs sent in far exceed in merit the anticipation of the Commissioners, and that there is every probability of a most successful result. We are informed that they are to be opened for public exhibition, on Monday, July 3rd; during the first fortnight an admission of one shilling each person will be demanded, after which time they will be open free, and until the minute each day they are kept on Saturdays, in accordance of that day it will be closed, and in the afternoon opened to the admission of those who will pay one shilling; the funds to be devoted for the promotion of art, as the commissioners may determine hereafter, according to the amount. We are sure that this arrangement will give the greatest satisfaction both to the competitors and the public.

ROIAL SCHOOL OF DESIGN.—Professor Dyce has resigned the office of director, and has been succeeded by Mr. Wilson, of Edinburgh, some of whose communications on art have appeared in our columns, and are sufficient to show that intimate knowledge of the construction of art which Mr. Wilson possesses. A better appointment could scarcely be made.

GREENWICH PIER.—We abstained last month from giving any account of the failure of this pier, which took place on 16th of May last, as we had not then an opportunity of personally inspecting it, or of ascertaining its construction; we have since been favoured by our valuable correspondent, T. E. with the following observations, and sketch of the pier. He observes, “The foundation of the pier is a mass of granite, 15 feet below low water, and 30 feet above high water, and is composed of granite, having been left in its natural state, and consisting of large and small stones, with a quantity of concrete, with a slaturation of foul gravel. The foundation is 60 feet long, and 15 feet wide, and is divided into three east iron piles, each 6 feet in height, these iron piles were fastened by four, or two pairs of wrought iron hand ties (1) 18 inches square, to wooden piles (F) 18 feet long, and 12 inches square, driven in land at a distance of 234 ft. from the front, and 50 ft. apart.” The high water mark is about 4 feet from the top, and low water mark 22 feet below, or about 7 feet below the stone landing. From enquiry, we rather suspect the lower ties, as shown in the sketch, were not fixed, nor do we see how they could be, as they are shown considerably below low water mark. The superincumbent weight of the brickwork appears to have forced out the upper part of the iron piles to a considerable distance, and caused the brickwork above to slip down, and force out the iron plate; but, it is very difficult to say, whether this is the real cause of the failure, for until the ruins are cleared away, nothing positive can be stated.

SUNDERLAND.—Several fissures are said to be apparent in the celebrated Victoria Bridge, over the Wear. The Sunderland Harbour Commission have submitted the plan of a new bridge, for converting the harbour into a dock, but they have another plan of improvement which is not yet public.

NEWCASTLE.—The new church of St. Peter has been opened, Mr. John Dobson, Architect, and a Catholic cathedral, by Mr. Pugin, is now being raised in the style is early English; stone is used throughout in both these edifices, the tower has been left unfinished until further funds are obtained. Messrs. Green are architects for Lord Durham’s monument, which is to be a Greek Doric temple, and built on Fronten Hill.

WARKWORTH HARBOUR.—The works are again commenced by the company, the contractor having made arrangements to surrender the works to the company.

NEWCASTLE AND NORTH SHIELDS RAILWAY COMPANY are excavating a cutting 50 feet deep for a road from the Station to the New Quay, with retaining walls, and a bridge to carry a road over it at a cost of about 7,000l.

BIRMINGHAM AND DERBY RAILWAY.—No arrangement is likely to be made in respect to the unfortunate differences with the Midland Counties Railway, sufficient to bring about in the approval of the whole line on the railway company maintaining it for ever; its cost is about 5,000l. The Trent company insist upon its being done this summer, in consequence of several bills having being sunk by coming in conflict with Trent Bridge.

HERTFORD AND WARE RAILWAY.—The works are taken by Grinell and Peto, who have also taken extensive improvements of the Severn, in Gloucestershire, to the amount of 120,000l.
NOTTINGHAM and DEBAY CANAL.—The tonnage on this canal has much fallen off during last year. The Yorkshire route of mails taking the Hull, and some of the Boston and Lincoln goods over their lines, to Manchester, and thence to Derby.

MORRIS.—A New church is to be built, and the Rev. Mr. Grey, a relative Grey, has subscribed 1,000l., and nearly another thousand was lately of

NOTTINGHAM.—S. Mary’s church, tower unsafe, secured temporarily by Mr. Cottonbank, architect, and Haskale, architect, has been called in by the corporation: the columns are split vertically which support the tower, and temporary trusses is used to support them.

ATHENS, May 12.—A statue larger than life, and excentet in the Egyptian style, has been found near March, Bath and London, and just brought to our museum. The figure has an iron disc in each hand. Some assert that it is a representation of Antinous: others consider it an Apollo.

THE SPEAKING MACHINE.—I have as yet seen no notice in your valuable periodical of an invention, which is, at present, attracting a great deal of attention here and abroad. I am informed that a machine has been invented by Mr. M. Faber, the result of a beautiful adaptation, of mechanics to the laws of acoustics. You are aware that the attempts of Cagnard la Tour, Flot, Müller, Steinek, to produce articulate sounds, or even to imitate the human voice, have not been very successful; in fact, our knowledge of the physiology of the larynx and its appendices has been so limited, that we have not even an explanation of the mode in which the falsetto is produced. Mr. Faber’s instrument solves the difficulties. I can only give you a very imperfect idea of the instrument. To understand the mechanism perfectly, it would be necessary to take it to pieces, and the dissertation naturally is not shown the visitor—less from a wish to conceal anything, than from the time necessarily required for such an operation.

The machine consists of a pair of bellows at present only worked by a pedal similar to that of an organ, of a caustic imitation of the larynx, tongue, nostrils, and a set of keys by which the breath is conducted into action. (The further description would be unintelligible without a diagram.) The rapidity of utterance depends upon the quality with which the keys are played, and though my own attempts to make a passage in this instrument rather ludicrous, M. Faber was most successful. There is no doubt that the machine may be much improved, and more especially that the timbre of the voice may be agreeably modified. The complete machine was shown at the Paris and Birmingham, and in the different publications and publications of the Deutschen Taschenbuch. Dr. Duhur of Baden—formerly attached to the Observatory at Vienna—owing to an affection of the eyes, was obliged to retire upon a small pension; he then devoted himself to the study of anatomy, and now offers the results of his investigations and application to mechanics, to the world of science. (A Correspondent of the Athenaeum.)

Hamburgh, March 31.

S.}

LIST OF NEW PATENTS.

(From Neurs, Robertson’s List.)

GRANTED IN ENGLAND FROM MAY 30, TO JUNE 21, 1843.

Six Months allowed for Eurolament, unless otherwise expressed.

William Newton, of Chancery-lane, civil engineer, for “improvements in obtaining copper from copper ores, some part or parts of which improvements are applicable to obtaining certain other metals contained in some copper ores.” (A communication.)—Seals of

William Edward Newton, of Chancery-lane, C.E., for “improvements in the method or system of constructing boats and other vessels, which the inventor intends to denominate the ‘Mondonian system.’” (A communication.)—May 30.

John Tappan, of Fitzroy-square, Middlesex, gent., for “improvements in apparatus applicable to flues or chimneys, for the purpose of increasing the draft therein, and promoting the combustion of fuel.” (A communication.)—May 30.

The Rev. S. Forsyth, of Salford, Lancashire, engineer, for “improvements in machinery for making bricks and tiles.”—June 1.

Pierre Frederick Ingold, of Buckingham-place, Hanover-sqaure, watchmaker, for “improvements in machinery for making parts of watches and other like instruments.”—June 1.

Henry Fox Talbot, of Lecock Abbey, Wilts, Esq., for “improvements in photography.”—June 1.

Martyn Roberts, of Carmarthen, Esq., for “improvements in machinery for the extraction of spirits from ‘alcohol’, and winding wool, cotton, flax, silk, or any other fibrous bodies.”—June 1.

Fennell Allman, of Salisbury-street, Strand, surveyor, for “improvements in apparatus for the production and diffusion of light.”—June 3.

James Johnson, of Volunteer-street, London, gentleman, for “improvements in machinery for sawing wood.”—June 3.

William Brown, of Glasgow, merchant, for “improvements in the manufa...

—feature of porcelain china, pottery, and earthenware, and which improvements are also in part applicable to the manufacture of paper, and to the preparation of certain pigments or printer's colours.”—June 3.

Robert Smith, of Commercial-road, Redcliff, Bristol, ship-owner, for “improvements in paddle-wheel.”—June 8.

Jonn Burns Smith, of Salford, Lancaster, cotton spinner, for “improvements in machinery for preparing, carding, roving, and spinning cotton, and other flaxen substances.”—June 8.

Carrington Plaunt Dobbs, of Kingston, Surrey, civil engineer, for “improvements in the manufacture of fuel.”—June 10.

Henry Page, of Cambridge, painter, for “improvements in the painting, graining, or decorating with oil, and other colours.”—June 10.

Richard Hardman, of Birmingham, manufacturer, for “improvements of glazing or cementing certain materials for building, and other purposes.”—June 10.

Edward Joseph Francois Dueslos de Bosqnois, of Clyde Wood Works, near Swansara, engineer, for “improvements in the manufacture of hemp, in hemp, flax, and jute, from ores and slags, and other products, and in the manufacture of their alloys with other metals.”—June 10.

Ernst Leutz, of Eastcheap, gentleman, for “improvements in machinery for raising and forcing water and other fluids, which machinery, when worked by steam or water, may be employed for driving machinery.” (A communication.)—June 10.

Alfred Francis, of Vauhall, Surrey, Roman cement manufacturer, and Isaac Funge, workman in the employ of the said Alfred Francis, for “improvements in cement or artificial stone.”—June 10.

Samuel John Knight, of Water-side Iron Works, Maidstone, Kent, founder, for “improvements in kilns or apparatus for drying hops, malt, and other substances.”—June 10.

William Wells Ingrain, of Birmingham, engineer, for “improvements in pressing and embossing wood, and other materials, in order to apply the same to various useful purposes.”—June 10.

Samuel Spinkes, of Wellington, Somerset, foreman at a woolen manufactory, for “certain improvements in machinery for carding wool, cotton, and other metallic materials.”—June 10.

John Tappan, of Fitzroy-square, gentleman, for “certain improvements in apparatus for grinding and polishing cutlery, and other articles, whereby the deleterious effects on the lungs and health of the workmen, produced by the metallic particles arising from the said operations, are entirely, or to a great extent, obviated.”—June 10.

William Edward Newton, of Chancery-lane, civil engineer, for “the novel application of certain volatile liquids for the production of light, and improvements in the combination of such or other volatile liquids.”—(A communication.) June 10.

John Galley Halfway, of Narrow-street, Limehouse, mast and block maker, for “certain improvements in paving and covering streets, roads, or other works.”—June 13.

Frederick William Eggleston, of Derby, confectioner, for “certain improvements in the combustion of fuel and consumption of smoke.”—June 15.

Henry Bessemer, of Balclay House, St. Paerac, engineer, for “certain improvements in the manufacture of bronze, and other metallic powders.”—June 15.

George Lister, of Derby, Gloucester, car manufactory, and Edward Budding, of the same place, machinist, for “certain improvements in the means of covering the cylinders of carding and screwing engines with wire cord, and in condensing the rovings derived from such engines, and also on apparatus for sharpening or grinding the points of the cords, which latter apparatus may also be employed for grinding other articles.”—June 15.

Edward Hammond Beattial, of Heybridge, Essex, iron founder, for “certain improvements in ploughs, and in apparatus which may be attached thereto, for ascertaining the draft of the ploughs employed in tilling land.”—June 15.

James Gardner, of Bath, Oxford, ironmonger, for “improvements in apparatus for raising and lowering window blinds, and maps.”—June 15.

James Gardner, of Banbury, Oxford, ironmonger, for “improvements in machines for mowing, reaping, sowing, and other vegetable matters for the food of animals.”—June 15.

Samuel Brown, of Gravel-lane, Southwark, engineer, for “certain improvements in the manufacture of cans and other vessels.”—June 17.

James Mackenzie Bloom, of Hampstead, esquire, for “improvements on meridian instruments.”—June 20.

John Read, of Regent-street, machinist, for “certain improvements in ploughs for draining, subsoiling, and cultivating land.”—June 21.
SOME OBSERVATIONS ON PROPRIETY OF STYLE, PARTICULARLY WITH REFERENCE TO THE MODERN ADAPTATION OF GOTHIC ARCHITECTURE.

By Edward Hall, Architect.

(Read at the Royal Institute of British Architects, June 26th, 1843.)

"dead men"

"Isaac their mute thoughts on the mute walls around."

"Yet to the remnants of thy splendid past,"

"Shall pilgrims pensive, but unwearied, throng."

Very few years have elapsed since the style of architecture, called Gothic, was ill-appreciated, or little understood in England. Teeming as our island is in its highways, and its sequestered nooks, with monuments of the piety of past generations—discoursing "sermons in stones"—and breathing, through the interval of centuries, on the chords of present time—the lyre lay long unstrung, and gave none but discordant notes. The labours of the honoured few, who alone cherished a love for the architecture of the country, were treated with ridicule and contempt; whilst the student and the man of letters, slighting, or ignorant of what his country contained, sought, in Italy, and in Greece, vestiges of the arts and mythology of nations, whose religion was idolatrous, and whose architecture ill consorted with the requirements of a Christian faith. Our cathedrals were repaired with a degree of carelessness, pardonable at no time; and were crowded with screens, and altar-pieces, and with costly monuments, discordant in style as they were tasteless in design and execution. But, happily for the honour of the age, love of antiquarian topics, and of works of art for their intrinsic excellence, have caused a re-birth in architectural history. The wonderful skill in construction, and the taste of our ancestors are appreciated; the remote village church is examined for the beauties which characterize it, not less than do fine proportion and elaborate enrichment the cathedral and the college;—religious feeling assists in the movement, and it is scarcely too much to say, that the time is close at hand, when, for ecclesiastical structures, Gothic architecture will become as much the architecture of the country as during the splendour of the thirteenth and fourteenth centuries.

However, as architects, we may regret the tendency at our universities towards imitation rather than design, it must be allowed, that the attention, paid to Gothic architecture there, has met with good results, in a greater care in the restorations of existing fabrics. The importance, as historical records, which attaches to all architectural remains, renders it a sacred duty in the architect to well inform himself on all features in different styles, so as to transmit to posterity the structures he is called upon to re-instate, with every line and trace of their founders' character and skill. The architecture of Egypt, its paintings and hieroglyphics, in its long and gloomy vistas, and its avenues of sphinxes, is a lasting petrifaction of the manners and customs of the people, and of the dominion of that mysterious hierarchy, who sat in judgment over the dead, and who curbed the flights of imagination in architecture and in sculpture by inviolable regulations. The porticoes and sculptures of Greece are living evidences of the refinement of a nation, who responded to the works of its artists, as to the creations of the dramatist, and the reasoning of the philosopher; while the sumptuous edifices of the Romans speak of the pomp of imperial sway and the slavery of subject states. The architecture of every country, and of every age, is vocal with the inmost workings of its creating mind; and it occupies the place of written history in points which, though of the highest interest, historians have for the most part failed to touch. The architecture of the middle ages is not less valuable to the observing student of history, than the architecture of Egypt, of Greece, or of Rome. To the eyes of the general historian and the artist, the majesty and richness of the cathedral tell of the self-sacrificing spirit of our forefathers, who devoted their wealth and their lives to the service of religion. Every village church is a key to the history of the surrounding district—from its effigies, its sepulchral brasses, and its heraldic enrichments, the topographer and the genealogist may derive important data, for the prosecution of researches into the history of a county, and of its principal inhabitants. The "very age and body of the time" are manifest in each feature, and in the minute details are related even the passions, and the animosities of the different orders of the priesthood. Though sad instances of destruction still occur, though churches still receive their periodical coat of whitewash—until the richest foliage is obscured by the useless repetition—the course of demolition has been reduced; while the restorations in progress, or about to commence, afford matter for the highest gratulation. Thus the architect must combine the pursuits of the antiquary with the study of the practical and the recent; his researches must extend into the curious and the obsolete, to enable him to understand the style and details of any edifice under his care.

It is a matter of surprise to all who study and love the architecture of the country, that its revival for ecclesiastical structures should have met with opposition. This opposition—urged by the highest love of art—has been publicly expressed and published, so that it seemed incumbent on those who desired to walk in the steps of our forefathers, to show that another view of the question was not unsupported by argument. But the matter not having received the notice that might have been expected, I have ventured before you this evening, and if the question suffer in my hands, I beg it may be understood, that arguments are not wanting which could have been adduced by those, who might have anticipated me in my present subject.

The opinions referred to may be thus stated. That the "taste of the day inclines to the Roman Catholic plan, suited to a demonstrative form of worship, rather than to the auditorium required by the Protestant ritual," and that the "churches of Sir Christopher Wren are better adapted for models." That proportions in Gothic architecture were "wholly capricious," and "subject to no order or regularity," nor that "any have been ever attributed" to the style by its greatest admirers, so that "columns or supports might be from five to fifty diameters in height, and were only bounded by possibility" that the delight, confessedly inspired by the works of the middle ages, is to be referred to a "love of the marvellous," which "love of the marvellous is dangerous, exaggeration being the first sign of a mind indifferent to the value and beauty and sufficiency of truth, and the surest sign of deprivation of judgment." The Egyptian, the Roman, and sometimes the Greek indulged in the gigantic, with a view to the expression of a prodigious energy; but the middle ages were prone to the marvellous, surprise was the great scope of the Gothic architect. That "the middle age church was wholly founded on superstitious associations." The plan described the cross, the universal symbol in hoc signo vinces. That "the nave represents the body of the saviour; and the side, which 'one of the soldiers pierced,' is considered to be the south as the region of the heart, is occupied at Wells by a chantry, at Winchester with the chapel of William of Wykeham, and is constantly the pulpit from which the faithful were reminded 'to look on him whom they have pierced,'" "The choir was inclined to the south, to signify, that 'he bowed his head and gave up the ghost,'" and "there are few cathedrals in which this defective is not remarkable." "At the head of the cross was the chapel of the Virgin—Jesus resting in the lap of Mary. At the foot, the west-end, was the 'Parvis,' supposed by some to be a corruption of 'Paradis,' that happy station from which the devout might contemplate the glory of the fabric, which was chiefly illustrated in this front, and from whence they might see the great sculptured picture, the calender for unlearned men, as illustrative of Christian doctrine and the temporal history of the church, under its princes and its pre-

1. It will be observed, that the subject of propriety of style in domestic architecture is not now entered into.

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lates. Three great niches leading into the church, the centre one above forty feet wide, were adorned with the statues of the apostles and holy men, who 'marshaled us the way we should go.' In front, the genealogy of Christ, the final judgment, the history of the Patriarchs &c." Further it is said, that "the same want of cultivated judgment, which is apparent in the aesthetical arts of the middle ages, is traced also in the imperfection of their statues and stereotomy, in which again solidity is sacrificed to superstitious." That as "the figure of the cross" was "indispensable," though "the arches of the nave, formed their abutment abundantly in the western termination, which was commonly fortified by prominent buttresses, no such abutment existed at their eastern termination towards the lofty pillars of the transept." Consequently, that "the smallest failure of foundation or superstructure, threw so much weight against these pillars as to occasion them to bend," and therefore, the weighting of the pillars with a tower or spire being insufficient, "the last disfiguring remedy, the construction of a reversed arch between them, was employed," (vide section of Wells Cathedral). Further, that we "crudely adopt the niched and canopied architecture of a religion, peopled with images of saints and martyrs, sibyls, angels and holy men, to a Protestant religion, which, admitting none of these, must leave the niches and the canopies tenanted, like well-girt frames adorning an apartment, the pictures being omitted—the pride and pomp of heraldry, armorial shields and crests, to an age in which chivalry is exploded and quarterings have dwindled to insignificance." That "slighting those excellencies of sculpture, which shed such lustre on the palmy days of Italian art, we oblige our artists to copy the obscenities and senseless carvings of barbarous times, simply that we may carry out the imitation of a style in all respects" and, finally, that the result of our want of unanimity in style will be the imposition of anachronisms on posterity, and the falsification of the pages of history in its most interesting and characteristic traits.—Any public expression of opinion is liable to opposition, and I may venture to dissent from these views, which I do for the following reasons.—Because the whole character and purpose of Gothic architecture is eminently expressive of the aspirations of a Christian faith. The upward tendency of the lines, and the pyramidal outline of the whole structure, culminating in the spire, draws the mind of the beholder from realities of earth to hopes of heaven. So inherent is the perception of this moral beauty, that a veneration for the forms of Gothic architecture, and a feeling of its propriety for Christian churches, has never been extinct. Contemplated by some, as the offspring of a dark and superstitious age—though the same objection would equally obtain against the invention of printing, and that of the compass—surrounded with the enrichments of a foreign style, it still appeared in those traditional features to which the affections of the nation firmly clung. The inclosure of the altar by a screen or railing, answering to the rood-screen, is found, along with the oblong plan, and other features of the national architecture, even in the churches of Sir Christopher Wren, while, amidst all the contrivances and adaptations of diminishing arcades, and peristyles, and of obelisks, the form of the spire and pinnacle was preserved. The metropolitan cathedral was constructed on the old model of the cross with aisles, central and western towers. The style of architecture, changed in domestic buildings, was, in its most essential features, unchanged in sacred edifices, whilst the enmity it did receive from the literati of the town, lessened not its hold upon the people of the country. The early churches, erected at a time when land had not attained its present extraordinary value, had sufficient space allotted them to afford room for interments, and to allow of the position and form which tradition had consecrated. The churches of the city of London, for the most part enclosed on every side, can scarcely be given as examples of the particular form of plan, most likely to have been adopted, had no trammels presented themselves to their builders. Yet in all of them there has been a recollection of the oblong form, suited to the earlier worship; whilst in a very large number the proportion of length to breadth is equal to that of Gothic churches. In some of them the foundations of the previous churches were retained; but it is scarcely likely such "economy" would have been practised in that age to the pre- sumed disadvantage of the church in other respects. In the smaller Gothic churches, (vide Fig. 1.) the whole length of the nave and chancel is frequently but twice the width of the nave and aisles, so that that part westward of the rood-screen, and in, or immediately adjoining which, all portions of the service, demanding the arrangement of an auditorium, are performed, is of the dimensions retained in those churches of Sir Christopher Wren, which approach nearest to the square form.

Fig. 1.—Plan of Haddenham Church, Bucks.

That fine effect of length in the nave of the Gothic cathedral, like all beautiful effects in art, is due to an impression, produced upon the mind by skilful proportion and arrangement, rather than to actual dimensions upon the ground plan. The length of the nave is little more than double the breadth of the nave and aisles; while it does not amount to that in some of the finest cathedrals.—So that any opinion that a form, presumed to be better adapted for sight and hearing, was employed, to the exclusion of the established proportions, is scarcely borne out by a careful comparison of different fabrics. The nave of the earlier church will be found better adapted for hearing than any of those churches which have not borrowed from the Catholic model: whilst the improvements in the internal arrangement of churches now in progress, by altering the size and position of the pulpit, and substituting open benches for pews, will render even an increased length of chancel less objectionable than the old arrangement, in which the cumbersome pulpit and reading-pew prevented all view of the communion. If an auditorium were all that is required for the purposes of religion, the ordinary lecture theatre would present the best form, but one which would excite no emotions of devotion. Were you to transplant one out of the major part of our metropolitan churches to some district 'remote from towns,' the chances are, that the structure would be called a villa or something else; but if you were to select Bow Church or St. Bride's, there would probably be some suspicion, that you had intended to erect a church. The truly appropriate character seems to reside in that style, which our forefathers adopted, and which is eminently expressive of every Christian's faith.

Since the close of the seventeenth century, when one, possessing the varied endowments of Wren, could style Gothic edifices "mourn-
tains of stone, vast gigantic buildings, but not worthy the name of architecture, or Evelyn could say "Gothic architecture is a congestion of heavy, dark, melancholy, monkish piles"—vague and inappropriate expressions, bearing as little assimilation to the style as did the attempts of the architect to the churches he reviled:—since the time when Gough and Carter, and other honoured few, alone upheld the merits of our antiquities, how much has the study of our national edifices increased; and from this study, wonderfully systematised within late years, has resulted a high admiration of the old English architects, and of the principles which guided them in their sublime conceptions. Yet, the opinions of the seventeenth and eighteenth centuries have been revived in the nineteenth, and Gothic architecture treated as devoid of sound principles of proportion and taste. Though no Vitruvius of the middle ages has bequeathed to posterity written rules, and though heights and projections be not governed by modules, the opinion has been gradually growing, and has now reached conviction, that principles of design did exist, and that proportions of parts were observed. In the main principles of design, all styles, having claims to rank as beautiful, agree; and in those principles the medieval architects were consummate masters. In any style of architecture, whose horizontal and vertical lines are of equal number and prominence, we should not expect to find that beautiful effect, which results from an increased importance being given in one of those positions. Thus, while in the Grecian temple the main lines are horizontal, in the Gothic they are vertical; a like principle being observed in each. So when, during the decline of Gothic architecture, the horizontal line came into increased use, all the richness of ornament—so profusely lavished upon the structures of that age—failed to conceal the original mistake. In attention to pyramidal outline, whether of masses or of parts, the Gothic architects surpassed all rivals. In "unity and subdivision of parts," the groinings and the window tracery of the best period, exemplify those main principles of beauty, which govern the disposition of the members in the Greek entablature—the beams and coffers in Italian ceilings—the cartoons of Raphael, and all beautiful compositions of whatever style and date. The west window of York Cathedral, improperly lessened by the presence of any neighbouring part. An arch of unornamented but elegant mouldings, placed beneath a rich crocketed canopy, circumscribes tracery of the most elaborate designs. Three mullions, each 11 inches in width and 5 inches in projection, divide the opening into four equal parts; each of these compartments is subdivided by another mullion, which is only 8 inches wide and 6 inches in projection. The ramifications of the head are marked out into large and bold features by the continuation of the larger mullion, from the sides of which spring the mouldings, which form the smaller ramifications. Drawing attention to so celebrated an example, with which all present must be quite familiar, affords me a main link in the chain of argument—indeed proves that the main unvarying laws of composition were known to the Gothic architects as to the great in art of every time.

"Mid curves that vary in perpetual twine,
Truth owns but one direct and perfect line."

This principle of dividing by large features, and subdividing by smaller, being—to use the words of Burke—"as it were, moulded into each other"—has been ably elucidated by Professor Willis in an elaborate paper on Gothic vaultings, published in the transactions of this Institute. It may be difficult to deny, that the principles of pointed design permitted a greater latitude, or, that exceptions to the general arrangement were not unfrequent in a style of such invention and variety; and it is also probable, that in the different lodges of Freemasons, the principles themselves might slightly vary; but to assert, by implication, that the beautiful creations of Gothic architecture are the results of accident rather than design, seems akin (if the comparison can be drawn without offence) to the belief of one, who, in the order and regularity of the universe, can discover no sign of a pervading Mind. The fact that the knowledge of the Freemasons was jealously guarded, is sufficient to account for our not possessing a written explanation of their secrets. Whilst, in one edifice, the proportions are to some extent deficient in elegance, in another we are delighted with their exquisite effect; which shows that they are still matter for study and attention, though they may not square with those of an opposite style. Take the example of an early English doorway of good character: we shall find that the perpendicular lines could not be lengthened or diminished without destroying the effect which its present proportions produce, unless we at the same time make some change in the decorative features. Thus, in the drawing of the doorway, Fig. 3, from Rothwell Church, Northamptonshire,
by the columns and decorations, and in appearance, by the horizontal line which runs across the composition in the shape of bands to the shafts. Yet, it seems to have escaped the attention of many detractors from the merits of pointed architecture, that it is possible, under different circumstances, to attain the same end by different means. As in Italian design—an arched doorway of two squares and a half in height, Fig. 4, would probably appear too lofty, if decorated with a simple architrave, but, if a cone with panels be inserted, Fig. 5, the eye is at once reconciled to the proportion. Mr. Hawkins, in his "History of the origin and establishment of Gothic architecture," says that in the year 1321, several persons (whose names he gives) who were appointed to examine the works at Siena Cathedral, declared that the works ought not to be proceeded with, as the established proportions of the old church would be destroyed, and it would not have that measure in length, breadth and height, which the rules for proportioning a church require. Had there been no settled rules of proportion, it is clear, that the architect could not have transgressed.

But the elucidation of a system, which might have been employed by the old architects, in proportioning the parts of buildings, has been attempted by Mr. Billings, and, as regards Carlisle and Worcester Cathedrals, with success. The same subject has also occupied the attention of the Oxford antiquaries. I am also disposed to give a higher rank than that of superstition to the system of proportion in which triangles were employed, first noticed by Cesare Cesariano, Fig. 6, and illustrated by D’Agincourt, in his elaborate work, entitled "Histoire de l’Art par les Monuments," in the sections of Milan and Bologna Cathedrals. The objections brought against this system appear to have resulted from an inaccuracy in the description and diagrams of Cesariano. In Fig. 6 the triangles are all equilateral, and their lines intersect parts of the building in such a manner as to lead to the belief, that they actually determined the proportion; thus symbolic of the Trinity. But it may be asked, whether any cathedral constructed on sound principles might not have the same proportions, as to width of nave and aisles, as the one under notice, and if so, whether the use of equilateral triangles might not give the most effective arrangement. But, omitting this view, the opinions as to the "superstitious" origin of Gothic proportions, are founded, not on careful measurements, but on the obscure text and rough diagrams of Cesariano, which vary so much from the actual dimensions, as to give the total height of the spire one third less, than as at present existing. The triangle is of the greatest service in proportioning the parts of buildings, in accordance with that pyramidal character which should pervade every building of whatever style, and seems to have been so used by the Gothic architects. In a late work by Mr. Bartholomew it is shown that the pyramid or triangle may have governed the proportions of the west front of St. Paul's Cathedral; and a similar method was probably practised by the earlier companions of the order, to which Wren belonged. Its application to the west front of York Cathedral I have endeavoured to show in the diagram, Fig. 7. That peculiarity of symbolising the

Fig. 6.—Cathedral of Milan—Cesariano’s Theory.

Fig. 7.—West Elevation of York Cathedral.

different parts of buildings, though proved to have obtained amongst the Catholic priesthood, may not have originated either the proportioning by triangles or the disposition of the several parts. The after symbolising of various parts invested them with a peculiar sanctity; but that, in the first instance it governed the entire disposition, or that it ever tended to lessen the beautiful effect, I think yet demands further proof. At least, it should be shown, that this imputed symbolism stood in the way of a better arrangement, ere the Catholic architects are condemned for even the smallest attention to it. Indeed, a symbolic meaning, so to speak, might be discovered in buildings, in which it is clear no such intention ever existed. In St. Paul's Cathedral, the three large doors might be thought to symbolise the Trinity, and the four arms of the cross with its eight aisles, the twelve Apostles. Whether any symbolic meaning might be discovered in the three porticos of the Post Office, and of the National Gallery, or in

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The translation of Vitruvius by Cesariano is a scarce work;—the illustration given is from Hawkins' Gothic Architecture.

the common street elevation of a door and window on each side, it is
perhaps not safe to say; but the mere facility with which coincidences
may be made to appear in all buildings, and in particular the constant
and necessary combination of three objects, shows the necessity of ex-
treme caution in speculating upon the subject. A writer in the Gentle-
man's Magazine well remarks, that those parts to which symbolism
has been most commonly applied, are deficient in the most essential re-
quisites, as the three divisions of the nave, and of the triple lancet, are
in co-equality. That, so great a variety of rules, have been at differ-
ent times, given for proportioning the parts of edifices, all nevertheless
agreeing in the results, goes to prove that the particular system to be
adopted is of less importance, than the use of some system, from
which may result that veiled grace, always delighting the mental
vision in a structure projected by symmetrical rules. Such rules the
Gothic architects are proved to have observed.—It is said that "co-
lumns or supports might be any number of diameters in height, and
were only bounded by possibility." Let us admit this, and examine
what practice has been pursued in other styles. By the elaborate ex-
periments of Mr. Eaton Hodgkinson, on the powers of resistance of
different bodies to compression, it has been proved, that in cylin-
drical forms, there is a certain proportion of height to diameter, be-
Yond which it would be dangerous to go, the resistance rapidly les-
sening in proportion with the height. To pass that limit would en-
danger the stability of the fabric; to keep much below it would be a
needless expenditure of material. From a non-observance of this
propriety, we have frequently seen columns of harder material of the
precise dimensions given to those of stone. Now such a practice is
foreign to the principles of Gothic architecture, as may be seen by
the most casual comparison of their works in wood, stone, and metal;
in which they had reference to the properties of each. The rules of
classical architecture require, that no alterations should be made in
the proportions of columns which are engaged, coupled or clustered,
though it is clear, that, in accordance with the principle hinted at
above, and a feeling, which, without reference to the results of experi-
ment, exists in every mind, the same proportions should not be ob-
erved. At least, the Gothic architects pursued a different mode, on
sounder views than have usually been attributed to them. Their cir-
cular columns, placed singly, were shorter than those which were clus-
tered or united as shafts to piers and arches. Further, when these
shafts were of great length, they were encircled by bands as at West-
minster Abbey. In the Ladye Chapel at Hereford, and in the Chapter
House at Chester, the isolated shafts to the windows are banded to the
adjoining mullion by ties of stone, which are converted into fea-
tures of decoration. But the absolute constructive necessity for such
ties is shown in the failure of slender shafts, in which such precaution
has been neglected. Shafts without bands, and at the same time of
great length, occur at Salisbury Cathedral; while in the Ladye
Chapel are isolated shafts, supporting the roof, of the slenderest di-
ensions, and uncombined with a larger column. Such examples are
extremes, or exceptions to the usual practice, and though as in this
wonderful edifice, calling forth our admiration and delight, they are not
what the modern architect would emulate. I venture to assert, that
we are justified in craving of those, who deny the existence of prin-
ciples and proportion in Gothic design, that they should compare the
cathedral, the abbey church, the parish church, and the collegiate
chapel, marked each by clear and distinctive lineaments; that they
should closely scrutinise and balance every minute part of a compo-
sition; that they should examine whether the different tendency or
number of lines, the different character or quantity of ornament, or
some other cause or influence, has not dictated a manner of treatment
varying from that they have observed in another composition, but in
strict accordance with the same first and inviolable principles of both;
or whether the example is not such an exception to the usual style and
principles, as all ages have witnessed. Our delight in Gothic architec-
ture is indeed the result of elegant outline and proportion, richness of
detail, sincerity and scientific construction, along with ad-
miration of the high purpose and untiring labour of the architect,
rather than of a "love of the marvellous," or mere respect for what
is old. The "love of the marvellous," of which the Gothic architects
are accused, was seen in the "large stones" of the Grecian temples,
the columns of one block of the temple of Diana at Ephesus, in the
temple of Jupiter at Agrigentum, in the costly structures of Baalbe-
ke and Palmyra, in the Colosseum, in the domes of St. Peter's at Rome,
and St. Maria at Florence, and in the gigantic order and all the con-
ceptions of Michael Angelo. "Another enemy to the beautiful, and
even to the sublime," says Forsyth, "was that colossal taste which
arose in the empire and gave an unnatural expansion to all the works
of art." As it is beyond the power of man to create a style, all styles
being the work of ages and of circumstances, rather than of archi-
tects, who should be able to infuse new beauties into all, and as,
in the words of Reynolds, "it is vain to endeavour to invent without
materials on which the mind may work, and from which invention
must originate;" are these the styles for which we must close our
eyes to the expressive architecture of our own land? Is there any
distinction between the end sought in the colossal works of the Egyp-
tians, the Greeks, and the Romans, and that "love of the marvellous"
ascribed to the Gothic architects? or is not the raising of surprise a
legitimate end of all architectural skill? I cannot think that the plan
of the middle age church was wholly founded on superstitious
associations, and that the spire and cross are not appropriate emblems
of both the Catholic and the Protestant faith. From the plan of the
cross result the most beautiful outline, both externally and internally,
and the most captivating effects of light and shade. It is not exclu-
sively Gothic; and no higher testimony to its merits could be gained,
than its adoption by so great an artist as Sir Christopher Wren. The
majority of the English churches are not cruciform, which is sufficient
to show the form was not indispensable. That some particular san-
ety was attached to one side of the nave in cathedrals, may be in-
ferred from the fact that in the majority, the monuments on the
southern side and in the southern aisle preponderate. But it should
at the same time be noted, that in several examples the monuments on
the north side are equal in number, or nearly so; and, that at Wells,
when there is a chantry under one of the southern arches, a corre-
ponding position is similarly occupied on the north side. As regards
the inclination of the choir to the south, I believe no perceptible in-
cination occurs in the English cathedrals; and at Litchfield, where an
inclination to the north is discoverable by measurement, the variation
is so slight, that I think few persons would discover it within the
building. The ladye chapel, though generally at the west end of the
choir, and certainly so placed with fines effect, is not unfrequently
elsewhere. In the cathedral of Bristol, the "elder ladye chapel" is
at the north side of the choir. A similar position is made use of at
Ely.

But the strongest objection brought against the practice of the
Gothic architects, is that their buildings have failed through want of
constructive principle; and that though they manifested considerable
enterprise and dexterity, they lacked that theoretical knowledge
which grew under a better order of society, and "the chastening
counsel of a Locke, a Newton and a Bacon." Now it cannot for one
moment be supposed that the scientific knowledge of the middle ages
approached to the learning of a Galileo, a Napier, or a Newton; nor
be denied that the mass of the people were utterly ignorant. But
the existence of a large number of mendicant friars, always at enmity
with the regular priesthood, yet as ignorant as those upon whose
fears they lived, seems to have led to the general belief, that all the
Catholic clergy had little in their heads but a knowledge of bad Latin;
or in their libraries, except the writings of the fathers. But, amongst
the churchmen was preserved all the knowledge of the age; they di-
rected the architectural works and the engines of the state; and
though their projects were often carried out by less skilful hands,
their expressed intentions bear the evidence of a knowledge of prac-
tical mechanics, of the composition and resolution of forces, which, it
is difficult to conceive, could rest on any other than a foundation of
geometry. Mere solidity is often best obtained in buildings, in which
but little science is called into play; but with a greater expense of
material and labour, and less scope for decoration and convenience.
be made out with marvellous care, he will yet turn to those few.
Small scientific skill was required for the construction of the Druidical
 temple, or the Grecian portico; but from the increased use of the
 arch arose a new era in the art of building. Smaller stones were em-
 ployed, with skilful arrangement of counterfort; and labour replaced
 by economy and facility of execution. With the change from the
 semicircular to the pointed arch, arose a still greater facility of ex-
 ecution, combined with a nearer approach to the advantages which had
 resulted from the principle of simple repose. But along with, though
 not necessarily resulting from the use of the pointed arch, a force was
 at work towards the ruin of many edifices, but for which the practice,
 rather than the theory of Gothic architects must be censured. The
 supporting columns of the central tower began to bend in the middle,
 as at Westminster; and other failures, all proceeding from one cause,
 took place little subsequent to the building of the several structures.
 It became necessary to connect the great piers of the tower, to pre-
 vent the recurrence; and counterforts were inserted at Salisbury,
 Wells, (Fig. 5) and elsewhere. It has been thought that this failure of

away, they will yet long serve to shorten the labour of the historian,
 as now.—The so called economy of modern times has deprived our
 art of that sister, without which she is insipid, and incomplete; but
 there can be no other reason that niches should be "tenantless" in
 any religious edifice: and none that the obsequities of former times
 should be copied in the present. The exquisite richness of the
 Gothic foliage would be apt, from its very profusion, to cloy upon
 the mental palate, had it no immediate contrast, as with the grotesque
 and the satirical. Thus, as at York, we find the passions of men and
 the habits of animals depicted amongst the leaves of a capital or a
 bracket. In other cases we have the monogram IHS and other reli-
 gious insignia. Though some of the carvings are sufficiently shock-
 ing to eyes polite, as for example, the gargulets, yet these are never
 "senseless;" they have always an expression in character with their
 purpose, and may safely be contrasted with the unnatural lions, the
 sphinxes, and chimæras of other schools of art. Though, in the
 sculpture of the earlier styles, forms were conventional, and a
 particular sentiment was expressed in an established mode, this
 severe style presents many claims to our admiration, though in
 execution, it can be as little compared with the later style, as
 can the marbles of Xanthus with those of the Parthenon. But
 good sculpture, and by Gothic architects, does exist, grand in concep-
 tion as that at Wells, and perfect in execution as that at Westminster;
 and it received the admiration of our own Flaxman. Speaking of
 the interior of Henry VII's chapel, he says, "The figures of the tomb
 have a better proportion and drawing in the naked than those of the
 chapel; but the figures of the chapel are very superior in natural
 simplicity, and grandeur of character and drapery." But, of the
 sculpture of Henry V's chapel, the work of a century previous, he
 says, "The sculpture is bold and characteristic; the equestrian
 group is furious and warlike; the standing figures have a natural
 sentiment in their actions, and simple grandeur in their draperies,
 such as we admire in the paintings of Raphael." Could there be a
 higher praise than this from so great a man? The vertical character of
 Gothic architecture does indeed demand in the garments, folds which
 may accord with the genius of the style; or rather eschews those con-
 tontions of drapery and whimsicalities of design observable in the
 works of the later Italian school, particularly of the followers of Bernini;
 and of which some idea may be gained from the engravings to the
 English edition of Palladio's works. If a group be viewed singly in
 a gallery or an apartment, where only it appeals to the eye, its forms
 may be influenced by the taste of the artist alone; but, in architecto-
 nomic sculpture, a different treatment of the subject is demanded.
 A greater rigidity, or a more erect position seems necessary for statues,
 when combined with architecture, in all styles. "Their attitudes," says
 Chambers, "must be upright, or, if anything, bending a little for-
 wards, but never inclined to either side. Their legs must be close to
 each other, and their draperies close to their bodies; for whenever
 they stand straddling with bodies tortured into a variety of bends, and
 draperies waving in the wind, as those placed on the colonnades of
 St. Peter's, they have a most disagreeable effect, especially at a dis-
 tance; from whence they appear like lumps of unformed materials,
 ready to drop upon the heads of passengers." That excellence of
 imitation is not the highest quality of art, is readily granted, but it is
 not less true, that in some degree it may detract from our delight, by
 its very excess "reminding us that life and animation are wanting,
" and thus defeating the aim of the artist. For remarks on this head,
 vide Reynolds passim, in the lectures of the professor of painting at
 the Royal Academy, and in Mr. Eastlake's translation of Kugler's
 Handbook.—To him, who feels that a devotional character should be
 impressed on all monuments erected in churches, I suggest in favour
 of Gothic architects one practical argument—a walk through West-
 minster Abbey. There he will find architectural ornaments ruthlessly
 sacrificed, that square patches of black and white may occupy their
 place. He will see eumose monuments to some "periwig-pated
 fellow," or some courtier of a passing day, occupying a position,
 tardily granted or denied, to the mementoes of the philosopher and
 the poet. But though each individual hair of their wigs or their whiskers

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7 The counterfort at Wells was probably coeval with the piers—that at
 Salisbury later in date.
mental effigies, recumbent in unbroken sleep, or with hands clasped in holy aspersion; and, overworn by the spirit of the place, he will walk with softer tread, his mind impressed with feelings of devotion, and with vivid recollections of his country's great.

In Gothic buildings, no construction is masked by decoration; no sham feature inserted to correspond with that is real. Sincerity is the guiding rule, and geometry the instrument. In vaultings, the thrust of the main supporting ribs is concentrated at one point, and there counter-abutted by a flying buttress, in the precise direction which the composition of the forces dictates. Bridged across the nave, it was further resisted by the wall buttress, and confined within narrow limits by the downward pressure of a pinnacle, until it found its limit in the earth. Now in this system of counterforts, (the principle of which it was hardly necessary to explain here,) we discover an adaptation of means to an end, surpassed only in the construction and action of the human frame. Thus, like the trellis on which the jasmine and the convolvulus entwine, the forms of pointed architecture are but the framework on which beauties are engraven, evolving those beauties, but never sacrificing themselves to them, and even snatchng peculiar graces from circumstances originally adverse. Gothic structures never disappoint, as almost every other edifice is sure to do. The first sight of the church, *bosomed high in tufted tresses,* the nearer approach, or the study of days, are alike pregnant with delight. The most skilful arrangements of contrast are displayed—in the low doors by which you enter the lofty pile; and in the spires which rise in every part of a level district. Also the contrast of dark to light, in such situations as the porch of Henry VII's chapel.

Whatever objections there may be to the practice of the medieval architects, these can have no hold against a modern adaptation of their style. We should work with all the skill derived from examination of Gothic edifices, and from analysis of the causes of failure in some, superadded to all the advantages which modern discovery affords. We should choose good stone, and select or prepare good foundations, protecting our buildings from damp and decay by drains and water pipes in place of the old gorguets. And the result of our study of each form of ecclesiastical structure, combined with our invention, would be the raising of fabrics worthy and characteristic of the age, which the peasant and the peer alike would recognise, as expressive of religious uses.

THE CAUSES WHICH HAVE ENNoblED ARCHITECTURE.

By Frederick Ling, Associate of the Institute of British Architects.

(Continued from page 154.)

"If to do were as easy as to know what were good to do, chapels had been churches, and poor men's cotages, princes' palaces."—Shakspeare.

It is not surprising that the great churches of Europe, but especially those on the Continent, should so frequently present a confusion and discordance in their parts, when they were the production of many ages, against the revolutions of which they had to contend, and when, moreover, their construction was committed to many different minds, who it appears very obstinately differed from each other with respect to their architectural principles. However beautiful these varieties of style may be in the abstract, we like to see the same character, the same feeling and expression running throughout the whole, as if one mind alone presided over it. But it seems as if many architects loved to show their predilection for some particular school when called upon to restore or add to any existing edifice, and to act entirely as their own taste and the principles dictated, without reference to what their predecessors had done, in order to make their work of a piece with them. It is, perhaps, one of the weaknesses peculiar to genius. We think, for instance, of the Corinthian portico of Inigo Jones on the west front of old St. Paul's; and not only what this celebrated man, but many others have done, in their fondness for the ancient or their love of novelty, by introducing some-

thing from Figurol or something from the Renaissance on such noble monuments as those of Notre Dame, and St. Germain l'Auxerrois at Paris. It is in consequence of this, that all which is most beautiful in the Gothic in the best ages of its invention, lies scattered over those countries where a passion for it was most felt, and where it naturally best flourished; and it is necessary to accumulate and combine these in order to form a perfect cathedral.

For the finest remains of this sublime art we look to the churches of the 13th and 14th centuries; and although there is scarcely any country which does not claim it as its own, yet we select those of Germany, as this seems the soil from which originally it sprung and was matured; and as in the year 1277, when the famous Strasbourg pile was commenced, there was established in that town perhaps one of the oldest associations of masters, which is the chief lodge, and who have the honour of having built, not only this, but Cologne, and many other edifices, of which the Germans have reason to be proud. That they were not wanting in talent and perseverance for bringing to perfection the style of building of which they were the professors, masters and had devoted themselves to, we have abundant proofs; great improvement was necessarily made in it; mistakes in the composition and resolution of forces were corrected; no defects in their designs were permitted eternally to remain for want of previously studying their effects upon the eye; and every thing was done both theoretically and practically, to place the art on a firm and solid basis. We say the chief aim of art consists in producing the grandest effects with the smallest means; in giving to a structure the greatest strength with the least material; in constructing it in a manner the most advantageous for the purpose to which it is destined, and wherever no ignorance can be detected in displaying the art by which all these ends are accomplished. We turn, then, to the works of these builders, and find they did not live to pile up stones in vain, but attained these results with a most unrivalled success.

Their union, moreover, with a number of similar societies, all attached to and teaching the same principles, placed within their reach immense power and immense resources. One of the opportunities that was afforded them of the certainty of the correctness of these principles, was the wide field of observation that was opened to them by means of travelling. By the numbers likewise of the workmen they had at their command, the wages with which they rewarded their labours, and the industry that they exerted among them, an employment was created which very much conduced to the happiness and well-being of the poorer class of people. But the good did not cease here. Men were everywhere occupied in erecting a church on a scale commensurate with the imposing rites of the Catholic worship. Superstition, too, in those ages, doubtless had no small share in producing the magnificent structures which were the wonder of the multitude; but we cannot blame them for this. It is not difficult to trace the weakness of our nature in everything, and to see it mingling even in what is most holy. At a period, therefore, less enlightened than our own, we cannot wonder if the land should be somewhat prompted by superstition in rearing one of those beautiful and elaborate spires which rise above our houses and ornament our land. But if we feel it a kind of devotion to look upon it, if we endeavour when gazing upon it to withdraw our minds from earth, and control our thoughts 'till we have got by heart its elegant proportions:"

let us not say that those who reared it were degraded by any such motive; but rather initerate their zeal and rival those effects of human skill and piety; though their authors were once turned into ridicule by the common people, and thought no better than fanatics. It was this class of persons whose co-operation were the means of enabling architecture during the middle ages; for whom no art could be too refined, as no religion too sublime. They considered it impossible to conceive any building too grand or too splendid in which to celebrate its solemnities: they wished to make it resplendent with the inventive genius of the pencil; and if they could not possess the frescoes of such artists as Raphael and Michael Angelo, these champions..."
of the Christian art, at least to cover its walls with painting and sculpture, as we see in many old Gothic churches of the north, on some of which the pictorial splendour of Italy and the warm countries seem to shine; and on whose lofty aisles and carved pavement, the sun, through the diapered windows, sheds its gorgeous colouring.

Such an edifice as that of which Steinbach was the architect-in-chief, the glory of whose construction none but the ignorant would gainsay, was a powerful motive to induce the inhabitants of other cities who could not boast of such a monument, to build such another; that at least they might not be thought wanting in zeal for, or behindhand in thus making a proclamation of, the new faith which at that time was spreading itself through all Christendom. Accordingly we find a striking similarity among all the great churches of the 13th and 14th centuries, and a conformity in their plan, arrangement, and decoration, which leads us to believe, beyond a doubt, that no other form was so naturally suited to the mode of worship, both in these and subsequent periods; and that it proceeded from some regular society, such as the freemasons, whose principles were the same, and for a time universal. The disposition of these cruciform churches, sometimes without, but more generally with, a range of side chapels, corresponding with the division of the side aisles, was, from the time of Constantine, more or less imitated by all civilized Europe; and there needs not a stronger argument in their favour, than in the difficulty that was experienced whenever an attempt was made to improve upon it. Abolish it, and with it abolish the ceremonies of the religion for which it is intended. But this is not all. A departure from the system exhibited in these ecclesiastical buildings, has been attended with the most dangerous consequences to art. It has been the ambition of all nations, who have excelled in architecture, and been masters of its true principles, to exhibit them, even to an ostentatious degree, in their proudest fabrics. Such a display of science commands attention, though it might be said it was done for mere love of glory; and this was particularly the case in the works we are considering. Now the moderns are too apt to do just the contrary; to disguise the construction of their edifices, that is to say, such churches as those which are unworthy of the name, and whose construction, from the sordid and unscientific means employed upon them, it was wisest to conceal. But can anything be conceived more degrading to art; and is it not to such causes we owe many failures that have occurred in modern church-architecture? The architects of any one of the splendid churches alluded to, would not have been guilty of anything so mean. They felt it was one of the requisites of art to exhibit undisguised the great triumphs which the mind had made in it; and to raise pleasure, or excite emulation, in the souls of all those who contemplated such a production of human wisdom. It might appear strange, therefore, that Wren and Jones, both of whom were at the head of such an institution, so little understood and appreciated that Gothic, which was once such a favourite among its members. But the cause will be easily explained, if we consider it was the fate of this noble art to decline after it had reached its meridian point; that a yearning after something new and uncommon hastened its downfall; and that its beautiful proportions and details became obsolete when the taste for the architecture of the Greeks and Romans naturally brought on the revival of classic antiquity.

The same uniformity of character, mentioned above, may be observed in public works of a civil kind, such as the castles and bridges. The former were absolutely necessary at a time when wars were frequent; and the latter afforded such security to travellers, who might otherwise be exposed to pirates on the river, that the building of them was considered an act of charity; and those to whom they were entrusted were styled frares pontifices. It appears they constructed a great number in Italy and in the southern provinces of France; and the remains of these old bridges and châteaux, are often so picturesque, that it is worth while to undertake a journey on purpose to see and study them.

Now it will not be denied that architecture owes much to the existence of such fraternities; especially during the middle ages, when they were like so many learned republics; when kings and nobles were proud to take a part in their proceedings, and assist in promoting their enterprises. There is no period of history in which we do not find men associating together when bent upon accomplishing any object to which individual exertions were, of course, unequal. The ancients could never have succeeded in their temples, their roads, their thermae or their aqueducts, had they not condemned their slaves, and all whom they had conquered, to labour on these great works. The population and industry of one single kingdom were not sufficient. Nearly all Asia, for instance, contributed to the building of the famous Diana of Ephesus; and one of those prodigious stones in the pyramids, which almost buries the inhabitants of the north, must have required in placing it just in its proper place, or even in managing the engine by which it was raised, double and treble the number of labourers which we usually employ on one of our public edifices. In more recent times it was the custom, when a palace, a castle, or a church was in progress, and workmen were scarce, to authorize officers to collect them wherever they might be found, in the same way as they press men for the militia, and detain them in the king's service, as it was called, until the works were completed.

A powerful means of ennobling architecture, as well as any pursuit on which the human mind may be engaged, is found in this principle of concentration. The idea of bringing together the fruits of the industry of past ages, naturally originates among all civilized societies. We look in all flourishing cities for those academies for the arts, those museums, and schools of design, which are among the happiest evidences of the power and well-directed wealth of a nation, and without which the arts would make but a very poor and feeble progress towards perfection. We recognize this principle, moreover, in those encyclopedias of knowledge, whose treasures enrich the libraries of Europe, and which are as indispensable to the man of letters as the collected remains of Greek art are to the sculptor; nor do we hesitate in clasping the founders of such works and such repositories among the benefactors of our race. For what would be the condition of the fine arts or of the human mind if London were without its British Museum and Royal Academy; Paris without the Louvre and Ecole des Beaux Arts; or Italy without its Vatican?

THE BRITISH MUSEUM.

Public attention is so engrossed by matters connected with the new "Palace at Westminster," or by other schemes of improvement for the metropolis, that no one seems now to take any interest in—to care for, or even to remember the British Museum, just as if it were of no importance whatever. This indifference may probably be owing to all hope having been long ago abandoned, of that structure being rendered a worthy piece of monumental architecture; for as far as it is built at present, its exterior is a perfect nullity. Still, even at this "eleventh hour," there is opportunity for redeeming its character, by making something satisfactory of the façade which has to be added, and will now be commenced, we presume, at no very distant time. For what remains to be done, however, that which actually has been done is so very insufficient a pledge, that it is to be hoped we shall be afforded the means of quieting our misgivings, and ascertaining beforehand what we are to expect. Some, or rather now many years ago, Sir Robert Peel declared in Parliament, that the design for the front of the British Museum was an architectural chef d'œuvre: we had our doubts at the time, and so far from being dissipated, they are now stronger than ever;—or to speak out more plainly, we have very
little doubt at all—on the contrary, feel most uncomfortable assurance of our worst apprehensions being realized, unless some stir be made in the matter.

Sir Robert Smirke himself may be just as admirable an architect as ever he was; yet a change there may be, if not in him, in others: the public have obtained some little more insight into architecture than they possessed ten or twelve years ago, and what they would then have thought very fine, they may now consider no more than barely tolerable. The coming before or the coming after the new Houses of Parliament, which ten years ago were not even so much as dreamt of, makes a prodigious difference; and not they alone, but many other things have come up in the interim, which are likely to take architectural precedence of the Museum.

As the intended façade has been so very long delayed, it is to be hoped that it will not now be hurried after all, but be delayed a little longer until the public shall have been informed what the design really is. Why should there be so much silence and secrecy in regard to it? for if the making the inquiry we here recommend, would seem to imply want of confidence in the architect's taste and ability, the extreme reserve shown on his part, and that of those who are more immediately concerned in the matter, equally implies very great mistrust in the design, and strong suspicion that it will not bear the test of much examination. It therefore looks as if it were intended to adopt the safer and more convenient course of evading public opinion until it can interfere to no purpose, but merely express itself in post facto grumblings. Let us not have another egregious instance of architectural smuggling as to public buildings erected at the public cost: there are by far too many such already; and the National Gallery alone might operate as a corrective warning—certainly should serve as one to the architect of the British Museum.

The façade for the Museum still affords, as we have already observed, an opportunity for a fine display of architecture, but whether the opportunity will be fully turned to account, is what we must wait to find out, when it will perhaps be discovered that comparatively nothing has been made of it. Let us suppose, however, that the design is one of surpassing beauty: why then, we ask, should Sir Robert, merely for the sake of taking the public by surprise, have defrauded himself in the meanwhile of all the credit to be derived from it, and which he might have been to enjoy very long ago? Had the same system of close secrecy been observed with regard to the Houses of Parliament, Mr. Barry would not be altogether quite so celebrated at present as he actually is. Of his edifice, we are permitted in manner to enjoy the beauties by anticipation, and to applaud the magnificence of the Victoria tower, that is to be. But in regard to the is-to-be façade of the British Museum, nothing is suffered to transpire, nor is curiosity allowed to be gratified. The only positive information relative to it, afforded at present, is that furnished by a ground-plan, published in a parliamentary report of 1838. From that, we perceive that the main building will have a continued colonnade in front, not extended in a single line from end to end, as in the façade of the museum at Berlin, but breaking round the advanced extremities or wings, and forming in the recessed portion of the plan between them, an octastyle, advanced one intercolumn, by an additional line of columns in that part. So far, there will, no doubt, considerable richness and play in regard to colonnation, and in that respect we shall get a step farther than we have yet done in the Anglo-Grecian architecture of our metropolis. Yet as provision seems to be made for something more classical, all the more desirable is it that the most should now be made of it, and that the idea should be perfectly wrought up; otherwise the disappointment felt at perceiving how greatly the whole falls short of what it will seem to have been intended to be, will be prejudiced against the satisfaction derived from its good points into vexation.

The promise made by the plan, may be totally frustrated by the elevation; and such will certainly be the case, should there, after all, be nothing more to admire in the design than the circumstances indicated in the former. If we are to look to the inner court as affording a specimen of what the external order is to be, we feel no eagerness at all to see the façade erected, nor even care if we ever behold it, since unless greatly better than that, the order will be exceedingly unsatisfactory in character, and will prove all the more so, because its tameness and dryness will be all the more offensive, in consequence of the greater pretension made by the columnation itself. Something more than Sir Robert's formal stereotype Ionic is here required—something far more worthy of the particular occasion, which is no every-day one. Let him, therefore, for once venture to disregard scrupulous adherence to the authority of precedent, and give us upon his own authority what may be quoted as a precedent by others. He can very well afford to do so, since he has long ago done enough to fully establish his character as a "classical" copyist, and has yet to convince us that he can be anything more than a copyist. Merely to do again what he has already done so often before, can hardly add another laurel to his wreath. Let him then forget his Post Office Ionic, his College of Physician Ionic, and all his other various (?) fancies, and give us an example of what may be made of an order whose "capabilities" are by no means so exhausted as to afford no fresh ideas. At all events let him bestow some study and greater pains upon his entablature, and let him by all means be less gauding of cornice. Some enrichment of frieze, and sculpture in the pediment if there is to be one, as we suppose there is, over the central central—would not be amiss, more especially as we have at present no one example in the metropolis, in which sculpture is applied in both ways.

There is, indeed, one thing in the plan that is so far from promising well, as to be very ominous, which is, that there will be windows throughout within the colonnades. Even if rendered ornamental features in themselves, such apertures must prove injurious to the general composition, and at variance with its columnar and polystyle character; besides which, windows are by no means the architect's forte, nor does he ever attempt to turn them to account in his designs. Such being the case, instead of making any favourable promise, the windows rather threaten to prove blemishes and positive defects, and to render the façade little more than a variation of that of the Post Office, a respectable quaker-like building, excused in columns; consequently, though both the one and the other may be unexceptionable in themselves, the combination is likely to prove very unsatisfactory unless it turn out in this instance something very different indeed from previous specimens, by the same architect. Very much, indeed, will depend upon a variety of circumstances in the elevation, which, even were we acquainted with them, can no more be described than can all the traits and lineaments that contribute to make up the general air and expression of a countenance, and which, though taken singly, seem of no importance, are in reality of the greatest, with regard to the ensemble and the general impression made by it.

Willing to entertain hopes, we feel that we have very great cause for fears, and not least of all on account of the reserve manifested on the one hand, and the indifference on the other, relative to the intended façade, notwithstanding that so very much depends upon it, because it is that, and that alone, which can now be made to render the building one of "monumental" aspect externally—and by "monumental," we mean something more than that degree of it derived from size and material, or from the mere introduction of columns. We have a right to look for even very much more than negative merit upon such an occasion, since should we obtain no more than that, the building will prove if not exactly an architectural failure, another lamentable instance of a noble and rare opportunity that will have been nearly flung away.

If—as is very likely—our remarks shall be thought to exceed the due limits of criticism, by prejudging what is not yet in existence, and by imputing to it defects imagined by ourselves, we do not pretend to say that such is in no degree the case. Our saying anything at all may be offensive, impartinent interference; but let there then no longer be any room for making unfavourable and ominous surmises, as there certainly is at present. As to forming a judgment beforehand, that is matter of very little difficulty or uncertainty where Sir Robert Smirke is employed, for all his productions have so little character except that derived from his peculiar mannerism, that it is hardly possible to
err in calculating the result of what he is about to do from what he has done—and that not very much in his favour. Should we here have erred altogether—why so much the better; and most happy shall we be to find that Sir Robert will have greatly surpassed not himself alone, but most others in the profession; and that the façade of the British Museum will show what may be done by us in the Grecian style, no less satisfactorily than the new Palace at Westminster already shows what can be accomplished by us in the Gothic. May the one prove a worthy rival to the other, and may there be cause for applying to them the remark—Pares magnis quam similis?

Candidus's Note-Book. Fasciculus III.

"I must have liberty Withal, as large a charter as the winds, To blow on whom I please."

I. There is just now quite a cartoon fever or epidemic raging among us. We have "Hand-books"—should they not rather be called "Eye-books"?—which profess to teach us how to look at cartoons; and an advertisement has lately appeared with "The Cartoons" prefixed to it, which begins by informing us that the present character of art is contrary to the eye, and the evidence of common sense, and concludes by assuring us that there is no hope for success in cartoon drawing and fresco painting in this country, "still the laws of the eye be made the standard of accuracy, as laid down in Parley's 'Science of Vision.'"! This is, perhaps, one of the most ingeniously plotted things of its kind ever produced—quite a master-piece in the art of advertising and its manoeuvring; yet although admirably well-timed as far as the public are concerned, quite the reverse for the poor artists, who now discover that they should have bought the book before they set about their cartoons, and not after their works have been hung up in Westminster Hall. By the bye, how did the great Frescantio of Italy—or, for the matter of that, how have artists generally—been able to do so well as they have done, in the present heightened state of art, contrary as it has been all along to the "evidence of common sense"? Have the whole world, artists and critics alike—been hiterto labouring under a fatuous delusion, fancying things to be very fine which are now proved? to be contrary to common sense? Truly deplorable in itself, such delusion seems also to be hopelessly incurable, since no cures have been wrought by the Parleyan system. That not a soul can be induced to adopt it, is evident, since had it been applied at all in practice, the effect would have been too striking to escape notice. Only one experiment (the first and last) has been made with it, and that was by Parley himself in a drawing exhibited at the Royal Academy, which, if not at all satisfactory in any other respect, completely satisfied the public as to the exact value of the "Science of Vision." Why it should now be recommended more particularly for cartoons, it is difficult to guess, for it is little more applicable to them than to flower painting. On the contrary, such a subject as Barry's Victoria Tower would be a capital one for showing the wonderful and curious effects produced by Parleyan perspective!

II. In making choice of a style for a building, it is necessary to consider not only if the style be suitable for the occasion, but also if the occasion be suitable for the style, and one where it can be shown to advantage. Should the building be of a kind to require a number of windows, Grecian architecture is not to be thought of, for though you may put Grecian columns, the genuine classical physiognomy of the style will be lost. Neither can the Italian palazzo style be employed to advantage, except where space can be allowed for it, so as to preserve its character in regard to its proportions—that is, the proportions between solid and voids. In this style narrowness of piers between the windows, and want of breadth between the windows on one story and those on another, is no less injurious to character and effect, than is wide intercolumniation in what professes to be Grecian architecture. The fault in either case is nearly the same; the difference being, that in the latter the defect is that of meagreness and "spawlingness," in the other, that of littleness and "squeezeing." Much, therefore, as that particular species of the Italian style has to recommend it for street architecture, hardly is it applicable here, owing to the narrowness of the fronts of our houses. Mere continuity of design may be obtained by uniting several houses into one general façade, yet that alone is not sufficient, because it does not increase the space between the windows and the several floors, does not at all alter the proportions, but only increases the number of windows by repetition, and no more alters the character in regard to design, than the number of yards of it measured out alters the quality of a silk or other stuff.

III. The sticklers for precedent, and those who would fain discourage, or if they could, even prohibit all invention, and reduce architectural design to a system of mere copying, give us no very high opinion of their own powers. They dislike invention and originality, for pretty nearly the same reason that the fox objected to the grapes as being sour, because he could not get at them. Again, they dislike novelty because it "puts them out." Puzzled at what they are accustomed to, and having no positive principles of taste to guide them, they decide at once that that for which no established authority can be adduced, must therefore be illegitimate and licentious, and because it deviates from standards and rules, it must likewise run counter to correct principles of art. Mere novelty, indeed, is not originality, in the better sense of the term, and it certainly would be absurd to admire as originality and inventive imagination, the merely doing that which had never been done before. But then it is in the same manner, mere prejudice and bigotry to condemn a thing, however it may be done in itself, for no better reason than because it is now done for the first time. If an idea be a happy one in itself, what matters though it be not exactly legitimate, and though we cannot trace its pedigree back any further!—rather ought it, on that very account, to be all the more prized, as a valuable addition and real acquisition to our architectural stock. There is a vast difference indeed between crude, capricious whims and original ideas. To be original, requires not invention alone, but patient study also. It would be too much to expect that even the happiest idea should present itself to the mind all at once, fully matured, and in all the perfection it is susceptible of. Originality, too, consists not only in the putting forth entirely new ideas, but in the power of imparting freshness to what has become common-place, and of bringing out beauties that seem not so much to be now first discovered, as to have been before overlooked where they were lying for the first comer. By our attempting to keep art stationary, and allowing no fresh current of ideas to flow into it, it is at length rendered stagnant also, becomes dull and sluggish, and degenerates into a system of plodding routine and copying, without either feeling or intelligence.

IV. There are some serviceable hints to be derived from Westminster Hall, as now fitted up for the exhibition of the cartoons. It enables us to judge what would be the effect of a public picture gallery similarly planned, and formed out of a single large apartment, divided into avenues of convenient breadth, by means of screens carried up only a moderate height, so as to leave a lofty open space over head, showing the whole of the general roof or ceiling. In regard to this last mentioned circumstance, the appearance of the Hall is very striking, and the fine timber roof seems in some degree of greater expanse than before, owing to the space below being contracted. In fact, the Hall and cartoons together form quite a picture, especially when the sun breaks in towards the latter part of the afternoon, at which times, in addition to the sparkling brilliancy and catching lights where its rays directly fall, a glow is diffused over the whole. Even when the sun does not shine at all, there is a sufficient degree of light—subdued and quiet, but still sufficient, though it proceeds chiefly from the single large window at each end; for if those in the roof have been enlarged, the others beneath them have been stopped up. There are, therefore, no side windows except such as are very high up; yet though, as we may convince ourselves, it answers here, were the same mode to be
proposed for a church, it would be objected to as totally inadequate. It seems to be one of our prejudices, that we cannot have too many windows in a building, nor too much light, as if a strong light must produce a corresponding degree of effect; whereas it more frequently diminishes and sometimes quite destroys it.

V. The Nelson Monument people would have done a good work, if, instead of hoisting up an enormously expensive column (for at the best the effect will be in no proportion to the cost), they had offered to remove the present trumpery-looking screen of the Admiralty, and erect in lieu of it a low but simple and dignified architectural elevation, the centre of which would have served as a basement for some sort of superstructure forming the "monument" itself, adorned with sculpture, and surmounted by a colossal figure of the hero of Trafalgar. There would surely have been neither impropriety nor want of meaning, in so attaching to that building a memorial of one of the most distinguished of British admirals. At all events the Admiralty would have had what it now very much wants—something to mark it to the eye, and to intimate that it is a public building, and one of some importance—at least in its purpose. It may, indeed, not quite unreasonably be objected that any piece of monumental architecture of the kind erected in front of it would neither have improved the actual appearance of that building, nor rendered it the friendly service of shutting it out from view; but that, on the contrary, the building would have shown itself as an unworthy companion to the monument. Still there would have been no great difficulty in contriving that the monument should appear an independent composition not otherwise connected with the "large house" behind it, than as being erected in the open space in front of the latter, as affording a convenient site between that house and the street. The site itself being somewhat confined would have been rather a favourable circumstance than the reverse, because the monument would have been of greater comparative or proportional magnitude. As a piece of coloured architecture or façade, the present screen looks positively diminutive; but an erection of the same dimensions might be made to appear almost colossal as a portion of a monument reared in the centre of it.

NOTES ON EARTHWORK, &c., UPON RAILWAYS.

ARTICLE VII.—PRINCIPLE AND CONSTRUCTION OF EARTH WAGONS.

In a former paper (ante, p. 184, vol. v.), when treating of the "plant" employed in excavations, the cost of earth wagons and the expense of repairs were fully stated. I am, notwithstanding, induced from the little information to be obtained, to make waggons the subject of an entire paper. I will first allude to the introduction of waggons for railway purposes. Mr. Nicholas Wood, C.E., in his Treatise on Railroads, p. 12, states, on the authority of Gray's "Chorographia," published at Newcastle, 1649, that "the carts employed in conveying the coals, were in 1692 called "wagways," and the carriages introduced by Master Beaumont, "wagons," and also that ever since that period the carriages employed upon railroads have been designated by the latter name; we may therefore infer, that the wagon of Mr. Beaumont was applied upon a railway, and that he was the first to introduce them into the north." Also, in page 16, the ground being formed pretty even from the pit, the whole length of the intended railroad or "wagon way," as it was termed. Here we have the ancient term retained in the modern nomenclature of "railway," not railroad, which is contracted to rail, in town. The wagons which are now used to carry coals, quit their load at the bottom, it being hung on hinges, and the form of body is hopper shaped, and they are made to carry 53 cwt.

Earth wagons are used in the making of railways for conveying the excavated soil, and are of two descriptions, called End Waggons and Side Waggons, from the direction in which they discharge the earth, which is done by a tilt like a tilt cart, the end or side being raised as the case may be. The timber framing which carries the hinge on which the body of the wagon turns in the act of tipping, is called the "soles," and sometimes the framing of the body of the wagon is called the upper soles. The form of the body is generally nearly square; the chief desideratum is that the construction should be simple, and rigid or firm, and that the height should be no more than will allow the wagon body sufficient elevation for the earth to leave it with the impulse that the wagon has obtained before coming to the tiphead.

The annexed engravings, Figs. 1 & 2, show the construction of one of the wagons used on the North Shields Railway, drawn to a scale of 3 feet to the inch. The following is a specification describing the construction. The "soles," a, of the underframing to be 6 in. deep by 5 in. broad, with three cross "sheths," c, 6 in. by 4 in., having three bolts 1 in. diameter, one on the side of each sheth to keep the soles together. The soles, b, of the upper frame, also, to be 6 in. by 5 in., with two cross sheths, d, 6 in. by 4 in., and two iron bolts the same as the under frame; these two sheths, d, to be morticed into the soles, b. Besides these, the upper frame to have four cross sheths, e, 4 in. by 3 in. thick, projecting over the frame and wheels on which the bottom deals are to be fixed. The length of the cross sheths, e, to be such as to make the wagon 6 ft. 6 in. broad at the hind end, and 6 ft. at the fore end, measured along the bottom deals, and the length in the clear of the bottom to be 6 ft. 9 in. and the top 7 ft. The "clearing deals" are to be 1 in. thick, of elm or oak. The top sheths, e, to be bolted down to the soles, b, with ½ in. bolts, a cross sheth, f, to be bolted down to the undersole, a, to support the front part of the wagon.
The framing to be all of good English oak; sides and ends to be 12 in. deep and 1\(\frac{1}{2}\) in. thick, also of oak or elm, and connected with kneeed strips to the cross sheets, \(c\), these strips to be 2 in. by \(\frac{3}{4}\) in. thick, sunk flush with the surface of the deals, and fixed with \(\frac{1}{2}\) in. bolts. The distance between the outside of the upper soles at the hinder end to be such as to allow them to come between the inner sides of the under soles when the wagon is being emptied. The door or back end to be made to lift off. The end of the soles to be hooped with iron, 2 in. broad and \(\frac{1}{2}\) in. thick. The joint or hinge, \(g\), for the coup, to be formed according to the sketch, so as to give a broad surface to bear on. The wheels to be 3 ft. diameter, and the naves cut and hooped with iron, and to weigh cwt. qrs. lb. each. The axles to be turned and of the best scrap iron, and the whole to be completed in a substantial and workmanlike manner.

Remarks.—If it be objected that the upper soles, \(b\), are placed diagonally, they may be put parallel with the inside of the under ones, which then might be shortened at the long end, and the crook, \(h\), for traction attached to the under side; but in this there is a disadvantage, for if they come in contact with other wagons, the shock will be given to the coup, which throws a considerable strain upon the joint or hinge. The size of the wheels might be reduced to 2 ft. 6 in., but I do not think them too large, viz. 3 ft.

The next description of wagon, shown in the annexed engravings, Figs. 3 & 4, does not tip from a joint, but slides along rollers or sheaves, with a curved stop attached to the body, which arrests the sliding motion; the momentum causes the body to tilt up. This construction possesses many advantages; the wheels are large, and the weight is well distributed amongst them, it carries a large quantity, and is at the same time low; it is also easy to tip, the binder sheaves being set a little higher, it almost runs when the catch is disengaged, two men at the embankment end can easily recover the coup. I sent a sketch of this construction to a friend who wished to make some; he inquired all over the north, of parties who would leave no stone unturned to serve him, yet he could not learn anything about this construction except from the sketch I sent. I mention this to show the difficulty of collecting information of this kind, as most parties make a mystery of trifles, who are engaged in such constructions. It is one of the attributes of want of education, and an external sign of a contracted soul. The wagons used on the Midland Counties Railway were similar to those just described, excepting that the sheaves were 8 inches diameter, and set lower, within the thickness of the under frame, so that the construction is a little lower than the former.

**WAGON, HARTLEPOOL RAILWAY.**

Figs. 5 & 6 show a wagon used on the Hartlepool Railway: it tips from a hinge, and the draw bar is attached to the body of the wagon, and the upper and under frames are of nearly equal lengths. Figs. 7 to 10 show the construction of a wagon used on the Great Western Railway, drawn to a scale of 3 ft. to the inch. It is nearly similar to the last, excepting that the draw bar is attached to the under frame and that the upper and under frames are of unequal lengths, which is a decided improvement, as it leaves a space between each wagon, so
WAGON, GREAT WESTERN RAILWAY.

Figs. 7 & 8.—Side and End view. Fig. 9.—Under-framing.

Fig. 10.—Tail-board.

that when an accident happens, the driver has some chance of escaping from being crushed between two wagons when they buff against each other. The following are the dimensions of this wagon; length on the top, 8 ft.
3
in., and bottom 7 ft. 8 in.; breadth at top in front, 7 ft. 2 in., and end 7 ft. 8 in.; the bottom is 1 ft. less, and is 1
1
in. thick; the sides and end are 2 in. thick, the bottom is 1 ft. 5 in. above the under soles; the soles of the under frame, 5 in. wide and 8 in. deep, the shetbs, 5 in. by 6 in.; diagonal braces, 3 in. by 6 in.; width in clear of soles, 3 ft. 3 in.; length of soles, 8 ft. 3 in. Wheels 2 ft. 6 in. diameter. I must observe that considerable talent and experience was employed in consultation upon this wagon before it was adopted; it is of maximum size, low, firm in construction, and strength of materials well proportioned; the appliances of the break, and disengagement of the tail board, are skilfully applied. As the draw bar was found not to answer so well when attached to the body, it was removed and fixed to the under-frame, and that by the elongation of the under-frame the shock is given to it and not to the body; therefore the hinge which is most liable to be broken, receives no shock. I can fully recommend this form of construction.

On the Midland Counties Railway, a wagon of a different construction to any of the preceding was used, both the sheaves and joint being dispensed with, the whole body of the wagon being lifted up from the hinder axle in the act of tipping, and the two axles being retained at an equal distance, so that the wagon falls to its original position as soon as the coup is recovered. I have seen wrought iron used for bodies of wagons of this construction, which answers a very good purpose.

Several attempts have been made, but invariably without success, to combine the end and side wagon in one construction, by making the body of the wagon to revolve. Mr. Cuthbert Burnup made one so early as 1829, for the Newcastle and Carlisle Railway as a pattern, which I think obtained a premium. Wagons of a good construction are a very material point for the consideration of a contractor; and as the days when Banks flourished are past, they are the main thing a contractor has to rely upon for a profit, if there is to be one in the present day.

The diameter of wheels for 14 yard wagons is usually 24 inches, and for 24 yard wagons 30 inches. The iron work in each wagon consists of draught hooks, draw bar, angle plates, breaks, tail-board irons, coupling chains, bolts and hoops. In taking dimensions, hoops are all outside measure, and bolts are measured from inside of head to outside of nut. In one wagon nearly 400 lb. of iron is used, including say a dozen hoops and twelve dozen bolts. The best wood is elm of English growth, which is better than oak, not being affected to a similar extent by the abrasion.

A wagon made to contain 31 cubical yards, is found in practice to be too large, 24 yards being found better, and in some cases they are made to contain only 14 cubical yards. The axle's diameter should be in proportion to the weight of the wagon. The bearings are internal, not as trucks and carriages for passenger traffic. To obtain a maximum effect, the pressure per square inch of surface should not exceed 90 lb. The friction of attrition alone is \( \frac{1}{6} \) of insistent weight. The axles are generally 3 in. diameter, and the breadth of the bearing 43 in.

In the execution of the Willesden contract on the Birmingham and London Railway, the contractor's outlay for rails was £1767, and for wagons £3558, together equal to £5355. At the completion of the contract, the rails and wagons were sold for £3237, causing a deficiency of £5118, for a distance of \( \frac{1}{4} \) mile, and for the removal of 837,000 cubic yards, which is equal to about 14½ per cubic yard. The greatest estimated quantity of earth capable of being moved by one wagon in a year is 5000 yards; the wagon will require renewing after three years' service, when the value of the old materials, supposing the cost to have been 16l. would be about 4l.

Although the construction of earth wagons and coal wagons are dissimilar, yet the amount of capital employed in the more permanent operation of conveying coals is not so much proportionally greater as would at first sight appear. On the Brindled Junction Railway, a thousand wagons are employed, at a cost of £13,000; and the charge per annum for repairs and interest is £4000. The company have taken them into their own hands. The Midland Counties Railway expended nearly £7000 in coal wagons, for the use of which they charge at the rate of one farthing per ton, and a toll of 1½ per ton; and estimate depreciation and repairs at 14 per cent per annum. The North Midland charge 1d. toll, and parties find their own wagons, the company having no stock of wagons. The cost of plant for earthwork under a mile lead, including all expenses, is generally taken at 2½d. per yard, being 1½ for rail and 1½ for wagons, or half the cost of labour; and in a former article I showed that nearly £7000 was spent in one contract in plant alone.

I think sufficient has been said in justification of devoting an entire article to this subject, and I can with a good grace affirm, that little, if any, detail is to be had in any of the works recently published, generalization being the order of the day. How far I have fulfilled my promise of entering on the construction of earth wagons, as noticed at the conclusion of a former paper, I must leave to the readers of the Journal. Few persons have had opportunities so extensive perhaps to observe different constructions, as I was engaged on three public lines of railway during their construction, and, besides, visited most of the principal railways when in hand. I have known the faulty construction of wagons make a halfpenny per yard difference
in the price of labour in excavations; and when it is considered that the quantity of excavation on some lines extends to nearly 100,000 yards, the amount then lost was nearly £400 per mile, or about the whole cost of the permanent way. This I think is sufficient to show that this subject is worthy of attention in all future lines of road.

Now that railways are being made single lines or partly double; points, crossings, and turn-outs, assume a place of greater importance than heretofore, and if you think them worthy of a place, I will endeavour to furnish another paper exclusively devoted to their consideration.

St. Ann's, Newcastle-upon-Tyne.

O. T.

THE STEAM EXCAVATING MACHINE.

We have already had the pleasure of introducing this important machine to the public, and we now avail ourselves of the opportunity of giving some further account of it. As is well known, it is of American invention; and this individual machine was imported from the United States, after having been employed on a railway there, for the purpose of testing its capabilities in this country. It is now at work on the Eastern Counties Railway, about 20 miles from London, and is exciting much attention. In its present state, the machine is rather complicated, but it is susceptible of great improvement; and we have no doubt that any machines manufactured in this country will be much simplified. For this purpose it cannot be in better hands, the management of the patent being entrusted to Mr. John Braithwaite, the engineer, whose mechanical attainments are well known to the public, and who is well qualified to turn a machine of this kind to the best account.

We shall now proceed to describe the performance of the engine, having already given its working details, with an engraving in the Journal, p. 147, No. 68, to which we must refer our readers. The accompanying engraving is a perspective view of the machine when at work, and it will be seen by it, that one man, the engine tender, stands behind, to regulate the performance of the engine, and another man in front to regulate the motion of the scoops and to turn the jib or crane to the right or left, as may be required. By the aid of this jib the scoop is enabled to take a sweep of 30 ft. and clear away obstructions before it to the height of about 14 ft.

The cubic content of the scoop is 1½ yard, and it lifts about 1½ cubic yard, two of which is about a wagon load of 2½ cubic yards. If the wagons were brought up as fast as the machine could supply them, it would fill 30 per hour. During the day we inspected the machine, it loaded 26 wagons of 2½ cubic yards each within the hour; and at another performance, it filled 103 cars in 5½ hours. By these trials the duty of the machine appeared to be upon an average 20 wagons or 50 yards per hour, or 500 yards per day. This quantity does not appear to be more than half the duty of the machines as detailed in a report before us, emanating from a committee of managers of the American Institute, New York, especially appointed to examine the machine. The committee state—

"The excavator has been employed for three years upon the Western Railroad and other places, and that this test showed an immense saving of expense. It is calculated to do the work of 150 men, and will fill cars as fast as they can be presented to receive their loads. Allowing for stoppages, one minute may be given as the average for filling a car of 1½ cubic yards. "The interest for the cost of the machine, wear and tear, men's wages, fuel and oil, 13½ dollars, (about 2½ lbs.), but to cover the contingencies, say 20 dollars."

There is also another report, showing the daily performance of two machines employed for two months, in almost constant work, at Brooklyn, New York, during which period the two machines worked collectively 881 hours, and excavated and loaded 92,593 cubic yards of earth, equal to 105 cubic yards per hour, or 1050 cubic yards per day. The machines worked during the above period upon an average nearly ten hours per day, which is equal to the working hours of a man. The quantity which one navigator can remove, or "get and fill," in one day, is about 10 cubic yards, or 1 cubic yard per hour; we have, therefore, the performance of one machine equal to 125 men, according to the statements of the American engineers.

We will now proceed to examine the comparative cost of working by the machine and manual labour. For this purpose we must calculate the power of the engine which is called a 10 horse engine, but on account of the high pressure at which the steam is worked, it will be found equal to 34 horse effective piston power. The following are the particulars of the engine:
I consider this machine of great value, and it can be used with great advantage whenever the quantity will justify the first cost. It is a simple machine, easily managed, and not costly.

Respectfully, your obedient servant,

George W. Whistler, Engineer, W. R. R.

Springfield, September 6th, 1841.

Dear Sir,—In reply to your letter of the 1st instant, I have to state that the excavating machine of Carmichael, Fairbanks, and Otis, has been in use on the Western railroad upwards of three years. I have witnessed its operations in stiff clay, in compact gravel, mixed with boulders of different sizes, in quick sand, and in common sand and loam. In all these various soils, the machine has worked advantageously, and the most so I consider in the cases which present most difficulty when the ordinary modes of excavation are resorted to—wet, in the clay and the quick-sand.

I have not at hand the means of stating the amount of material excavated per month in the several soils enumerated, but I recollect that in August 1840, in sand and gravel in the section, it excavated 19,000 cubic yards in twenty-five working-days, and 1000 yards per day were excavated for several days in succession. I consider the machine of great value, susceptible of being applied advantageously wherever earth in any quantity is to be removed, easily kept in repair, and by no means a costly engine.

It is now, as you are aware probably, applied exclusively to work on terras firma, but the engine may readily be placed upon a scow, and used with great effect in dredging.

Respectfully,

W. H. Swift.

APPARATUS TO REGULATE THE SUPPLY OF WATER TO BOILERS.

It is becoming a very common practice, and there can be no doubt as to its being attended with great advantage, to use steam of fifteen and twenty pounds pressure per square inch, instead of two and three pounds per inch, as is usual with the Boulton and Watt engines, and to reduce its elastic force, previous to its passing to the condenser, by allowing it to expand within the cylinder. Having lately been called upon to fit an expansive apparatus to an engine of this class, it of course became necessary to make considerable alteration in the apparatus previously employed to regulate the supply of water admitted into the boiler. To effect this alteration in accordance with the principle of the old apparatus, it would require a feed-pipe some thirty feet high, with the usual complement of rods, levers, counterweights, &c., to communicate motion from a float upon the surface of the water within the boiler to a stop-valve at the top of the feed head. This principle is, however, in some instances adhered to, to a very great extent, but in the present it would have created a frightful "monument," too much so to be tolerated by a town which once boasted great engineering skill. In order to avoid this, I contrived an apparatus which answers the purpose beautifully, and has such a remarkably simple outward appearance as to induce me to take the liberty of submitting it to the readers of the Journal.

The accompanying engravings consist of two views of my apparatus. Fig. 1 is a side elevation, and fig. 2, a vertical section. The parts distinguished by letters are as follows:—T, the top of the boiler; W, the water level; V, the valve-chest, cast on the end of the pipe P; C, a compensation valve; F, a float, encircling the pipe P (made of sheet copper); R, three small rods descending from the float to the three ends of the crossbar B, which are shown flatwise in fig. 3; E, the pipe to convey water from the feed-pump; S, a small rod for connecting the valve C with the crossbar B; D, a door, fixed by four screws to the side of the chest, which may be readily removed in case of examining the valve.

With this simple arrangement, it will be observed, there is not a packed joint of any kind through which the steam can escape, and here we get rid of that very common and disagreeable hissing of the
steam from around the float-wire, &c., the effect of which always proves so injurious to the boiler.

The compensation-valve, I presume, will be too readily understood to need any explanation from me; it may, however, be noticed, that it is composed of brass, and that the part which is attached to the float, as well as the other part, is cast in two pieces, as may be distinguished by the section-lines in fig. 2—this is essential to the putting of the valve together. It may be further observed, that, to avoid any alteration in the original feed-pump, a spring-valve is introduced in a convenient part of the pipe adjoining to E, just sufficient to allow the surplus water to make its escape without subjecting the plunger to any additional strain.

Lectis, July 1, 1843.

Vesper.

GRESHAM COLLEGE.

(With an Engraving, Plate XI.)

The widened line of communication from the Post Office to Lothbury and the Bank is an improvement that was greatly needed, for it used before to be not only most inconveniently but dangerously narrow in many parts, and those where there was the greatest traffic of all. Nor has the improvement which has taken place in that respect been unattended with considerable improvement in regard to architectural appearance, both as regards the elevations of the houses generally, and one or two designs in particular. Of these last, the chief is "Gresham College," which stands at the corner of Cateaton and Basinghall streets, and which, if we are rightly informed, is now to give its own name to the first of them, it being intended to be called Gresham Street. This building was erected from the design of Mr. George Smith, architect to the Mercers' Company, at whose expense the building is erected. The elevation, represented in our engraving, is that of the entrance front towards Basinghall Street, and is a more than ordinarily digested composition, and of marked monumental character. Besides that the order itself is upon an ample scale, (the height of the columns being rather more than 35 feet,) it displays itself to very great advantage, owing to there being no windows, nor any other aperture than the entrance door; consequently there is great repose and breadth of surface, besides a decidedly peculiar character, of which we have so very few instances even among our public buildings—which do not always show with the happiest effect the orders applied to them—that it amounts almost to a novelty. It is here too, a greater merit than it ought to be, that the order is treated consistently—that, instead of being at all neglected, the entablature is well finished up with carved mouldings to its architrave, and the cornice itself made unusally bold and rich, so as to be a striking feature in the whole composition, and give decided expression to that important part of an elevation—and if it may seem exaggerated in its proportions and enrichments, to those who are accustomed to the meagre and shelf-like things usually put as the finishing of an Ionic or Corinthian entablature, even excess in this respect is far less reprehensible than the opposite fault of deficiency. We do not say, that as the columns are unfluted, too much embellishment is put into the cornices, because a cornice equally rich might be applied where there are no columns at all; still we are of opinion, that had, in this instance, the three-quarter columns been fluted, they would have been better relieved against the plain wall, and there would also have been a pleasing degree of variety arising from the contrast between them and the angle pilasters.

Such further degree of decoration was all the more desirable, because owing to the aspect of this front—which is that facing the east, the effect of boldly defined light and shade, which it would else have, is nearly lost. Much, therefore, is it to be regretted that this elevation could not be adopted for the south one, in which case it would have had the further advantage of being towards the wider of the two streets—and it evidently shows itself to be properly the front and not the side of the edifice. At present the side which is now made the front, looks too secondary in importance to the other, and as seen at the same time with it in an angular view of the building, not sufficiently of the same character, for while the east elevation is nearly solid, the south one is—we were going to say—full of windows; and so, indeed, it is in one sense, because, though there are only six windows in all, viz., three on a line on each floor, they fill up the design too much, the extent of frontage being only 37 feet, which was not sufficient to allow of such breadth for the piers as would have produced a character of solidity, in keeping with that of the entrance front.

It could further be wished that the windows themselves were more alike as to style, for the three lower ones, which are arched segmentally, and have "kneed" architraves, do not very well accord in character either with those above them, or with the rest of the design. The upper windows have slightly projecting stone balconies before them, and full entablature dressings, which do not leave sufficient space between them and the general entablature of the order; and unless these windows could have been kept from rising higher than the lower line of the pilaster capitals, that inconvenience might have been in some degree obviated, by giving the pilasters themselves only shallow anta-caps.

The interior is devoted to the purpose of lecturing; the upper story contains a well arranged but small theatre, and the ground-floor contains private rooms for the professors, entrance hall, and a noble staircase.

THE GREENWICH PIER.—The lawsuit between the stone pier company and Messrs. Grissell and Feto, the contractors, has been stayed by proceedings in Chancery. Messrs. Grissell and Co. have obtained an injunction; the cause has been referred to eminent counsel, and an amicable arrangement entered into for both parties to bear an equal proportion of the expense to be incurred in putting the permanent pier into really substantial condition. It is stated that to do so at least 17,000l. must be expended. The pier company are driving a number of piles close to and alongside the watermen's floating pier, and are determined to drive them away from their position.—Times.
A NEW AND SIMPLE METHOD TO FIND
THE PERPENDICULAR HEIGHT OF MOUNTAINS, HEAD-
LANDS, &c. ABOVE ANY GIVEN DATUM, FROM
BAROMETRICAL AND THERMOMETRICAL
OBSERVATIONS.

By OLIVER BYRNE, Mathematician, Author of "The Doctrine of
Proportion," &c.

RULE.—Add the allowance found in Table I for the difference of
temperature taken by the attached thermometer, to the logarithm of
that height of the barometer which corresponds to the least degree of
the thermometer. Then to the logarithm of the difference of the
logarithms of the heights of the barometer observed at the higher and
lower stations, thus corrected, add the logarithm of the allowance
found in Table II, for the mean temperature of the detached thermo-
meter when increased by the constant number 92102; this sum will
be the logarithm of the required height in fathoms. Observe: the
first four figures of the logarithms of the heights of the barometer,
together with the indices, are to be counted whole numbers, and the
numbers taken from Tables I and II must always have five places of
decimals, though they need not always be used. Tables I and II may
be dispensed with, as 456789 answers to a degree of the attached
thermometer in Table I, and 0024650 to a degree of the detached, in
Table II.

Previous to M. De Luc commencing his experiments on the baro-
meter, it was considered that a mean between the two temperatures
shown by the thermometer attached and the height of the mercury in
the barometer at two different stations, was sufficient to determine the
perpendicular distance of those stations. But De Luc found, by re-
peated experiments, that an additional or detached thermometer was
necessary, which has since been confirmed by General Roy,
Sir G. Shuckburgh, and others.

However, before making further remarks, we shall illustrate the
rule just given by practical examples.

| Table I. | Of the allowance for the difference of the temperatures of the at-
tached thermometer. | Table II. | Of the allowances for the mean temperatures of the at-
tached thermometer. |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tens</td>
<td>Units</td>
<td>Tens</td>
<td>Units</td>
</tr>
<tr>
<td>————</td>
<td>————</td>
<td>————</td>
<td>————</td>
</tr>
<tr>
<td>4</td>
<td>567 8</td>
<td>0</td>
<td>0 00 0 00 00</td>
</tr>
<tr>
<td>0</td>
<td>01 5</td>
<td>0</td>
<td>0 00 0 00 00</td>
</tr>
<tr>
<td>0</td>
<td>01 5</td>
<td>0</td>
<td>0 00 0 00 00</td>
</tr>
<tr>
<td>5</td>
<td>13 1</td>
<td>0</td>
<td>0 00 0 00 00</td>
</tr>
<tr>
<td>1</td>
<td>54 3</td>
<td>0</td>
<td>0 00 0 00 00</td>
</tr>
<tr>
<td>1</td>
<td>13 1</td>
<td>0</td>
<td>0 00 0 00 00</td>
</tr>
</tbody>
</table>

Examples.

1. The heights of the barometer at the bottom and top of a hill are
259862 and 281387 inches; the attached thermometer at the bottom
and top indicates 68° and 63°; also, the detached thermometer at
these stations gives 71° and 55° respectively. It is required to find
the perpendicular height of the mountain.

<table>
<thead>
<tr>
<th>Thermometer attached.</th>
<th>Thermometer detached.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower station</td>
<td>68°</td>
</tr>
<tr>
<td>Higher &quot;</td>
<td>63°</td>
</tr>
<tr>
<td>Difference</td>
<td>5</td>
</tr>
<tr>
<td>Mean</td>
<td>63</td>
</tr>
</tbody>
</table>

Barometer at summit, where attached thermometer indicates least degree
From Table I for 5 units we have 28 137, log. = 14172.557
Log. corrected 14174.84094

Barometer at base 29862, log. = 14174.8494
Take = 14174.8494

Log.      57634806  = 27868488
Then, from Table II, for 6 tens = 11408
For 3 units (making in all 63°) = 00740
Constant  = 92102
Log.      107650  = 0290140
Height in fathoms = 02904385, corresponding to log. 27926988

II. Wishing to know the perpendicular height of the mountain
Chranaghlin, in the county Wicklow, and having two barometers and
detached thermometers which for months before agreed with each other
in different states of the air, leaving an assistant on a level with the
sea near Arklow, with directions to make accurate observations
every fifteen minutes from 3 to 4 in the afternoon (our watches being
previously regulated) I proceeded to the top of the mountain, and at the
appointed hour commenced observations. The mean result of the five
were as follows—the barometer stood at the summit 28635, and at
the base 30620 inches; attached thermometer, 61° and 65.5°, and de-
tached thermometer 54.5° and 78° respectively. It is required from
these data to find the height of the eminence.

<table>
<thead>
<tr>
<th>Thermometer attached.</th>
<th>Thermometer detached.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower station</td>
<td>65°</td>
</tr>
<tr>
<td>Upper &quot;</td>
<td>65°</td>
</tr>
<tr>
<td>Difference</td>
<td>4°</td>
</tr>
<tr>
<td>Mean</td>
<td>124°</td>
</tr>
<tr>
<td>Mean</td>
<td>62°5</td>
</tr>
</tbody>
</table>

Barometer at summit, where attached thermometer is least
For 5 units, from Table I, we have 182715
For 6 tens          = 11408
For 2 units         = 000494 making up 62°5
For 5 hundredths    = 000012
Constant            = 92102

Subtract 1855 1725

Log. corrected for temperature 14174.02754

From Table II we have,

Barometer at summit, where the attached thermometer is least

Log. of 458634  = 24568580

Bence's height in fathoms = 306923, log. 24568580

It may be observed, that this experiment was repeated at different
times, and consequently in various atmospheres, yet the result never
varied two feet. We may, therefore, conclude that the highest
summit of the Wicklow mountains is nearly 1853 feet above the
level of the sea.

This rule will be found to give results more accurate than either
that of General Roy or of Sir G. Shuckburgh, and can be applied
with greater ease.

General Roy makes the height in fathoms = (10000 / 4168 x (1 + [f - 32] / 90240)×
Sir G. Shuckburgh makes it,

(10000 / 4168 x (1 + [f - 32] / 90240) fathoms; where f is
the difference of the logs, of the heights of the barometer at the two

37
stations; \( d \) = the difference of the degrees shown by Fahrenheit's thermometer attached to the barometer; \( f \) = the mean of the two thermometers shown by the detached thermometers exposed for a few minutes to the open air in the shade, at the two stations. The sign \( \pm \) takes place when the attached thermometer is highest at the upper station, and the sign \( \mp \) when it is lowest at that station. 10000 (log. \( m \) - log. \( M \)) was the expression formerly given to find the altitude in fathoms, \( m, M \) being the heights of the mercury at the base and summit of any eminence. This formula is very easily applied, and not far from the truth when an allowance is made for the increase of temperature above 31\( ^\circ \), for this is the degree of temperature to which the above formula is calculated, or rather adopted. As air expands very nearly \( \frac{1}{273} \) part of its bulk with every degree of heat, and suffers the same contraction with every degree of cold, the following rule was usually given. Rule.—Observe the height of the mercury at the bottom of the object to be measured, and again at the top, as also the degree of the thermometer at both these situations, and half the sum of these two last may be accounted the mean temperature.

Then multiply the difference of the logs of the two heights of the barometer by 10000, and correct the result by adding or subtracting so many times its 43th part as the degrees of the mean temperature are more or less than 31\( ^\circ \); the last number will be the altitude in fathoms.

We are too apt to say, when two or more phenomena happen together, that one is caused by the other; where all may be governed by some unknown phenomenon. The writer of this article agrees with Mr. Pasley, that the philosophy is false which teaches that expansion is caused by heat, for without fire or heat water is expanded as it becomes ice, and air in the air pump vacuum; solids require fire as a means, but the expanding cause itself is perfectly distinct from fire. However, when experiments show that certain phenomena increase and decrease together, one may be taken as an index, if not as a function of the other; but great care ought to be taken not to draw general inferences from limited experiments. At some future time we shall explain why the attached and detached thermometers differ, and also show how they may be made to agree, and at present proceed to the more immediate object of the communication. To illustrate the rule just given, we shall add another example.

III. If the heights of the barometer at the bottom and top of a hill are 29.37 and 26.59 inches respectively, and the mean temperature 26\( ^\circ \), what is the height?

Log. 29.37 = 1.467939
Log. 26.59 = 1.412783

\[
0.0431856 \times 10000 = 431.856 . \text{ Then } 31' - 26' = 5 \text{ degrees, therefore by the rule, } 431.856 - 41.856 \times \frac{1}{273} \times 401.856 - 16.94 = 401.856 = \text{ the height in fathoms.}
\]

We shall now investigate the last formula, and give an outline of the theory upon which this proposition is founded. Let EA R represent part of the surface of the earth, and A T a column of the atmosphere. Consider this column to be divided into a number of equal and infinitely small parts, as AB, BC, CD, &c., in each of which we may suppose the density to be uniform, because they are infinitely small. Now since the density of the air is always directly as the compressing force, therefore we have the density of the air in any of the portions AB, BC, &c., as the weight of the column of the atmosphere above that place; that is, if \( P \) represents generally the pressure, \( D \) the density of any place, \( P' \) the pressure at any other place, and \( D' \) its corresponding density, we shall have \( P : P : D : D' \); that is, the pressure is to the density in a constant ratio, and may be represented by \( n \) to 1; therefore,

\[
P : D : : P' : D' : : n : 1 \text{, consequently abstractedly speaking,}
\]

\[
D = \frac{1}{n} P,
\]

\[
D' = \frac{1}{n} P',
\]

That is, the density at any place is equal to, or rather may be measured by, the \( n \)th of the pressure of the column of the atmosphere above that place, or by the \( n \)th of the compressing force. Hence if we make \( P \) stand for the pressure at the surface \( A \), and let each of the parts AB, BC, CD, &c., be equal to 1, then will \( \frac{1}{n} P \) represent the weight or pressure of the part AB, and therefore,

\[
P - \frac{1}{n} P = 2 - \frac{1}{n} P = \text{ the pressure at } B, \text{ and } \frac{1}{n} P = \text{ the density or weight of } BC. \text{ In the same way, }
\]

\[
\frac{(n - 1)^2}{n^2} P = \text{ the pressure at } C, \frac{(n - 1)^2}{n^2} P = \text{ the pressure at } D, &c.
\]

So that the pressure, and consequently the density, will decrease in a geometrical progression, as the altitudes increase in an arithmetical progression. Calling the density at the surface \( d' \), and the several altitudes 1, 2, 3, 4, &c., we shall have the following corresponding series:

\begin{align*}
\text{Altitudes} & \quad 0, \quad 1, \quad 2, \quad 3, \quad 4, &c. \\
\text{Corres, densities} & \quad d, \quad d^2 - 1, \quad d^2 - 2, \quad d^2 - 3, \quad d^2 - 4, &c.
\end{align*}

This is strictly analogous to the property of logarithms. In fact the several altitudes form a peculiar system of logarithms of which the reciprocals of the corresponding densities are the natural numbers; from this circumstance they have been denominated atmospheric logarithms. From a similar circumstance the Napierian are termed hyperbolic logarithms, because they express the areas contained between the asymptote and curve of an hyperbola. We shall write these atmospheric logarithms with large letters, thus, "Log," to distinguish them from the Briggsian or common logarithms, which are written "log. 10," or simply "log." and also from the hyperbolic or Napierian which are denoted by "log. n." Let \( A, a \), represent any two altitudes, and \( D, d \), their corresponding densities, then will \( A = - \log. D, \) and \( a = - \log. d; \)

\[
\therefore \quad A - a = \log. d - \log. D = \log. \frac{d}{D}
\]

Now it is a well known property in logarithms, that by assuming different values for the base, there will be as many different systems of logarithms; and it is equally well known, that in all the various systems of logarithms, the logarithms of the same numbers can be converted from one system to another, by a constant multiplier or modulus. The object of our present inquiry is to determine a constant multiplier that shall convert the common logarithm of a number into the atmospheric logarithm of the same number. To accomplish this, let

\[
\log. \frac{d}{D} = x \log. \frac{d}{D}
\]

\[
\therefore \quad A - a = x \log. \frac{d}{D}
\]

Then making \( a = 0 \), which is the same, if we suppose \( d \) to represent the density of the atmosphere at the surface of the earth, we shall have \( A = x \log. \frac{d}{D} \).

In order to find \( x \) let us take the height of a homogeneous atmosphere, when the temperature shown by the thermometer is 31\( ^\circ \), and the height of the barometer 29.9 inches at 6057 feet; then the density at the surface, and one foot above it, will be
That is, the pressure at the surface will be equal to a column of air of uniform density 36057 feet high; and consequently one foot above the surface = 26056 feet high, or a foot less. Since the densities are as the pressures, we have

\[ A - a = \log \frac{n}{a}, \]

making 26057 = \( n \), we have

\[ 1 = \log \frac{n}{a}, \]

and

\[ M = (1 + \frac{1}{2a} + \frac{1}{3a^2} + \frac{1}{4a^3} + \frac{1}{5a^4} + \ldots) \]

But when, as in the present case, \( a \) is a large number, all the terms but the first may be neglected as unimportant; also, since \( M = \frac{34324948}{10000} \), the modulus of decimal or common logarithms,

\[ 1 = \frac{1}{x} \cdot \frac{34324948}{26057} \]

whence \( x = \frac{26057}{34324948} = 60000 \), very nearly, or \( x \) may be readily found from the expression

\[ x = \frac{1}{\log \frac{n}{a}} \]

The above formula is reduced to

\[ A = 60000 \log \frac{d}{D} \text{ feet}; \]

or putting \( a \) and \( M \) the heights of the mercury at the earth's surface and at the altitude \( A \), then the fraction

\[ \frac{d}{D} = M \]

Also since 6 feet are equal to one fathom, the simple multiplier 60000 for feet becomes 10000 for fathoms, which is more convenient. Hence instead of

\[ A = 60000 \log \frac{d}{D} \text{ feet} \]

We have \( A = 10000 \log \frac{d}{M} \) fathoms,

which is the formula formerly used in measuring altitudes by the barometer.

With respect to the height taken for the homogeneous columns of air, different writers vary, but this difference does not affect the ultimate result. It is well established, that the height of an homogeneous atmosphere, whose density would be equal to that of the air at the earth's surface, and weight the same as that of the real atmosphere when compared with a column of mercury or other fluid of the same weight, the heights will be reciprocally as the specific gravities of the air and mercury or other fluid. So that if we take the specific gravity of the air at the earth's surface at 1\( \frac{1}{2} \), when compared with distilled water at 1000, and that of mercury 1400, also the column of mercury in the barometer = 29\( \frac{1}{2} \) inches, we have 1\( \frac{1}{2} \) = 10000 : 29\( \frac{1}{2} \) : 14000 inches = 29600 = 5 feet 10 inches. But the specific gravity of fluids varies as their temperatures vary. It has been found by various experiments, that when the mercury in the barometer stands at 30 inches, and the thermometer at 58\( \frac{1}{2} \), the specific gravity of air, water and mercury are nearly as 13 1000 and 13000. Hence 13 1000 : 30 : 340000 inches = 25333 feet = 5636 miles, the height of a homogeneous atmosphere. Again, taking the specific gravity of the air at the earth's surface at \( \frac{1}{14} \), which some affirm, and the barometer at 29 inches, it will be 13 1000 : 29\( \frac{1}{2} \) : 298255 inches = 27318 feet = 51154 miles. Hence, generally, we may assume if the air was of the same density at all altitudes as at the earth's surface, its height would be between five and six miles. But it matters not what degree of temperature we assume, for we can always accommodate the result to any other temperature, as before observed, by augmenting or diminishing the result by the 2\( \frac{1}{14} \)th part for every degree above or below 31\( \frac{1}{2} \). It may further be observed, that the common barometer, with some trifling alterations, of which we shall speak hereafter, is the best and most to be depended on; for many which are said to be improved have only the recommendation of deviating from it in simplicity. It appears from accurate observations, that mercury stands higher in tubes of larger than in those of narrower bore; and therefore, when observations are made with different barometers, attention should be paid to the difference of their diameters. In order to prevent the effects of the attraction of cohesion, the bore of the tube should not be less than one fourth of an inch; but one third of an inch would be better.

Note.—Further particulars relative to this important subject is given in a work about to be published, entitled "A New Theory of the Heavens and Earth."

**Observations on the Construction of Roads through Bog.**

The bogs in Ireland form a vast extent of surface, which for the most part, is profitless, save for fuel, but a large portion of which is capable of being converted at a small expense into good arable land, which would yield an average crop; but the absence of roads in these extensive wastes, has prevented the capital of individuals from being profitably invested, in the reclamation of those barren plains, now tenanted by the plow and the snipe.

It seems to have been the system with engineers of former days, to avoid by every means the construction of a road across bog, and accordingly they have not scrupled, by a very circuitous route, greatly to extend the distance between the termini in preference to encountering the unstable foundation of a bog, which the science of road-making has, in latter years, rendered comparatively easy and safe undertaking. Still, even in modern works, it is to be regretted that so frequently is to be seen a road, otherwise well selected and judiciously laid out, materially injured by deviating from its proper course, in order to avoid an intervening bog, and as the engineer, in tracing a line of public road, should ever bear in mind that the chief advantages of communication is to open the country, and to afford every facility for improving and drawing out the resources of those lands, whose capabilities have been suffered to lie dormant for want of this advantage, the intersection of bogs by roads should therefore not be avoided.

The most favourable months in the year for commencing operations in the construction of bog roads, are June, July, August and September (if dry), since at those periods the surface is more free from water, and consequently the bog more firm than in the rainy months; and it is of the greatest importance to have fine weather for these works.

When a line of road passes over a shallow bog of from three to four feet in depth, with a firm and compact substratum, and when soiling material could not be procured without the expense of land damage, and the cost of carriage should be great, or when the soiling should be of an inferior or unsuitable quality, it will be most advantageous (provided the gradients will admit) to remove the bog mould altogether, to form the road upon the hard bottom, and to sink the grips sufficiently deep to prevent the moisture of the adjacent bog producing injurious consequences.

In the construction of a road over the surface of a bog, the first point to be attended to, and which is of the chief importance, is the thorough drainage of that portion of the bog upon which it is determined to place the road materials. When the line is locked out, a grip is to be cut on both sides of the road of sufficient capacity to command the complete drainage of the surface; and in soft bog, a second grip should be cut on both sides, at about 10 feet distance from the first; and it will be particularly necessary that great attention should be observed in keeping them free from impediments, and that there should be no obstruction to the free passage of the water. The second grip, in addition to the greater facility of drainage, will be
found useful as a protection against persons cutting turf up to the very road fence, and in a short time, leaving the road (as is frequently the case) an embankment dangerous for travelling on, and liable to slip. The surface water should then be tapped off by means of mitre drains judiciously placed, and when the whole is perfectly free from water, the inequalities of the surface should be reduced by filling the hollows with heavy sods, and the formation conducted in the usual manner for roads upon ordinary upland ground, but it will be judicious to give the cross section greater convexity to allow for compression.

The laying on of the soling is the next operation to be attended to; and as to the period for undertaking this work, I must differ in opinion from many engineers, who strenuously insist that the soling should not be laid on, until one, and in some cases two seasons, after the grips have been opened. I would recommend, that when the surface of the intended road had been freed from water, by the means before mentioned, that the soling should be immediately put on, as the superincumbent weight will compress the bog, and thereby accelerate the process of drainage, and also protect it from the frequent saturations with rain, to which it would otherwise be subject, as by the formation all the surface water must fall off into the grips.

This opinion, which I now venture, is founded upon practical observation. About three years ago, when superintending the execution of a long line of road in the south of Ireland, under the direction of the Board of Works, which for about six miles was carried across bog of various depths, a portion of it was solid immediately after being drained, and a portion after the drains had been opened and the surface submerged was left unsolded, in consequence of the winter setting in: in the following summer, when proceeding to complete the operations in the bog, I found that part which had been sold was firm and well consolidated, and in excellent condition for receiving the metalling, while that portion which had been unsold, was in a much worse and softer state than the adjacent bog, especially where the surface had been cut for the purpose of reducing the inequality.

As the durability of a road will depend in a very great measure upon the soling, the quality of the material to be used for this purpose, is of great importance. Vegetable earth is certainly bad, and if, in the absence of better material, made use of, cartage should not be permitted upon it until after the metalling had been laid on. A compound of stiff clay and sharp sand, mixed naturally, constitutes an excellent soling substance, as it will form a tenacious unyielding crust, which will not be liable either to wash away or sink into the bog. This substance is frequently found under bog, and in such cases, will be the best which can be used, and the most economical. Seven inches in depth of soling will be sufficient for country roads where the traffic is not very great.

After the soling has been laid on and the compression and drainage completed, the fences should be made in the usual manner, with pipes or outlets underneath, to convey the water from the water-tables into the grips. Road contractors generally construct the fences, when cutting the grips, with the sods and turf mould which is raised therefrom; but this is both an incorrect practice and false economy, as the subsidence and compression of the bog will cause the fences to form a waving line, instead of the direction first laid out, and the weight of the soling will generally cause the surface between the fences to spread out, and then a larger area than required must be covered over with metalling, which will greatly increase the expense. In a bog road in the county of Kerry, fenced at the time of sinking the grips, and laid out 21 feet wide between the fences, I found, after the soling had been laid on and consolidated, and when about to spread the broken stones, that the width between the fences measured 26 feet. In this case there was a decided loss to the contractor, as he was obliged to cover with metalling the entire surface of the road, to within 18 inches of the water tables on each side.

The stoning and blinding is conducted in the same manner as in ordinary roads.

When a road is to be formed on an embankment over bog, the base of the embankment should be very wide, in order to extend the superincumbent weight over a large surface, and the sides should slope

2 feet horizontal to 1 foot perpendicular. The irregularities of the surface, upon which the embankment is to be raised, should be reduced, and then covered over with regular courses of dry hearty sods, with the hearty side placed downward, but the top course should be laid with the hearty side upward. When the embankment has been raised to the required height, the road should be formed solid, faced and stoned as before described. In a soft and yielding deep bog, the sods for the embankment should not be cut from that portion of the bog adjoining the road, or the embankment may subside very much, and cause the adjacent surface, from which the sods have been cut, to elevate.

I have seen the injurious consequences of this practice exemplified in many cases, but in two in particular: in the first, the embankment subsided very much, and the gradients were completely altered, the longitudinal section of the road forming a wavy line: in the second case, a gullet constructed about the centre of the embankment, sunk beneath the level of the bog, before the embankment was completed, and the adjacent surface was elevated; a second gullet was built over it, and also disappeared, and a third gullet was built over the second, after the necessary precautions had been taken, and the embankment has since remained firm.

In constructing a road in cutting in bog, after the stuff has been excavated, the surface should be covered with one or more courses of bog sods, and then formed, soleed, fenced, and stoned in the usual manner, leaving previously paid due attention to the drainage.

Dublin, 6th July, 1843.

F. V. C. , A.R.I., C.E.

THE CARTOONS—1819, 1843.

It is exactly nine and thirty years ago, when a youth named Henry Ardor was waiting for the mail, which was to carry him from his father's roof and his mother's affections, to London, to try his fate as an historical painter; that an old friend of the family, a very wise and worthy man, and brother of Northcote the painter, came to bid this youth farewell. "Ah, it will never do," said his father. "I hope it will," sobbed his mother. "I am determined it shall," said the youth: his venerable friend shook his hand, and said, "Be sure, my dear young friend, you begin with the skeleton, and study hands and feet; for there is not a painter in London who understands a hand or a foot."

The horn was heard, now dying away, now bursting as it turned the corner of the street in full view, and the horses were seen, trampling and curbed, the royal coachman, with his white hat and scarlet coat, and the guard, red-faced and important, drove up like lightning, and drew up in style. The youth kissed his sobbing mother: "God bless you," echoed from all the assembled friends in a country town, the door drove home with a slam, the horn again blew, and away rattled Henry Ardor, wrenching his affections, with a spasm that squeezed the burning tears out of his eyes, which sealed his cheeks as they fell.

His love of art was a passion of his being, and had been from his earliest infancy; he had often ridiculed in his native town the tip-toed absurdities of the old portrait school, and had often been corrected by his father for presumption; he had made up his mind to devote himself, with all his heart and all his soul, to reform the design of his country, by mastering the construction of the figure, to take pupils as soon as he was qualified, and if talented, to spread the sound doctrine of beginning with the skeleton, and enforcing that as the basis. He entered London, May 14, 1801, and overwhelmed with the intensity of his great object, he went to the new church in the Strand, and falling on his knees, prayed God for success only in proportion as he deserved it. Remembering the warning of his worthy friend, his application was incessant, so that in two years he produced works which honoured his name; he had been admitted a student at once in the Academy, and greatly benefited by that excellent school, and such a cluster of genius was admitted at the same time, that the men of that period have been the support and the reformers of the art ever since. Such was his obedience...

What would he say now?
and his diligence, that he deservedly earned the affection and the respect of all his superiors, and all his superiors hailed him as an example to all other young men. Now though there were and had been eminent men, West, Hessey, Barry and Fuseli, not one of them had so deeply and scientifically mastered the figure, and at that time, 1803, though there always had been lectures on anatomy, the skeleton had never been in the antique, and it was from the repeated entreaties of young Ardor, and his fellow students, and the keeper's repeated remonstrances to the council, that the council at last yielded to his wish.

Ardor soon got into high life, and was the wonder of its coteries—went to four routs of a night, as told by the women he had an antique head, and lay in bed late next day; but finding this species of fascination not conducive to application, he determined he would himself from its fascinating attractions—although if he had waited a year, he would have been utterly forgotten, and "left alone in his glory," as hundreds of Ardors had been before, and will be again whilst that delightful gift pursues novelty in preference to excellence. Such was the present Ardor got in his native town, that a boy named Caution was roused to come up: up he came too, drank tea with Ardor, and went away so fired by Ardor's enthusiasm, that the next day he called and said, "I'll be a painter, Ardor."

Ardor loved his art better than himself always, and said, "Caution, if you will, I'll tell you all I know." Caution put himself at once under Ardor. Ardor lent him a plisher hand, his anatomical drawings, admitted him at all hours, made him his friend, his pupil, his companion; and pursued all he had got himself by hard work; as Ardor said, "If I can advance the art, and reform design, my end will be answered." Caution was a good and moral youth, and was very grateful, and so were Caution's friends. Caution went to Italy, and found all the principles Ardor had taught him of the greatest utility in comprehending the great works he saw. In the mean time Ardor took other pupils, and made them go through the same course; and thought it a good plan if two cartoons could be got up from Hampton Court at the Gallery for the use of his pupils. An influential friend approved of the plan, applied to Lord Farleigh and the late Duke of Sutherland, who in an audience of the King, got leave; and Mr. West was ordered to see two cartoons moved up, as keeper of his Majesty's pictures; and St. Paul at Athens, and the boats, were those Mr. West chose.

The moment the cartoons came to the gallery, Ardor sent in all his pupils, who made chalk cartoons the full size, and such was their excellence, and such their impression in the town, that the crowd was obliged to be stopped, and the doors shut, to prevent injury to Raphael's works. Ardor on this moved the cartoons of his pupils to St. James's Street—gave a splendid private day to the nobility—the Arch-Duke Maximilian came with Lord Aberdon—all the women of fashion praised Ardor more than ever, and Ardor and his pupils became the fashion of the day, and it was said nothing could stop Ardor's career. Unfortunately Ardor had got very angry with the Royal Academy, where he had educated himself, and shared its favours, and Ardor in his fury against the members of that body, had so provoked them by the truth and exposure of their abuses, that they one and all put their powerful influence against Ardor's attempt to flout a school, and they denied Ardor had any merit at all—they abused his pupils—drove Ardor to ruin, and involved two of his pupils in equal ruin with himself. People of fashion did not know why Ardor was so abused, but concluded forty men must be right, and Ardor deserved it; and so they let Ardor alone and forgot his works, and Ardor was four times ruined and four times again on the field, so that at last it was considered, to ruin Ardor, was a folly. During all this time Caution had been in Rome, and having been severely bitten by Germans, who dressed like Raphael, returned to England, with a resolution to tithe his old master, and all his friends too; but he found Ardor so high in the public feeling, and so inveterate in sound art, that there was no introducing the new insanity but by luring or burying Ardor, and it was therefore agreed, between Caution and Namby Pamby his friend, that Ardor must be buried as he would not be bitten.

It must be told, that one night in 1812, Ardor was in the house of Lords, and when Lord Wellesley was speaking, he put himself in the attitude of St. Paul at Athens; Ardor thought of the cartoons and of the Vatican, and he looked up and saw the Spanish armada. Ardor directly planned the decoration of the old house, laid a plan before the ministers, petitioned both houses, never ceased persecuting all the authorities—the old house was burnt down—Ardor petitioned for the new, till at last it was resolved the new houses should be adorned—A Commission was formed, Caution became secretary, as he deserved, Namby Pamby gave lectures, and the plan of burking was immediately put in practice, for in the lectures of the one or the reports of the other, Ardor was entirely extinguished. Now this was very hard for Ardor had fought the battle, when Caution and Namby ran away, and the people said it was a great shame to burke Ardor, whatever might have been Ardor's enthusiasm; but Caution had a great game to play, and Caution knew the safest game to play is always to go with the current, and Ardor's love of truth being obstinate to all, Caution buried Ardor as well as his works. In the mean time some people wanted the Germans, as the English could not draw—Ardor opposed it, and these people said, as they can't draw, let us make them compete in caricatures, and then we know they will fail, and then no one can object to the Germans coming, who can draw. The plan was eagerly seized, cartoons were prepared, the youth of England were suddenly called from their daily habits of getting their daily bread, and the following year produced works, which astonished their enemies, delighted their friends, and settled for ever the question of their genius. Ardor was so delighted to see the realization of all his struggles, this confirmation of the plan he had successfully begun twenty-four years before, that he died of joy in the 57th year of his age, and fell a victim to the danger of telling truth to power, under whatever circumstances of provocation—Hail and farewell to him.

I had a great regard for him, and was very sorry, so I wrote this epitaph out of regard to his memory, but before he died I am happy to say he had completed his remarks on the cartoon exhibition, as well as some valuable observations on fresco and design, which shall appear now or hereafter, as it suits.

Epitaph.
Here lies the body of
HENRY ARDOR,
An English Historical Painter,
Who died in the midst of a desperate struggle to make Sovereign, Legislature and People do their duty to the higher walks of design.

"active and nervous was his gait,
And his whole body breathed intelligence."

Wordsworth.

This little romantic history of Henry Ardor was absolutely necessary before proceeding to lay before your readers his remarks on the cartoon exhibition—lst. As to the degree of hope cartoons are justified in generating; 2nd. As to the degree of merit the present exhibition exhibits; 3rd. As to the question of oil or fresco for the houses: 4th. As to what is the style to be chosen either in fresco or oil, and 5th. On the danger of delaying much longer a decided plan of decoration.

lst. As to merit—
Could the Germans at such a sudden call for specimens of colour, and light, and shadow, and surface, have answered as we have answered this; the one is no more unjust than the other—the Germans know no more of colour, and light, and shadow, and handling, than the English were supposed to know of form: could the Germans have answered the call of the English have answered this?—I reply in a voice of thunder. Not nor any other nation on earth! This, then, is a glory, in spite of the solemn inanities of a timid press!—this is a glory you have achieved, young men, by your own innate bottom. The Rout of Comus (63); Alfred in the Camp: the Death of Lear; St. Augustine; the Skirmish of the Picts; the Plague (139); the Càracas (54); the Una and Satyrs (10); the Constance; the First Jury; Alfred and the Witan; the Curse (33); and Edward & John (118) entering London, through Southampton; would honour any school in any cartoon contest, in any city in Europe: yet cartoons are a delusive fascination, hardly any hopes raised on cartoons alone have answered expectation; for the practice of the brush is so different from the port crayon, that it may never be taken as an axiom, that the more attractive the cartoon the less attractive will be the fresco; and I have never found any pupil who made hard over-

2 Very characteristic of Ardor.
wrought cartoons, ever display with the brush the most distant symptom of nature, truth, or imitation; the most ridiculous expectations have always been excited, the most unbounded anticipations always put forth. Well, the picture was begun, the band felt awkward, the colour was meddy, the touch feeble, the effect flat, the power of drawing even became poor, till it could scarcely be credited the work was by the same hand, as the promising cartoon. The artist was entirely justified, when looking at a laboured cartoon of Cammucini, the labour of years, when he said, "And after all this trouble comes a bad picture." The cause principally of this incongruity, is the error of modern Europe, in making cartoons a means and not an end, like the ancients. The system of overwrought niggery is German and modern Italian; the cartoons of the school of Athens is the thing—indeed Raphael was but twelve years in the Vatican, if six had been occupied with one cartoon, how many frescos would he have done? The native spirit of the British school will prevent this waste of time, and their common sense will also prevent their making cartoons an end instead of a means, and if they thus consider them under this head, there will be no danger of any injury accruing to their power of pencil.

The landing of Caesar, No. 64, is a head prize, and in my opinion most unjustly—Caesar is paltry in character, stature, and expression—certainly not the Caesar of Cicero, Suetonius, Sallust and Bacon; he looks like a Centurion engaged in a squabble. It would be impossible to conceive he was meant to be a great general, the "prensus dux," watching the landing of an army; there is no army, there are a few boats in the sight, without order or plan, naval or military!—Who is a furious little ancient Briton darting his spear at?—Why is another pulling down in a ferry the rocking horse he rides?—Why is an Roman soldier scrambling up and another down?—What is the meaning of all the scramble?—What authority is there that all the Britons had short arms, short bodies, and bony legs?—Had they not got knee pans? was not the inner ankle higher than the outer in the ancient Britons?—There is no evidence of a clear comprehension of story, no nature in character, no dignity in action, no drawing, no knowledge of structure, no beauty, no grace, great dash of conte, great power of effect, great impudence of execution, but no mastery of form; infinitely inferior to 63, close to its side, and altogether an unaccountable specimen of the system of La Roche's school—the costume school of La Roche—for, of the naked, it is evident, neither master or pupil know much. I am quite astonished, and respectfully enter my humble protest against such an honour bestowed, to the injury and insult of the British school. It is perfect infatuation, and is evidence beyond controversy of the absolute necessity of professors being settled at the Universities, to prevent men of fashion making such decisions.

If the general proportion of the human form had been explained at college, it would have been impossible for any men of station to have made such a mistake.

First Trial by Jury (106)—A fine cartoon, composed with ability, but not drawn equal to Alfred and the Danes. Alfred and the Danes, as a work of composition, power, and expression, is admirable, and was fully entitled to one of the highest prizes. No. 129, the Fight for the Beacon is an admirable, a daring, masterly, powerful, ill-drawn, vicious group; the student will do greater things; but this stamps him as a man of genius. St. Augustine (106) is a beautiful cartoon, adapted for fresco. Una and Satchy (10) is as fine a specimen of correct drawing as any school could produce in the world; Una wants beauty of feature and swelling of hip, to touch our hearts. 78, Boadicea haranguing the Iceni, is a beautiful evidence of extraordinary power of handling. 106, Alfred submitting his Code of Laws, is weak in power of drawing, but an excellent cartoon. Caracates (84) is a very fine work, largely drawn, a little approaching to manner; how superior in dignity to Caesar! how poetically treated is Caracates! there are symptoms of a feeling for colour in the head and sky; but I do not anticipate much power of painting; there is no look of touch in the chalk, and occasional feebleness in the drawing—still it is a grand work. 82, A Skirmish between the Picts and Romans, is a magnificent work of art—full of vigour without exaggeration, and power without violence. Think of what cartoons have carried off prizes from this! It is painful, 135, is a fine specimen of pictorial management in a cartoon. 128 is by a boy of 16, and a fine instance of expression, though the convulsive man is undone. The Death of Lear (26), is a noble work, finely composed; and not overdone in breadth and style.

How easy it is to see the cartoons of painters. I would divide such works into the cartoons of those who know how to paint—cartoons of those who give promise of painting, and cartoons of those who will never paint at all. I fear there are a great many here of the latter character. These are, I think, all the principal cartoons. Yet there is one of Constable on the ground (27), a very fine work, though a little hard—still it is finely correct in drawing and costume—everything is distant, yet in keeping, nothing slurred yet nothing obtrusive; it announces a correct eye, nature, composition, and drawing; it has no prize—how could they prefer Eleanor to this, or Lear, or Alfred in the camp of the Danes, or a skirmish with the Picts, or half-a-dozen others. Really the judges had no difficult task, the gradation of merit is palpable, and surely if the artists had made a respectful stand, many things might have been prevented, which must give the judges pain now. The great error was, coming to any decision before the public had been admitted; this was the practice of Greeks and Romans, viz., always to admit the people before deciding on works of art; had this been done, the pupil of La Roche, amiable as he is, would never have had a first prize, so strongly would the public feeling have been expressed—in future, it is the safest plan, unless any portion of the judges have a predilection for a particular cartoon, and fear the public, then, it had always better be done with closed doors. Though the country is convinced the names of the judges were a guarantee for honor and integrity, yet they have all the habits of society, so much is done in a pleasant party, so beautiful is the influence of women, such are the concessions due to breeding, that there is no hope of absolute justice unless you admit the people—their voice is the voice within, and after their decision from impulse, politeness is of no avail. I would therefore earnestly recommend in future this to be done, to silence all cant.

The object of the wealthy is amusement; nothing contributes so much to relieve ennui as novelty; and nothing can be newer than a young man they never heard of, producing a work they never saw, or a subject they never thought of before. This is the bane of English society, no youth is ever suffered to mature the talent he displays, by continued kindness; but, the wonder of one season, he becomes the bore of the next, and his mind is tortured and his heart lacerated, at the successive discovery that all the praise bestowed on his works had been for years bestowed upon others who had disappeared, and would be bestowed on those with equal sincerity who had not yet made their appearance: artist or poet, admiral or general, beauty or deformity, all contribute their share in the wonders of the season, which lasts about three months. Whilst this pernicious system is confined to the patronage of private circles, it is well enough, for all share the evil and the good; but carried into a great system of public patronage, its effect will be deadly in the extreme: if we are to have a succession of wonder, first in cartoons then in drawing—one year in glass and the next in fresco, how far shall we be fit to decorate when the houses are ready?—we shall not have advanced one jot, and be as much at a loss five years hence, as we should be now, if Barry was to announce the walls are fit for decoration. When Cornelius was here, he said, "Now is not too early to begin the cartoons!" Two years are past, and no plan is defined; we are trying for genius, as we were then, and as we shall be to the last hour, six years hence. With these tendencies, the following hints may not be useless. Take care you do not waste yourself with experiments, and be glad to get a cheap decorator after all. Take care you do not pursue the discovery of new genius with such keenness, as to fix on a new boy of 15, the last year. Take care, from a desire to give every body a chance, the decoration be not a series of thoughtless without basis or connexion. Try no more experiments to prove the incapacity of the British, for every trial will prove they have greater claims to employment than you wish to see. Fix on a plan for decoration as early as possible, and let each individual work, fresco or oil, be put a part of the general development. That the upper classes are sincere there can be no doubt, only the government must not let their delightful and volatile habits intrude on the solemnity and dignity of a plan, which is meant to honour the legislature, the people and the sovereign, and develop to its full extent the hidden and bursting genius of the country.

With respect to the selection of fresco or oil, fresco beyond all question is to be selected for architectural decoration, provided the continental principle of superior and subordinates be adopted; but not else, if the Commission wish the country to be saved from disgrace. The same system which
ensured the victory of Waterloo, the successful termination of St. Paul's, and will ensure the successful completion of the Houses, viz. a general and officers, an architect and pupils, must be adopted if fresco be chosen: the absurdity of gratifying the democratic independence of British artists, where every one thinks himself able to guide, is ridiculous; all will be confusion—lime, mortar, splash, cut, scramble and failure. I will venture to say that the young men do not desire it, and no young men can be more easily led, if their affections are touched, than the British. They have now been fairly brought out, and I hope they will not be deserted; but I advise them, if they have any sub-employment which gives them bread, not to neglect it if they have mothers to maintain, sisters to protect, or relations to help; let them paint quietly what they are wanted to do, so as not to depend on the caprices of governments, keep their independence by honest means, and to remember they have shown more talent than was expected, though not by me, and more than was desired by many who longed for their failure.

Now as to the style of design for the walls: must it be in the perfection of art and reality, or must it be the art which was meant when Gothic architecture began? After the Fall, shelter was early as much a necessity as food, hence arose huts and columns, roofs and houses; then leisure and peace generated ornament, and hence arose perfect architecture and its orders. Architecture therefore preceded art, and must have been in a high state, when art was in infancy; but it does not follow that art in infancy is more in character with architecture in perfection, because from causes over which it had no control, it was in infancy when architecture was perfect! The association may be powerful, but at this time of day, when art in perfect state has been discovered, the association may be rendered as infallible, by uniting perfect art and perfect architecture, as it is now strong in its imperfection.

No man will assert the British people were not as handsomewhensminster Hall was built as now—no one will assert they walked on tip toes, as they were painted, or stared as they were painted, or looked as flat as they were painted at the time—no man will assert that light and shadow were not as powerful then as now—that colour was not as brilliant, and forms not as well knit, and if these things are represented on Gothic buildings the reverse, it was not on principle, but ignorance; what absurdity then to go back to the ignorance as if it were principle, instead of boldly breaking the association by making common sense the guide, and giving us Britons as we know Britons were, because if Britons were such poor creatures as they were painted, neither Westminster Hall or Westminster Abbey would ever have been built, conceived or finished.

It may be said there is a limit—there is; the florid vulgarity of Rubens would be as unfit as the starved impotence of Cimabue. The cartoons of Raphael appear to me to be the medium, not inconsistent with colour, or light and shadow, form or expression, nature or idea; and to this style I earnestly hope the artist will look, independent as it is of the whiskered elegance of the German, the theatrical pedantry of the French, or the careless neglects of the portrait English.

With the power of drawing, visible in this exhibition of cartoons, nothing need be feared; and the great superiority of the British school in construction and form, to the French school, as exhibited in the pupil of La Roché, is a singular feature. La Roché's pupil was brought over by a noble lord to floor the school, and the school has flourished him; the reason is, the British begin by the skeleton and construction, all over the country, and if they continue, no school on earth will surpass them; and there is no knowing to what extent they will go, whilst the French, (Ingres and La Roché) do not investigate construction till boys have got a relish for the brush, and then, anatomy and construction are tedious things! Great honour is due to the academy school, for all I praise are students, and if the present keeper does not permit himself to be Germansized, every excellence may be expected still. There is one affectation, which must not be mistaken for a beauty—the competitors, who have been abroad, make a black line round their figures; before tracing for the wall this may be well, but the absurdity of doing such a horror, to show you know it is to be done, is contemptible and pedantic. God keep the British students till the eleven hour from such a detestable obstruction to rotundity. The desire people of fashion have for what is new, is a danger to be guarded against by the Commission; the chances are, if the plan of design be not soon settled, and the artists act properly to work, when the walls are ready, the whole may fall into the hands of young men, for the sake of giving them a chance, as it is said, and the whole thing become a ridicule from the most generous feelings. It cannot be too often repeated, that the caprices of the cliques of fashion, who have regularly, with the kindest intentions, flattered and entrapped, deserted and ruined, a succession of generous youths, who believed all they were told, till poverty undeceived them, should not be permitted to gain ground, in the dignity of public patronage, for nothing will be the result, but crude experiments without hope, and futile consequences without genius; the government finding the public money wasted in vain, will become hopeless of raising art, or improving the people, and that honourable members may be no longer annoyed, will hurry the affair into the hands of some hasty decorator, who glad of a job will do it cheap, and render Briton again the byword of some future Winkelmann, or some future Dus Bois, and ages will again pass without such another moment.

Henry Arder.

Here my dear friend left off; and I must add, what I am sure every reader will agree to—God keep us from such a misery. If I find any more papers of my late dear friend, Mr. Editor, I will regularly forward them, and beg to say I am.

Arder's Executor.

P.S. I am quite sure if anything goes wrong in the commission, I shall be honoured by a visit from Arder's ghost, from which heaven defend me.

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**PROCEEDINGS OF SCIENTIFIC SOCIETIES.**

**INSTITUTION OF CIVIL ENGINEERS.**

March 21.—The President in the Chair.

"Description of the Blast Furnaces and of the Barrow used for filling the Charges of Mine and Coke into them, at the Butterley Iron-Works, Derbyshire." By S. C. Kreeft, Grad. Inst. C. E.

The three smelting furnaces described in this communication are situated at Butterley, in Derbyshire; and three others, belonging to the same proprietors, exist at Codnor Park Forge, about 21 miles distant, where their produce is converted into malleable iron.

In the internal form or dimensions of these furnaces there is not any peculiarity; the diameter over the hearth is 4 feet, over the boxes 15 feet, and at the charging-plate 8 feet—the total height being 45 feet.

The stacks, however, differ from the ordinary form in their external construction. The base of each is 40 feet square, battering inwards at an angle of 71° (3 inches to 1 foot); the quoin-stones and course work being laid at right-angles to the battering line, or at angle of 16° with the horizon. Instead of the usual semicircular arches over the tuyeres, pointed Egyptian arches are substituted, and an open vertical joint or separation in the masonry is left from the apex of the arch up to the top of the stack on all the four sides. This is done for the purpose of obviating the evils generally arising from the expansion and contraction of the stack in heating and cooling, from which the keystone of the semicircular arch usually falls, and the work exactly falls around the iron arch, the vertical joint in the masonry merely opens from the heat, and in contracting resumes its former position, without any injury to the other joints of the masonry or denting any of the archstones. The stacks are confined in the usual manner by wrought-iron braces, 3 inches diameter, built into the walls, with washer-plates and cutters at the extremities.

The mode of filling or supplying the materials into the furnace is particularly described: it is by means of a circular barrow of wrought iron, running on four wheels, the shafts by which it is guided, being so arranged as to form a steel-yard balance for weighing the contents of the barrow; the bottom is conical, and is capable of being raised or lowered by a rack and pinion, which is worked by a rod placed between the shafts, so that when the workman has pushed the barrow over the furnace-mouth, he can, by turning a handle, lower the conical bottom and distribute the materials equally around the interior periphery of the furnace. This regularity in depositing the materials is of importance to the good working of a furnace, and would alone render the barrow an improvement on the ordinary mode of filling, but it is also found to be more economical in every respect.

The charge for good forge-pig-iron is

<table>
<thead>
<tr>
<th>Material</th>
<th>Charge (cwt)</th>
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</thead>
<tbody>
<tr>
<td>Coal</td>
<td>9</td>
</tr>
<tr>
<td>Arpillicous iron ore from the coal measures</td>
<td>101</td>
</tr>
<tr>
<td>Calcareous ore from the Peak of Derbyshire</td>
<td>2</td>
</tr>
<tr>
<td>Limestone</td>
<td>3</td>
</tr>
</tbody>
</table>

Four and a quarter charges produce 1 ton of iron, or 38 cwt. of coal to 1 ton of iron.

The average produce of each furnace is from 90 tons to 120 tons per week.
The average results of yield of the furnaces may be taken thus:—

<table>
<thead>
<tr>
<th>For the Years</th>
<th>1839.</th>
<th>1841.</th>
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</thead>
<tbody>
<tr>
<td>Calcined ore used</td>
<td>18,484</td>
<td>19,521</td>
</tr>
<tr>
<td>Peak ore used</td>
<td>73</td>
<td>19</td>
</tr>
<tr>
<td>Average mine ore used per ton of iron</td>
<td>2.66</td>
<td>0.00</td>
</tr>
<tr>
<td>Limestone used</td>
<td>6.694</td>
<td>0.00</td>
</tr>
<tr>
<td>Average limestone per ton of iron</td>
<td>88.0</td>
<td>0.00</td>
</tr>
<tr>
<td>Average amount of coal per ton of iron, No. of charges 3-26, or f</td>
<td>2.37</td>
<td>0.00</td>
</tr>
<tr>
<td>Coal to blast blast</td>
<td>0.00</td>
<td>0.00</td>
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<tr>
<td>to heating blast</td>
<td>0.00</td>
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<td>to calcine mine</td>
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<tr>
<td>Tons</td>
<td>6,822</td>
<td>0.00</td>
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Three of the furnaces are blown with air, heated to about 680°Fahrenheit.

The average results of the bullion transactions of the Bank of England, in order to explain the difficulties which led to the invention of the machine. The new coinage first arrives at the Bank from the Mint in what are called “journeys,” a single journey weighing 15 lb., and containing 701 sovereigns. The officers of the Mint are allowed 12 grains plus in every pound-weight of metal for the irregularities incident to working it into coin, but they usually work to within half that allowance, which is technically called “the remedy.”

There have been coined for the Bank lately 5,000,000 of sovereigns, and the greatest variation from the weight allowed was only 60 grains, or one-third of the remedy; each sovereign should contain a portion of this remedy, to allow for wear in public use, and this average variation of one-third of the metal is invariably observed. The usual delivery of new coinage at the Bank contains 100 journeys, which is counted by weight only—that is, 200 sovereigns are counted into one scale, and the rest of the delivery is weighed in parcels which balance these 200, and this is all the counting the new coinage receives. The regularity and precision of the manipulations at the Mint obviate the necessity of any further examination, either as regards the gross amount or the weight of an individual piece.

When the currency returns to the Bank from the public it becomes necessary to ascertain if it has been reduced below the standard weight, and this imposes an onerous duty on the officers of the Bank. The amount of gold paid daily over the Bank-counter varies considerably, but 30,000 may be taken as a rough average, and hence arises a tedious, irksome, and expensive process in weighing so large a number of pieces singly and to quick coinage, at the same time, the light from the standard coin.

The mode of weighing coins by hand requires much dexterity, practice, and attention; but, in spite of all these, errors were inevitable, and it was to obviate these that the machine was invented by Mr. Cotton, the Governor of the Bank of England, who constructed it from his plans, by Mr. Napper, (of York Road, Lambeth,) and is thus described:—Its exterior presents a plain brass case, with a small copper tube on the top plate, about 4½ inches from which there is an opening in the top plate. In this opening is seen a platform in the form of a quadrant. This platform is suspended above one end of the beam, and is to receive the coin to be weighed. On one side of the case is a tilt—to receive the sovereigns as they are weighed—partitioned so that one division is left for standard coin, and the other for such as are light. There is a sliding door to each division, for removing the coins at pleasure. The machine may be worked like a clock, with a weight, or by any simple application of power.

Its visible action is as follows:—The hopper being filled with gold, upon setting the machine in motion, it immediately places a sovereign on the little platform which serves, as already stated, in place of a scale-pan, and if it is of standard weight, a small tongue comes rapidly forward and pushes the sovereign into that side of the till allotted to each coin; if light, another, and the same till to the opposite side of the till. The action of these tongues is at right angles to each other. While a sovereign is being weighed, a succeeding one is on its way from the hopper to the platform, and the moment the preceding sovereign is disposed of, it is weighed and its value is recorded in the machine, and the hopper, supplied with gold, and remove it from the till as it is filled, is all the attendance necessary.

The more minute particulars of the mechanical arrangement of the machine, such as the fulcrum support, the counterpoise, are described in the following statement by Mr. Miller is given, as a comparison with the old method of weighing:—“With the bullion-scales 4000 may be stated as the number a person can weigh in six hours. As the sovereigns now tendered at the Bank-counter are most of them new, the scale dips quickly in weighing, and a person can weigh 3000 in six hours; but a short time before the issue of the new coinage, the same person could only weigh 3000, as it took a longer time for the scales to indicate. The bullion-scales cannot indicate nearer than $\frac{1}{16}$th of a grain at the above rate. The machine is perfectly from the absence of error by which the scales are affected, and weighs as quickly, whether sovereigns are new and of full weight, or old and doubtful; it can weigh 10,000 in six hours, and divide coin varying by $\frac{1}{16}$th of a grain.”

The paper is illustrated by two drawings of the internal arrangement of the machine, and a model showing the action of the tongues and platform.

Remarks.—Mr. Oldham exhibited the automatic balance at work weighing coin; and after describing, with the aid of a diagram and model, the action of some of the more delicate parts of the machine, he observed that in seeking to obtain extraordinary performances by machinery, mechanical property of the connection was of prime importance; and this consideration led to the action of many parts was the result. The automatic balance was peculiarly worthy of notice from the judgment exercised in its relative proportions, as was proved by the fact that, after being at work for several months, it had become more delicate in detecting slight variations between standard and weight coin. It was first constructed. Mr. Cotton’s object in this invention should be well understood. Public convenience demanded great accuracy in weighing the currency; by the ordinary mode of weighing gold with the bullion-scales—although it was due to the bank-tellers’ duties—that they had so far been satisfied, the most onerous duty—it was cantaneously impossible to guard against the various difficulties detailed in the paper. The injury sustained by the optic nerve, from constantly watching the indicator of the scales, was a serious inconvenience to the operative, which, coupled with the incidental sources of error referred to, created a greater absence of error by which the scales are affected, and weighs as quickly, whether sovereigns are new and of full weight, or old and doubtful; it can weigh 10,000 in six hours, and divide coin varying by $\frac{1}{16}$th of a grain.”

Mr. Cotton said that his attention had been attracted to the point by the inconveniences to which the “tellers” were subjected in weighing gold for the public; with balances so delicately constructed as the bullion scales, the application of the air by the suddenly-opened door, or even the breathing of those around, sufficed to cause errors. It was possible, also, by pressing the fulcrum against the bridge, to produce such a degree of friction as materially to interfere with accuracy; and the tellers confessed, that after weighing two or three thousand coins the sight was injured, and they no longer observed with the same degree of correctness. He therefore imagined that a machine might be contrived, which being defended from external influence, might weigh coins as fast as by hand, and within one-fourth of a grain; but he certainly did not contemplate the invention as it is, for the idea was, that the light coins should be taken off by a forceps, and that some of average weight should be pushed off by the succeeding ones; but it was found, that the slightest inaccuracy in the milled edges sufficed to give them a wrong direction; therefore, when he made thousands of coins the sight was injured, and they no longer observed with the same degree of correctness. As the first machine was tried, out of 1000 sovereigns, 160 were found to be light. They were given to a teller to be verified, and he returned several of them as being of the proper weight; but upon again weighing them more carefully, the result given by the machine was found to be incorrect. As the proof of how many of the coins need to be put into consideration in delicate machines, he might mention that, after being used for a time, the machine varied in its results, and on examination it was discovered that the
end of the lever, which traversed the pendant, had become magnetic, and thus affected the balance. An ivory end was substituted, and ever since that period its accuracy had been maintained.

Mr. W. Miller observed, that the efficiency of any scales must be determined, in a great degree, by the fineness of the edge of the fulcrum of the beam; and it would be easily imagined that the friction, to which the edge in a pair of bullion scales was subjected whilst weighing five or six thousand sovereigns per day, must soon impair its delicacy, and consequently the efficiency of the instrument. To obviate this, while it was not thought that the beam must turn upon its fulcrum. Such was not the case with Mr. Cotton's machine; its beam did not act at all, unless a light sovereign was placed upon the platform; so that among 1000 sovereigns, if only 100 were light, the beam of the machine would only move 100 times, while that of the only beam 1000 times would oscillate 100 times. An immense advantage was thus given to the machine in point of durability. All weighing was but an approach to correctness, and the nearest point to which the best kind of common scales were sensible, might be stated as \( \frac{1}{100} \) of a grain, and one-fourth of that grain would hardly cover their errors; but the machine was sensible to \( \frac{1}{1000} \) of a grain, and \( \frac{1}{10000} \) would fully cover its errors, which were not a twentieth part so numerous as these of the scales.

Woollen Factory for Turkey.

Mr. Fairbairn exhibited a model, showing the plans, sections, and architectural elevation of a Woollen Factory, to be constructed of cast and wrought iron, near the town of Izmet (Turkey), for the Sublime Porte.

Mr. Fairbairn said, that in 1839, he visited Constantinople under the instructions of the late Sultan Mahomed, and reported upon nearly all the government works. Their extension was checked by the death of that prince, but the present Sultan was disposed to carry them into effect, and by his orders Mr. Ohanes Dadian had arrived in England, in furtherance of the project. He described the state of the country, the pros and cons of producing woollen manufactures, and the building materials, the kish, and other buildings, with a cast-iron column and beams, with an iron roof. He then described in detail the construction of the different parts of the building, and the machinery, which would be driven by a fall of water of 25 feet in height, of the computed average power of 180 horses. Several ingenious devices were described for preventing any objectionable effects from the high conducting power of the metal. One of these was a siphon, so as to admit the current of air through the hot season; and the iron roofs were so arranged as to have beneath them a coating of plaster, to serve as a non-conducting substance. The two principal rooms were described to be 272 feet long, 40 feet wide, and 20 feet high; and 380 feet long, 20 feet wide, and 29 feet high; with a great number of other buildings, in the several processes in the manufacture of coarse woollen cloths, for the counting-houses and departments of the directors, and for the reception of the Sultan, &c. The area of the enclosed space, including the court-yard and buildings, was nearly 3 acres, or 110,621 square feet. The floor surface in the basement rooms was 16,480 square feet. Ditto in the upper rooms = 54,016 square feet.

March 29.—The President in the Chair.

Cast and Malleable Iron.

"Experiments upon Cast and Malleable Iron, at the Milton Iron Works, Yorkshire, in February, 1813." By David Mushet, Assoc. Inst. C. E.

The blast furnaces at Milton had been for a long period worked with heated air, generally under a pressure of 3½ lbs. per square inch, and each with two nozzles on the blast-pipes of 2½ inches and 2½ inches in diameter. The apparatus requiring to be renewed, a quantity of iron was made by cold-blast, which, as the materials or other circumstances of manufacture were not in any way changed, offered an opportunity of testing the relative strength of the hot and cold blast, of iron, of which Messrs. Graham and Co., the proprietors, took advantage, and the assistance of Mr. Mushet to conduct the experiments. A strong wooden frame was erected, upon which were fixed iron supports at 4 feet 6 inches apart, for sustaining the bars to be proved. A bar of iron planed perfectly true, with a dove-tailed groove, and a graduated brass scale, was used for ascertaining the deflection. The bars to be experimented upon were all cast alike, 5 feet long and 1 inch square, and cooled with equal precaution. The results are given in a series of tables, of which the following are the average results:

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<tr>
<td>12</td>
<td>4. Cold-blast iron re-melted in the cupola, mottled or approaching to white</td>
<td>7.153</td>
<td>442</td>
<td>9418</td>
<td>427</td>
<td></td>
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<td>2</td>
<td>Same iron re-melted in the cupola with an increased quantity of coke</td>
<td>7.044</td>
<td>435</td>
<td>11916</td>
<td>519</td>
<td></td>
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<tr>
<td>3</td>
<td>No. 3. Hot-blast iron re-melted in the cupola</td>
<td>7.012</td>
<td>520</td>
<td>1542</td>
<td>782</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>No. 3. Hot-blast iron re-melted in an air furnace with coal</td>
<td>7.107</td>
<td>610</td>
<td>1532</td>
<td>940</td>
<td></td>
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<tr>
<td>5</td>
<td>No. 3. Hot-blast iron cast from the blast furnace</td>
<td>7.012</td>
<td>439</td>
<td>156</td>
<td>686</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Ditto</td>
<td>7.040</td>
<td>439</td>
<td>143</td>
<td>630</td>
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The result of these tables are examined, and among the deductions drawn from them are—that the Milton cold-blast iron is rather deficient in strength; that the hot-blast iron is stronger than cold-blast, when re-melted in a cupola with coke; that hot-blast iron from the furnace is equal in strength to the average of the two sets of specimens of cold-blast re-melted in the cupola; that the No. 3 iron from the blast furnace is not stronger than No. 1 quality. The general results show, not only the superiority of the Milton hot-blast iron over that made by cold-blast, at the same furnaces, but over that of a very large number of works, as shown by the following comparative table taken from Mr. Fairbairn's report in 1839—

| Cwt. qrs. lb. | There was charged in the cupola, No. 3, pig-iron |
|---------------|-------------------------------------|---------------------|
| 20            | 1                                  | 0                    |
| 19            | 3                                  | 14                   |

The results of the experiments upon malleable iron made from hot-blast pig, and plate, show extreme ductility, when subjected to blows of a hammer 24 lbs. weight, of which one example will suffice. A bolt 2½ inches diameter, puddled from refined metal, notched half round to the depth of one-eighth of an inch, required 120 blows to break it.

Remarks.—Mr. Cotton remarked, that the paper would have been more satisfactory, if it had stated more particularly the weight of the weights, the intervals of loading, and the length of the periods during which the bars remained loaded. He had found that when a beam was near the point of fracture, if the weights were added quickly, it would apparently bear more, than if a certain time was allowed to elapse between their application. His practice in experimenting was to make small additions of weight, at given intervals, which might be increased in length toward the point of fracture; more correct results were thus obtained.

Mr. Lowe believed, that in making iron, the main consideration after selecting good materials, was to proportion them according to the hygroscopic state of the atmosphere. It was well known that better iron was made in frosty weather than in damp warm weather; and he was convinced that the less air was deprived of its moisture, the better would be the effect.

Mr. Parker observed, that the experiments on the strength of wrought-iron bars could scarcely be received as conclusive, as the power employed had been variable and ill-defined. If a given weight had been allowed to drop from a certain height, and the incisions in the bars had been made with
precision by a machine, the power required to produce fracture could have been easily calculated, as regarded the impact.

Mr. Farey observed, that notwithstanding the difference between the results recorded in the paper, and those arrived at by Messrs. Fairbairn and Hodgkinson, he was inclined to place confidence in them on account of Mr. Mushet's surprising success in the amount of heat that had been derived from the materials, and in the developing of the furnace, the Milton hot-blast iron, when re-melted in the air-furnace, attained the high breaking weight of 610 lbs., which was greater than that of the best specimens of cold-blast iron. Mr. Farey then described at length the chemical combinations which occurred in the blast-furnace. The general result was, that the use of hot-blast accelerated the process of separating the oxygen from the ore, and of replacing it by carbon, rendering also the subsequent fusion more rapid and complete. A great advantage was obtained by avoiding the cooling effect, which was formerly produced by the introduction of a quantity of cold air under pressure: the point of fusion was higher up in the furnace, and the quality of the metal, when it fell into the hearth, was not injured by being blown upon, as it was protected by the covering of liquid slag at a high temperature, which was a great advantage. The cold-blast was not being facilitated, the metal contained a redundancy of carbon, notwithstanding a less quantity of fuel was consumed. It was probable that the want of strength sometimes observed might arise from the imperfect amalgamation of the carbon with the metal, and this would account for the strength being increased, but the carbon was more particularly in the air-furnace, where it was generally affirmed that the carbon was more gradual than in the cupola. This gradual process was not desirable for cold-blast iron, in which the carbon was already well distributed; therefore in all foundries, the air-furnaces had been replaced by cupolas, and in the new process, the blast itself was directly made. When the hot-blast was first proposed, it was supposed that it could not answer, because in air furnaces, better iron was generally made in the winter than in the summer. This was a fallacy which ought not to have been entertained, as it was well known that the good working arose from the dryness of the air in the winter, on account of the water-regulators for the cold-blast, which were generally abandoned, and large dry reservoirs, with or without floating piston regulators, were erected in their stead.

Mr. Field corroborated Mr. Farey's statement of the iron, when re-melted in an air furnace, becoming hard and brittle. He had in consequence abandoned their use, and made even the heaviest castings from cupola. He attributed the deterioration of the iron to the slowness of the process of melting in the air furnace. He had found the No. 1 hot-blast pig-iron too rich and weak for general purposes; the No. 3 generally possessed the greatest strength.

Mr. Rennie, in answer to a question put by Mr. Farey, said, that in his experiments, the transverse strength was 750 lbs. per sq. inch, when the bearings were 3 feet apart, the strength was 897 lbs., with specimens of good quality. He believed that in some experiments on iron made with anthracite, published by Mr. Mushet in 1836, the cold-blast iron was stronger than pig-iron at 10 per cent. per ton than that made by the hot-blast process. This might have arisen from peculiar circumstances, as Mr. Crane, of Yarnichudewy, had shown him a pig of hot-blast iron, which had resisted upwards of a hundred blows of a sledge-hammer, while the ordinary cold-blast pig-iron were generally broken by about a dozen blows. From the discrepancy shown by the various experiments, he was inclined to think that the knowledge of the real effects of heated air, in reducing metallic ores, was at present very limited.

Mr. W. Brunton said that the only place where iron had been made with anthracite, was at the Iron foundry works, South Wales; and the report by Mr. Mushet, which had been alluded to, was upon the iron made there. The black band iron-stone had recently been found at the Beanport iron-works, South Wales; and as the furnaces were now blown with bated air, a large quantity of good soft iron was produced. That mine had been 16 years in operation, and had required £4000 per annum to work it, and the pig-iron produced, was esteemed good.

Mr. Darison submitted that the want of strength, which was complained of in the hot-blast iron, might in some degree arise from the use of raw coal instead of coke in the blast furnace, as the sulphur and other deleterious matters, which were formerly got rid of in the process of coking, were now introduced to the furnace, and probably combined with the iron.

Mr. Hume stated that with Mr. Lavington's instrument to determine the hygrometric state of the atmosphere had much influence on the quality of the pig-iron produced. It was found in India that even with the rich hematite ores and charcoal, which were solely used by the native workers of metal, good iron could not be made when the air was charged with moisture; but that during the hot dry winds the best metal was produced.
ferent qualities of iron, and had been found perfectly satisfactory for practical purposes. A wrought iron bar, 1 inch square, was bent into a deeply indented serpentine or zig-zag figure, having three or four bends, each end of the bar terminating in an eye. This was used as a pattern, from which several serpentines were cast at each running of the furnace, the ingot being suspended and a scale being attached to the lower one, weights were gradually added until the castings broke. Such a figure was fractured with very little weight, and the method did not afford any test of the actual strength of the metal; but it was simple, and as the foundryman could compare it with the wrought iron, it afforded a corrected scale for the comparative strength of the different kinds of iron under trial, and to make the necessary mixture. The system was used in his foundry whenever new kinds of iron were purchased, and he obtained good results from it.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

June 26, 1843.—Mr. Britton gave an essay on the fine Anglo-Norman Porch to Malmsbury Abbey Church, which was illustrated by several drawings. He also referred to, and made incidental remarks on several other Christian porches, comparing and contrasting them with the famed Grecian and Roman Porticos of Pagan architecture. The subject afforded scope for interesting criticism, and was well calculated for a large auditory of young architects. We fully agree with our veteran antiquary in reproducing the absurd and tasteless practice of copying and applying, or rather misaplying, the parts of ancient structures in modern churches, town halls, theatres, and common street houses, when perhaps no other part of the building has a classical feature; and certainly the whole has no analogy, either in purpose, sceney, or association to ancient edifices. It would be as congruous and correct to place the cannon's, or bishop's, wig on the scoscope of a modern street house, as to have the door of the porch be applied with harmony and propriety to almost every variety of building—from the church to the workhouse, from the palace to the cottage. Mr. Britton exemplified this very forcibly, and justly, by referring to many diversified examples in England, and also commented on the great varieties of edifices which the masonic architects of the middle ages designed and erected for the use of their contemporaries, and for the adornment of their descendants. The following were particularly noticed:—those attached to the cathedrals of Salisbury, Wells, Ely, Peterborough, Lincoln, Gloucester, Hereford, &c.; also to many in parish churches and chapels, particularly to the unique and extraordinary double porches on the north side of Redcliffe church, and to those of Taunton, Grantham, St. Mary's at Bury, Bishop's Cleve, King's College chapel, &c. His illustrations and comments were, however, more immediately directed to the north Porch of Malmsbury Abbey church in Wiltshire, which he has partly illustrated and described in his "Architectural Antiquities, vols. I. and V., and also in his "Dictionary of the Architecture of the Middle Ages." We quote part of the description of this bold and highly adorned architectural appendage to a church, which must have been an object of perfect taste of the finest and most impressive Anglo-Norman edifices in the country.

"The door-way, with the whole of the porch, may be referred to and considered as constituting the finest specimen of Anglo-Norman architecture in England. I believe it is unparalleled in arrangement, in elaborate sculptured design and ornament. A series of eight mouldings, which extend from the base on one side to the base on the opposite side, are all covered with sculptured enrichments of varied design. Some of the patterns resemble those in Greek architecture, and are on vases. They are scroll, diamond, and oval-shaped frames, inclosing groups of human figures, animals, &c., intended to delineate passages from the bible and the testament. A label, or hood moulding, with serpent's heads at each extremity, encircle the arch. Within this archway is a large square room, or vestibule, having a stone seat at each side, with columns standing to the left of a series of eight moldings, which hold alto-relievi, representing the twelve apostles, seated on two benches, and two figures apparently flying over their heads. The ceiling was vaulted and ribbed; and, opening to the church there was a smaller doorway, with a pediment; sculptured ornament, and a base-relief of the Deity, or the Saviour, with incensing angels by the upper cornice. On the right, or eastern side of this doorway was a piscina, and above the ceiling was a room, with a fireplace, for a monk or porter, who had charge of the church."

July 10.—This evening was occupied by reading the Prize Essay, "Are Synchronism and Uniformity of Style essential to Beauty and Propriety in Architecture," by Mr. Chamberlain, for which the medal of the Institute was awarded.

On Monday evening, the 24th July, the session closed, with a full attendance of members and visitors. Mr. Donaldson read a paper on the domestic architecture of the Belgian cities, illustrated by numerous drawings, displaying the peculiarities of the irregular buildings of Flemish architecture in the middle ages, as compared with our own. The more general use of stone and brick in the Belgian houses of this class forms one striking contrast with those in England in which timber was, with few exceptions, the principal material.

Mr. Mantham explained Mr. Payne's patent process of saturating timber with sulphate of lime for preserving it from dry rot.

Mr. Tite, V. P., who occupied the chair, closed the session with some observations on the progress and prospects of the Institute, and on the state of architecture as an art, on which he took occasion to make some remarks on the present tendency to an abuse of the Gothic style.

ORNAMENTAL GLASS.

Charles Robert Ayers, of John Street, Berkeley Square, architect, has obtained a patent for improvements in ornamenting and colouring glass, earthenware, porcelain, and metals.—Patent dated July 25, 1843. Specification enrolled January 23, 1843.—If the surface of the glass, earthenware, &c., is to be covered with a plain ground, it is first to be coated with some adhesive substance, such as essence of lavender. A piece of net, or other thin tissue, is then laid over the article, which is to be dusted over with the colouring matter in the state of fine powder. The colouring matter, passing through the holes of the tissue, attaches itself to the adhesive coating. The tissue is then to be removed, and the article submitted to the action of the fire, taking care, in the case of metals, not to bring them to a red heat, as the colour is more easily fixed thereon than on earthenware, porcelain, &c. When the articles are to be ornamented with figures, &c., they are first coated with a bed of silk, velvet, and other tissues or a mixture of silk and wool, which will provide a more lasting covering than if it were treated with the powder, or other tissue, as before. Stencill plates, made of paper or any other convenient substance, in which the figures have been cut out, are then laid over the tissue, and the colours dusted on; after which, without taking off the net, paper, &c., the goods are subjected to the firing process. Another method of ornamenting such subjects is to cover the article in having the figures cut in blocks similar to woodcuts, which are covered with tartrine varnish, and impressed on the article to be ornamented, which is then dusted with the colour or colours, and fixed as in ordinary cases. Claims.—1. The patentee does not claim the application of colour to earthenware, &c., in a state of powder, but its application in a state of powder with net or other tissue intervening. 2. The application of stencill plates, of various figures, as above described. 3. The impressing the figures or ornaments by means of blocks, and then dusting on the colour.

WESTMINSTER BRIDGE.

Letter from Mr. Barry to the Speaker, in answer to a Report of Messrs. Walker and Burges, upon the proposed alterations.

Sir,—As Messrs. Walker and Burges have thought proper to print and publish a Letter, addressed to you as Chairman of the Commissioners of the Bridge, relative to the suggestions I ventured to offer for the improvement of that bridge, in a Report which I made to the Fine Arts Commissioners, of the 22nd February last, I feel called upon to address you to a few observations, for the information of the Board over which you preside, in reply to the objections and removing several misconstructions which that letter is calculated to occasion.

WESTMINSTER Bridge has long been considered extremely inconvenient, as well as unsightly, and, from its proximity to the new Houses of Parliament, is generally felt to have a most injurious effect upon the appearance of that building. A remedy to the defects of the bridge is, I am persuaded, not only to lower the road-way, to increase the water-way and headroom under the arches, and to reduce the mass of the bridge to the greatest practicable extent. In order to accomplish these objects in the most effectual manner, it appears to me to be necessary to rebuild the bridge: but as the Commissioners were incurring a large outlay in securing and extending the foundations, I recommended in my report above alluded to, that the rebuilding should be confined to the superstructure.

Previously to noticing the several points of Messrs. Walker and Burges' Letter, I would beg to call your attention to the suggestions contained in my report were offered merely as hints for the consideration of the Fine Arts Commissioners, and not as mature opinions founded upon a careful practical investigation with reference to execution, in which I stated most distinctly I did not wish to be engaged. I presumed that if the Fine Arts Commissioners deemed those suggestions worthy of attention, they would refer them to the Commissioners of the bridge, by whom they would be duly considered, and, if approved, carried into effect by their own officers.

I now proceed to notice the several observations of Messrs. Walker and Burges, which are contained in my report. With reference to those upon the relative properties of circular and pointed arches, and to the authorities which they quote in depreciation of the pointed arch, I beg to state, that the hypothesis in which those authorities are said to concur, namely, that a perfect arch, or one of the greater diameters of a circular arch at the crown, is at direct variance with the opinion of Professor Moseley, of King's College, one of the highest authorities in such matters, who, in a letter to me upon the subject states, "that a pointed arch does not necessarily require a great pressure, or indeed any pressure," upon its crown, to prevent it from falling, and that the reasoning
upon which an opposite conclusion is founded in Messrs. Walker and Burges' report is erroneous." Both theory and practice confirm me in the opinion which I have advanced in my report, that a pointed arch requires less thickness at the crown than is usually considered necessary for a circular arch. As, however, it might possibly be inferred from the observations of Messrs. Walker and Burges that the arch which they propose for the Westminster Bridge was intended for its purpose, although they do not attempt to prove that such is the case, I have thought it right to enter into a careful investigation of its properties; from which I am fully convinced, that I have not carried the principle which I have advanced sufficiently far, and that I have not inferred the conclusion, from even the largest of the proposed arches, it would be no great effort of engineering science to reduce the thickness of its crown to nearly one-half of what is proposed by Messrs. Walker and Burges; by which means the lowering of the road-way over the centre arch might be carried to the extent of 3 feet, without increasing the clear height of the centre arch as I have proposed; if such reduction were deemed to be an objection of any importance. In this opinion I am confirmed by the examples of numerous stone bridges both in this and other countries, and by the judgment of several eminent engineers and mathematicians of the present day.

With reference to the loss of water-way, which I stated was occasioned by the buoys or spandrels of the present arches at high water, I ought perhaps to have explained that I referred to such portion only of the water-way as is affected by those obstructions, which might, however, I think, have been inferred: With regard to the removal of these obstructions, I do not agree with Messrs. Walker and Burges in thinking that it would be unproductive of any useful effect upon the "currents and falls"; and I consider the argument that the proposed arches are founded upon the assumed level of high water according to Trinity standard, whereas the present ordinary spring tides, as they must be well aware, rise considerably above that level; on one extraordinary occasion recently as much as four feet. That some objection to such a good would be, I think, unavoidable; with respect to my proposition of lowering the centre arch 18 inches, which it appears Messrs. Walker and Burges consider will be "rather a practical evil," as affecting the navigation of the river, it is necessary that I should call your attention to the clear height of the middle openings of some of the bridges above Westminster Bridge, as they have done to those only which are below the bridge. While the clear height of the centre arch of Westminster Bridge is 26 feet above Trinity standard of high water, the centre openings of the modern bridges at Vauxhall and Hammersmith are of the respective heights of 25 feet 4 inches, and 16 feet 1 inch, to say nothing of those of Battersea and Putney Bridges, which are much less, but which I admit are extremely inconvenient. As the largest steamers which pass up the river are those which ply between London Bridge and Chelsea, and as their drafts are jointed with the distance of their of passing even under Putney Bridge, the height of the bridge opening of which is only 11 feet 2 inches above high water. It cannot be imagined that the lowering of the centre arch of Westminster Bridge to the extent which I have proposed, can really be an objection of any importance as regards the navigation of the river, while the great object which we should thereby gain by a further depression of the road-way, to the extent of 18 inches, reducing its inclination to 1 in 10, instead of 1 in 24, as proposed by Messrs. Walker and Burges, would be of the greatest advantage to the traffic over the bridge, as well as to the effect of the new houses of Parliament when viewed from it; a point which I subjoin ought not to be disregarded.

Messrs. Walker and Burges state in their letter, as an objection to the form of arch which I have proposed, that the failure of one arch would cause the total collapse of all the piers on either side on which they say is not to be disregarded in a bridge, the piers of which have been so badly founded, that to support them has been a constant expense, and is at this moment a source of considerable anxiety; although they further state, that the works they have in hand, if as successful as both parties, would remove the danger in which they have ever been, and at last perfect so. The part of this objection which is founded upon the lateral thrust of arches, will apply with equal force to all arches of a segmental or elliptical form, which are generally adopted in modern bridges, and even to segments of the circle in a certain degree, but no arches of the kind proposed by Messrs. Walker and Burges to be ignorant, although in the allusion which they make to Lablache's opinion that subject, they leave it to be supposed. With regard to the other part of the objection, namely, the failure of the bridge if one arch should be destroyed, Messrs. Walker and Burges would not have recommended the very serious outlay which is now being incurred in securing them, if they conceived there was any risk whatever of their ultimate failure; but if a possible failure is notwithstanding to be taken into consideration, can a more powerful argument be advanced in favour of a new superstructure, than that the weight upon the piers might be thereby reduced at least one-third?

To Messrs. Walker and Burges' design for a new superstructure I object, principally because it does not accomplish the main objects for which a new superstructure is, in my opinion, desirable, namely, the reduction of the mass of the bridge, and the lowering of the road-way to the utmost practicable extent; neither does it afford any improvement whatever in respect of the safety of the bridge, or the comfort of those who use it; and I firmly believe, in my opinion, of far greater importance, both for the sake of public convenience and architectural effect, than the style of architecture to be adopted.

As to the principles which Messrs. Walker and Burges consider should govern the nature of a design which is to be had in this instance, I entirely disagree with them; I conceive that the height of the opposite shores and buildings upon them should mainly determine the aesthetical character of the design. If, as in Waterloo Bridge, where the shores are high, one being naturally so, and the other raised, and the road-way is level; where the superstructure of a great number of buildings is intersected by a river, it is above the level of the road way; and where the bridge groups with the substructure of such an important building; the character of the design cannot be too bold and massive; but if, as at Westminster, where the shores are low, and the bridge must in consequence group with the superstructure of an extensive work like that of the new Houses of Parliament; and where the parapet must, in consequence of the height required for the centre arch, assume a curved line, which is an element rather of elegance than of boldness, the character of the bridge should be light and graceful.

Upon the taste of Messrs. Walker and Burges' design for a new superstructure in what they term the "Norman style," I forbear to offer any criticism in detail, as the conditions which should be observed in a bridge are, in my opinion, wholly at variance with the essential characteristics of that style; but it is important to point out, upon their observations relative to points of taste, including those especially which refer to harmony and contrast between the bridge, the new Houses of Parliament, and the neighbouring buildings, as they seem to me to furnish their own important objection.

In conclusion, I beg to add, that I still remain of the same opinion, as I expressed in my report to the Fine Arts Commission, as to the necessity of a new superstructure to Westminster Bridge upon the principles therein advocated; and as, a favourable opportunity is now afforded of carrying into effect that great object in a manner entirely new and moderate, when compared with its importance, I trust the Commissioners will not be indisposed to take my recommendations upon this subject into their most serious consideration.

I have the honour to be,

Your very obedient servant,

Charles Barry,
Speaker of the House of Commons,
Chairman of the Commissioners of Westminster Bridge.

OPENING OF THE NEW GRAVING DOCK AT WOOLWICH.

The opening of this stupendous work took place on Monday, 17th July, when Mr. Henry Fox, the chief engineer of Her Majesty's frigate Chichester, for the purpose of being copped, &c. Viewed only as a work of mere machinery and architecture, the dock would, in itself, be a most striking object; but when the difficulties required to be surmounted in its construction are considered, its and excellence is one of great importance, and a specimen of the perfection to which this particular description of civil engineering is carried in this country. The basin is in solid granite, with steps, or what are technically termed altars, on each side, 15 inches to one foot deep, affording facilities for descending to the bottom, and also for props or supports being added, thus enabling any vessel, whatever may be her size, to be supported on her keel without injury. The length is 500 feet at the top of the water, 245 feet at the bottom; the width of the basin is 80 feet at top, gradually diminishing in the middle to 32 feet, and increasing to 60 feet at the bottom. The appearance of a perfect concave some 26 feet deep. To this basin there are two folding-gates, or locks, extending the whole width of the dock, made of iron and timber doubled, and weighing about 60 tons each; and the perfection with which these gates work, and are adjusted to each other, may be seen in the fact, that though each of them are of the enormous weight of 60 tons, two men, or rather a boy and a man, can move them easily. These gates open to the general basin communicating with the Thames. The dock itself is filled by the river tide, or by a steam-engine working with two 20 horse-power boilers, which can either fill the dock or withdraw the water in about six hours' time. When the engine is required to empty the dock, the water withdrawn from it can either be discharged into the common sewer, or into the basin, which communicates with the Thames. The engine is entirely of iron and coppered: it is a beautiful piece of mechanism. The time it takes to empty the dock varies according to the size of the vessel received in it, a large vessel displacing more water than a smaller one. In the case of the Chichester, which appeared to be about 90 tons, the water taken was about six hours. There is also upon the top of the engine-house a tank holding some 200 tons of water, available in cases of accident, and in
KYANIZING OF TIMBER.

Sir,—In consequence of one or two erroneous statements which have appeared in your Journal, and also on account of a Report to the Treasurer of the Brighton Suspension Chain Pier Company, upon the preservation of timber from decay by Mr. Prichard, of Shoreham, which report contained many mis-statements, which, if not contradicted, may injure the reputation of a very valuable discovery, you will much oblige me by inserting the following remarks.

1st. It is asserted that sleepers Kyanized five years ago, and in use at the West India Dock warehouses, have been discovered to decay rapidly.—I would state in reply, that Kyanized sleepers have not been used at any of the West India Dock warehouses, but the Anti-Dry Rot Company did lay down at their own station, West India Docks, in 1836, some Scotch fir sleepers prepared with very weak solution, by way of experiment, and some of these have shown symptoms of decay.

2ndly. It is asserted that the wooden tanks at the Anti-Dry Rot Company's station, had been attacked by woodworm and occasionally held solution; only one or two of the boards showed the slightest symptoms of decay, and that on the outside alone. Mr. Prichard, it appears, is not aware that a waterproof tank is capable of containing a solution of corrosive sublimate without waste; the solution will not penetrate timber laterally, but only from the extremities, and therefore that it is in no way surprising that a tank containing a solution of corrosive sublimate should decay on the outside.

3rdly. It is asserted by Mr. Prichard, that in Shoreham Harbour there is a wailing piece, the very heart of English oak, Kyanized, and in use exactly four years, which is said to be a honeycomb, or network, completely eaten away by the vedelo navalis, and other sea-worms.—The truth of this assertion is denied upon the authority of the amended Minute of Survey and Report from the Commissioners of Shoreham Harbour.

4thly. Mr. Prichard states that he opposed Kyanizing on the ground that in tropical climates it would be as poisonous as the quicksilver mines of Illyria.—In reply to this statement, I would refer to Masters, Edshury of Great-Yarmouth, who built a ship, many years since, wholly of Kyanized wood. It has been three voyages to the South Seas, the crew have returned each voyage remarkably healthy, and we have now in our possession some of the bilge water, which has been analysed, and found to be considerably more pure than on ordinary voyages.

I am, Sir, Your obedient servant,
TASWELL THOMPSON, Secretary.

We have got room for the Committee's Report further than the following extract.—Rotten.

"Report, that Mr. Thornton, the Harbour Master, had pointed out five pieces of English oak wailing which the sub-committee had inspected and found sound as sound, in their opinion, as when first put in, and that Mr. Prichard stated that the piece he alluded to as heart of oak was removed from the pier by himself, but he refused to exhibit it."
sufficient surface of metal was present to convey the current into and out of the water. Before proceeding to apply this fact, however, the first experiment was repeated, but with a smaller battery.

A copper wire was next laid down on the gravel walk along the north bank of the Serpentine River, from the bridge which separates Hyde Park from Kensington Gardens, to the east end of the river. About three square feet of metallic surface was attached to each end of the wire and put into the river; a galvanometer was put into the circuit at the bridge, and a small Grove's battery at the other extremity of the wire. The electric current passed by the water, and returned by the wire, and with such power as would have been the case with an ordinary metallic circuit. In this arrangement the magnetic influence ceased the moment the circuit was broken, as it would have done in an entirely dry circuit.

Reflecting on the foregoing experiment, it occurred to Mr. Bain that the natural moisture of the earth might be a sufficient conductor for the electric current, and with a view to ascertain the correctness of this assumption, a wire was led along a wood-paling extending from the river to a well about a hundred and fifty yards distant; one of the metallic surfaces attached to the wire was put into the river, and the other into the well; the galvanometer was put into the circuit near the river, and the small battery near the well. On completing the circuit, the current passed freely, as in the former experiments, showing that when sufficient moisture is present, the earth is a good conductor of voltaic electricity; and that one-half of a voltaic circuit is all that is necessary to be insulated from surrounding conducting matter.

While reflecting upon these experiments, some few months after they had been performed, Mr. Bain was led to infer, that if a surface of positive metal was attached to one end of a conducting wire, and an equal surface of negative metal to the other end, and the two metallic surfaces put into water, or into the moist earth (the wire being properly insulated from surrounding matter), an electric current of considerable energy would be established in the wire. This proposition was soon tested by an experiment performed in the grounds of Mr. Finlaison (the government calculator), at Algber's House, Loughton, Epping Forest. In a moat distant 150 yards from a pond of water, was placed a plate of about 12 inches surface of positive metal, and in the pond a similar plate of negative metal, and a galvanometer with a conducting wire connecting the two plates were laid along a gravel walk. The moment this arrangement was completed, the galvanometer showed that an electric current was passing from the metal in the pond, through the earth to the metal in the moat, returning back again by the wire. The current was of considerable energy, and this experiment was repeated a number of times with unvarying success.

Similar experiments upon a larger scale were tried upon the Serpentine River, in Hyde Park, with equal success.

These points being satisfactorily established, Mr. Bain next proceeded to make the experiment as shown in the annexed diagram.

A surface of zinc (Z), was buried in the moist earth in Hyde Park, and, at rather more than a mile distance, a copper surface, C, was similarly deposited; the two metals were connected by a wire, suspended on the railing, and on placing a galvanometer between the wire and the earth, as shown in the diagram, an electric current was produced, which passed through the intervening mass of plate from the earth, returning by the wire. In the first experiment, the metallic surfaces being small, the electric current produced was feeble, but on using a larger surface of metal a corresponding increase in the energy of the current was obtained, with which a electrotype process was performed, and various electro-magnetic experiments performed with uniform success.

Subsequent experiments have shown that if two metal plates (a negative and positive) of sufficient surface are sunk in the earth as a battery, and wires led therefrom, electrotype deposition may be effected, and various electrotype apparatus worked for any length of time. The most successful results have, however, been obtained by depositing several surfaces of positive metal in the earth connected into a group by wires from which a conducting wire was led to a series of negative surfaces similarly disposed at a more remote spot. When considerable power is required, this is the arrangement that should be adopted. It is essential to success, that the earth wherein the plates of metal are deposited should be of a moist nature. A current has, indeed, been obtained in dry soils, but of such small energy as to be of no practical utility. This, however, may have been occasioned by the very small proportion of metallic surface with which the experiment was made.
chimera called the perpetual motion. Mr. Bain intends to apply it also to telegraphic purposes, in which its agency secures him improvements of the last importance, for he can certainly, by its means, discard wheels of any and every description, as well as electro-magnets.

"A is a mahogany case with a glass front; B is a metal bracket fixed to the back of the case, and to which the pendulum D is suspended. C C are permanent steel magnets. The sides of the case are so formed as that the pendulum-ball D can vibrate freely between the poles of each magnet. The magnets are so placed as that poles of dissimilar names face each other. E is a small platinum ball affixed to a brass stem, free to move to one side or the other, being fastened to a light spindle carried by the pendulum end at H. The plate of copper E is deposited in the moist earth, from which a wire leads to the bracket B. The plate of zinc G is likewise deposited in the earth, and its wire leads to the piece of metal I. To the lower end of the suspension-spring of the pendulum is attached a wire coated with silk. It is led down the back of the rod (which is wood), and then coiled longitudinally, in many convolutions, around the edge of the pendulum-ball, in a groove previously made for the purpose. It is then taken up the back of the rod and terminates in the bearings of the spindle at H. The action of the engine is as follows—A constant and uniform current of electricity would be established, and would pass through the earth, the plates and wires in the direction of the arrows, as long as the platinum ball E rests on the platinum pin projecting from the metal I. But if the pendulum is put in motion, suppose that, at first, it were drawn aside until the ball D should be between the poles of the right-hand magnet, the point H being now farther to the right than the ball E, the latter would fall to the left and rest on the pin K until the pendulum took its vibration to the left, when the ball E would fall to the right, and so on continually, the action being produced by the change of the centre of gravitation at each vibration of the pendulum. This action of the ball E rests on and cuts off the flow of electricity at or near the extreme ends of the pendulum's vibrations, so that the convolving wire of the pendulum-ball is attracted and repelled by the magnets at the proper points of its vibrations, and thus a continual motion is kept up for an indefinite period of time."

We shall endeavour next month to draw the attention of our readers to the ingenious printing telegraph of Mr. Bain.


Several useful works have been published on the law of patents; the object of the present one is to give a clear exposition to inventors and parties interested in patent property, of the modes of obtaining patents, and of making them legally available, without entering into detail. The authors have brought some new light on various points of the subject; and with regard to the meaning of the word "manufacture," they propose a much simpler definition. After quoting the classifications of Godson, Webster, Carpmael, Rankin, and Holroyd, the authors proceed to observe—

"As these classifications do not assist us in defining the word 'manufacture,' they do not appear to have any practical value to the inventor in defining his claim, or to the public in testing it. For both these purposes the words of the statute, 'any manner of new manufactures,' are amply sufficient, and in every case in which an inventor may have been so ill-advised as to claim a "method," or a "principle," or a "process," and his right has been questioned, the judges have found it necessary to bring him back to the expressive word 'manufacture,' and exposed to him, that for the invention of that, and that only, will the law afford him the protection of a patent. Or if a difficulty occurs in ascertaining whether or not the security of a patent is attainable, the solution of it is always found to depend on this simple question, whether the invention will give to the public a novel useful and venable result, in short, a 'manufacture,' and not by considering its eligibility to be ranked in the class of 'substances,' 'machines,' 'combinations,' or 'principles.'"

"It would be easy to show that many of the tedious questions which have perplexed inventors, juries, and counsel, would have been either removed altogether, or immediately solved, if the words of the statute had been regarded, without reference to the ingenious definitions given of them."

In confirmation of the view here taken, the authors cite various cases decided by the judges, and then proceed to observe—

"That the complex classifications of patentable manufactures hitherto attempted, are resolvable into the very simple one of "made and things improved, we shall complete this part of the subject, and prove the sufficiency of the word 'manufacture' to cover all beneficial inventions, by selecting a few of the most striking instances from the number of patents which have been granted nominally for methods, processes, &c., and showing, in each case, what was the 'manufacture' produced."

In support of this definition, quotations are given from several cases, selected from a large number, which the authors contend are sufficient to show how the words of the statute, "any manner of new manufactures," may be applied, to limit the extent of every claim of invention.

The authors now proceed to define who may obtain a patent, which we do not think requires much explanation, as the words of the statute, "the true and first inventor," is simply comprehensive. They next explain what conditions a patent is granted, and then give the various forms necessary for obtaining and securing it, and conclude by describing the use of a patent as property, remedies at law for defending it against infringement, and what is requisite to be done provided the patent is voidable in part, so as to secure a valid title; all of which the authors have explained very briefly, but quite sufficient for the general reader to comprehend, without wading through long legal reports.


This series does not diminish in interest, on the contrary, its character is well maintained. In the numbers now before us are contained several interesting plates. That ancient monument, the Acropolis of Tiryns, is well illustrated, and is a good example of the old Cyclopean citadel. It is a remarkable proof of the extensive progress of architecture at this era, that no less than four hundred towns are known to have been surrounded with stone walls of Cyclopean work, supposed to denote the seats of so many Pelasgic colonies. The Acropolis of Tyrins is a gigantic monument, the walls of which enclose a superabundance of 137 feet in length, by 39 in breadth. The external wall is in general 19 feet 9 inches thick, and in some parts 25 feet 3 inches. its height 42 feet 3 inches. The blocks are in some cases from 10 to 13 feet long, by 4 feet 4 inches thick. The vaults of the galleries are considered as probably the most ancient specimens of the pointed arch in Greece. The church of the Invaders at Paris, affords another illustration: its section shows a triple cupola, and an enormous waste of space between the internal and external roof of the nave. The mosque of Al Mowaiyad, at Cairo, is one of those composite buildings in which the early Arabs indulged, showing a Moorish superstructure upon Greek and Roman columns. The harmony, however, of the general design is preserved. The cathedral of Athens is a monument of not less interest, as a specimen of the Byzantine style, with its lantern, and alabaster windows. It is supposed to belong to the Venetian period. The market of St. Germain will be of interest to our numerous readers engaged in the construction of such works in the provinces; the plates show a view, elevation, ground plan, and the details of the roofs. The market is a parallelogram, with an open court in the interior. The dimensions are 302 feet long by 216 broad. The stalls in the Marché St. Germain are 356 in number. In order to enable our readers to compare, we have brought together the sizes of several markets in France and England.

<table>
<thead>
<tr>
<th>Names</th>
<th>Length in feet</th>
<th>Breadth in feet</th>
<th>Area in square yards</th>
<th>Cost. £</th>
</tr>
</thead>
<tbody>
<tr>
<td>St. Germain, Paris</td>
<td>302</td>
<td>246</td>
<td>8254</td>
<td>40,000</td>
</tr>
<tr>
<td>St. John's, Liverpool</td>
<td>549</td>
<td>135</td>
<td>8235</td>
<td></td>
</tr>
<tr>
<td>St. Martin's, Paris</td>
<td>328</td>
<td>197</td>
<td>7179</td>
<td></td>
</tr>
<tr>
<td>Farringdon, London</td>
<td>256</td>
<td>164</td>
<td>4661</td>
<td></td>
</tr>
<tr>
<td>La Valée, Paris</td>
<td>204</td>
<td>151</td>
<td>3422</td>
<td></td>
</tr>
<tr>
<td>North Market, Liverpool</td>
<td>215</td>
<td>135</td>
<td>3105</td>
<td>13,000</td>
</tr>
<tr>
<td>St. James, Liverpool</td>
<td>114</td>
<td>90</td>
<td>14,600</td>
<td>10,000</td>
</tr>
<tr>
<td>Corn Market, Liverpool</td>
<td>300</td>
<td>108</td>
<td>4320</td>
<td>30,000</td>
</tr>
<tr>
<td>Market Hall, Birmingham</td>
<td>160</td>
<td>108</td>
<td></td>
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</table>

The Halle au Ble belongs to the same class of subjects, and presents the example of a metallic cupola, 40 1/2 feet 6 inches in circumference, and 106 feet 7 inches high. Six hundred stalls.
A Map of the Geology, Mineralogy, &c., of the British Isles and part of France. By J. A. KNAPP.

The importance of geology, as a practical science, in connexion with Agriculture and Engineering, is now too well appreciated to require any comment; and the value of any accession to our information on this subject, is equally obvious. It is with these views that we now recommend to the patronage of our readers the publications of Mr. KNAPP, who has devoted all his labour and research, well worthy of encouragement. He has undertaken to describe the geology, mineralogy, internal communications, harbours and ports of England, and the adjacent countries, together with a part of France, availing himself of the most recent information, and the investigations of the most eminent men of science. Thus each part of the map is laid down from the researches of these geologists, who have most distinguished themselves in the examination of particular districts, exhibiting their minute observations, and illustrated by numerous sections. For each part the authorities are given, and an explanatory index is added, referring to the most approved classifications and nomenclature, in English, French and German; in fact, the most minute details are to be found in this map which have not appeared in any other: the size is 5 feet 4 inches by 4 feet 4 inches; we should observe that all the railways and canals are shown, the elevation of the strata, heights of mountains, mines, levels, &c.


This number contains the vertical section of a saw frame, elevation of shears for cutting iron, and the details of an eight day clock. Thus the conductors are realizing a most important desideratum, the publication of a popular series of working drawings of machines, affording instructions at the same time to the workman and draughtsman. We are pleased to see that a small work on mechanics is to be published to accompany the diagrams. We can fairly say that a series of greater importance to the working man has rarely been published. We should observe that one of the advantages which this work possesses, is, that it will enable classes to be formed in the provincial mechanics' institutions for the study of mechanical drawing, an object for which many working men are chiefly induced to become members of such societies.


This is one of the most comprehensive of the many little treatises which have been published on the manipulation of the new art of design. Coming from the hands of the Messrs. Knight, well known for the attention they have paid to practical science, shows that this part has been carefully compiled. It takes up the subject in all its branches, including Calotype, Chrysotype, Cyanotype, Photography, Ferrotype, Anthotype, Daguerreotype and Thermography.

The British and Foreign Traveller's Guide. Sherwood & Co.

This little work, which appears to have been compiled with great care, is of the highest value to the traveller, who, indeed, ought not to be without a copy; it gives the times of starting, the fares, and route of all the English and Continental railways, and steam vessels, besides some highly useful and necessary information as to exchanges, and the value of foreign measures and money.

NEW CHURCH—STRETFORD. NEW ROAD, MANCHESTER.

Thus beautiful church was designed by Messrs. Scott and Moffatt of London. It is built in the early English style of architecture, which prevailed in this country during the reign of Henry II. To give anything like a perfect description of the building in a limited compass would be impossible; I shall, therefore, content myself with a description of its most prominent features. The church is cruciform in plan, and is composed of nave, aisles, transepts, and apsis or chancel, and a tower at the west end. The dimensions are as follows:—length of nave 65 feet, breadth of transepts 21 feet, and length of chancel 17 feet. The total internal length, including the thickness of the chancel arch, 108 feet. Length of transepts 68 feet, breadth of nave 24 feet, breadth of aisles 11 feet 10 inches, diameter of the pillars 2 feet 2 inches; total internal breadth 52 feet, height of pillars 15 feet 4 inches. There are four arches on each side of the nave, struck from the floor to the eaves and have a semicircular arch of one wide, solid block. The height of the nave, including pillars, arches, and clerestory 40 feet, and the total height up to the ridge of the roof 58 feet. There are no galleries, except a small one at the west end of the nave, the greater portion of which is in the tower; and the front forms a semi-octagon, perforated with small trefoil headed arches, which are supported by square pillars, having base mouldings and small mouldings above. The head is composed of stone corbels left on the pillars at the west end for the support of the breast beam of a larger gallery, to extend the whole breadth of the nave and aisles; but it is to be hoped that such a gallery will never be built, as it would totally spoil the internal effect of that end of the church. The body of the church is fitted up with open stalls or pews, and the seats are arranged so as to command a view of the altar, as if not to conceal the idea of a blank window, and the whole enriched with small pillars. In the next stage, the walls are perforated with quatrefoils of most beautiful design, and executed in a masterly manner. The next stage forms the ringers' chamber, and being similar to the second, will not need any further description. The fifth stage forms the bell-chamber, and is completely built, and is entirely covered by a dome, under which is one arch, the head of which is filled in with a foliated circle of four cusps. The corners of the tower are flanked with octagonal turrets, five heights of which are disengaged; and two faces of each turret are again flanked by a buttress rising three stages up the tower. The turrets finally terminate in very richly composed pinnacles, which are enriched in place of the usual trefoils and eggs, supporting small arches, the points of which die under the drip of the pinnacle. Each pinnacle is crowned with a finial, and further enriched by a rib at each angle. The walls of the tower are crowned with an unbroken parapet, the breast resting on small trefoil headed arches, and are enriched with fine detached corbels. Viewing the tower as a whole, whether by itself or in connexion with the rest of the building, it is certainly one of the finest towers of its class in Great Britain, ancient or modern. Yet it has one fault, whether seen in elevation or perspective, viz., that the pinnacles are considerably too large.

The next thing to be noticed, is the porch on the north side, standing out from the west bay of the north aisle; the outer arch is very highly enriched with a variety of beautiful mouldings, and two rows of what is called the dog-tooth ornament; there are three small pillars to each porch, with base mouldings and enriched capits. The arch is surrounded with a label, the inner sweep of which is enriched with the dog-tooth ornament, of a much smaller size than those just mentioned. The corners of the porch are flanked with handsome buttresses, terminated with rich canopies. The gable of the porch is surmounted with a beautiful cross; the ceiling consists of stone groined arches, with very beautiful ribs at the angles. The next portion of this side of the church claiming attention, is the north transept, the front of which is perforated with small two-lancet windows coupled together, the spaces between them and the corner buttresses being filled in with narrow lofty panels, and the heads of both windows and panels form an unbroken series of four arches, crowned with labels, and resting on beautiful small pillars. Above these arches is a wheel window, divided into four lights, springing from the centre. On the point of the gable above this window, is fixed a very handsome cross, enriched with a crown of thorns. The angles of the transept are flanked with buttresses, and crowned with octagonal pinnacles, similar in design to those on the tower. The chancel forms in plan five sides of an octagon, with a bell truss at each angle. Connected with the south bay of the chancel is a small but handsome vestry, with an outer door on the south side, and two small trefoil headed windows on the east. There are two inner doors, one opening into the south transept and the other into the chancel. There is nothing in the south side of the church which requires particular description; all the windows, both of aisles and clerestory, are coupled lancets, two to each bay: the chancel windows are of one light. The
The corridor consists of a range of tond pilasters, painted in imitation of veined marble, and highly polished, supporting a plain cornice; in the floor, and immediately under a long sky-light is a large well-hole, with mahogany batten round it. Iridal hallaming covers the lower part of the wall, and the lower deck, which contains several other state cabins or dormitories.

The ladies' cabin is fitted up with paintings enameled on slate, by Herdmann, after the manner of the French painters, and of most pleasing effect. It is arranged with a high degree of beauty and love-tending scenery, with a variety of interesting figures portraying the tender passion. The frames consist of an ornamental head with centre ornament, and the pilasters are covered with a great enrichment composed of palms, leaves, and flowers, run round the frieze. The whole of the ornaments are chastly finished in white and gold; and a large looking-glass, judiciously placed, is ornamented with a frame similar to the picture. The work-work is grained in pine-wood, and the top of the ceiling is finished French grey. This room has been curtailed of its fine dimensions by a passage having unnecessarily been taken off for an adjoining tier. A partition of wood inserted a slice off from the skylight, and ruins the appearance of the ceiling.

The adaptation of Bielefeld's paper mache, for the decoration of steam vessels, is the most curious art, so far as we have become acquainted with it. It has its great advantage over every other material for this purpose. The Hindostan was enriched with it, though in a very different manner, and has showed the successful result of a hot climate on this fragile material. The durability and former characteristics being its resistance to vermin—neither worm nor any other insect, heat nor damp, so far as present experience proves—will attest it; and its durability is unchallenged. The state panels are also well adapted for decoration, the highly coloured varieties revealing all the beauty of the paintings with surpassing brilliancy, and the rigidity of the substance renders it un-liable to warp.

The spacious fore-cabin and lobby, communicating with the principal corridor to the forecastle. On the lower deck, fore and aft, are many other state rooms or dormitories, all fitted up with the greatest attention; and those of the stern, and partly concealed, are so arranged that the works have been executed with his vigilant and experienced eye.

The first is on the 6th of July the Bemcank left the China dock, and proceeded on the 10th to Bombay, and arrived there on the 21st of September. The Commander, Captain Kellock, Mr. Shaw, Mr. Wilson, the builder, Mr. Fawcett, and a few other gentlemen. She started at 6 o'clock, the wind blowing from the westward.

The following is a statement of her progress:

**STEAM NAVIGATION.**

**THE BENTINCK STEAM-SHIP.**

This splendid vessel was built for the Peninsular and Oriental Steam Company, at Liverpool, by Mr. Thos. Wilson, and furnished with engines by Messrs. Fawcett and Preston. She is a companion to the Hindostan, and destined for the same purpose, to convey the mails between Suez and Calcutta, Malabar and Bombay. She is nearly similar in dimensions, model, and prows to the Hindostan, as follows:

- Length of keel: 230 feet
- Length overall: 250 feet
- Beam, within paddle boxes: 39 feet
- Depth from spar deck: 31 feet
- Breadth amidships: 42 feet
- Engines (2 of 250): 500 horse power.
- Diameter of cylinders: 75 inches.
- Stroke: 6 feet.
- No. of strokes per minute: 12

The vessel is rigged in the usual manner of large steam-ships, as a three-decked schooner, and her standing rigging is of Smith's patent wire rope. The spar-deck forms a fine and uninterrupted promenade; and on each side the quarter-deck there are broad seats covered with mahogany, resembling ranges of sofas, which also form bims. The state saloon is about 32 feet square, being of expression of elegance by which they are characterized: looking still higher, he would behold the open roof of timber, undisguised by the painter's brush, telling its own simple honest tale. Advancing still further eastward, he arrives in the transverse, where his attention will be caught by a semi-octagon stone pulpit, partly copied from an ancient one still existing in Beauvoir Church, Hants, although inferior to it in several respects. The latter is pure in all its details, but unfortunately this is not so; for instance, there is a row of square quatrefoils round the base of the pulpit, which are decidedly of Tudor character, and which are so very paltry and insignificant, as totally to spoil the whole design. But this is not its only fault; the effect is further injured by the small, shallow, and poverty-stricken foliature, spanned over the windows. The most lamentable fault is the tasteless and unphilosophical application of the four small pillars (on which the pulpit appears to rest) rising out of a bunch of foliage, and appearing as if in the act of falling down. The next object claiming attention, is the groined ceiling over the altar, which is most beautiful in design; the ribs spring from small pillars of stone, placed in the angles of the chancel, and the whole groining has the appearance of being of the same material.

**Manchester. JAMES HADFIELD.**

**GOING.**

At 6h. 10m. abreast of the Rock. At 2h. 16m. abreast of Trinity Lamps. 6h. 55m. N.W. Buoy. 5h. 50m. Light Ship. 12h. 15m. Holyhead. 6h. 4m. Rock Light House.

**RETURNING.**

Making the trip out and back upwards of 130 nautical miles in 11 hours and 56 minutes. Her speed was occasionally 12 knots, she was found remarkably easy, the engine made 135 revolutions per minute, the water of the paints with surpassing brilliancy, and the rigidity of the substance renders it un-liable to warp.

On the 17th ult. she proceeded to Dublin, from thence to Southampton, and we presume, ere this, has taken her departure for the east.

**THE "GREAT BRITAIN" IRON STEAM-SHIP.**

This vessel was launched on Wednesday, July 19, in the presence of Prince Albert and many distinguished guests. We have frequently noticed this vessel during her progress, but we were not able to general to our readers, as the stouter of water, is designed for the Baltic and English coasts, and is not a war-vessel, but for the carriage of mails and passengers. She is a vessel of 3,947 tons burden, 1,000 horse power, and 120 feet in length, and is constructed on the plan of a screw-propeller vessel. She has a constant draught of 26 ft., and a forward or second class of 119 in 6 ft. She will make well lightened and ventilated. The third deck consists of the dining saloons. The grand saloon being 91 ft. 4 in. by 20 ft., and the second class or forward saloon 61 ft. by 21 ft. 9 in. These saloons are all 8 ft. in height, and surrounded with sleeping rooms, of which there are 26 with one bed, and 113 with two beds, giving 252 berths; an improvement has been introduced which affords, by means of passages, much greater privacy than in any other vessel. The fourth deck is for cargo and coals. Under this deck, in the after-part of the ship, is a large air-room for an air-conditioner from the boiler to the fore bulkhead. The forecabin is appropriated to the officers and sailors; mess-rooms, berths, sal-rooms, &c., are underneath. The middle part of the vessel, from the after-part of the after-deck to the position of 89 ft. is occupied by the engines, boilers, engineers' cocoa, and cooking department, which is also over the boilers. There are three boilers capable of containing 230 tons of water, with 26 ft. diameter, and 36 ft. 6 in. high. The cylinders are 88 inches in diameter, which stand in pairs opposite to each other, at an angle of 60° to work the shaft of the propelling gear. The chimney is 8 ft. in diameter, and 26 ft. high, and the crown of the chimney is 7 ft. above the deck. She will carry about 1,700 square yards of canvas, rigged with Smith's wire-ropo. The hull is divided into 4 water-tight bulkheads. She is built by the due of the British Admiralty, and is a new build, under the immediate direction of Mr. F. P. Smith. Upwards of 1300 tons of iron have been used in her construction, and that of the engines and boilers. Her draught of water when loaded will be at 10 ft. 9 in., and at 8 ft. 8 in. when empty, the keel is from 3 to 1 inch thick, and all the other plates about 1 in. thick. She is clinker-built, and double riveted in the longitudinal laps. The ribs are framed of angle iron 6 in, by 3½, and are about 14
in. apart in the middle, gradually increasing to 18 and 21 inches, so that they are so placed as to be riveted upon ten iron keelsons, the centre ones being 3 ft. 3 in. deep. As the engine-room, for the purpose of additional strength, there are 9 intermediate double ribs, and 10 additional transverse ribs. The joists for the support of the coals are made in two forms; one 14 ft. and the other 12 ft. by 1 inch riveted on the side. The distance of the joists are about 23 ft. The deck planks are fastened to the angle iron by screws from below, and fixed at each end with iron plates. The side plating is 14 ft. long, divided into two sections, in resisting both external and internal pressure, and are supported lengthwise by longitudinal beams and stanchions. To preserve the hull from stray electro-magnetic currents, two iron bars, riveted together, run the length of the vessel, and these angle-iron bars and deck planks. The wrought-iron masthead was manufactured at the Mersey Iron Works, and is the largest ever constructed, weighing 16 tons and 13 cwt., and being 98 ft. long, changed by machinery, and will be capable of throwing off 7200 gallons per minute.

The ROYAL STEAM YACHT VICTORIA AND ALBERT.—This vessel, the particulars of which we gave in the last June number of the Journal, p. 216, and are reproduced in the accompanying cut, is expected to be ready about the first of July. Commander Smith tried the speed of the vessel by the log and found it to be about 12 knots or nearly 15 statute miles per hour, the engines at the time making 15 strokes per minute. Her engines are collectively of 490 horse power; they reflect the highest credit upon Messrs. Manuabys and Field, the eminent engineers, for the superiority and beauty of their workmanship; they are upon the direct action principle, with double cylinders, as patented by Mr. Joseph Maudsley and Mr. John Field, and described in the Journal, Vol. iii., p. 75, accompanied by engravings. Although this was only the first trial, the engines performed their duty with a smoothness, neatness, and certainty entirely beyond expectation. Commander Smith said the speed of the vessel by the log and found it to be about 12 knots or nearly 15 statute miles per hour, the engines at the time making 15 strokes per minute. Her engines are collectively of 490 horse power; they reflect the highest credit upon Messrs. Manuabys and Field, the eminent engineers, for the superiority and beauty of their workmanship; they are upon the direct action principle, with double cylinders, as patented by Mr. Joseph Maudsley and Mr. John Field, and described in the Journal, Vol. iii., p. 75, accompanied by engravings. Although this was only the first trial, the engines performed their duty with a smoothness, neatness, and certainty entirely beyond expectation. Commander Smith said the speed of the vessel by the log and found it to be about 12 knots or nearly 15 statute miles per hour, the engines at the time making 15 strokes per minute. Her engines are collectively of 490 horse power; they reflect the highest credit upon Messrs. Manuabys and Field, the eminent engineers, for the superiority and beauty of their workmanship; they are upon the direct action principle, with double cylinders, as patented by Mr. Joseph Maudsley and Mr. John Field, and described in the Journal, Vol. iii., p. 75, accompanied by engravings. Although this was only the first trial, the engines performed their duty with a smoothness, neatness, and certainty entirely beyond expectation.

The ENGLISH FREGATE PENelope.—This extraordinary ship, which has created so much interest in the nautical world, by being cut in half and lengthened 63 feet amidship, and transformed from a sailing to a steam frigate, is now ready. The engines are by Messrs. Seaward and Cope. There are two of them, each weighing nearly 7000 lb. and the total power is only 429 horse, the velocity of the piston being taken at 229 feet per minute. The diameter of the cylinder is 92 inches, and the length of stroke 10 feet. Each engine has eight bolts, and the bolts are made, as with them are combined every really valuable invention in that department of the application of steam-power in the royal or mercantile navies of this or any other country. They have brake or change pumps, to preserve the steam up to a certain point, a water pump to fill the cylinders when required, a means of regulating the rate of admission of water by extracting the heat from it before it goes overboard, expansion gear by which the steam can be used more economically; but the boilers produced are of the most simple description, being wrought iron, compact and octagonal, but a very small space in the vessel, compared with their great power to move paddle-wheels 10 feet 6 inches broad and 31 feet diameter. The engines are driven by the paddle-wheels, by water-tight baulks, and not the least heat is communicated from the engine to any other part of the vessel, and their presence is not perceptible in the habitations of the men. The boilers are expected to be completed in the course of the present month, and ready for sea. We hope to be able shortly to give full particulars of both the vessel and her engine.

BEAULS PATENT ROTARY ENGINES.—At the Society of Arts, on Wednesday evening, 14th June, Mr. Whishaw (the secretary) read a paper on "The New Rotary Engines," invented by Messrs. L. T. & B. E. East Greenwich, New York, and Mr. Whishaw stated that he himself was the agent for the England. Although the motor of the engine is 14 inches in diameter, and in 84 inches long, it is 30 inches long, and weighs 2000 lb. It is a three-cylinder engine, and is capable of working at a speed of two strokes per minute, and to be able to give any desired power. The engine is said to be perfectly silent, and is very efficient. The engine is said to be perfectly silent, and is very efficient. The engine is said to be perfectly silent, and is very efficient. The engine is said to be perfectly silent, and is very efficient. The engine is said to be perfectly silent, and is very efficient. The engine is said to be perfectly silent, and is very efficient. The engine is said to be perfectly silent, and is very efficient. The engine is said to be perfectly silent, and is very efficient.

MISCELLANEOUS.

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of the was 1st stem It at a presented, suffered Court, have points fluid, the is which of instances running pronounced by rationale the 9th paper of May 1837, the has recently been, at the 10th of July; this year, however, there was a rise of the tide. This rise continued only four days, after which the water fell, and it still continues falling as it always does until the period of the summer solstices. History affords no example of so early a rise of the river, and a few instances are recorded of a second rise taking place shortly after the first. One of these instances occurred in the reign of Cleopatra and the other in the year 1777.—Cologne Gazette.

Rise and Fall of the Mediterranean Sea.—A singular phenomenon appeared between the harbours of Valetta on June 2, the water suddenly rising to the height of three feet; overflowing the works of the new dry dock; it almost immediately fell five feet and a half; during this period, a great current was set out of the harbour, so that the boatsmen could scarcely stem. It is supposed this circumstance must have occurred through some earthquake at a remote distance. We hear that at Tripoli in Barbary, several seamen's lives have been lost.

Legal Decision Regarding Well-Sinking.—In the Court of Exchequer Chamber in Error, on Wednesday, May 19, a judgment of considerable importance was pronounced by Lord Chief Justice Tindal, in the case of Acton v. Bashall. The defendant, whose horse was killed by the steamship, the plaintiff had sunk a well, and the water which it collected was sufficient to work his mill; but in 1837, the defendant dug a coal-pit three-quarters of a mile distant, which, eventually, drained the well dry, and, therefore, an action for negligence was brought. On the trial, the judge told the jury that if the defendant had dug the pit in the manner which was usual in working and winding a mine, he was justified by what had been done. There were exceptions to this charge, which had, subsequently, been argued, but the Court now decided that the summation was correct. The Court were of opinion that the case should be decided on the principle of the rule which gave to the owner of the soil everything under the surface of it; and that if the plaintiff had suffered loss by the exercise of the defendant's right, it was a loss which was damnum nullum injurious, and for which no action could be maintained.

Supplement to Patents granted in June.

William Newton, of Chancery-lane, civil engineer, for "improvements in the preparation of paper designed for book notes, government documents, bills, cheques, deeds, and other purposes, wherein protection and safety from forgeries or counterfeit is required." (A communication.)—Sealed June 15.

Thomas Mitchell, of Dalton, York, dyer, for "a machine and apparatus for increasing and permanently fastening the face or gloss of all kinds of woolen, worsted, and fancy cloths, by the application of steam above, without immersive the goods in water."—June 15.

Thomas Richard Guppy, of the Great Western Iron Ship Building and Steam-engine Works, Bristol, a civil engineer, for "improvements in the building of metal ships and other vessels."—June 15.

George Edmund Donisthorpe, of Bradford, York, top manufacturer, for "improvements in combing wool and other fibrous substances."—June 15.

John Oliver York, of Upper Colliery Street, Westminster, engineer, and William Johnson, of Horseley Iron Works, Staffordshire, ironmaster, for "improvements in paving or covering roads, streets, and other ways or surfaces."—June 15.

Samuel Mason, of Northampton, merchant, and Caleb Babbs, of Leicester, manufacturer, for "improvements in the manufacture of boots, shoes, slippers, overcoats, and cloaks, and improvements in machinery or apparatus used in such manufacture, and in the preparation of materials for the said manufacture."—June 15.

William Edward Newton, of Chancery-lane, civil engineer, for "improvements in apparatus for propelling vessels."—June 15.

George Robins Booth, of Hanley, Stafford, manufacturer and chemist, for "an improved mode of applying heat from various combustibles to manufacture and other useful purposes and clothing the same into paper, (A communication.)—June 15.

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Lemuel Willman Wright, of Guisford Cottage, North Wales, engineer, for "improvements in machinery or apparatus for bleaching various fibrous substances, and is also in possession of an invention of improvements in machinery or apparatus for manufacturing the same into paper, (A communication.)—June 15.

List of New Patents.

[From Mansfield, Robertson's Ltd.]

Six Months allowed for Enrolment, unless otherwise expressed.

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Samuel Eccles, of Hulme, Lancashire, machinist, and Matthew Curtis, of Chorton-upon-Medlock, machinist, for "improvements in bonns for weevling."—June 22.

Moses Taylor, of Lincoln-ain, gentleman, for "improvements in collars for horses and other animals. (A communication.)—June 23.

Nicholas Troughton, of Swavesey, Cambridgeshire, gentleman, for "improvements in dressing ores requiring washing."—June 23.

William Needham, of Birmingham, gunsmith, for "improvements in firearms."—June 24.

John Duncan, of 72, Lombard-street, gentleman, for "improvements in the casting and construction of types for printing." (A communication.)—June 26.


Richard Waller, of Bradford, York, coach-builder, for "improvements in the construction of carriages. (A communication.)—June 27.

John Thomas Betts, of Battersea, gentleman, for "improvements in covering and stopping the tops of boxes, jars, pots, and other vessels." (A communication.)—June 27.

Edward Johnson, of Nelson-square, Blackfriars-road, Surrey, surgeon, for "improvements in apparatus for bathing."—June 27.

Alexander Parke, of Birmingham, artist, for "improvements in preparing solutions of certain vegetable and animal materials, applicable to preserving wood and other substances, and for other uses."—June 27.

Charles Kurtz, of Liverpool, manufacturing chemist, for "an improved lamp, for the combustion of naphtha, turpentine, and other resinous oils."—June 30.

Charles Tetley, of Bradford, gentleman, for "an improvement or improvements in the action of boilers, otherwise generators, for producing steam."—June 30.

James Lancaster Lines, of Garden-court, Middle Temple, Barrister-at-law, for "improvements in steam engines, and in machinery for propelling vessels, which improvements are applicable to other purposes, being on extension of patent for the term of five years granted by his late Majesty King George the Fourth to Alexander Calloway, King-street, Southwark, engineer."—July 1.

James John Green, of Woolwich, surgeon, for "improvements in apparatus for securing, or fixing, standing, rigging and chains, and other tackle."—July 1.

Charles Phillips, of Chipping Norton, Oxford, engineer, for "improvements in apparatus or machinery for cutting grass, corn, and such like substances, in apparatus or machinery for cutting vegetable substances as food for cattle."—July 3.

Thomas Welldale, of Horsham, Sussex, machinist, for "improvements in machinery for making hay, which improvements are applicable to other agricultural purposes."—July 3.

James Verity, of Leicester-street, Regent-street, boot and shoemaker, for "improvements in the heels and soles of boots and shoes."—July 3.

James Hartley, Wear Glass Works, Sunderland, glass manufacturer, for "improvements in the manufacture of glass."—July 3.

James Boydell, jun., of Oak Farm Works, Stafford, ironmaster, for "improvements in the manufacture of metallic roofs and jalousies, and improvements in joining sheets or plates of metal, for various purposes."—July 6.

Florimond Delcroix, jun., of Norfolk-street, Strand, merchant, for "improvements in apparatus for the preparation of gas for use and the passage of air in chimneys of furnaces." (A communication.)—July 6.

James Neville, of Walworth, civil engineer, for "improvements in the form and manufacture of horse-shoes."—July 6.

John Wright and Richard Wright, both of Richmond, York, boot and shoe makers, for "improvements in boots and shoes, and other like covering for the feet."—July 6.

Joseph Cooke Grant, of Stamford, Lincoln, ironmonger, for "improvements in the construction of harness."—July 6.

John Woodhouse Day, of Well Field, Durnham Collery, and land agent, for "improvements in apparatus to facilitate the loading of vessels with coal, cumbus,"—July 24.

George John Newbey, of King William-street, London, artist, for "improvements in the manufacture and construction of window blinds, shutters, and other similar articles, parts of which improvements are applicable to other purposes."—July 6.

Henry Clarke Ash, of Birmingham, manufacturer, for "improvements in the construction of teapots."—July 6.

James Booth, of Liverpool, clerk, and doctor of laws, for "improvements in the means of converting rectilineal into rotary motion, and of converting rotary into rectilineal motion."—July 6.

Thomas Masters, of Upper Charlotte-street, St. Pancras, confectioner, for "an improved freezing, cooling, churning, and ice-preparing apparatus, the parts of which may be used separately or in combination."—July 6.

Joseph Howes, of Limehouse, esquire, for "improvements in propel-ling, parts of which improvements have been communicated to him by a foreigner residing abroad."—July 6.

George Parsons, of West Lambrook, Somerset, gentleman, for "a portable roof for various agricultural, and for other purposes."—July 7.

George Parsons, of West Lambrook, Somerset, gentleman, and Richard Clyburn, of Uley, Gloucester, engineer, for "improvements in machinery for boring, cleaning, and crushing various animal and vegetable materials or substances."—July 10.

Jacob Samuda, of Southwark Iron-works, engineer, for "improvements in the construction of steam-engines, particularly applicable to the purposes of steam navigation."—July 10.

John Laird, of Birkenhead, Cheshire, ship-builder, for "improvements in the construction of steam and other vessels."—July 10.

William Edward Westfield, gentleman, engineer, for "an improved agricultural machine, or implement for ploughing, harrowing, or filling land." (A communication.)—July 13.

Richard Laming, Radley's Hotel, New Bridge-street, Blackfriars, London, gentleman, for "improvements in the preparation and application of ammonia, to obtain certain chemical products."—July 13.

Joseph Mansdlay, of Lambeth, engineer, for "improvements in machinery used for propelling vessels by steam power."—July 13.

George King Scullthorpe, of Frederick's cottages, Coleharbour-lane, gentleman, for "an improved method of fastening and securing bedsteads."—July 13.

Henry Pinkus, of No. 1, Duke-street, Portland-place, esquire, for "improvements in the methods of applying motive power in combination with apparatus and machinery, to certain purposes in propelling, and applicable to railways, to ships, or other vessels afloat."—July 13.

Stephen Geary, of Hanover-place, King's-cross, architect and civil engineer, for "improvements in machinery or apparatus for clearing, cleansing, watering, or wholly or partially covering with sand, or other materials, roads, streets, or ways, and which machinery is also applicable to other similar purposes."—July 13.

William Midworth, of Mansfield, Nottingham, brass founder, for "improvements in the construction of what are commonly called street guard plates for public water services, and in the mode of constructing the stop-valves, or stop-stops, for stopping, opening, or stopping, stop-cocks are also applicable to various other purposes, where the flow of water, or other liquids, is required to be regulated or suspended."—June 13.

Henry Smith, of Birmingham, Warwick, for "improvements in apparatus and machinery for causing the engine of a coach to give a more even vibration when standing in the street."—July 13.

William Hutchinson, of Joy Bridge-lane, Strand, marble and stone merchant, for "improvements in machinery for cutting marble and other stones."—July 13.

James Neville, of Walworth, civil engineer, for "improvements in obtaining power by means of gases, applicable to working machinery."—July 13.


Robert Ransome, of Ipswich, iron-founder, Charles May, of the same place, also of 4, Great-street, Rotherhithe, Arthur Ransome of Playford, Suffolk, farmer, and William Worby, of Ipswich, foreman to Messrs. T. B. and A. Ransome, for "improvements in machinery and apparatus used for ploughing and scything land, and for reaping, and for improvements in machinery and apparatus used for threshing, cutting, and gridding for agricultural purposes, and for improvements in the construction of whipple-trees."—July 15.

James Overend, of Liverpool, gentleman, for "improvements in printing fabrics with metallic materials, and finishing silks and other fabrics."—July 15.

William Garrett Taylor, of Halliwell, Lancaster, cotton spinner, for "improvements in the machine and machinery for the manufacture of silk fabrics, and in preparing and dressing yarn for weaving."—July 15.

James Gallop Beater, of St. Clement's-place, Worcester, tailor, for "improvements in the fastenings for trousers-straps, and in fastenings for wearing generally."—July 15.

Henry Austin, of Hatton-garden, civil engineer, for "improvements in the construction of water-closets."—July 20.

Charles Bertram, of the Borough of Newcastle-upon-Tyne, esquire, for "an improved mastic or cement, which may be also employed as an artificial stone, and for coating metals and other substances."—July 20.

Joseph Harvey, of James-street, Buckingham-gate, gentleman, for "improvements in the construction of two-wheeled carriages."—July 20.

William Daniel, of Abercrombie, near Newcastle, Master tinnymaker for "improvements in rolling iron into plates or sheets."—July 22.

James Nasmyth, of Manchester, engineer, for "improvements in machinery or apparatus for driving pist, parts or parts of which improvements are applicable also to forging or stamping metals and other substances."—July 22.

Joseph Daniel Davidge, of Greville-street, Hatton Garden, machinist, for "improvements in manufacturing certain materials as substitutes for whalebone applicable to various useful purposes, and in the machinery for effecting the same."—July 25.

David Napier, of York-road, Lambeth, engineer, for "improvements applicable to boilers or apparatus for generating steam."—July 25.

Federic Lewtas Westenhoh, of 131, Regent-street, merchant, for "a doubled speeded steam-engine for driving a printing press."—July 25.

Samuel Faulkner, of Manchester, cotton-spinner, for "improvements in the machinery or apparatus for carding cotton and other fibrous substances."—July 25.

William Bedloe, of Poole's Hotel, London, gentleman, for "improvements in railways, and in the machinery or apparatus employed thereon."—(A communication.)—July 26.

Great and manifold have been the disputes on the terms beauty and taste. Right reason and sound judgment seem to enter principally into the composition of the latter quality, whether applied to morals or the fine arts, and with regard to the former, much cloudy argument may be cleared away by considering beauty in two points of view—as positive or intrinsic, and relative; the former appealing to the senses, the latter addressing itself to the understanding. The agreeable sensations arising simply from the form or colour of an individual object, is due to its intrinsic beauty. Relative beauty arises from the fitness of things—from the perception of a means adapted to an end—from the parts being well calculated to answer the design of the whole. Relative beauty, therefore, being intimately connected with utility, is that which we principally recognise in architecture. Many objects intrinsically beautiful may occupy a prominent station in an architectural composition; but although strong and abiding associations of ideas, may often render it difficult to distinguish intrinsic from relative beauty, yet it is certain that beauty is produced in architecture in the most eminent degree, by combinations of parts, none of which could justly be called beautiful if separated, and considered singly on their own merits; and it is no less certain, that the most beautiful elements of architectural composition contribute nothing to the beauty of the whole, unless properly associated. They merely become absurd, as may be seen daily in the base prostitution of the exquisite models of Greek art.

That beauty in architecture is inseparably connected with the ideas of fitness and utility, is made evident by the fact, that we acknowledge the highest degree of beauty to subsist in the most opposite extremes of taste—in other words, that the exercise of judgment and reason, which constitutes taste, leads us to consider beauty with reference to fitness and utility; and if one modification of architecture is admitted to a pre-eminence over others, it is because its fitness is the most obvious, and the means by which its purpose is attained, more simple and immediate. Whether we contemplate the architecture of the Egyptians or the Greeks, the stupendous piles of the Eternal City, the gorgeous monuments of the Gothic style, the mystic intricacy of the Alhambra, or the finished productions of modern Italy, the mind perceives, in each and all, the adaptation of the means to the end, and the development of the spirit of the age and country, in which, and for which, they were created, and these form the essential principle of the relative beauty of architecture. Now where shall we turn to find the beauty born from the spirit of our age and country, in the architecture of the 19th century? The very proposition at the head of this paper is an answer. In the 19th century we are in possession of a material in extensive operation, offering us new modes of construction, new proportions, the power of creating new forms and combinations, differing from every thing that has preceded them in art. It is now 62 years, since the erection of the bridge at Colebrookdale first revealed the capabilities of cast iron in construction on a large scale; and during that period, science and cast iron have marched hand in hand, with strides it is amazing to contemplate. But what has art effected with this new power? The Institute of British Architects are still at the inquiry "what effect should result to architectural taste, from its general introduction?". In the real adaptation of cast iron to architecture as an art, we are much where the Dorians were, when they had placed four trunks of trees in a row with a tile upon each. There the Doric order might have remained, had the Dorians been of our stamp, and there it would have remained had trunks of trees instead of cast iron been first used in construction in our time. Or perhaps the parallel will run closer, if we compare ourselves with the ancients, when they first adopted the principle of the arch, since they combined it with architectural forms already established; as we shall probably seek to do with cast iron, whenever we begin to bestow our attention upon it. After 62 years' experience, under circumstances through which a new and original style of architecture might have been developed, we are still where the Romans may have been when they built their Cloaca Maxima.

To what are we to attribute this stagnation in all our ideas, as regards art in this point of view? Doubtless, to the blind spirit of imitation and obstinate adherence to precedent (whether applicable or not, seems of little importance) which characterises the architecture of the present day. Where cast iron is to be used, the first requisite seems to be to keep it out of sight, or to make it look as much as possible like something else. To impress upon it the character of a style would be more in the spirit of the ancients, whom we profess to adore. Not that it is in the power of any man to stand forth and say, "I will invent a style." A style, like a language, must be the growth of time and circumstances; and who is to make the first essay in an age when precedent is "the be-all and the end-all," and when he who cannot command success, cares not for the higher distinction of deserving it?

The fatal effect of this spirit on our architecture might be evidenced in various ways. What has been advanced on the subject of cast iron is very far from being the strongest point in which it might be shown, but the argument must be limited to the question under immediate con-
sideration. May, perhaps, be further illustrated by a reductio ad absurdum. Let us suppose that the Greeks had possessed no marble, but had known the art of casting large weights of iron, and had thought proper to use it "with regard to arrangement and design," as it might have been used in their hands; we will further suppose that the art had been lost; we should, perhaps, still have looked upon the monuments of antiquity so designed and constructed, in the same vulgar spirit with which it has been the fashion to contemplate the Parthenon—as something to be imitated. How would our "genius have been cramped!" (as the phrase is). How should we have lamented at finding ourselves restricted to the use of stone, or marble, in which we should have sought in vain to reproduce the light forms of antiquity! Instead of striking out original proportions, and combinations adapted to our means, we should sit down perfectly convinced that neither beauty nor character could be created under the disadvantage of such materials, and abandon ourselves in despair to the construction of bare walls, the monstrosity of which might now and then be relieved by the crash of a public building, though the laudable attempt of some classical genius to support it on Bath stone columns five-and-thirty diameters high. Extravagant as this notion may appear, it is not without its parallel, in the neglect of the present generation to seek for the elements of beauty in a material which new wants and new principles of construction are every day rendering more and more inevitable in our constructive architecture. It is not, of course, with the intention of suggesting any new mode of treating cast iron in point of art, that these observations are submitted to the Institute; but we may fairly infer that neither the ancient nor medieval architects who have bequeathed to us inventions in art, which (lacking as we do the vivifying spirit of original thought) it cost us something even to imitate with success, would have overlooked the peculiar capabilities of a material holding so important a place in their constructive architecture, as cast iron now does in ours. Material has, in all ages and styles, performed an important part in modifying design; and it is recognised as one of the most important elements of relative beauty, as exhibited in architecture, that the real and apparent construction should assimilate, and that the simplest architecture, in whatever style, is that in which art has turned to beauty and ornament the forms and proportions dictated by necessity, or by science. Without, therefore, hazarding any new or startling problems on cast iron, or on architecture in general, it may be to the purpose to enter into some inquiry as to the use of metal in the arts, its influence in modifying design, and the purposes to which it might be applied in architecture, without losing sight of the precedents afforded by antiquity and the middle ages, to which we seem bound hand and foot.

1. Let us consider first, how far the proportions of the supports, which is the most obvious effect to be produced by the formation of a genuine style adapted to the use of cast iron, is to be reconciled with any principle derived from the works of antiquity. It will scarcely be disputed, that no proportion of parts, so long as there is a perfect accordance in the different members of any composition, is inconsistent with beauty. That this was a principle of ancient art, may be inferred from the fact, that among the numerous examples of the Doric order, which have survived from antiquity, no two present the same proportions. Nor can it be argued, that on the ground of proportion exclusively, any one is more perfect than the rest, since each must be viewed with reference to the character impressed upon it, whether tending most towards majesty or grace; and its beauty will consist in the perfect accordance between one feature and another. It was a remark of Sir John Soane, that this diversity in the antique orders of architecture, was not the result either of caprice or negligence, but of a careful study of the effect intended to be produced. Thus from the temples of Paestum to that of Cora, the Doric column passes through a variety of proportions, ranging from 41 diameters in height to 9. To what proportions the architects of antiquity might have drawn out their supports, had metal entered into their construction as largely and familiarly as it now does into ours, it would be treading on dangerous ground to offer a conjecture; but that they conceived, and freely designed, in a style of architecture

of extreme tenacity, when they were unembarrassed by solid materials, is evident, from the decorations of Herculaneum and Pompeii, and other remains of ancient art. Nor is the architecture which the brush has perpetuated on the walls of antiquity, to be regarded as a mere capriccio. Throughout these decorations a great portion of the framework is architectural, and presents an assemblage of members analogous to those of regular architecture, carried out with a uniformity and consistency, which entitle these compositions to be considered as an organized style, adapted to the purpose to which we find it devoted. It is not intended by these observations, to propose that we should solidify the decorations of Herculaneum or the Baths of Titus, (though it would be easy to do worse,) but it seems indisputable, that the ancients saw nothing incompatible with beauty or good taste, in the proportions thus developed. Had it been otherwise, they would surely have avoided the semblance of architecture altogether, instead of elaborating into a regular style these exquisite creations of the fancy. (See the head piece.)

Although this modification of architecture is confined to painting, yet there are other works of ancient art in which proportion takes as wide a range, and in which the modifications of design are to be directly traced to the nature of the materials employed, and most especially to the use of metal. The candleabra and tripods of anti-
quity, of which such numerous examples are extant, offer the most convincing proofs of the opposite extremes which beauty may touch,

Antique Tripods.

Marble. Bronze.

where it is relative and connected with the principle of reason and utility. How different are the proportions of these objects, modelled on the same general form and outline, and destined to the same office, according to the material, marble or bronze, in which the artist has thought proper to execute them. Change the material, and the one becomes absurdly heavy, the other impracticable. And yet so little attention has been paid by the moderns to a principle which might be supposed too obvious to be missed, that it would be very easy to point out candleabra copied from antique marbles and cast in iron, without regard to the absurdity of executing the mass in metal, when designs so much more consistent with the material, and equally authorised by antiquity (since it seems indispensable to copy something) were to be had for choosing; and others might be indicated in which a better feeling, as regards the shaft, only renders more obvious the disproportions of a lumpy pedestal, substituted for the exquisite tripod arrangement, universal in the metal candleabra of antiquity. Cast-iron, however, being so much more brittle than bronze, would require a somewhat different treatment, if considered in an original spirit. Besides candleabra and tripods, we may point to antique seats, in which the modification from the same cause is no less striking. And even in those forms, which are less open to variety from being the direct representations of natural objects, the handling is with equal skill adapted to the materials. The draperies of statues are studied with especial reference to this point; and some works of antiquity which have descended to us in marble, have been pronounced by competent authorities to be copies from bronze, on account of their peculiarity in this respect. In vases, also, there is a marked difference in the design, as the material is marble or bronze as may be seen in innumerable examples in the museum at Naples. If our means are deficient for carrying this parallel of the ancient practice in marble and metal much farther, it makes at least a strong case, that it is uniform and consistent as far as it goes. It is no objection to the argument which has been drawn from the decorative architecture of Herculaneum and Pompeii, that the ancients never attempted to approach that style in execution, by reducing their supports to the minimum which might have been permitted by the materials they were in the habit of employing. It is not contended that cast-iron is necessarily to be reduced to its minimum. The trabeculated system, which is the fundamental principle of Greek architecture, and the predominant feature in the derivative style of the Romans, demanded a certain proportion between the masses which were employed for the architraves, as connected with the marble ceilings of the peristyles, the pediments, and the roof, and the columns on which they rest. We learn from Vitruvius that the ancients studied the nicest shades of distinction in these proportions. And how happily have they been determined! Human ingenuity has sought in vain to improve upon them, and every palpable deviation in parallel combinations, brings with it the sensation, that the principles of relative beauty are disturbed. Change the material, as in the timber architraves of the Tuscan order, according to the doctrine of Vitruvius, and the proportions are at once revolutionized—but without any compromise of the essential principle of beauty, since the means and the end remain consonant, and the parts are fitted to the design of the whole.

2. In considering the works of antiquity with reference to the influence of the use of metal upon architecture, we have been reduced to argue upon analogies. The consideration of another style of architecture, which divides with the chefs d'œuvres of Greece itself, the admiration of posterity, will afford us a much clearer view of the influence which cast-iron may exercise upon art, and what is more
without compromising the daring principle of imitation and precedent. It is indeed strange, that so little advantage should have been hitherto drawn from the employment of this material, in a style to which it so readily lends itself as the Gothic.

The principle of Gothic architecture, as opposed to the Greek, the prevalence of the perpendicular line, has been well discriminated by Rickman; and it is not to be doubted that another principle with the Gothic architects, if indeed it be not identical with the first, was the reduction of all the points of support, both real and apparently, to a minimum. This is especially obvious in the earlier style of Gothic, where the clustered shafts calculated to effect this impression on the eye, are detached from the main body of the constructive pier with which they were at a later period incorporated. Sometimes this effect is greatly increased by a combination of isolated shafts, without the nucleus of a central pier, and in the composition of subordinate parts, as in double and triple lancet windows, where the support given by the columns is only apparent, we have single isolated shafts of excessive slenderness—and there are some remarkable examples, which go far to prove this principle of design to have been limited only by the capabilities of the materials employed. Such is the lady chapel of Salisbury Chapel, where four single isolated columns, 32 diameters or thereabout in height, form, or appear to form, (it is not very certain which,) the actual support of the main vaulting of the roof, leaving after ages to marvel at the hardihood of the design, and the skill of the execution, and though last, not least, the success which has attended it. There are other cases in which it is evident that the supports have been reduced as far as prudence would admit. The nave of Herne Church in Kent, affords an example of single shafts, in which the proportions have undoubtedly been thus regulated.

Now this characteristic of Gothic architecture, which the architects of the middle ages attained generally by the help of Purbeck marble, with much limitation and difficulty, we in the 19th century have the means of producing with far greater facility, and carrying to a much greater extent, by the aid of cast-iron, which places it in our power to arrive at a degree of lightness, of which the Gothic architects could only dream, though they made bold efforts to realise it; and it does appear most extraordinary, considering how popular Gothic architecture has become, and how well its details are understood, that so few attempts should have been made to render iron available for the combined purposes of construction and beauty. On the former consideration, it has sometimes been used, but either in disguise, or with economical views only, in the naked deformity of a mere post or joint, without relation to the fitness of the whole, and with scarcely even a pretence at architectural character. Considering how essential it is in modern churches that the internal supports should cause the least possible obstruction, it is strange that the peculiar sympathy between obvious utility, Gothic architecture, and cast-iron, should not have been more diligently studied. The inveterate canker of imitation and precedent, has in this case as in others, poisoned the sources of invention. There is no original precedent for cast-iron columns, and we must therefore persist in building them with stone, or with something which is to pass for stone; or if we use iron, we must give up as impracticable all attempt to give it a genuine architectural character. We may with certainty pronounce in this case, that iron might be used strictly in the spirit of the Gothic architects; and it may even be affirmed that they would willingly have taken the utmost advantage of this material had they possessed the art of casting it. If a precedent is yet demanded, the actual use of metal, if not iron, in columns, may be seen in Exeter Cathedral, where isolated shafts of brass enter into the composition of the sedilia adjoining the altar.

Let us bring the search after the kato in the construction of Gothic columns in cast iron, to a practical test. The weight of the clerestory and roof on an ordinary church of forty feet high or thereabout, standing on lateral arches of eleven or twelve feet opening, may be about twenty tons on each column, and supposing the shafts of the columns to be twenty feet long, the requisite strength in cast-iron would be met by a diameter of six inches. Now there is no reason whatever why a column of forty diameters in height, should be abstractedly considered deficient in beauty. The effect of this, as of any other proportion, would depend entirely upon its being in union with the other members of the architecture, or the reverse; but if we suppose a stone arch to be carried on this column, a very material practical objection arises, inasmuch as there will not be room on the top of the column to develop the necessary bulk of the stool of the arch, either as regards its construction or decoration, unless the capital were spread to a degree involving weakness, both real and apparent. Hence an incompatibility between such a column, and such an arch, destructive of relative beauty. If, however, we consider the properties of cast-iron, we shall find that a solid column on this scale is the most disadvantageous mode of employing it, since a much smaller quantity of metal expanded into a hollow cylinder will possess a much greater degree of strength. If we make the shaft of a column under these circumstances twelve or fourteen inches in diameter instead of six, we shall find, while we consult economy and utility in the column, that the arch will grow from it without exaggerating the projection of the capital, or departing in the slightest degree from any form or proportion authorized by precedent.

There is, however, an original example which might have been put in the foreground, where the columns are actually reduced beyond the proportions which the architect, for reasons best known to himself, has thought fit to give to the stool of the arch; and the capital is piece out on each side, by a sort of attached corbel upon which the mouldings terminate. It is at Winchcombe Church in Gloucestershire. Whatever may be thought of the principle of this arrangement, the effect is very bad, but being a precedent, and therefore a desirable addition to the stock of materials for imitation, it is thought right not to withhold it. Whenever the rage for precedent and imitation shall abate, there are stupendous effects to be produced in architecture, especially of the Gothic character, by the use of iron columns; but it must be when the material is recognised to be legitimate, and not cased with deal, or "painted and sand'd," or "jointed and coloured," as the price books have it, "as stone."

Thus far, in this branch of the subject, cast iron has been considered with reference to columns only. In subjecting other members of the Gothic style to a similar inquiry, it will be necessary,
since we are arguing upon precedents, to argue with more caution, as precedents become less obvious. We may learn, from a comparison of carvings in stone and wood, how completely the mode of treatment varied with the material in Gothic as in classical art, and especially how well the relief of the ornamental parts of the work, was proportioned to the bulk necessary to the self-support of the substances employed. The skill with which a considerable variety of moulding and outline, and an effective distribution of light and shade was produced in wood without employing unnecessary thickness of material, or exposing a high relief to the destroying action of the weather, is not one of the least remarkable instances of the ability of the Gothic architects, nor the least worthy of careful examination by their imitators, some of whom have nevertheless studied to bestow upon woodwork, all the amplitude of relief to be found in precedents executed in stone. From the practice of our masters in this respect, we may safely infer, as we have done before, that they would have displayed equal skill in devising new proportions and new modes of treatment for iron, had they applied it to as many and as important purposes in construction, as might be devised and executed at the present day.

Such purposes and modifications, it must be repeated, is not the intention of the present essay to suggest; but the inference is not one of mere conjecture, since we actually possess works of art of the middle ages in metal, legibly stamped with the peculiar influences of the material, to which sundry modern attempts to Gothicize in cast iron are very unlike indeed.

Before we proceed to more elaborate works, it is worth while to point out the various patterns in which the iron and lead work is disposed, in the windows of the early Gothic. A series of these designs will be found in Carter’s Ancient Architecture (Part I, plate 79). It is true that these forms are subservient to the display of stained glass, but, independently of the glass, they are worthy of consideration and study. At the Sainte Chapelle at Paris, the iron work rivals the tracery of later times in the variety and richness of the patterns. The material in these examples is wrought iron, but very little modification would be necessary to execute them in cast, and since iron bars are indispensable in all Gothic windows, it is extraordinary that so little advantage should have been taken of this mode of turning them to account.

Although this simple and obvious mode of employing iron in Gothic architecture has been generally overlooked, more than one instance might be adduced in which it has been used for the entire window frames, but without any idea beyond that of imitating stone; that is to say, of adapting the material to as inappropriate a model as possible. In these performances the forms furnished by precedents in stone are so closely imitated, and the bulk of the parts, and relative breadth of the openings so far approached, that the result is a most uncomfortable sensation of meagreness, weakness, and disproportion. Had the analogy with stone been openly abandoned, and the supports made no greater than is necessary, the material would at once be recognized, and the mind so far satisfied. In what way the Gothic architects would have treated a metal window frame, we may infer from two works in metal, in which analogous architectural combinations are developed; viz., the screen of Edward IV’s monument at Windsor, actually executed in iron, (what can precedent do more for an un inventive age?) and that of Henry VII, at Westminster, in brass. A comparison of a portion of the latter with a compartment of the stone screen of Islip’s Chapel, of about the same superficies, will explain better than many words the peculiar influence of metal, upon original Gothic composition. Whenever we recognise cast-iron as a material susceptible of beauty, there is nothing upon which its capabilities will be more successfully developed than in windows, Gothic or otherwise. Of closely barred windows and grilles, we make abundant use for various purposes, but we have scarcely thought of decorating them, except when some ambitious ironmonger presses the favourite "Greek honeysuckle" into some new invention, more foolish than the last.

The subject proposed by the Institute, upon which the foregoing observations have been made, is one of the greatest importance in the present state of the arts and sciences in England. The modes in which it may be discussed are many; and valuable hints in architectural composition might be elicited, if it were proposed with the object of studying the capabilities of the material, and suggesting modes in which they might be made available in art as well as in science. In the preceding remarks, it has been taken in a single point only. The general argument on the effect of material upon design might be extended, without perhaps digressing more than might be allowable, and the modifications of our native architecture in the chalk and rubble churches of Kent—the decorative flint-work of Norfolk and Suffolk—and the different treatment of the detail, in the contemporaneous structures of the counties of Lincoln and Gloucester, contingent upon the quality of their stone, would afford ample and decisive examples bearing not too remotely on the main subject—but all
CANDIDUS'S NOTE-BOOK.

FASCICULUS LII.

"I must have liberty Withal, as large a charter as the winds, To blow on whom I please."

I. It is with naked windows as with naked figures—the latter may be either innocent enough or grossly indecorous, just as they happen to be introduced. Put a naked figure, that may be unexceptionable in itself, into a picture where other figures are clothed, and it becomes an indecency—of which, by the bye, there is an instance which had better have been omitted, among the cartoons in Westminster Hall, where semis-culote gentlemen in parvis naturalibus "eat a figure" alongside of others who are in breeches. As to windows, the rule should be, if you can't afford clothes, that is, "dressings" for them all, bestow them on none. It does not, indeed, follow, that all are to be dressed alike, or in the same degree, for some may be comparatively in dress; but between unclad and a state of nudity there is some little difference. It is nothing less than a positive violation of the ordinary and most obvious proprieties of architectural decorum, to give dressings to the windows of the principal floor only, and leave all the others absolutely bare. Yet how frequently is this done! which being the case, we must suppose that it is admired as producing at least a smartish look—something of-would-be consequence, like that of those unhappy people who affect to be above their own class in society, yet can get into no higher one, and so render themselves objects of ridicule to both. Another most tasteless practice is that of sticking in columns and pilasters between windows which have no dressings, or if any at all, such as are by no means sufficient to produce consistency of character. Yet it is of such bungling vulgar stuff that the architectural "magnificence"—so the penny-a-line critics call it—of Regent Street, and Regent's Park palaces, and of Pinnicolo and Paddington, is made up. This is the sort of stuff which, as Welby Fogin—who does not always call his words for ears polite—says, "absolutely make us spew to look upon them"; whence it may be supposed that John Nash and his school must have caused many a dreadful fit of languishess.

II. Surely architects have an excellent right to claim Mercury for their patron, as being the God of Thieves. Not content with stealing ready-made orders and columns, they generally pilfer almost every thing else, till sometimes there is nothing whatever in a design they can fairly lay claim to as their own, except the tastelessness with which they botch together their stolen ware. For their not exercising their invention at all in regard to columns, the excuse is that they are things by far too precious to be "tampered with," and even the idea of attempting—not to produce a fresh order, but to modify the standard examples of the orders, so as to produce others, is reproved as presumptuous. Yet that they should almost invariably steal ready-designed windows too, is somewhat unpardonable, more especially as they afford very great scope indeed for diversity of design and decoration, where decoration is most of all imperatively required, if there is to be any degree of it at all.

III. Together with the very best piece of design Soane ever produced, the Bank of England exhibits some of his worst. Did we not know it to be fact, never could it be imagined that the north-west angle of that edifice, and the centre of the south front, were by the same architect; the latter is as complete a failure as the other is beautiful and picturesque—a mere jumble of ill-assorted parts, and in its ensemble stamped by a littleness of manner amounting even to paltriness. The arched entrances are so utterly at variance in every respect with the order, that they alone would disfigure the composition, were it otherwise ever so unexceptionable. Bad enough in themselves, they look some degrees worse than they else might, owing to the very strange contrast they make with the large square-headed blank doors—features of rather questionable propriety in themselves—introduced into the wings of that elevation. So long as the centre part remained to be done, it was to be expected that the architect would here put forth all his force, and give us a veritable coup de maître. Instead of which, when he came to what ought to have been his finishing stroke, he seems to have got quite to his wit's end, and to have been left without an idea. Fortunately this portion of the façade will look more miserable than ever now that it is brought into close proximity with the portico of the new Royal Exchange: nor is "fortunately" here either a slip of the pen or error of the press, but seriously meant, because it is fortunate that there is now a very sufficient pretext afforded for remodelling the exterior of that portion of the Bank, so that it may not look absolutely pitiful in comparison with its new neighbour. As this part is here really loftier than the rest, so also might the order be very well made upon a larger scale than that of the wings; and indeed it was generally supposed beforehand, that such was the architect's intention; instead of which he merely piled up there what shows itself no better than an excrescence, and one in pretty much the same taste as that hoisted up on the top of the Mansion House, and which has lately been removed—an example that ought to be followed by the Bank.

IV. The precedent as to alteration set by the Mansion House might, indeed, be both greatly extended in regard to that building itself, and be followed by a very great many others, to their no small improvement. Were something, for instance, done to the body of St. Martin's Church, so as to make it tolerable by a people with the portico, that edifice might be rendered far more worthy than it now is of the reputation it holds. The National Gallery would sustain no loss by getting rid of its miserable done; nor would Goldsmith's Hall be improved for the worse, were its lower part made to agree with the upper part, instead of being, as at present, two distinct halves, one with mere holes to the wall, the other with more than usually ornamented windows. Neither Somerset House nor Sir W. Chambers' reputation would suffer were the paltry "pigeon-house" turrets on the sides of the inner quadrangle to be swept away. Were, again, the United Service Club to subscribe to buy a cornice for their building, it would be a deed of charity—would be clothing the naked, and almost like feeding the hungry, for at present it has a most famished and famine-struck appearance. As to Buckingham Palace, that might very well escape intact, it being altogether incorrigible and unimprovable. Nothing short of such a judicious "accident" as those which befel the Houses of Parliament and Royal Exchange, could clear away all its vices and blunders; and it would be too much to look for a special interference of Providence to deliver the nation from such a disgrace as that precious pile of architectural gawgaw and trumpery.

V. It matters not what may be the capabilities of a style, if it be taken up by those who have no capability of their own. What is nominally one and the self-same style, will show itself altogether opposite in character according to the talent and taste, or the no talent...
and no taste, brought to it, a remark which I have already made more than once before, but one which cannot be repeated too often. Of the Italian style and of the very same species of it, we meet with very striking contrasts in Barry's two club-houses in Pall Mall, and the Club-house Chambers in Regent Street. The difference as to quality and taste between the latter and the two former is hardly to be expressed, for it does not amount to much when stated in words; nor can it be indicated further than by vague, qualifying epithets. In the two Pall Mall examples we perceive a refined elegance, and a most captivating simplicity produced by what most people seem to imagine opposed to simplicity, namely the most patient study and careful elaboration of every part, even to the minutest details. There is no one part that is overdone in proportion to another; no one that is underdone. Everything is in its proper place, and contributes to the beauty of the ensemble. There is nothing you would wish either to add or take away. Eminently beautiful in themselves, the individual features acquire redoubled charm, from the felicity with which they are combined. The Regent Street example, on the other hand, is almost the direct reverse: while it is very far from being free even from decided blinmishes that might be easily pointed out, its general inferiority lies in numerous particulars and circumstances, which hardly admit of being described or pointed out, except in rare race with the building before one. One great defect is, that the whole looks too much squeezed together, and is consequently deficient in repose; nor is it less so in regard to richness, notwithstanding that this last seems to have been aimed at by the variety of parts—which, however, are all poor in themselves. I have heard it pretended, that the predominating characteristic of Barry's Italian style, is the cornicione: let those who fancy so, try it, and they will soon find out their mistake. There is no deficiency of cornice in the façade of the Clubhouse Chambers; but a most terrible deficiency of other merit. It is to Barry's two designs, what a very ordinary pippin is to a pineapple.

VI. One great merit of Barry, as strikingly exemplified in the two buildings above-mentioned, is that his detail is his own. Every part of it appears to have been expressly studied and devised for the actual occasion; whereas in general, even where better than usual in itself, detail seems to be taken from books or other authorities, and applied without the slightest modification, and in such manner, perhaps, as to be rather injurious upon the whole, by causing all the rest to appear in very inferior taste. Some will then, probably, ask, what is the service of purchasing architectural publications, if we are not to be allowed to borrow any thing from them?—the borrowing, by the bye, meaning nothing else than stealing—which by some is practised in so barefaced a manner, that they do not even pretend to design their own details at all, but set their clerks to copy it from prints and books. The use of such examples is to study them, to form one's taste upon them, to learn to discriminate between what is excellent and what defective in them, and so to profit doubly by imbibing the true spirit of the former, and avoiding the latter. The use of such lessons, is to derive ideas from them, therefore they are not likely greatly to benefit those who stand most of all in need of such aid; it being a well known fact, that those who have fewest ideas of their own in their heads, can find least room there for those to be got from other people.

VII. It is to very little purpose for any one to attempt making a stir about the British Museum. The case is altogether a desperate one: and nothing remains for us, but to submit with grateful resignation to what must be, and to what fate—in the person of Sir Robert Smirke, irrevocably decreed long ago, shall be. It is true, circumstances have greatly altered since his Post Office was hailed by the newspapers as a most classical piece of architecture, at which time there was scarcely any other channel for architectural criticism, or the expression of opinion in regard to it, than the columns of a newspaper, which were likely enough to entertain sympathetic admiration for the columns of the great architect in question. Yet, if there has been some change in that respect, there has been none in Sir Robert; as for the matter of that, why should there be any, since he long ago attained such perfection, that to look for further improvement would be most unreasonable? To say the truth, he has given so many examples of the same sort of excellence over and over again, that half a score of them might be exported to some of our colonies, and we at home be nothing the poorer.

VIII. Notwithstanding that so very much has been said upon the orders, both in books and in lectures, no one—as far as I am aware—has yet entered into satisfactory comparison of ancient examples and modern applications of them, showing how far their character and effect has been preserved, or else neutralized, if not quite destroyed. So far from seeing anything on that head, or giving any cautions at all, although they are evidently enough needed, they leave it to be inferred, that provided an order or a few columns be tolerably correct in themselves, all the rest must, as a matter of course, be equally satisfactory—even admirable. That such vast importance should have been attached two or three centuries ago to the mere mechanical study of the orders, is not very surprising, even natural and excusable. Surprising, however, it is, in no small degree, that such should continue to be the case almost as much as ever. Hardly less astonishing is it, that out of the countless number of publications professing to supply general instruction relative to architecture and matters of architectural taste, there is scarcely one which enters into the principles and rationale of composition—I mean into the general principles, the application of which must be left to individual judgment, and to the circumstances of the particular case; for what may be very appropriate at one time, may be quite the reverse at another. It is true, instruction of this kind must be but very limited after all, and in a manner needless, because those who are most capable of profiting by it, are also capable of working it out for themselves, which is all, the very best and most efficient mode of study. In fact, it is this sort of study and the capacity for it, which chiefly constitute talent, or in a higher degree, genius. For want of continued study of this kind, even those who set out at first with a certain stock of talent, sooner or later, quite exhaust it; which, however, may be quite in material in one respect, because, his reputation once established, a man's ability is taken upon trust. People—some people at least—may feel that they are very dissatisfied within themselves with what has the recommendation of a name; but then they feel that they ought to doubt their own judgment, or at all events do not care to seem to swim against the stream, and accordingly with the discretion of timidity, leave the world to find out the humbug in its own good time, which it generally does, as witness "the great Mr. Wyatt," now transformed into "James Wyatt, of execerable memory."

IX. Poor Sir John Soane!—now to be made after all an object of posthumous abuse, by the very man who was constantly toadying him in the most servile manner while he was alive! Yet so it is. The censure may be merited; the suppressed work of his alluded to, may be such that no one can "conscientiously compliment the author or the man;" but supposing that character of it to be perfectly just, it is any thing but creditable—absolutely disgraceful to the other party, that entertaining such opinion of Soane, he should all the while have professed the greatest admiration and respect for him, and have eagerly seized hold of every opportunity, and even the slightest pretext at all for doing so. Instead of vindicating his "much esteemed friend's" professional character from any of the numerous aspersions that have been thrown out against it, he makes himself an opportunity for aspersing his moral character, raising suspicions all the more prejudicial, because, the work itself being suppressed, and no copy of it even in the British Museum, it cannot be ascertained how far it really deserves the reprobation so very pointedly implied. That the quondam most obnoxious admirer of Sir John Soane should now become his traducer, is indeed startling; but of the two, Soane showed the greater discretion, for he suppressed his obnoxious work, whereas the other has been so absurdly indiscreet, as to let it now be seen what was his real opinion of a man whom he may be said to have worshipped in public.
A true master mind is to be recognized not only by its great works, but by its slightest and least important attempts. In particular to the artist should apply the motto, Nihil quod tetigit non ornabat, the same general principles of taste regulate details as regulate a grand design. We certainly must confess that some of our prominent examples of architectural proficiency recognize this rule, but on opposite grounds; with them the same frigidity and the same slovenliness prevail in a palace as in a workhouse, and the same absence of art is to be recognized in each. We do not mean this; on the contrary, we want to see the true artist exhibit himself in every performance, for negligence in details can scarcely ever accompany the grand in design; in fact, we have ever found that master minds were those of the most extended information as to minutiae. The mind of Michael Angelo took in the whole range of art in all its variety of practical manipulations; Napoleon and Wellington, in the midst of their vast schemes of conquest, knew how many pairs of horses' shoes each trooper had in reserve, and how they ought to be made; Homer and Shakspere have shown the greatest acuteness of observation in whatever affected their compositions. Is it to be supposed that those possessing such powers of observation, and exercising them so constantly, would consider it worthy of them to slaven over the details of their own profession? Architects and architects' employers, we are sorry to say, too often think otherwise, the mens divinior is some cabalistic idol only to be brought forward at jubilees, or in times of some public excitement, not to be exercised and exhibited on every occasion. Such was not the feeling of our Greek, our medieval masters; the Athenian vase, the tomb, the weapon, at once reveal their classic origin; the smallest works of the middle ages show how deeply rooted was the love of art, the same in the least piece of church furniture as in the glorious pageant of the minster itself. Such was not the feeling of our own great masters; the works of Inigo Jones and Christopher Wren afford as many points of study in their details as in their general aspect. Above we have given a representation of a windmill 1 by the former of these eminent men, a design showing how well he could bring his resources to bear on what is generally considered such an ephemeral and trivial occasion for their exercise. This work is in Warwickshire, and it will be seen that the mill is raised on a basement of six arches, which contains the mill stairs. The cornice at the top of the mill, the impost moulding of the piers, the base moulding of the same, the string course above the arches, and the archivolt, show that he has not been negligent of due and effective ornament. It is a study which many of the present day may contemplate with advantage. Simple yet ornate, not exaggerated in character, not overstepping the modest bounds of propriety, and yet giving a picturesque contour well adapted to the situation in which the object is placed.

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1 For this engraving we are indebted to our contemporary, the Builder.
THE BRITISH MUSEUM.

Sir,—Having the privilege of visiting the British Museum yesterday, I have set down a few remarks which you will perhaps give in your Journal, as supplementary to the paper on the subject of that edifice in your last number.

The building, I find, in store yea as to appearance, for that façade has not yet been to taken down, but internally there has been a good deal of work carried on, through which a temporary boarded up passage leads from the hall to the Townley Gallery. I have been obliged, for one of the tasteful little rotundas in that suite of rooms has been cut near in halves, preparatory to its final demolition. Those rooms were, it must be owned, rather too confined, considering that the Museum is open to a sometimes thronged concourse of persons; still, it is to be regretted that they could not be spared, for they are not likely to be replaced by what will be more attractive in point of architectural character. Of the Lycian or Fellowes' marbles, I will only say they are not worth a tenth part of the fuss that has been made about them, most assuredly not worth sending out an expedition to secure more of them. Should the Lycian mania continue, we may expect counterfeit antiques, equally precious, to be manufactured on the continent and imported into this country. But then there is the very thing! A real treasure, and a specimen of art that Sir Robert Smirke ought to go down on his knees to! Excruse the harum-scarumness of my manner; I am not quite mad—merely a little flippant or so. "There," said I to myself, "if Sir Robert does not make something of that, he himself ought to step in and take it himself, and to keep company with the mummy gallery up stairs." However, it is too late to be running at this rate, for until I explain, you will hardly guess what I am driving at. Of course you are aware of Sir Robert's penchant for columns with Ionic capitals; he has favoured us with a vast many in his time, but with scarcely two good specimens out of the whole number, forgetting that it is possible to have too much even of a really good thing. Invention, of course, not to be thought of; for were he to give us a fresh idea of his own for any such purpose, good as it might be in itself, it would excite a hubbub against him from all the orthodox, and the classical puritans; yet he has no occasion to invent, but merely to adopt, for his façade to the British Museum, what is in the Museum itself, consequently its legitimacy can be proved on the spot. All this, you will say, is sheer rigmarole; true, and here comes the solution of it. What I am alluding to is the bold and rich antique voluted capitals, on each of whose four sides or faces is sculptured a mask in full relief—a well imagined composition, and, as it seems to me, one highly appropriate for such a building as a museum, as the display of sculpture on the capitals would serve to indicate the real edifice is partly devoted to the purpose of a public sculpture gallery. Or, shall we say that external character is of no consequence, since "good wine needs no bush."

In sober seriousness, what are we to have from Sir Robert Smirke on this important occasion? What we may expect from him we too well know; but surely he will not now be allowed to go on as he has hitherto done—at least, without strong remonstrance on the part of those who, like yourself, have the means of calling attention to the subject.

I am, &c.,

C. WHITE.

ENGINEERING IN NORTH AMERICA.

Sir,—I take the liberty of requesting from some of your readers a statement of the great public works which have been executed in Great Britain or Ireland, under the direction of Mr. Hamilton H. Killaly, Chairman of the Board of Works in Canada; also a reference to any reports made by him, or papers on scientific subjects which he may have contributed.

The late Governor General, in a despatch to Lord Stanley, dated Quebec, 19th July, in speaking of "Engineers of merit and ability, and the scientific requirements, who, being strangers to the country, can have no local bias;" and Mr. Killaly "believes" that the Governor-General must principally have alluded to him, (p. 65, and questions 338 and 339, p. 40, Ev. Beauchains Canal, a copy of which you have.)

The proofs of the "great experience and scientific requirements" must therefore be sought for across the Atlantic; and though tolerably familiar with, as I supposed, the names of all the eminent British engineers, and of many of the residents even, I never met with the name of Hamilton H. Killaly among them; nor did I find an individual more fortunate among my Canadian friends—including some of the first gentlemen in the province—who in a numerous professional acquaintance here.

This explanation will, I hope, be sufficient to justify the course I have taken; and I trust there can be no impropriety in my requesting, or in any gentleman giving, the desired information, as to Mr. H. H. Killaly's "great experience and scientific requirements."

I am, Sir, &c.,

W. R. CASEY.

P.S. I take this opportunity to request the insertion of the following note.

Note to article on "Canadian Board of Works," Journal, Feb. 1843.

The length of the locks on the Welland Canal has been increased to 150 feet, "principally by representations from the merchants and forwarders of Oswego," as officially announced. This is in accordance with my view, that the Welland Canal is quite as much a New York as a Canadian work, ostensibly of cost, and risk of income excepted.

Speaking of the income of the Lachine Canal, a late Montreal paper says, "Downwards the falling off in the transport is most serious, the steamers and most of the barges running the Lachine rapids, to save canal tolls and towage." The Cornwall Canal, around the Long Sault, was opened for a short time, large steamers using it upwards, but descending the rapids. A serious breach has most occurred, and been repaired internally. The passage for the tolls on the Rideau Canal have been increased, and in answer to a remonstrance, it was observed that the tolls on that canal should not be so low as to direct the whole trade from St. Lawrence—an act that may improve the communication. Lord Stanley's Bill puts the trade, the St. Lawrence, on a somewhat worse footing than lighthouses, about 2s. per quarter of wheat. I omitted to observe in the paper to which this Note refers, that £230,000 appropriated for common roads, £15,000 only are to be expended in the lower country, containing two-thirds of the population, and the commercial wealth of the country; whilst £17,000 are to be expended in or in the immediate vicinity of the district, represented by the Chairman of the Board of Works.

Time is rapidly and only too fatally confirming the views contained in my communication of February. The present policy, by connecting in the public mind the engineer with the politician, does vast injury to the profession; brings in its train taxation on all classes; odious restrictions upon the building of canals and waterways; and will effectually prevent the settlement of the province, by frightening the emigrant to that part of the "far west" where no public debt exists.

W. R. C.

By a typographical error the width of the locks on the Lachine Canal was stated to be "30" instead of "20 feet," the present width. The rate of insurance (in one of the notes) should be "three-eighths of one per cent."

SCREW PILE LIGHTHOUSE, AT FOOT OF WYRE.

Sir,—It having frequently appeared, not only in the newspapers and other publications of the day, but also in the report of evidence before Committees of the House of Commons, that the Screw Pile Lighthouse at foot of Wyre, was erected by Captain Dunham, R.N., F.R.S.E, &c., you will oblige me by giving insertion to the following letter, addressed to me by that gentleman, in reply to a remonstrance on my part.

ALEX. MITCHELL.

DEAR SIR,—At your request I have pleasure in stating, that I believe the Screw Pile is your own patented invention, and the plan of fixing lighthouses on submarine foundations (candianks) by their means, is also your's. And I know that the plan, specification, and estimate of the Screw Pile Lighthouse, at the foot of Wyre, was, with the exception of the lantern, wholly prepared by yourself and son, which work you and your son erected by contract at your sole risk, after I had determined the site, and furthered the operation by attending the tidal work in person until all the piles and pilers were planted. This statement is at your service. Remaining, your's truly,

Fletwood, July 19, 1843.

ALEX. MITCHELL, Esq., Belfast.

H. W. DENHAM.
The application of the instantaneous transmission of electricity, as a means of communication between distant places, promises to become one of the most important inventions of the present age, and to rival even locomotion on railways in the facilities afforded of transmitting information. The science of electricity is yet but in its infancy; and though it has, during the comparatively short period of its study, withdrawn much of the veil from the works of Nature, that which has hitherto been revealed and already accomplished by its agency, serves to show that it is capable of disclosing far greater mysteries, and of being applied to much more important uses. When the transmission of electricity instantaneously through miles of wire became known, it was not long before the possibility of applying that property to the communication of signals suggested itself to the fertile ingenuity of man. The inconvenience of using frictional electricity, and the intervals of time requisite for its excitement, however, formed difficulties which could not be sufficiently overcome. Nothing, therefore, was effected in the construction of such telegraphs, though the high state of tension of frictional electricity renders it far better calculated for traversing long lengths of wire than the electricity of feeble tension excited by chemical action. The full tension of voltaic electricity, indeed, prevents it from overcoming the resistance which even the best conductors offer to its passage, and unless the quantity developed be great, and the conducting wire be perfectly insulated, much of the power will be lost in passing through a long circuit. It was not, consequently, until after the discovery by Professor Oersted, in 1819, that the voltaic current would deflect a magnetic needle, and the subsequent discovery that the efficacy of a feeble current on the needle may be greatly increased by multiplying the convolutions of the wire through which it passes, that the efforts to construct an electrical telegraph assumed a practicable shape.

When it was ascertained that on causing a current of voltaic electricity to pass over a magnetic needle freely suspended, the needle was instantly deflected into a position across the direction of the current, it appeared reasonable to expect that, by employing several wires and magnetic needles, and by causing the electric current to deflect either of the needles at pleasure, their deflections might be so regulated as to form intelligible symbols. In the first stage of the invention, it was proposed to have as many magnetic needles as there are letters in the alphabet, each one having a separate wire passing over it connected with one of the poles of a voltaic battery. To each needle was affixed a small screen, which, when the electric current was not passing through the wire connected with it, concealed from view a letter or a figure. A number of keys were arranged somewhat in the manner of the keys of a pianoforte, each of which was connected with one of the wires of the voltaic battery, and a letter was marked on the key corresponding with the one concealed by the screen on the needle to which it appertained. By touching any one of these keys the metallic connection was completed, and the current of electricity, on passing over the magnetic needle, deflected it, and exposed to view the letter beneath. In this manner it is evident a correspondence could be carried on between persons far apart by either spelling the words, letter by letter, or by agreeing to certain symbols for the expression of words or sentences. As the transmission of electricity occupies no perceptible time, the deflection of the needle at the distant station would take effect almost at the instant the voltaic circuit was completed by touching the corresponding key. This application of electricity as a means of telegraphic communication, appeared to realise in principle the most sanguine expectations of its efficacy, but in practice many difficulties arose. The number of wires, and the perfect insulation each one required, would have pre-
vented the plan from being practically applied, and the expense would have been a serious obstacle.

The correctness of the principle having been fully ascertained, attention was directed to render it available by arranging the needles in such manner that any two of them could act simultaneously, and thus produce a point to the letter in any one of the series of signals for which the number of wires were sufficient. In 1840, an electric telegraph of this kind was constructed on the Great Western Railway, for a distance of twenty miles, by Messrs. Cooke and Wheatstone. Five needles were employed on that telegraph; they were arranged on a diagonal dial, wherein the letters of the alphabet were painted, so that any two of the needles might be mutually in line, when the letter required to be denoted by the wires was such that the motion of the galvanometer would coincide with the appearance of the signals. The conducting power of the earth was rendered available for the return-current, and by other contrivances all the signals may be made with only three wires. This was a great advance on the earlier attempts at electrical communications, and if nothing further had been accomplished, the advantages of this system of telegraphing were sufficient to ensure its ultimate adoption. Within the last two years, however, the progress of invention has brought electrical communication to such perfection, that, by means of one wire alone, and without an artificial voltaic battery, any signal between distant places can not only be indicated, but actually printed at both stations simultaneously. The invention of the electro-magnetic printing telegraph, but into the merits of their respective claims we have no desire to enter. Professor Wheatstone and Mr. Bain, a watchmaker from Scotland, are the disputants, and each contends that the other has appropriated his ideas, though the mechanism of the two is not alike. The telegraph of Professor Wheatstone consists of metallic veins, as developed by Wheatstone, that it does not require the agency of any other electrical force than the natural electricity to be derived from the moisture of the earth.

It had been known for some years that a sensible degree of electricity could be conveyed by connecting different metallic veins, and Mr. Bain has further discovered that by placing plating metal underground, and connecting them by an insulated wire, a constant current of electricity is excited sufficient for working the telegraph of his construction. By this means the uncertainty, trouble, and expense of a voltaic battery is avoided, the actual power is done away with, and the instrument itself, and the telegraph must be considered a single wire. We shall proceed to explain the modes operari of this self-acting telegraph, and without pronouncing an opinion respecting the comparative merits of the two competing electro-magnetic printing telegraphs, we shall be able to show that Mr. Bain's, at least, exhibits great ingenuity and vast inventive resources, and that it is capable of being extended extensively for the most important purposes.

The annexed woodcut represents the apparatus in all its parts, an exact counterpart of which is to be placed at the distant station with which it is to communicate. It is the main-spring barrel acting on a train of wheels, G, H, I, which turn the balls of the governor K, and the band B, of the dial A, B, C, whereon the requisite letters and figures are engraved. It is immaterial whether the telegraph shall be single or double. The wheel is stopped by the arm E, which catches against the lever affixed to the arm of the wheel I. To set the machinery in motion, therefore, it is necessary to remove the stop E from its bearing on the lever, and this is done by electrical agency in the following manner — A is a coil of wire twisted round a light hollow frame of wood, and freely suspended on a center. B is a powerful permanent magnet fixed within the coil; and C, C are sections of similar magnets. D is a spiral spring connected with the source of electricity, buried underground, which leaves the coil free to move when the current of electricity passes through it, and brings it back to the original position when the electric current is broken. The peculiarity of this arrangement is, that the coil of wire is deflected instead of the magnet, by which deviation from the usual action, the deflecting force is rendered more energetic. The metallic band of the head is connected with the deflecting coil, but it is insulated from the dial itself, the latter being in metallic connection with the wire laid down between the two stations. Thus the head has a natural position towards which it is set, and the arm of the wheel is inserted into any one of the holes marked on the dial, the band is stopped by pressing against it, and the metallic connection is then completed. The electricity thus passing through the coil of wire deflects it into the position represented in the woodcut —its natural position, towards which it is set, and which it retains until the arm of the wheel is removed, and the electric current is renewed by again inserting the metal pin into the dial. The type wheel L, on the arbor of the wheel H, is so adjusted, that when the hand of the dial is stopped at any letter, a similar letter is presented opposite the small cylinder M, wherein the paper for receiving the printed communications is fixed. By the rotation of the wheels the balls of the governor diverge, thereby raising one end of the lever V and depressing the other, which allows the anticipations with great exactness; and the rotation of the arm is still prevented by contact with the second pallet X, and preparations made in the circuit is again completed by stopping with the metal pin the band of the dial opposite to the required signal, the coil of wire A is deflected to its former position, and the machinery is stopped by the arm E. The balls of the governor immediately collapse, and by depressing the end of the lever V, the arm E is raised, and the eccentrised wheel, or arbor, is passed over the second pallet X, the arm S (which is moved by a second mainspring in the barrel N), connected with a train of wheels to complete its revolution. The motion of the crank presses the type against the signal-cylinder, and a piece of ribbon saturated with printer's ink being interposed between the paper and the type, the latter is fixed upon the former, and the message is, in fact, thus printed in one continuous spiral line. As the two apparatus at the distant stations are exact counterparts of each other, and are set in motion simultaneously by voltaic action, the hands on the climbing always stop at the same symbol, and that symbol is printed on both the sheets of paper, and also transmitted to the distant station.

The cost of an electro-magnetic printing telegraph of the kind we have described, would not we believe exceed 40l. per mile. It is no doubt susceptible of further simplification; but, taking the apparatus in its present state of improvement, it is capable of extensive applications, not only in transmitting information from the outports and the principal centres of manufactures, to the seat of government, but also for conveying intelligence from remote parts to their distant agents and correspondents. When the facility with which instantaneous communications can be made by electro-magnetic printing telegraphs becomes better known, and the plan more extensively adopted, the doubt not that public telegraphs will be established, and be considered as important as our railway communications. The establishment of regular postage communication between all parts of the kingdom. Means might be adopted, if necessary, to secure the secrecy of communications thus transmitted, or the parties communicating might agree upon cyphers, the signification of which would be intelligible to the given electro-magnets only.

Electric telegraphs have already been applied upon several railways with signal advantage, and it only requires the simplification and cheapening of their construction, which seems to be now attainable, to render their adoption on railways general. By communicating from station to station the time at which a train starts, its arrival may be known precisely, and the wheels will be disposed accordingly. This is essentially necessary in the case of special trains, and when the roads are undergoing repair, and, by thus warning the public, might be the means of altogether preventing accidents from collisions.

Electric telegraphs also present an important economical advantage in the construction of railroads on lines of inferior traffic, since, by their aid, the transit of the trains to and fro might be conducted on a single line of rails with equal safety as on the most costly double line. As the departure of each train would be instantly signalled from one station to another, there would be no danger whatever, of two trains meeting; and the times of departure from each terminal would be so arranged that the up and the down train should meet at a stated point where a short double line might permit them to pass. We conceive it to be within the range of probable improvements in the electro-magnetic telegraph, that the wheel of the engine, as it passes along the rail, should be made to trace its course on the signal-cylinder with the aid of a telegraph, and that the number of trains on an extended railway might be known at a glance, and each one be seen tracing its own course on the telegraph chart of every station. But without waiting for further improvements, the electro-magnetic telegraph, in the state of perfection to which it has been brought, is a valuable possession, and successfully affords facilities sufficient to render its adoption on all railways a point of duty with the directors, as such a forewarning of danger, it is admitted, would prove a most valuable preventive of accidents.
DOCTOR SPURGIN'S PATENT HOISTING MACHINE.

For Raising Bricks, Mortar, and any other materials employed in Building, and adapted to the Unloading of Ships and Warehousing of Goods.

In our last month's Journal we stated that a new machine for hoisting bricks, &c., was to be seen at Prince Albert's Gate, Knightsbridge; we are now enabled to give our readers a rough sketch of the machine, together with a description which will explain its operation.

Description of the Machine.—The main part of the machine, A, consisting of the gearing to set the machine in motion, rests upon the ground. The second part is a trestle, which may be placed upon the scaffolding of the bricklayers, as at F; in the upper part of this trestle is an indented wheel, B, which corresponds perpendicularly with a similar wheel, attached to the principal body of the machine, resting on the ground. Passing round these two wheels is an endless iron chain, which is put in motion by one or several men, who turn the handle of the machine, A, consisting of a pinion-wheel working into a large toothed wheel, on the axis of which is an indented wheel, round which an endless chain passes, and also round a corresponding wheel at the side of the one at the foot of the vertical chain; the latter is set in motion when the wheel A revolves, together with the endless chain just described, over the indented wheels at C and E, by which the chain operates its rotation. On the side of the chain ascending, the workmen attach their hods full of material, by means of a hook fixed in the hod, as at B, and others detach them, as at F, to carry them to the bricklayers on the scaffolding. The empty hods are attached to the chain on the opposite side, as at G, and descend to the ground, where they are detached, as at H.

The chain may be lengthened and shortened as necessary. When a story is added to the scaffolding, the trestle is placed upon the new story, and the chain lengthened as required. At the top is a screw for tightening or relaxing the chain, as occasion may require.

The figures 1, K, L, are accessories used for hoisting the materials, viz., 1, for broken bricks; K, for water; and L, for pieces of stone for windows, chimneys, &c. M is an enlarged view of the indented wheel, and N the chain.

The advantages of this machine are, that it relieves the workman from the most toilsome part of his labour, by doing away with the practice of ascending the ladder; and it prevents, as far as possible, the accidents arising from this practice, to which he so often falls a victim. It also enables building operations to be carried on with much greater expedition than heretofore; and at the same time it diminishes the cost of such works.

Dynamical Table of the Strength of a Man, shewing the number of Bricks that can be carried up a Ladder by an ordinary Labourer.

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ELMES' PATENT MOORING AND SIGNAL BUOYS.

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ELMES' PATENT MOORING AND SIGNAL BUOYS.

Plan of the top.  Section through the centre.

Mr. Elmes, who is the Surveyor of the Port of London, observing the very great inconvenience and loss occasioned by the constant sinking of the mooring buoys on the river Thames, through perforations being made in them either by accident, or by the shrinkage of the materials, which cause them to be filled with water, turned his attention to see whether their construction could not be so formed as to render it next to impossible to sink them; the result has been the formation of the Patent Buoy, which we shall proceed to describe. In external appearance and materials, it is the same as those in general use, but through the centre there is a tube for the bridle-chain; and instead of it being attached to the underside of the buoy, it is in the patent buoy attached to the mooring ring at the top. The patentee states that the buoyancy is such that any number of holes perforated in its external surface will not injure it; and the interior of the buoy is divided into "vascular cells," which form water-tight compartments.

This invention is also applicable to all manner of floating bodies, as well as for ship's moorings, such as signal buoys, to indicate the situations of shoals, rocks, wrecks, and other dangerous impediments to navigation, for the carrying of floating beacons, flags, lights, bells, and other signals of contingency to such danger. One of these buoys, a large beacon or signal buoy, has been floating securely for twelve months past, including the last tempestuous winter, in the bay of Dublin; and a mooring buoy of the largest size has been used, by
PERMISSION OF THE PORT OF LONDON IMPROVEMENT COMMITTEE, IN THE CORPORATION MOORINGS, ON THE UPPER SIDE OF MOORINGS OFF THE EAST INDIA DOCK ENTRANCE AT BLACKWALL, FROM THE 15TH OF OCTOBER, 1841, CARRYING IN THAT DEEP AND RAPID REACH OF THE RIVER NEARLY TWO TONS OF MOORING ROPES AND ANCHORS OF SOME OF THE LARGE SHIPS THAT ENTER THOSE DOCKS DURING THE WHOLE OF THAT SEVERE WINTER TILL THE AUTUMN OF LAST YEAR. IN SPITE OF THIS SEVERE WORK, AND THE FACT THAT IT HAS NOT HAD OR REQUIRED A SIXPENCE OUTLAY IN REPAIRS, IT IS AS BUOYANT AS EVER.

NEW INVENTIONS AND IMPROVEMENTS.

REFLECTING LANTERN HELIOTRIPE.


The lantern was constructed by Messrs. Henry N. Hooper & Co., of Boston, under Major G.'s directions. It is similar in form to the Parabolic Reflecting Lantern, sometimes used in lighthouses, but much smaller, so as to be portable.

The burner was of the argand character, with a cylindrical wick, whose transverse section was half an inch in diameter, supplied with oil in the ordinary manner. The wick was placed in the parabolic reflector of paraffin wax, of which the outer surface was lined with a smooth, one-twentieth of an inch in thickness, polished very smooth, and bright. The dimensions were as follows:

<table>
<thead>
<tr>
<th>Diameter of base of frustum of reflector</th>
<th>Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance of vertex from base</td>
<td>3 5/8</td>
</tr>
<tr>
<td>Distance of focus from vertex</td>
<td>2 2/5</td>
</tr>
<tr>
<td>Diameter of cylindrical burner</td>
<td>5 1/2</td>
</tr>
<tr>
<td>Diameter of larger burner, which was never used, but which, by an adapting piece, could be easily substituted</td>
<td>1 1/2</td>
</tr>
</tbody>
</table>

The instrument answered the purpose for which it was intended, admirably well, and was of great use in tracing the due north line. While it occupied the station at Park's Hill, 15 feet above the surface of the ground, or 289 feet above the sea, in the latter part of September, and early part of October, 1841, the light from it was distinctly seen with the naked eye at night, when the weather was clear, from Blue Hill, whose summit, where crossed by the meridian line, is 1071 feet above the sea; the intervening country averaging about 500 feet above the sea, and the stations being 56 miles apart.

It was remarked, that the wick employed by Major G. was considerably smaller than that usually made, even for parlour lamps; and to this came the attribution, in a great measure, the perfection with which the parallel rays were transmitted from the reflecting parabolic surface, so as to make them visible at so great a distance. Though a greater quantity of light is generated by a larger wick, the portion of rays reflected in a direction parallel to the axis, and which alone come to the eye, is the smaller as the flame transcends the focal limit. The size of wick most advantageous for use, may easily be determined by experiment: Major G.'s impression is, that the smaller its transverse section, provided it is only large enough to escape being choked up by the charred particles, even one-third, or perhaps one-fourth, of an inch, the farther the light would be visible.

It has occurred to Major G. that lanterns of this description might be used with great advantage as station marks, in extensive trigonometrical surveying, of all sorts of great lengths of sides. A revolving motion might be given to the lanterns, so as to make the light transmitted from them visible to many different stations within short intervals of time. Their simplicity, and the ease with which they are managed, would perhaps give them, for such purposes, a great advantage over the Drummond or Bude lights, even though they be not so brilliant as the latter.

The heliostone, which he employed in the day time, was made by order of Mr. Hasler, at the instrument shop of the coast survey office. It was a rectangular parallelogram of good German plate glass, 1 by 1 1/2 inch in size, giving an area of reflecting surface of 2.52 square in. This also was seen at the distance of 36 miles.

SELF-ACTING CIRCULAR DIVIDING ENGINE.

At one of the recent meetings of the Astronomical Society, a paper by W. SIMMS, Esq., was read describing a Self-acting Circular Dividing Engine. The engine, in general arrangement and construction, is similar to that made by Mr. R. Troughton, though there are several additions and peculiarities, which are pointed out. The circular engine-plate is of gun-metal, 56 inches in diameter, and was cast in one entire piece, teeth being ratched upon its edge. The centre of the engine-plate is so arranged that it can be entered by the axis of the instrument to be divided, and the work by this means being brought to bear upon the teeth at any radius, an engine-plate arrangement prevents the necessity of separating the part intended to receive the divisions from its axis, &c., a process both troublesome and dangerous. Upon the surface, and not far from the edge of the engine-plate, are two sets of divisions to spaces of 60 parts, one set being silver and the other strongly cut upon the gun-metal face. There are also as many teeth upon the edge as there are divisions upon the face of the engine-plate, namely, 3320, and consequently one revolution of the endless screw moves through a space of five minutes. The silver ring was divided according to Troughton's method, with some slight variations. In this operation it seemed to the authors the safer course to divide the circle completely, and then to use a single cutter for ratching the edge; and he believes that the teeth upon the edge have been cut as truly as the original divisions themselves. Another important arrangement is, that the engine is self-acting; it requires no personal exertion or superintendence, nothing being necessary but the winding up of the machine, or rather the raising of a weight which, by its descent, communicates motion to the dividing engine. The machinery is so arranged that it can be used or dispensed with at pleasure. There being some cases in which a superintending hand is desirable, the authors then proceed with a description of the machinery, as represented in the drawings accompanying his paper, and draws attention to the contrivance by which the engine can discharge itself from action when it has completed its work. He is concluded by observing that the machinery, however expensive, can be made by an ordinary workman, is adapted to all the engines now in existence, which are moved by an endless screw, lessens the labour of the artist and increases the accuracy of the graduated instrument.

COATING METAL.

WILLIAM HENRY FOX TALBOT, of Laycock Abbey, Esq., has obtained a patent for "improvements in coating or covering metals with other metals." Patent dated November 25, 1842. The specification of Mr. Talbot's present patent discloses no new principle in the art of metallic precipitation; but it supplies some very useful improvements in its manipulative details.—1. To prepare metal articles for gilding, Mr. Talbot dips them in a weak solution of silver in hypo-sulphate of thallium. 2. To prepare an article for either gilding or silvering, he first cleans it well, then connects it to one of the wires of a voltaic battery, next plunges both poles into a vessel filled with some acid solution, which, decomposing the water, the hydrogen is given off by the article intended to be gilded or silvered. After a little time the article is detached from the battery, and thrown into a solution of gold or silver, where it specifically acquires the required coating. 3. To gild metallic articles, he makes use of a mixed solution of gold, and any one of the b器 metals, with the exception of mercury, which would separate the gold. 4. He also gilds articles by obliterating the oxidation of boracic acid, the latter having the effect of greatly improving the colour. 5. To remove the dark tint which metallic articles sometimes acquire when dipped in a solution of gold, they are immersed in a very weak solution of nitrate of mercury. Any mercury which may adhere is afterwards removed by an acid, assisted by volatlic action. And, 6. When in silvering an article, the solution of silver ceases to impart any further addition to the coating (in consequence of the coating and the solution becoming of identical properties), Mr. Talbot dips it into a different solution of silver, or into a solution of some other metal, which he replaces it in the first solution, when it is found to act with the same energy as at first. The same method of alternate dipping is also applicable to solutions of gold.—Machinist's Magazine.

OXIDES OF METAL.

JOHN MULLINS, of Battersea, Surrey, surgeon, has obtained a patent for "certain improvements in making oxides of metals, in separating silver and other metals from their compounds with other metals, and in making white lead, sugar of lead, and other salts of lead, and salts of other metals."—Patent dated October 27, 1812.—Mr. Mullins's improvements are six in number. First, he produces the circle of lead, and other metals by forcing currents of atmospheric air, or oxygen gas, through masses of the metal in a melted state, "heated to the temperature of their respective points of oxidation," and then skimming off the oxides from the surface. Second, to make white lead he exposes the oxide of lead obtained by the preceding process, which is stated to be much superior to the ordinary litharge and vitriolic.
massicot of commerce, to the vapours of vinegar and carbolic acid gas. Or, third, he exposes a solution of acetate of lead, or other suitable salt of lead, made from "the oxide obtained as aforesaid," to an atmosphere of carbolic acid gas. We quote at length the patentee’s description of the mode in which this is effected: it is new, ingenious, and likely to answer well. In chambers, or large jars of earthenware, or other material, are suspended several large sponges, which are supported in the jars by strings of worsted, so as not to touch the sides of the jar, or one another. Having made a saturation of the air in the jars with carbolic acid gas, and a solution of other suitable salt of lead, from the oxide obtained as aforesaid, and placed this solution in a vessel above the top of the jars, and having moistened slightly the sponges with the solution, and also the worsted strings suspending them, the strings are then made to dip into the solution contained in the vessel above the jars, and, by the power of capillary attraction, the sponges are kept constantly moist by a supply of the solution descending down the worsted strings; and the supply can be regulated at pleasure by the size of the strings, or otherwise. Evaporation is continually going on, and crops of sponges are formed on the surface of the sponges. The jars are made to communicate with a gas-holder, or other reservoir, containing carbolic acid gas, which gas is made to fill the jars in order that the sponges may be surrounded with an atmosphere of carbolic acid gas. By the action of the gas, the salt of lead on the sponges is readily converted into censure, assisted probably by the decomposition of the acid of the original solution. When it has been ascertained that a sufficient quantity of the censure has been formed, the sponges are removed and washed in a vessel of pure water; and if the sponges contain any uncoalesced soluble salt of lead, which is generally the case, the water dissolves it, but the censure falls to the bottom on the water remaining at rest. The water is to be re-used for forming the solution when decanted from the precipitated censure. The sponges are then replaced as before and the process completely repeated, thus continually oxidizing his oxide of lead, and generally for the reduction of all metals from their ores or oxide. Fifth, when a mass of melted lead, treated by the process just described, contains any silver, the silver, being less oxidizable than the lead, accumulates at the bottom of the pot, whence it is drawn off occasionally to be further purified and separated. And sixth, to separate iron, the oxides are discharged down a shoot, fixed at an angle of about thirty degrees, formed of wood, or of some other non-conducting material, from the bottom of which the poles of a number of magnets project upwards, and to which a slow, lateral, slice-like motion is given by machinery; the magnets attract and retain the iron, and the oxides pass free.—Ibid.

**IMPROVEMENTS IN IRON.**

**James Palmer Budo,** of the Ystalyfera Iron Works, Swansea, for "Improvements in the manufacture of iron."—Patent dated October 20, 1842; Mr. Bold’s improved process of manufacturing iron, as distinct from those described from Nelson’s and Crane’s processes, may be called the cold uncharcled blast. The points of novelty to which he lays claim are these.—First, the application of anthracite or stone coal, combined with a blast of atmospheric air, in the natural or unheated state, maintained at a pressure of pillar of upwards of 23 lbs. above the external atmosphere, as the common circumstance is iron from stone, iron, or coke. Secondly, the application of anthracite or stone coal, combined with the use of water tuyeres, and with a blast of atmospheric air in the natural or unheated state, in the smelting or manufacture of iron from iron ore, or iron oxide, the application of anthracite or stone coal, in combination with four or more tuyeres, and a blast of atmospheric air in the natural or unheated state.—Ibid.

**GAS.**

**James Cuthbert,** of William Street, Regent’s Park, engineer, has obtained a patent for "certain improvements in manufacturing gas, and an apparatus for consuming gas."—Patent dated July 12, 1842. The "improvements in manufacturing gas" consist in producing, by a peculiar apparatus, described by the patentee, a triple compound, composed, first, of coal or other gas; secondly, atmospheric air, (in the proportion of from 3 to 12 per cent); and, thirdly, vapour of naphtha, or other volatile hydro-carbon, (in what proportions is not stated). The most remarkable feature in the apparatus employed for this purpose is, that the moving power which actuates it is the gas itself. The improvements in "apparatus for consuming gas" consist in substituting for the ordinary concentric rings a spiral coil, "by which the light is equally concentrated, with the advantage that only one inlet-pipe is required."—Mechanics’s Mag.

**METAL SHIPS.**

**William Fairbairn,** of Manchester, engineer, has obtained a patent for "certain improvements in the construction of metal ships, boats, and other vessels, on the aeration of metal plates to be used therein."—Patent dated July 6, 1842. The plates are so rolled or constructed as to be perfectly smooth on that side which is to become the outer side of the vessel, but along the two inside edges of the plate there are raised two bands or strips, varying in breadth, according to the thickness of the plate, and, of course, the length in joining the plates, so as to be punched in the usual way, and afterwards counter-sunk on the outside. In joining, the plates are brought edge to edge, being flush on the outside; and upon the inside is laid a piece of flat iron, pierced with two lines of rivet holes, so as to correspond with the holes in the plate, to which it is to be riveted. Where it is required to have greater strength, so as to resist increased external pressure, the flat bar has a raised feather along its outer side, the section of which will form that of A & T. The bands, or strips, along the edge of the plates are to be formed so as to be placed at the ends of uniform strength throughout when pierced for the rivets; and thus to obviate the risk of the plates being broken in that part, which is generally, if not always, found to be the result in cases of concussion, &c. The rivets are so made as to fill the countersink, and thus present a uniform smooth surface on the outside of the vessel when completed, which of course must meet with less resistance in passing through the water.—The claim is to the manufacturing of plates, and joining them as above-mentioned, in the construction of boats and other vessels.—Mechanics’s Mag.

**A FIRE-PROOF POWDER MAGAZINE.**

An experiment was lately made at Painé’s wharf, Westminster, for the purpose of testing the competency of the powder magazine, used in ships of war, recently patented by Mr. J. A. Holdsworth, as being impervious to fire, though subjected on all sides to the greatest possible degree of heat. A model of a magazine, about nine feet square, was placed on the wharf over the bed of the feet of the magazine. This model is formed of a double set of thin iron plates, rivetted together and placed about two feet under the hollow being filled with water, and supplied from a vat placed somewhat above the level of the magazine, and entering it through a pipe inserted in the lower part of the model. A channel of communication exists through every plate, as well as through the wooden model, and a single pipe conveys the stream of water back to the vat from which it is supplied. The door of the magazine is hung on hinges, made hollow, and guarded from leakage by stuffing boxes, so that the water flows into the door through one hinge and out through the other. The patentee having the principle of his invention, placed a quantity of combustible matter within the model, over which some gunpowder was laid on a sheet of paper. A registering thermometer having been placed inside, the door was closed, and a stock of dried timber deposited on every side of the model, was set alight. The fire was kept up more than half an hour, and the water rose to very nearly boiling heat, continually passing in a stream through the upper pipe into the reservoir containing cold water. On the door being opened, the combustible matter and powder were found to be perfectly uninjured, and the highest point to which the mercury had risen within the model was marked at 10 degrees Fahrenheit. A somewhat similar principle has been applied to the stoker’s room in the Victoria and Albert royal steam yacht, where the bulkheads have been constructed of two plates of sheet iron, instead of wood faced with iron, a stream of water constantly flowing between, by which the temperature of the engine room is kept cool.

**ORNAMENTAL GLASS.**

**Mr. John Carr,** of North Shields, earthenware manufacturer, and AARON RYLES, of the same place, agent, have obtained a patent for "an improved mode of operating in certain processes for ornamenting glass."—Patent dated 9th November, 1841; which consists of improvements in the operations of staining, stopping out, and washing glass, the improved method of operating on the staining materials, instead of being mixed with turpentine, or other volatile oils, or water, as usual, are mixed with boiled linseed oil, or such other oil as is generally employed when printing with enamel colours on glass; and instead of floating the staining materials over the glass, in a liquid state, they are printed or transferred from metal plates, and, when dry, are fixed by firing, in the usual way. When operating with staining materials mixed with oil, as aforesaid, in pot metal, or on flashed glass, opaque and transparent shades are produced, leaving the surface of the glass plain and smooth, instead of being blemished with a half-common mode of applying body colour, for the purpose of shading. As regards the operation of stopping out, the materials, used for that purpose, are mixed with boiled oil, and printed on the glass, in the manner above described: the liquid staining composition is then floated over the whole surface, including the parts so stopped out, and the colour is fixed by firing. After the glass has been cleaned, the pattern, which was printed on it in stopping out materials, is exhibited in the original colour of the glass, and quite distinct from the ground colour of the glass, in stopping out materials, as aforesaid, the remainder of the ground may be obscured in the usual manner; thus producing transparent patterns
PREPARING PAINTED SURFACES OF PAPER.

HENRY MARTIN, of Norton-Terrace, Camden-town, painter, has obtained a patent for "improvements in preparing surfaces of paper."—Patent dated March 30, 1849. This invention consists in embossing and enamelling the surfaces of paper, and in manufacturing paper-hangings. A coat of oil-paint, of the desired colour, is first applied to the surface of the paper, as evenly as possible, with a common paint-brush; it is then rubbed lightly over with a brush, similar to a clothes or shoe-brush (giving it a circular motion), to remove the marks of the paint-brush; after which, an additional process is given to the paper by passing it through a trowel, called a "softener," lightly over it. If more than one coat of paint be laid on, this process is repeated. Or, instead of the above method, the paint may be applied by conducting the paper between two rollers, together with an embossed or other failure of the design. In this process, the paper is passed with a roller partly immersed in it, the superfluous paint being removed from the felt, as it ascends, by a scraper. The paper, thus prepared, is embossed, by passing it between engraved rollers or dies; or is converted into paper-hangings, being stuck upon the walls or other surfaces. If a glazed or enamelled surface is to be given to the paper, the oil-paint must be used in a thick or round state, and thinned only with turpentine, in the same manner as if it were used for "flattening." When the turpentine evaporates, the colour becomes set; the paper is then placed upon a bed of woollen cloth or other soft material, and a palette-knife or trowel, with a polished surface, is passed over the painted surface of the paper, with a slight pressure; the colour being set, yields to the pressure, and a glaze is thereby produced, which may be afterwards heightened in the usual manner. Other means may be resorted to for glazing the painted surface of the paper, if preferred.—London Journal.

NEW SAFETY VALVE FOR ENGINE BOILERS.

(From the Transactions of the Liverpool Polytechnic Society.)

The Secretary read an interesting letter on this subject from Mr. Maitland, formerly a member of the society. It was dated Montreal, where the writer was then residing. The following are extracts from it—

"Shortly after my arrival in this country, a serious explosion took place of a steam-boiler on a canal high-pressure boat. The boiler was constructed on the locomotive principle. The effect of the explosion took place immediately behind the tubes of the fire-box. The fire was composed of wood or other materials, which, by reason of the appearance that indicated that the explosion had taken place from scarcity of water. The engineer, in evidence, declared that he was allowed to carry 50 lbs., but there is no doubt but that a much greater pressure than that would be required to tear the boiler in the manner the Shanrock's was torn. The boiler was constructed throughout of 2-inch plate. This, there is no question, is too thin for tube plates. The tubes were wrought iron. From all the circumstances of the case, I have no doubt but the boiler exploded from a too great accumulation of steam, and having either a too small or insufficient safety-valve, they did not allow it to blow off. From this circumstance I was induced to pay some attention to, and, if possible, to improve, the safety value. I send you a sketch of one which I consider does away with many of the objections of the present one in use. It is more especially useful when steam of high pressure is used. If a valve is constructed to be out of the reach of the engineer—that is, to be out of the box that contains the valve, if the valve be of any size at all—the weight required to be enormous, for the pressure is 15, 20, or 30 lbs. per inch. In the valve I have invented this objection does not hold, as the same amount of water is employed, and without prejudice, as well as to the old plan a valve of 2 in. diameter. The top valve is 10 in. diameter, and the lower one 9½ in.; consequently, the area to be loaded is only a ring 10 inches diameter and one-eighth inch broad. As the Polytechnic Society is established for the advancement of science, I will, if I were to have any service to its members, prepare a paper on marine engineering in this country. The boats attain a speed here, with an economy of fuel as you have as yet not got at home. A boat was started this summer on the St. Lawrence, called the Florizel, and navigated the famous American. Some engineers visited her here from the Hudson, and they declared they had nothing that surpassed her. She is 250 feet long; breadth, or beam, 27 feet; depth of hold, 10 feet; diameter of cylinder, 57 inches; length of stroke, 10 feet; diameter of wheel, 36 feet; length of length of flat, 10 feet; and depth of flat, 2 feet 6 inches; strokes, 21 per minute; steam, 25 lbs.; speed, 15 miles per hour!"

Mr. Maitland's valve consists of a very simple and ingenious modification of the common equilibrium valve, now well-known and much used among engineers. Steam from the boiler enters freely a flat chamber, the top and bottom of which are formed by two valves, firmly connected together and both opening upwards. Now if these two valves be of equal diameter, the steam-pressure above the lower valve will exactly counterpoise the pressure beneath the upper valve, consequently the valves will have no tendency to rise, and no steam will be allowed to escape. But if we suppose the upper valve to be one-eighth of an inch the larger in diameter, the pressure on it will overcome that on the lower valve, and the two valves being connected together they will both rise, and allow the steam rapidly to escape, the upper valve being the only one having an area equal to the sums of the areas of the two valves. The force required to keep this valve down is so small that the ordinary lever is dispensed with; and in place of it a weight corresponding to the pressure required is placed immediately upon the top valve, thus preventing a tendency to sag or stick from want of atmospheric pressure, and making the apparatus what it really is—pre-eminently a safety-valve.

THE SMOKE NUISANCE.

REPORT OF THE PARLIAMENTARY COMMITTEE.

The select committee appointed to inquire into the means and the expediency of preventing the nuisance of smoke arising from fires or furnaces, and the means of removing it, were empowered by the minute of the committee of evidence taken before them, to the House, have considered the matters to them referred, and have agreed to the following report—

In their endeavors to investigate the subject, your committee have determined to profit by the experience of the different towns in the country, and have received the evidence of the most eminent men in the science of chemistry, of practical engineers of high reputation, of leading master manufacturers and proprietors of steam-engines, and of ingenious persons who had devised means for the suppression of smoke. The attention of the parties called to give evidence has been principally directed to the consideration of the following heads, on which their opinions were given.

1. Whether it was practicable entirely to prevent, or very much to diminish, the nuisance now so severely felt in large towns and populous districts from the smoke arising from fires and furnaces?

2. Whether, if this were practicable, it would be advisable to take any steps to prevent the nuisances; as so doing might interfere with the property or interests of manufacturers, or of the proprietors of furnaces?

3. If, in the event of the two former questions being answered in the affirmative, they would recommend some legislative enactment to be framed to prohibit the nuisance of smoke.

In regard to the first of these questions, it appears from the whole of the evidence of scientific and practical men, including master manufacturers, that smoke, which is the result of imperfect combustion, may in all cases be much diminished, if not entirely prevented. It appears to be the unanimous opinion of the witnesses conversant with the subject, that imperfect combustion arises from a deficiency of atmospheric air, or the mixture of air and smoke, and that the heat of smoking is a consequence of imperfect combustion. The smoke, which would separate mechanically by an artificial shower of water, produced in a fine constructed for the purpose, are only various applications, in different forms, of this general principle: even the flow or jet of steam which has been applied by some persons to prevent smoke in furnaces, being merely a modification of this general principle; as, in a steam and chimney, combustion, air must necessarily flow in with it, otherwise the combustion in the furnace is arrested. The evidence before your committee further shows, that the admission of atmospheric air, under proper regulations, into the furnace, is productive of saving in fuel, by causing the particles of carbon, which would otherwise rise in smoke and be wasted, to ignite, and thereby to increase the heat in the boiler. It appears that the expense attendant on putting up whatever apparatus may be required to prevent smoke arising from furnaces is very trifling; and, as some of the witnesses observed, the outlay may be repaid within the year by the diminished consumption of fuel. For additional information on this subject your committee wait the next application of the House. Several most ingenious patents and inventions for the prevention and consumption of smoke, were laid before your committee, which, from the testimony of the proprietors of furnaces by whom they were adopted, appeared to answer the twofold purpose of preventing smoke and of lessening the quantity of fuel consumed. The means of preventing smoke might also be applied to the furnaces of steam boats; but such application would be attended with rather more expense than on land, from the occasional want of space, and the setting of boilers in a steam- vessel. No doubt, however, existed, in the opinions of
those examined, that the prevention of smoke could be accomplished in all steam-vessels.

The use of anthracite coal and of coke, as the means of preventing smoke, were not overlooked by your committee; but, being well known, need not be repeated here.

In reference to the last and most important point under the consideration of your committee, how far it would be expedient to frame some legislative enactment to lessen the nuisance from smoke, your committee, after a careful survey of the evidence before them, seeing that the evils arising from smoke are severely felt in all populous places, and are likely to increase in proportion as the wealth and use of machinery cause a greater extension of furnaces and steam-engines, come, without hesitation, to the conclusion, that such a legislative enactment should be introduced without delay; and they trust that the perusal of this evidence will ensure cordial aid and co-operation, on the part of the proprietors of factories, in accomplishing an object so essential to the comfort and well-being of the surrounding country and population; an expectation which your committee feel justified in entertaining, by the knowledge of the laudable exertions which have lately been made, with much success, by the manufacturers and inhabitants of Leeds and Bradford, in Yorkshire, for the prevention of smoke in those districts.

Your committee have received the most gratifying assurances of the confident hope entertained by several of the highest scientific authorities examined by them, that the same black smoke proceeding from fires in private dwellings, and all other places, may eventually be entirely prevented, either by the adoption of stoves and grates formed for a perfect combustion of the common bituminous coal, or by the use of coke or of anthracite; but they are of opinion, that the present state of knowledge on that subject is not such as to give any hope of any legislative interference with these smaller matters.

In conclusion, therefore, your committee beg leave to recommend that a bill should be brought into parliament at an early period of the next session, to prohibit the production of smoke from furnaces and steam-engines.

They indulge a hope, the matter will be thought of sufficient national importance to induce the government to bring in a bill: but, in the event of their not doing so early next session, your committee recommend that the chairman of this committee should frame such a measure, as being the necessary result of the complete and strong conviction to which they have been come by the prosecution of the inquiry.

17th August, 1843.

KYANIZING OF TIMBER.

Sir,—A letter having appeared in your Journal for August, from Mr. Tavell Seaward, Secretary to the Anti-Dry-rot (Kyan's) Company, commenting on my report and letter on the preservation of timber from decay, I trust you will allow me a corner in your valuable Journal in answer thereto.

Mr. Thompson says that I have made statements most injurious to the interests of the Kyanizing Company.

As a matter of fact, he is no doubt most anxious about its interests; but I have no interest whatever in any process or patent, and have only been anxious to find out the best mode of preserving timber from decay, and the attacks of worm.

Mr. Thompson states that both my report and letter are very inaccurate.

Now, Sir, this charge of "inaccuracy" refers chiefly to my statements respecting the decay of sleepers at the West India Dock warehouses, and the wooden tanks in the Kyan Company's yard.

To prove the truth of this statement, I think you will agree with me, that it is only necessary to refer to the published minutes of the discussion at the Institution of Civil Engineers for session, 1842, in which the following appears:

"Mr. Samuel Seaward said he believed the present method of Kyanizing to be very imperfect, and alluded to a number of sleepers so prepared for the West India Dock warehouses having recently been discovered to decay.

"Mr. Martin (Engineer to the East and West India Docks) confirmed this account of the decay of sleepers. Fifteen out of twenty were destroyed. They had been prepared by simple immersion, and had been down about five years. He had understood that some of the wooden tanks in which the solution was kept at the Anti-Dry-rot Company's yard were decayed.

"Mr. Dull had prepared a number of timbers for Mr. Seaward for trial. Mr. G. Calder and Hebble navigation, by immersing them in the solution for two or three days which was about double the period allowed by the patentee. He had some specimens of boards, and in all almost of them there was an appearance of decay in various stages. An oak board one inch thick, Kyanized in 1839 last year since that company had been in the market, was slightly affected, but the heart remained sound; fungus was, however, growing upon it. Poplar boards, Kyanized in 1838, 39, and 40, were all partially decayed. In preparing the timbers, he had always followed the instructions given by the patentee, and had tested the strength of the solution with the hydrometer, but had mixed up fresh solution even more frequently than was supposed to be required. On dismantling one of the tanks for holding the solution, he found the iron work partially destroyed, and entirely covered with globules of mercury."

It appears that Mr. Thompson did himself take part in this discussion. Why did he not then contradict the statements, if untrue; or after these minutes had been printed and published in almost every journal in London, why did he not explain them away at the time, instead of reserving his explanations and answer for many months? And even to this moment, in the absence of such explanation, I was, and am now, of course, bound to believe the statements of Mr. Seaward. But you will observe, Sir, that he does not, even now, deny the fact of the sleepers and tank having decayed; he only says the sleepers were not in the West India Dock warehouses, but were laid down in Kyan's own yard. In my opinion, this explanation makes the case more unfavourable to the company, because it shows that the process will not preserve the timber laid down in their own yard, how can they expect that the public will believe that it will preserve timber elsewhere.

Mr. Thompson must be well aware that I could have cited many other instances of its failure; what says the supreme bench of arbitrators, the Committee of Public Works, in its report of 1851, commenting on the success of Kyanizing in the London and Birmingham Railway? "They were all Kyanized, but the result has been unfavourable and unsatisfactory, for after laying three years, great numbers discovered symptoms of decay, indeed many were removed absolutely rotten, and he had abandoned the Kyan's process, and adopted Mr. Beetham's oil of tar.

Why has J. K. Brunel, Esq. C.E. (under whose directions such immense quantities of timber were Kyanized) abandoned it and adopted the oil of tar? Will Mr. Thompson inform us what has become of his Kyanizing tanks at Bristol, and how many loads of timber were Kyanized at Hastings during the last two years; and also at Shoreham; and why were the tanks at the latter place offered at 10s. per load to be converted into oil of tar tanks?

What says Mr. Thompson to the experiments in the mushroom-house at Welbeck, where good Baltic timber lasted longer than the best Kyanized oak; and will he tell me how many hundreds of Kyanized sleepers on the London and Brighton Railway have decayed? On the 31st of last month I visited the model-rooms (or museum) of the Advertiser, at Smutsheath, and examined pieces of Kyanized oak and fir now there, which were placed in the sea at Sheerness, and are perfectly honey-comb and destroyed by the worm.

Dr. Moore proved the same thing at Plymouth; and amongst the Transactions of Civil Engineers, is a report from a gentleman at Dover, proving that Kyanized timber shared the same fate there, and that the worms eat it quite as much as they did the unprepared timber. I could bring a host of other proofs if requisite. But I think I have said enough to dispose of Mr. Secretary's first and second heads respecting the Kyanizing process, and that he would have seen that I grounded my opinion as to the injurious effect of the vapour of nuxcumy, on the opinions given to the Advertiser by Sir Humphrey Davy.

In conclusion, allow me to state that my opposition to corrosive sublimates arises solely from the public interest, and that I have publicly announced from a conviction that in hydraulic works (and it was such works that my letter and report treated upon) it is as useless as soft soap, as it does not prevent decay when exposed to sea water, as hydraulic works generally are.

The importance of the subject of preserving timber, I hope will be a sufficient excuse for the space I have occupied in your Journal. I am, Sir, your obedient servant,

WILLIAM B. PHIRNARD.

HEALTH OF LIVERPOOL.—On the occasion of Dr. Lyon Playfair proceeding to Liverpool to examine into the causes of the great unhealthiness of that northern metropolis, Mr. Henry Laxton, has addressed to him a short pamphlet, in which he ably lays bare the prominent causes of the evil, and suggests the requisite improvements. He attributes the unapproachable state of health of Liverpool to the following causes: open cesspools; proximity of buildings; insufficient drainage; smoke from factories and steam vessels; celliar occupation, and dirty state of buildings; open spaces, where water and refuse are allowed to collect and decompose; insufficient supply of water, and deficiency of pleasure grounds for the school children.
THE RELATIVE EFFICIENCY OF LONG AND SHORT CONNECTING RODS, CONSIDERED IN THE EXPOSITION OF CRANK AND CONNECTING ROD MOTION.

By H. F. Clifford.

The subject of the following paper is one of great importance to the practical mechanic; and as we have never yet seen any satisfactory solution of this long disputed question, we have endeavored to draw such conclusions from the investigation of the theory of crank and connecting rod motion as we feel convinced will set at rest all previous doubts concerning the comparative advantages of long and short connecting rods. With a given force in the direction of the piston, our object in the present investigation is to ascertain the best means of obtaining the greatest amount of that force in the direction of rotation, and thus render friction as small as possible; in other words, whether a short or long connecting rod the more effectual method for fulfilling the conditions of our proposed inquiry.

We shall first show that if F be the original force exerted by the piston rod of a steam engine along its own axis, that there is more of that force transmitted in the direction of the long rod than the short one.

Let P Q, Fig. 1, be a cylinder with piston, and let the piston rod exert a force F, at the point B, where the rods B A, B D, connect it respectively to the cranks A C, D E.

Fig. 1.

Let A B make an angle (\( \phi \)) with the horizon.

\[ \begin{align*}
\text{B D} & \quad (\theta) \\
\text{The resolved part of F} & \quad (1) \\
\text{in the direction of A B} & = F \cos \phi \\
\text{in the direction of B D} & = F \cos \theta.
\end{align*} \]

Now the magnitude of the force in either direction depends on the cosines of the angles, which the respective rods B A, B D, make with the horizon, and since \( \cos \phi \) and \( \cos \theta \) become a maximum when \( \phi \) and \( \theta = 0 \), it follows the smaller the angle the larger the numerical value of the cosine, and since \( \theta \) is considerably less than \( \phi \), the long rod has evidently more of the resolved part of F in its direction than the short one.

Again—

The resolved part of F \( (1) \) in the direction of A C = \( F \sin \phi \)

D E = \( F \sin \theta \).

The magnitude of the forces in this ease depends upon the sines of the angles, and since the larger the angle the greater the sine, the resolved part of F in A C is much greater than that in D E; in other words, the pressure into the centre, or friction in the axle, is more in the short than in the long rod.

Having proved then that there is more force in the direction of the long rod, we now proceed to show that the resolved part of the force in B A, and B D, in the direction of rotation, is greater in the case of the long than the short rod; or,

Proposition. To find the part of the force exerted by the piston rod of a steam engine which is perpendicular to the crank, in any given position of the fly.

Let E A, Fig. 2, be the piston rod, the direction of which produced is supposed to pass through the centre of the fly C; A B, the connecting rod; C B, the crank: B D T, the tangent at B.

Let C B = a, A B = b, A C B = \( \phi \), B D = z, A D = z.

\[ \angle A B D = \phi, \quad \angle \text{the tangent makes with connecting rod} \]

A B.

The resolved part of F in B A = \( F \cos \phi \)

\[ \begin{align*}
&= F \cos (A B D + A B D.) \\
&= F \cos (\phi + \frac{\pi}{2} - \theta) \\
&= F \sin (\theta - \phi) \\
&= \text{suppose.}
\end{align*} \]

The resolved part of F in B D = \( \theta \)

\[ \begin{align*}
&= F \cos \phi \sin (\theta - \phi) \\
&= A \quad \text{Fig. 2.}
\end{align*} \]

Investigating equation \( A \), it is evident that the smaller the angle \( \phi \) the greater the force in B D, and the longer the rod A B, the smaller the angle it makes with the tangent, and thus we have more of the resolved part of the force in B A, in the direction of rotation in the long rod, \( \text{a fortiori} \), how much more have we of the original force F, transmitted by the piston in the direction of rotation in the case of the long than the short rod.

There is, however, a small error in the crank's orbit, in which the short rod possesses an advantage, for let E B, F, be respectively a long and short connecting rod, A G H, the fly, G C H, perpendicular to A E, and let the crank (in Fig. 3) be in such a position that B T, the tangent, bisects the \( \angle \) between the rods; let D be the point corresponding.

\* The solution of this equation is rather intricate, as we have to express the value of F in B D, in terms of the known quantities \( a, \theta \), and \( b \); but, as it is desirable to know the result, we give the working.

\[ \begin{align*}
\text{Now cos } \phi &= \frac{b^2 + z^2 - x^2}{2bz} \\
\text{or} &= \frac{x = B D = B C \tan \theta = \theta \tan \theta}{B D = F \cos \theta}.
\end{align*} \]

\[ \begin{align*}
A B &= \frac{\sin \phi}{\sin A B D} = \frac{\sin \phi}{\sin (\frac{\pi}{2} - \theta)} = \sin \phi. \\
\text{and} &= \frac{z = b \sin \phi}{\cos \phi = b \sin \phi \sec \theta}.
\end{align*} \]

By substitution in equation 1, we have

\[ \begin{align*}
\cos \phi &= \frac{x^2 + a^2 \tan^2 \theta - b^2 \sin^2 \theta \sec^2 \theta}{2ab \tan \theta} \\
\text{or} &= \frac{2ab \tan \theta \cos \phi = 2ab \tan \theta \sec^2 \theta - b^2 \sec^2 \theta (1 - \cos^2 \phi)}{\text{completing the quadratic}}.
\end{align*} \]

Dividing by \( b^2 \sec^2 \theta \) and putting \( \theta = 2m \), we have

\[ \begin{align*}
\cos_2 \phi &= \frac{2m \sin 2 \theta \cos \phi = (1 - 4m^2) \sin^2 \theta}{\text{and extracting the root}}.
\end{align*} \]

Now the positive sign must be taken in order that cos \( \phi \) may always be possible.

\[ \text{Compl. } \cos \phi = 2m \sin 2 \theta + \sin \theta \sqrt{1 - 4m^2 \sin^2 \theta}. \]

And \( \sin \phi = \sqrt{\cos_2 \theta - 1 - 4m^2 \sin^2 \theta} \)

\[ \text{Let } X = \text{the resolved part of } F \text{ in B E,} \]

then from equation \( A \), \( X = F \cos \phi \sin (\theta - \phi) \)

\[ \text{Putting for sin } \phi \text{ and cos } \phi \text{ their respective values, } X = F \sin^3 \theta \left(1 + 4m \cos \theta + \cos \theta \sqrt{1 - 4m^2 \sin^2 \theta} \right) = F \cos \theta \sin \theta (2m \cos \theta + \sqrt{1 - 4m^2 \sin^2 \theta} \sqrt{\cos_2 \theta - 4m \sin^2 \theta} \left(2m \cos \theta + \sqrt{1 - 4m^2 \sin^2 \theta} \right) \right), \]

which is the required equation.
ing to B on the other side of E A, then the points B D, will evidently lie between G and K, and R and H. Let CP (in Figs. 4 & 5) represent the other position of the crank, and let P T be the tangent at P. First suppose the forces exerted by the connecting rods in their own directions to be equal, then it is clear (in Fig. 3) their resolved parts in the tangent will be equal, since \( Z E B T = Z F B T \). Now from Fig. 5, it will be seen, that while the crank moves from B to K and from K to D, the short rod makes a smaller angle with the tangent than the long one, consequently, through this arc, the short one possesses an advantage; but, on the other hand, in Fig. 4, while the crank moves from A to B, and by parity of reasoning, from D to A, the long connecting rod makes the smaller angle. Hence, if we suppose the forces exerted by the rods in their own directions to be equal, the long rod is preferable, since in a whole revolution of the crank, it has the advantage through the arc D A B, which is \( > \) arc B K D, through which the shorter one has the advantage. But the forces exerted by the rods in their own directions are not equal, since if F be the force exerted by the piston \( F \cos P E F \), the force in the direction of the long rod is always greater than \( F \cos P F C \), the force in the direction of the shorter one, except when \( F \) coincides with A or K, when they are equal, and thus the superiority of the long rod in the entire orbit in the transmission of rotary force, has been satisfactorily demonstrated. Lastly, since the resolved part which produces rotation is greater in the long than the short rod, the resolved part perpendicular to this direction, or tending to the centre of the fly, is less in the long than the short rod; and this resolved part produces friction on the axis of the fly, which is the chief thing to be guarded against.

It is this trying advantage possessed by the short rod that has induced several clever practical mechanics, with whom we are acquainted, to argue in favour of its superiority; but, whilst we agree with them, that it has the property of pressing at a more favourable angle during the progress of the crank through a very small arc, they must not forget the gradual increase and decrease of the force exerted by the piston on either side of the dead power point \( R \); the inequality of the forces in their own directions, and that, moreover, this alleged superiority lasts only during a very limited portion of the crank's entire revolution.

Theoretically speaking then, there is no limit to the length of the connecting rod of a steam engine, but in practice, we are generally confined for space in the erection of machinery; still from the foregoing analysis, we should endeavour to make it as long as we conveniently can, in order to obtain the greatest amount of rotary force, and thus render friction as little as possible. This subject might be practically illustrated, by taking a steam cylinder, furnished with the usual appendages, and connecting the piston rod end to the crank with a rod fitted with a long eye or slot, so that the length of the rod could be adjusted at pleasure. On the crank shaft put a small drum, and suspend a heavy weight, that has to be wound up over it. By comparing the work done in a given time with the same amount of steam from the boiler, (at an equal pressure in either case,) it will be found that the result of the experiment, if accurately performed, will fully attest the superiority of the long rod, as shown in our theoretical deductions.

THE BRITISH MUSEUM.

New events produce new institutions. In the beginning of this century it would have been considered a silly freak of the swinish herd to have required the inspection of any architectural design, their functions being limited to mute and confiding admiration, when the doctors had given their list that the plaster palace or warehouse church was a master-piece of art. What did the public know of art, and what right had they to interfere? Would they have been allowed to pass their comments on the lath and plaster palace in Buckingham swamp? Certainly not! Neither did architects in those days consider it necessary to pay deference to the judgment of the public or of any one else. It was quite enough that they were employed to do the job, and they put it out of the way in the quietest manner that they could, received the money, and posterity will neither care for the architect nor edifice. The increasing attention paid to English art under the auspices of George III. and George IV. led to the regeneration of public feeling with regard to art, and to those efforts which have been made of late years for the cultivation of the public taste; and as the public have obtained a higher qualification, so they have necessarily required the exercise of higher powers. The throwing open of the British Museum, the extension of the school in it, and the establishment of the National Gallery, have opened the way, which has been followed up by subsequent measures, and it is no exaggeration now to say, that the public have twenty times the power of artistic instruction which they had twenty years ago. The mechanics' institutions have co-operated in this movement by the formation of drawing classes; and the delivery of lectures on art, the extension of provincial exhibitions, or the establishment of art-unions, have fostered the public disposition on the subject. Neither has the government less co-operated; the improvements effected at Hampton Court, the better administration of public collections, the institution of schools of design, and the introduction of drawing as a branch of primary instruction, have all had the same tendency. Contemporaneously a demand has been made on public grounds, on those authorities having charge of new constructions, that the designs should be submitted to public competition and public inspection, and the principle of responsibility to the public voice in the case of architectural works has been fully established. Acted upon by the government with respect to that glorious monument, the New Palace of the Houses of Parliament at Westminster, that principle has been carried out in a most satisfactory manner in the exhibition of the Cartoons, for the
interior decorations. That this principle cannot be injurious to the artist, we are prepared to affirm; that it must have a beneficial influence, the competition to which we have just alluded has fully proved. The incentive to exertion, the sentiment of responsibility, the foretaste of success, which the artist already feels, all tend to develop the highest faculties, and to produce the noblest works. We cannot, perhaps, in this day, reproduce the feeling of religious responsibility which animated the artists of old, and the want of which has been one great cause of the deadness of modern art; we must, therefore, avail ourselves of the nearest approach which the institutions of the present day afford. The vitality of this principle is thus established, and its general application a matter of necessity. We have already alluded to the happy effects of public responsibility in the case of the Houses of Parliament; we now demand its application in an edifice scarcely less remarkable, and not less popular—we mean the British Museum. This is peculiarly the palace of the people, and it is not unnatural that deep interest should be felt as to the designs contemplated for the approaching completion of this edifice, affording, as it will, in its façade, the opportunity for great architectural display, and having the resources of government available for the purpose. We consider it most essential, both as a matter of principle and expediency that some satisfaction should be given to the public anxiety by the announcement and exhibition of the intended design. These are the views which we most earnestly beg to impress on the proper authorities, and we confidently hope for every attention to the many expressions of the public voice on this subject.

**DAVIES' RAILWAY CARRIAGE BREAK.**

This railway break has now had a long trial on the London and Birmingham Railway, where it has been adopted to some of the carriages with great success, and has been highly approved on the line. It is the invention of Mr. David Davies of Wiganmore Street, Caven-dish Square, who is well-known as an extensive railway carriage builder. The following description, by a reference to the accompanying engraving, which we copy from the Mechanic's Magazine, will fully explain the action of the breaks.

\[ a \]
\[ b \]
\[ c \]
\[ d \]
\[ e \]
\[ f \]
\[ g \]
\[ h \]
\[ k \]

These levers are connected by a pin on the extremity of one lever sliding in a slot in an iron plate on the end of that opposite to it, so that any motion conveyed to the one, is simultaneously communicated to the other.

Motion being given to the screw, the traversing nut \( f \) is drawn towards the bevel wheel, which causes the several levers to assume the position shown by the dotted lines, which will occasion the breaks to press against the circumference of all four of the wheels with immense force, preventing their rotation and converting the carriage into a perfect sledge. This combination of the mechanical powers is so advantageous to the development of power, that with such an arrangement it would be almost impossible to crush the wheels. In all the breaks we have hitherto seen, there has always been a violent thrust between the wheel and the carriage, or between two of the wheels, tending to break or bend the axles; in the present plan there is not the slightest strain upon the axle, the gripes being exerted on the two opposite sides of the wheel, and the force that might be thus applied with perfect safety, would be sufficient, if applied in the usual manner, to cause an inevitable rupture in the machinery. Although the action of this break is rapid, it is by no means so sudden as to entail any evil upon that account.

In illustration of the power of such a system of breaks, let us suppose that each of the breaks presents a surface of only three times the area of the bearing surface of the wheel upon the rail, and that the total weight of the carriage is ten tons; it follows then that if each of the eight breaks were pressed against the circumference of the wheel with a force of little more than eight hundred weight, rotation of the wheels would be effectually prevented. When it is further seen that this small force is exerted through the medium of a screw, acting upon a system of levers most advantageously disposed for the multiplication of power, it will be evident that the application of a few pounds to the break handle would instantly arrest the progress of the wheels.

**NEW BUILDING ACT.**

We have a copy of the last bill as amended, and we are happy to announce that in this the amendments suggested by ourselves and others have been fully carried out, and the bill in its present shape, with a few trifling alterations, we should be happy to see passed. As, however, the bill is again referred for further consideration and amendment to Mr. George Smith, one of the city district surveyors, and architect to the Mercers' Company, Professor Hocking and Mr. Thos. Cubitt, the builder, all well known for their practical attainments, we defer going again into the details of the measure until we see the result of their labours and recommendations, which is to be presented to Parliament in the ensuing session. We cannot conclude these few remarks without expressing the obligations under which the profession are to Lord Lincoln, for the readiness he showed to enter into the free discussion of the details of the first bill, and to amend its defects.
ARCHITECTURE IN THE REIGN OF GEORGE III.


From a condensed popular sketch very much is not to be expected, because the writer is so cramped as to space, that he can hardly do more than touch upon a few leading generalities and summing up of his opinions—certainly has no room for entering into specific criticism, nor always for fully explaining his meaning. We can accordingly look for little more than bare opinions and critical dicta, which must be accepted as correct; and to us, who are unable to examine into them. Still, even to those who are already familiar with the subject, an opprobrium of the kind is interesting if only as refreshing the memory, and it would be strange, indeed, if some fresh remark or other could not be picked up from it. Let us begin by quoting the following introductory one.

"Beyond the English school, as it was constituted at the accession of George III., could devise no correction of the errors of their predecessors, but by resorting to crude imitations of Palladio, a recurrence to forms and combinations established under other modes of existence totally different from their own, at another period and in another climate. Neither their discriminating taste in the selection of the beautiful, nor their profound knowledge of the practice of the Italian schools, can redeem the want of fitness which characterizes their productions, their disregard of the exigencies of our climate, and their inattention to our domestic habits; for in many cases their plans as well as their elevations are borrowed from the Italian. The consequence is, that the students, as the school was not thoroughly attached, which they wanted skill to naturalize; it persisted, therefore, leaving nothing in its place, and another half century found architecture in England reduced to a condition unprecedented since its first development as an art, devoid of unity, character, and principles."

While this is, in the main, true, it is also somewhat vague and indistinct; and to us it appears to partake of contradiction to speak of the discriminating taste, and the profound knowledge of the Italian schools, possessed by persons who resorted to "crude imitations of Palladio." Beeble as may have been their powers of invention, it is strange that those who it seems were acquainted with, and capable of appreciating, Italian architecture generally, should not have extended their views beyond Palladio and other system-mongers. And if, in regard to this point, we find ourselves somewhat at a loss, still less do we comprehend what the writer is driving at when, if we do not mistake his meaning, he gives it as his opinion that, being adapted to a different climate, the architecture of Italy is essentially unfit to be followed by us—least without sufficient modifications. It may be so, but we have yet to learn wherefore; for though this philosophical remark is a pretty old acquaintance of ours, we having met with it we know not how many times before, never have we met with even an attempt at an explanation of it. Hardly is there any thing in the constitution of such a style that unfit it in any degree for application in almost any part of Europe, and of moderate climate. The want of fitness of climate and weather as any mode of building can do, and therefore the difference of climate must be corrected by other means; instead of marble pavements or inlaid floor, we require thick carpets, good fires, stoves in vestibules, and the like; and instead of sitting with open windows, we are glad to keep them shut. But matters and circumstances of this kind have nothing to do with one mode of building more than another. From what is sometimes said on the subject, it might almost be supposed that every ten degrees of latitude would require a different mode of architecture; and also might it be supposed that the climate of England was as severe as that of the most northern parts of Siberia. Matter, we believe, would have to be—for the time at least—the most appropriate of any for ourselves.

Let us test the "climate doctrine" by facts: what say they; is St. Paul's found to be at all worse adapted to our climate than Westminster Abbey? Is Windsor Castle decided better so than Buckingham Palace? Baroque buildings have been as usual in other countries. If we consider our climate requires? or though they give us the very quintessence of the Italian style, are they not perfectly English in accommodation—as thoroughly or rather infinitely more so than many houses, and very costly ones, too, which exhibit no other style externally than that called the hole-in-the-wall style? Still, our climate, it may be argued, does not admit of arcades and colonnades; why not—or if not, then ours is not the English climate? This is no argument gives us specimens of clusters and covered walks, which are essentially the same things as the others, differing from them only in style and in name.

The fault lies not in adopting the Italian style—Palladian or any other particular species, but in not at the same time adapting it to circumstances, and further improving it. And if this be what the writer means, we agree with him in regard to his representation of the state of architecture in this country at about the commencement of the present century. What we do, for instance, it was very often the case, and it may be said to have been in a state of starvation—reduced to the extreme of meagreness and insipidity. Of this, we have most convincing proof, in the New Vitruvius Britannicus, which consists entirely of buildings of that period, most of them below mediocrity in point of taste and design, and all, more or less, infected with higgledy-piggledy mannerisms, and false similitude, and marked by nothing so much as the utter absence of all artist-like feeling or study. Even where the glimmering of an idea seems to have presented itself, nothing is made of it; nor is there among the whole collection a single design that is even decently finished-up. The Adams, the Wytts, and the Bo- nomis, bedevilled and vulgarized architecture; their over-splendid, tawdriness, the insipidity, dulness, and wishy-washy characteristics. In order to escape the reproach of heaviness, they fell into the opposite extreme of fminism; while of simplicity they seem to have had little other idea than nakedness of composition, scantiness of details, and utter disregard of finish—that same qua non in the aesthetics of ar- chitecture. Whatever they did they aimed at richness, the result was seldom more than a sort of muddling prettiness; nor was that always consistently kept up. With the Adams, such was generally notoriously the case: their designs, for the most part, exhibit trumpery ornament, patched upon buildings that were not even prepared for embellishment of any kind, being in themselves quite a state of miasma, as is strikingly the case with the Adelphi, Caen Wood, &c., which are wretched architectural stuff, hardly a degree better in point of taste than our modern g in palace style. "In the screen of the Admiralty," says the writer in the Pictorial History, "Adam surpassed himself. It is a work of great beauty, independently of the only instance in which he adopted the ornamental ideas of the Greeks, and a combination of the Greek and Roman. As to its being much more positive merit, however, we do not agree; on the contrary, our opinion more fully coincides with that expressed by another critic, in the London Interiors, Part 23, who speaking of the Admiralty screen, says, "it neither agrees in any way with the building to which it is atten- ded, nor does it make one it can stand in front of upon any stone wall to a public edifice; for it looks too much like a reduced copy of what was intended to be nearly double—or speaking more correctly, nearly four times the size, or about 250 feet in length by 45 in height, instead of only 130 by 22." And again, "As far as the Doric colonnades themselves go, they are satisfactory enough, but not so the curves and corners, a most extraordinary state of meagreness. The side wall is a mere mock character, and too much cut up, especially by the plain blank windows or panels in the pier, which while they destroy width (breadth) of surface, produce an appearance of poverty—of the absence of decoration rather than of richness: another more egregious and evident defect is, that over the arch, the architrave and frieze of entablature, otherwise continued thought, are omitted, and thus the entablature is maimed and mutilated in the very chief point of the design!"

Adam may very deservedly be commended for one thing—the study he bestowed on his plans, and for the greatly improved, more convenient, and likewise more effective arrangements which he introduced, in the building of our domestic architecture, in a very essential point; but as an artist, his taste was at the best of a very nymph-sam-billy kind.

James Wyatt was in some respects a sort of Adam reformato. It was his good fortune to make a decided "hit" by his first work, the Pantheon, in Oxford Street, as to which we are unable to speak, never having seen any of it, we should have to be—"for the time at least—the most appropriate of any for ourselves.

Let us test the "climate doctrine" by facts: what say they; is St. Paul's found to be at all worse adapted to our climate than Westminster Abbey? Is Windsor Castle decided better so than Buckingham Palace? Baroque buildings have been as usual in other countries. If we consider our climate requires? or though they give us the very quintessence of the Italian style, are they not perfectly English in accommodation—as thoroughly or rather infinitely more so than many houses, and very costly ones, too, which exhibit no other style externally than that
Dover House: it is, indeed, upon far too small a scale to tell at all to advantage, where it is placed, for it there shows as a mere bit, and is in fact so small, that the interconnection of the portico is of necessity much wider than it ought to be: still it is marked by much elegance of taste, classical feeling, and artistic quality. Nevertheless, this piece of design is excluded from the New Vitruvius Britannicus, and the same case is also made with Carlton House in Soho. So any uninterested and exceedingly poor subjects are admitted into it.

We shall probably return to the subject when it is resumed in the Pictorial with reference to which we have been speaking; and we suppose that the next chapter of the kind will be the final one, and will continue the history of English architecture down to the end of the first quarter of the present century.

Marine Steam Engines in the Royal Navy.

A letter has been addressed to the Lords of the Admiralty on this subject, and printed, which is likely to excite a good deal of public admiration and much controversy among the members of the engineering profession. Mr. Alexander Gordon, the author of it, is, it is well known, the agent of Napier of Glasgow, and consequently, as he suggests, his testimony is open to the imputation of some bias, and he has been induced to bring forward this pamphlet on the occasion of some Parliamentary returns, which he has obtained through the medium of a friend in the naval service. The returns are to the effect that marine steam-engines are of great importance, both to the nation and the mercantile interests, and particularly at a period when one-fourth of our coasting trade is carried on by the means of steam vessels, and when there is such certain prospect of its still further increase. The deficiency of steam statistics, is, however notorious; and those who are interested in this subject are calculated to alleviate the evil. They are, as we shall subsequently show, deficient in the most important details, and arranged so as to produce particular inferences. If they were not intended to suit particular objects, why is it that the return is limited to the vessels named in the order, and not extended to all vessels engaged in coasting for within the period of the last ten years? Had this been done, we should have had the Medea, Hydra, Gorgon, Driver, and others, now all kept carefully out of sight, but most necessary for the purpose of instituting any fair comparison, or deducing sound conclusions. Why have we not the dimensions of the engines, the tonnage and dimensions of the vessels, and the consumption of coal? Again, we have a return of the cost of repairs without any statement of the service on which the vessel has been placed, whether in war service or merely steaming about the coast. Mr. Gordon has himself said enough to show the many circumstances which interfere to prevent a fair comparison being drawn, or fair play being given to machinery; but there are many others which are not shown. We are told that the value of a vessel from the cost for repairs, when the circumstance of the expediency of a vessel is calculated to put it on more severe service, and thus render greater repairs necessary, while an inefficient vessel is shielded, and thus has neither service nor repairs.

Under all these circumstances we must protest against any inference being drawn from these very suspicious returns—so incomplete that on their appearance they deterred us from making use of them. That the government have unconsciously lent themselves to this imperfect mode of inquiry we are convinced, and we trust they will not leave it to individual members of the House in the ensuing session to perceive this system, but that they will render that protection to the marine engineers of the country by the publication of accurate and comprehensive returns, which are imperative as an act of justice, after a statement so very injurious, from its incompleteness, has been put forth to the world. We call for this as an act of justice to the marine engine builders of the Thames, the Mersey, and the Clyde; for the Communication of information rendered indispensable by the growing wants of the commercial steam marine, and by the necessity of enlightenment upon this subject to the government itself. Within the last three years not less than 2,000,000 have been expended by the government and the great steam ship companies upon the construction of vessels of the largest class and greatest power. That information under this head has now commenced, and, as a matter of national economy, it is expedient that we should be able to profit by all the experience of the past. Let us have the dimensions and weights of the engines, the number of strokes they perform, the mean velocity of the vessel, the quantity of fuel consumed, the length of engine room, the contract price, the tonnage and dimensions of the vessel, the peculiar service for which intended (as the Niger expedition, for instance), what service the vessel
In the above table we have added to the government returns the dimensions of the engines.

The table shows the number of engines and the dimensions of the engines. The table includes the following columns:

- Names of engines
- Contract price per horse
- Original contract
- Cost of repairs
- Repairs up to 31st March, 1843
- No. of days incapable of working
- Length of stroke
- Non-voluntary horse power, velocity of piston
- Diameter of paddle-wheel
- Breadth of board
- Depth of boards
- No. of pairs of engines
- Original contract: £10,700
- Cost of repairs: £1,158
- Repairs up to 31st March, 1843: Jan. 1840, £207; Feb. 1840, £235; March 1840, £240
- Total: 1,158
- Contract price per horse: £53

Mr. Gordon gives us six causes for the inefficiency of so many new steamers as appears in the face of the Parliamentary returns, viz.:

1. The novel principle of construction of engines thought necessary for accommodating them to the limited engine-room. 2nd. The attempt to have light engines in ships which most afterwards have ballast to keep them upright. 3rd. Defects in the material and workmanship. 4th. Incompetency of ship's engineers appointed by the Admiralty. 5th. 'Quarter-deck' interference. 6th. Some unavoidable disaster. I believe that all of these may be causes of mishap, but the six suggested does not seem to have affected the evils so glaringly apparent on the Parliamentary returns. The two first supposed causes are discussed above. The third appears also to have some application. But for any one to attempt to account for such heavy repairs and loss of service by the fourth and fifth, and to lay the blame on engineers aloft and officers in command, would only show a bad selection of his standards and an incredulous interference of the other.

We perfectly agree with Mr. Gordon as to the necessity of a higher rating for engineers in the Navy, with so many engineering offices connected with that department, and the demand for engineering talent which exists there, we think it is absolutely necessary that proper measures should be taken to secure the services of the educated members of the profession. The rating of another class of scientific men in the navy could be better to promote the high standing which the navy is taking as an educated profession, while the many subsidiary advantages which would accrue from having the services of engineers available requires no comment.

As to that subject upon which so much reluctance has hitherto been exhibited, a return of the consumption of coals, no difficulties it seems to us stand in the way. It can surely be told how many tons of coals are put on board a government vessel, and the description of them, at any rate we cannot see why returns given by the officers of the private Atlantic steamers cannot be given by those of government vessels. As Mr. Gordon observes, a difference of one pound of coal per horse power per hour would make a difference to the country of £10,000 a year. We think an annual return should be made imperative.

We have the returns of duty of Cornish engines, and accurate returns of the consumption of railway engines, and we know the economy which has resulted from the experience thus afforded. Annual returns should be published, which would operate as a check upon the coal owner and upon the engineer; and we do not see why a system of premiums for economy in the consumption of coals should not be introduced among marine engineers as it has already worked with good effect upon the Belgian railways and some of the English.

As we have already observed, before we can come to the same conclusion as Mr. Gordon, we must have more extended returns, and more accurate information. It is not fair to the parties to judge them by what is now before us, and as Mr. Gordon appears to have had something to do with obtaining the present returns, we hope in the next session he will take care to prevail upon Captain Gore, or some other member, to move for the extended information we now require.


The institution of this museum is an event which cannot but be considered as most valuable to engineers. It is a recognition by the government of the great advancement of engineering science, and of the influence which it has had in systematically developing the resources of the country. The labours of the engineer have opened up districts not before available, and the development of the means of communication have given the public an interest in every locality. Under such circumstances, the knowledge of our mineral treasures, and of their useful applications, is indispensable, and the establishment of a museum was the most fitting means for effecting this. The establishment formed at Craig's Court, Charing Cross,
sequentially merits the visit of the student and professional man; and the descriptive account of Mr. Sophus is one of the best guides he can have on the occasion. Mr. Sophus has devoted much attention to this subject, and his shilling manual is a most readable and instructive book. It is open to the public gratuitously every day, excepting Sunday, from 10 o'clock till 4, from November to February, and until 5 o'clock during the rest of the year.

"The Museum of Economic Geology, as now arranged, comprises an entrance hall or lobby, an apartment on the ground floor 46 feet long, and 18½ feet wide, and a gallery on the first floor 100 feet long, varying in width from 17 to 25 feet. The department of the Office of Mining Records comprises a room, 25 feet by 20 feet, in which tables are for drawing plans, and a gallery on the second floor 103 feet long, containing mining implements, and maps of mines and mineral districts, and of various engines, machines, &c., used for working and draining mines. In addition to these are a laboratory, conducted Mr. Richard Phillips, E.R.S., the curator of the museum; a workshop in which models are constructed, under the immediate direction of Mr. Jordan; and a small library or private room for the use of the director. To these apartments additions will doubtless be made from time to time commensurate with the national usefulness of the establishment, and the more so, as, owing to the extensive opportunities afforded by ordnance geological surveys, and the great liberality of numerous owners of mineral property, and other public-spirited friends of science, a large proportion of the valuable contents of this museum have been, and will assuredly continue to be, received without any expense beyond the mere carriage of the specimens. It is gratifying also to know that the present administration cordially approve and support the arrangement of the museum, which was commenced by their predecessors, and by their attention to its interest, evince their regard for those foundations of our national wealth, a knowledge of which, as Sir John Sinclair has justly said, is of more importance to this country than all the mines of Mexico and Peru."

Launch of the Great Britain.

Mr. Davis has got up a lithograph on this subject from the able pencil of Mr. Thomas Allom, which possesses merits not only of artistic treatment, but of accurate delineation. The view was taken immediately after the launch, and the fidelity of it is evident, as also in the case of the adjacent scenery and minor details. It is certainly one of the best representations of the Great Britain which has yet appeared; and equally an ornament to the office as to the drawing-room. We extract the following account of the details of the vessel and engines, which are appended to the engraving, and we understand are correct:

Keel laid Dec. 19, 1839; floated July 19, 1843.

Length extreme, from figure-head to taffrail ..... 222 0
Do. upper and forecastle decks ..... 308 0
Do. between perpendiculars ..... 286 0
Extreme breadth ..... 50 6
Depth after masts ..... 32 0
She is divided into four compartments by means of iron bulkheads, 3 ft. thick, viz., 1st, forecastle; 2nd, fore-saloon; 3d, boiler and engine-room; 4th, after saloons.

Total surface of fire-bar, 228 feet super
Chimney 8 feet diameter, height 34 feet.
Screw propeller, 16 feet 6 inches diameter.

The Museum is open to the public gratis every day, excepting Sunday, from 10 o'clock till 4, from November to February, and until 5 o'clock during the rest of the year.

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Chimney 8 feet diameter, height 34 feet.
Screw propeller, 16 feet 6 inches diameter.

Effects of Lightning at Sea.

A paper from the commander of the Vigie, with an account of the effects of electricity in a recent voyage, was read at one of the recent meetings of the Academy of Sciences. It states that the mainmast was three times struck with the electric fluid very severely, but that no damage was occasioned to the vessel, or even to the sprit-rigging. A sailor was sent up to see what effect the electric fluid had on the paratonnere, and as soon as he reached it, he experienced such shocks as nearly caused him to fall down, and he felt the same every time he placed his hand on the base of the paratonnere. It had become a magnet. The same effect had been produced on every work of iron in the vessel. The compasses too had their needles disarranged, and would no longer serve to guide the ship. Eight or ten days after, the Vigie met another vessel, and obtained one of her compasses, but the magnetic action communicated itself to this one, and the instrument became useless.


To the Queen's Most Excellent Majesty.

We, the Commissioners, appointed by your Majesty for the purpose of inquiring whether advantage might not be taken of the rebuilding of your Majesty's Palace at Westminster, wherein your Majesty's Parliament is wont to assemble, for the purpose of promoting and encouraging the fine arts in your Majesty's united kingdom, and in what manner an object of so much importance might be most effectually promoted, humbly report to your Majesty, that having, in furtherance of the objects proposed by us in our first report, and sanctioned by your Majesty, invited a competition in cartoons, we have now humbly to submit to your Majesty that the competition referred to has taken place, and that we are satisfied with the evidence of ability afforded, not only by the works of the successful candidates, but those of many others.

Having satisfied ourselves respecting the attainments of many British artists in the practice of cartoon-drawing, and respecting their capacity to attain excellence in those qualities which are essential in historical painting, we now propose, in pursuance of the plan before announced by us, to invite artists to exhibit specimens in fresco-painting of a moderate size, which, by being portable, will enable all candidates for employment in that method of painting to send in works exhibiting their qualifications therein as painters and colourists, and which, taken together with the larger compositions in drawing which they have exhibited or may exhibit, and with other existing evidences of their talents, may enable us to proceed to the selection of artists for the decoration in fresco of certain portions of the Palace. Nevertheless, as paintings executed in other methods may be free from a shining surface, and may therefore be deemed by some artists to be fit for the decoration of walls, we have invited such artists to exhibit specimens of the methods in question, and shall regard such methods as open for consideration.

With respect to sculpture, we have announced that various statues will be required for the decoration of the Palace, and we have invited artists to exhibit models, in order to assist us in the selection of sculptors to be employed.

With regard to decorative art of various kinds—namely, glass-staining, arabesque-painting, wood-carving, ornamental metal-work, and ornamental pavements, we have, in like manner, issued notices inviting artists and others to send in specimens, in order to assist us in the selection of persons to be employed.

We have further to your Majesty, that the choice of candidates for employment in oil painting, and other departments of the art besides historical painting, will be considered hereafter, and that the order in which the several branches of art and decoration applicable to the embellishment of the Palace have been considered by us, has been, and must continue to be, determined by the time requisite for the execution of the works, the study required by the artists in modes of execution which are new to them, and by the progress of particular portions of the building.
PAYNE'S WOOD PATENT.

In the House of Commons on Wednesday, August 16, Mr. Barclay put a question to the noble lord at the head of the Woods and Forests, respecting Mr. Payne's patent process for preserving timber from dry rot, and the ravages of insects. He understood that the properties of the patent to this extent had been pretty fully tested, and more than all by the department over which his lordship presides, and that it had been satisfactorily shown that it had the property of rendering wood prepared by it unflammable or at any rate of depriving it of a large degree of combustibility. Lord Lincoln said he felt most happy to give the honourable member the fullest information he possessed on the subject. The matter had been brought before him in his official capacity, and he had thought it right to take considerable pains to be well informed on so important an invention. He had paid a visit to the premises, and inspected the very ingenious machinery and process of Mr. Payne, but not liking to trust his own judgment in a matter where great professional skill was essential, he had directed Mr. Phillips, professor of economic geology, to examine into the invention and report upon it. That report the noble lord said was highly favourable; and since then he had directed the erection of a structure in his department in which the process had been applied to all the timbers, and under the inspection of the woods and forests surveyors. He had no doubt himself of the great value of the invention, and believed that experience would confirm his present favourable opinion, but time would be necessary to test it. The Admiralty had applied to him on the same subject, and a similar answer had been returned to them. He should be happy to lay before the hon. member for Sunderland the report of Mr. Phillips. Mr. Barclay thanked the noble lord for his satisfactory statement, and moved that the report be laid upon the table of the house, which was agreed to.

A STEAM METER.

M. Clement has invented an instrument which he calls a manometric thermometer, for measuring the temperature and tension of steam in boilers of high and low pressure, and particularly to prevent accidents by explosion. It is formed of two strips, one of which is silver, and the other of platinum, rolled up in a spiral form. These strips are soldered together, and one of the extremities is fixed, while the other is attached to a copper vertical rod. Owing to the difference in the dilatation of platinum and silver, when the temperature of the instrument varies, its upper extremity imparts a movement of rotation to the copper rod, which is communicated by means of a rack-wheel to two hands, which indicate the variation of temperature.


STONE FROM

<table>
<thead>
<tr>
<th>Portland</th>
<th>Norfolk</th>
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<tbody>
<tr>
<td>Messrs. Webb</td>
<td>£10,722</td>
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<tr>
<td>Mr. Dixon</td>
<td>10,720</td>
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<tr>
<td>Mr. Herbert</td>
<td>10,640</td>
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<tr>
<td>Messrs. Cubitt</td>
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<tr>
<td>Soward and Son</td>
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<tr>
<td>Grissell and Peto.</td>
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<tr>
<td>Lee</td>
<td>10,260</td>
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<tr>
<td>Woolcot and Son</td>
<td>10,178</td>
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<tr>
<td>Mr. Winsland</td>
<td>8,800</td>
</tr>
<tr>
<td>Messrs. Piper and Son</td>
<td>9,554</td>
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The Directors have decided to have Norfolk stone, and accept Mr. Winsland's tender. The works have commenced.

PUBLIC WORKS IN PARIS.—The National observes, that it is not without interest to consider the sums expended within the last 21 years in the improvement and embellishment of Paris, which have rendered it one of the finest cities in the world.

France. Expended on works relative to the distribution of water, aqueducts, reservoirs, fountains... 30,986,547
In digging and paving streets... 17,644,961
In purchases for enlarging the public avenues... 39,017,708
The construction of commercial edifices as well as in objects of art and decoration... 62,984,919
In the purchase of ground necessary for those edifices... 17,802,729
Total... 168,465,764

We humbly subjoin, as an appendix to this report, some papers treating in detail various matters connected with the subject of our inquiry, and explanatory of the proceedings of the commission; and, with respect to the architect's report, have to state that we have taken it into our attentive consideration; but although we have, in consequence, issued various notices calculated to assist us in coming to a final conclusion thereupon, we are not yet prepared to lay any specific recommendation before your Majestty, both in consequence of the building not being sufficiently advanced, and the result of the inquiries and experiments made and making by and under our direction not being sufficiently ascertained, to justify us in coming to any final conclusion in this respect. And with reference to that part of the architect's report which relates to local improvements in the neighbourhood of the Palace, we consider that, however deserving of attention the improvements in question may be, they do not come within the inquiry with which we are intrusted.

ALBERT. LYNEHURST. SUTHERLAND. LANDOWNE. LINCOLN. ABERDEEN. J. R. G. GRAHAM. HENRY GALLY KNIGHT. J. RUSSELL. B. HAWES, JUN. PALMERSTON. S. ROGERS. THOMAS WISE. MELBOURNE. COLBORNE. CHARLES SHAW LEFEBRE. ROBERT PEEL. RUSSELL. ROBERT HARRY INGLIS.

Whitehall; July 28, 1845.

[Here follows Mr. Barry's Report which we published in the Journal last May, page 173.]

EXTRACT FROM THE REPORT OF THE COMMITTEE ON WESTMINSTER HALL.

Your committee, to whom was referred the duty of making investigations respecting the ancient state and modes of permanent and temporary decoration of Westminster Hall, and respecting the dates and extent of its architectural alterations, have the honor to report that they have examined Westminster Hall with a view to the objects of the inquiry committed to them. That they have reason to believe that the original hall of King William Rufus occupied the same area as the present building. That they believe that whatever portion of the fabric of the Norman hall of the palace of King William Rufus may remain, it is entirely encased and concealed by the walls of the actual structure. That the walls of the actual structure, as they now appear, with the exception of the surface alterations made in 1806-7, and also the existing roof, were erected in the reign of King Richard II., in the year 1398; the walls being then heightened, and the original rubble of the Norman work being then encased in ashlar, and the buttresses added. That they have no reason to believe that there were any permanent decorations in the interior of the said hall other than those which now exist. That the temporary decorations on occasion of state trials, or of coronation banquets, varied with the need and propriety of the service to which the hall was applied. That in the last year of the reign of King Richard II., the hall appears to have been "hung and sumptuously trimmed," by which phrase your committee understand hangings of tapestry and other temporary decoration; but that there is no reason to believe that there was at any time any decoration of painting of any kind on the walls, though in making this observation it is right to add, that your committee feel that there is in the existing hall sufficient light for the proposed exhibition of cartoons. That the use of banners and trophies suspended from the roof or rafters of the hall was not earlier than the reign of Queen Anne, and was soon discontinued. And in respect to the last subject of inquiry remitted to them, so far as the same has not by anticipation been already answered by the statement that the hall is substantially unaltered, your committee find, that in 1821, the two courts of justice which were excrescences on the south side, and which were comparatively modern erections, were removed; that a door in the centre of the south end was opened; that two smaller doors at the sides were closed; that a row of dormer windows was opened in the roof on each side, and certain doors opened to the courts of law on the west side.

Your committee observe that one of the windows on the east side has been partially closed, two windows adjoining the same having been originally closed externally, so far as it appears by the clock tower of the ancient palace rising directly against them, and still obstructing them, though it was reduced in height by the late Mr. Wyatt in the course of the works which he conducted in 1806-7.


Whitehall, March 21, 1845.
REMARKS ON THE PRESENT STATE OF ARCHITECTURAL TASTE AND PRACTICE IN OUR LARGE TOWNS.

(From the North of England Magazine, June 1843.)

I.—GENERAL PRINCIPLES OF ARCHITECTURE.

The state of architectural taste in this country is confessedly very low and imperfect, and does not receive that degree of attention and regard which from its nature and importance it deserves. As the subject of taste does not touch our personal comforts and wants, it is apt to be regarded with indifference, by many, who have means and opportunities of encouraging the art and influencing its practice. It would not be right to say that the majority of such individuals disregard this subject from the direction of their habits and tastes lying altogether, or chiefly, in personal gratification; but, I believe, there are many individuals who, having made it the business of their lives to acquire wealth, and, from association and circumstances, been led to regard material comforts and ease as the chief end of their every-day life, have had no favourable opportunity or stimulus to the cultivation of those refinements of sense and feeling, which embody themselves in the productions of the fine arts. It is true mental endowments are possessed and cultivated in a very high degree by people of all classes, and the present age is immensely superior to any previous one, if not in the profundity, at least in the variety and almost universal diffusion of its scientific requirements; but this eminence is almost entirely intellectual: it evinces little refinement of taste or feeling, or lively perception of the beautiful.

I do not intend the above remarks to apply, by any means, universally: but they apply, I think, equally to all classes. The middle and lower classes have not the opportunities which are possessed by the upper, of testifying their taste in architecture, but as far as I am able to judge, the latter do not evince that superiority, which from their position might have been expected. There are indeed many distinguished exceptions. There are many who have a very high appreciation of excellence in this art, but still that the cerebrum deservedly applies to us generally, cannot, I think, be denied. Without attempting to account for this state of taste, I merely remark that the effect is in some degree aided, in manufacturing towns at least, by the fact of the mind becoming habitual to the contemplation of works of more utility in the shape of mills, warehouses, &c., and that the principles which determine their character are unconsciously, but very improperly, applied to works of a totally different nature.

The art, as well as the literature of the present day, is too much a subject of fashion and caprice, and depends too much on the particular taste of the public which may happen to predominate at the time; this remark applies especially to architecture. It may, perhaps, be said that such has been the case in the best ages of antiquity, but it will be found on examination, that the changes which were always going on in style, among the Greeks for example, took place when the art was advancing towards perfection, and were the result of a deep study of its principles and capabilities, and of the variations which are always going on in the manners and customs of a partially civilized people. Our architecture, on the contrary, wants character, and application to the circumstances of the times. A building ought to grow without effort and almost unconsciously out of the wants which call it forth, and should be the result of these, produced under the direction of taste. It is this which makes the remains now existing in Greece, Egypt, &c., so interesting and valuable, as monuments of the past history of those nations; and it is only by working on these principles that we can give our buildings either character or interest.

We must go back to first principles, and apply them to our wants and circumstances. Such is our want of character, that if half-a-dozen of the principal public buildings, which have been erected in this country within the last half century, should be examined a thousand years hence, without accompanying history or tradition, it would be a more puzzling question than has ever yet been proposed to the antiquary, to determine the character, civil or religious, of the people who could raise monuments so various and anomalous. Fortunately the doubt is as to their surviving one century instead of ten. In addition to this prevailing ignorance and indifference to architectural excellence, the architecture of the present day is subjected to the pernicious influence of what is called by some economy, but which is often more akin to meanness. It has been said by an eminent living architect, "Economy is the bane of architecture!" but it is only false economy that architecture has to dread; and I cannot but think that true economy, properly directed, would exercise a very beneficial influence on works of architecture. How often do we see individuals and committees, in attempting to avoid the charge of economy, falsely so called, and to acquire a reputation for liberality and taste, actually commit a much more egregious error than the one they seek to avoid. The result in such cases is often little better than ostentation and a paltry regard for appearances; the works are sure to be all outside, and what little enrichment they do possess, is invariably in the most conspicuous places, to catch the eye of every casual observer. A glance is sufficient to show all the beauty or interest they possess, and when once seen, little desire is felt for a second inspection. How few of our modern buildings offer any temptation to explore and examine their beauties. What have we to compare with our old cathedrals, abbeys, or even small country churches, where almost every visit reveals some new beauty, or tends to deepen the impression of former ones; and this, independent of all interest arising from association?

The ignorance from which all these evils spring, is unfortunately not confined to the public generally, who cannot be expected to possess any profound knowledge on the subject, but is very prevalent among even professional men. It is much to be wished that some standard of proficiency were established, by which the competence of all desiring to enter the profession might be tested; for it is notorious, that comparatively few of those professing as architects, in some of our most important towns, are really competent by talent or education, to do credit either to themselves or to the profession. That this opinion is founded on jealousy or ill will, I think no one, who looks round on the different buildings in the neighbourhood of Manchester or Liverpool for instance, will assert. With few exceptions, all the buildings in those towns which display real taste, or evince originality of conception, are by non-resident architects; but it would be invincible to remark further, than merely to mention the fact, as regards these localities. Happily this wide-spread ignorance is now beginning to disappear before an increasing zeal for the cultivation of the art, and investigation of its principles; and it may very safely be prophesied, that the more it is studied and understood, the more will its claim to a high place in our regard be acknowledged.

I do not consider it necessary to say anything in defence of the fine arts in general, or of architecture in particular. The time is gone by for its being looked upon as an art merely of utility; and there are few now who will venture to deny its beneficial tendency to elevate the mind to the perception of refined and intense pleasure. I may remark, however, that if taste be important and worthy of cultivation in the fine arts generally, it is particularly so as regards architecture, as the productions of this art are easily, and their influence, whether beneficial or otherwise, lasting as themselves. Besides, buildings of some sort or other cannot be dispensed with, and, being open to the view of all, must have a very extensive influence on the public taste.

I propose first to lay down, and explain as familiarly as I can, some of the chief fundamental principles of the art, including nothing but what may be called the postulates, or self-evident truths, which are really very few and simple, and on which it will be my endeavour to found all the subsequent remarks which I may have to make. The chief difficulty in the way of the free reception of the truth of these principles, and the propriety of their application, to our every-day circumstances, is that of diverting the mind of prejudice, or that effect of long habit in viewing objects of a particular character as perfect, or least without at the time feeling conscious of their defects. Almost the whole of architectural rule may be comprised in one idea, which applies equally as a test of excellence in all the arts, viz., Fitness or Propriety. It is unnecessary to adduce any proof or even illustration of this, as it would obviously be useless to argue with one who would deny that a thing is good or excellent, in proportion as it serves the purpose for which it was intended, without redundancy or deficiency, and as it accords with propriety of feeling and character. This principle applied to works of architecture, ought to enable a competent and unprejudiced mind, on viewing a building, to ascertain at once, or at least to form a tolerable conjecture, as to its purpose and destination. 31
This fundamental principle may be considered under three heads, viz.---1st, Convenience; 2nd, Construction; and 3rd, Character, including Form and Enrichment. All these departments are of course modified and controlled by economy, and also combine with and control one another.

We shall consider first, Convenience, which will determine the number, size, and arrangement of the different portions of the edifice, according to their use and purpose. These considerations are so various and extensive, that it would be both tedious and out of place to enter into an examination of them now. I may, perhaps, at a future time notice some few instances in which our practice is defective. When this distribution, depending on convenience, is determined, the next subject demanding attention, and which is, perhaps, the least regarded, is Construction. This includes considerations of material, climate, and durability. As to material, that is obviously the most proper to be used, which possesses in the highest degree the requisite strength, durability, and resistance to climate. There are three classes of materials commonly used in buildings---1st, those which are best adapted to resist compression, as brick, stone, &c.; 2nd, those best adapted to resist rarefaction, as wood; and 3rd, those which resist tension, as iron. Now, it is important to remark, that from the totally different qualities of these three classes of materials, they require in construction, a totally different mode of treatment; thus, the first class are obviously best suited for external and internal walls, those parts of the fabric in short, on which all the rest must depend;---the second class are best adapted for horizontal and oblique bearings, as in floors and roofs, and the third are calculated for ties, and for various other minor purposes. Of course, there are peculiar circumstances in which the application of these materials may vary, but the above are the general and obvious uses to which they are best applied. The climate also exercises (for I should say ought to exercise, for in this country it does not) a very considerable influence, not only on the material employed in building, but also on the forms and features, as pitch of roofs, &c.

Now these general principles, simple and obvious as they may seem, and indeed are, are very often disregarded in practice, which is one cause of so much incongruity and want of character in our architecture. I may also mention now, in connexion with propriety, another very important fundamental principle, forcibly expressed by Pugin in his "True Principles of Christian Architecture," and a disregard of which is a chief source of error in this country. I mean that "the construction of a building should avow itself;" there should never be any attempt to conceal the real structure, by a sham apparent one. This every unprejudiced mind will allow; it is, in fact, only a consequence of our first rule of fitness. The mind must be satisfied on this point before it can derive pleasure through the senses: for let an object be ever so beautiful in form and enrichment, if there be any misapplication of materials, or any attempt at deception; if it betray any mean device or contrivance by which it is made to assume (in material or otherwise) a character not properly belonging to it, a refined taste can never but be disgusted with the deceit; while all the beauty which may belong to the mere form teals only to increase the feeling of dissatisfaction which such an object would excite. In addition to what Pugin has said regarding the concealment of construction, I should say that, as a general rule, we should not only not take pains to conceal it, but that we should also, as far as practicable, expose the real construction to view. Every essential part of the structure should be apparent. Another rule which follows from the above is, that every object in art should be in form, colour, and dimension, just what would be in accordance with the nature of the material of which it consists. It was on these fundamental principles that the magnificent works of the Greeks and Egyptians were executed, and also those wonderful structures of the middle ages, which adorn every quarter of our island.

The rules above given are constantly violated in the present day. We see in all parts of the country, but especially in the neighbourhood of manufacturing towns, hundreds of houses which every body knows to be built of brick, but which from some fancy or other, are made to appear as though they were built of stone, betraying at once, the pride of the proprietor in desiring an expensive material, and his poverty in being unable to obtain it. The practice is so universal, that many, I have no doubt do not see the matter in this light; and many follow the custom, because it is come to be considered necessary for maintaining a respectable appearance; but I believe that pride originated it, and that when it is analysed, it will come to what I have stated. Another instance in which plaster is improperly made to assume the appearance of stone, is very frequent in churches, entrance halls, &c.; it consists in lining it in imitation of large square stones. Now this being a deception is sufficient at once to condemn it, but it also has a very chilling and comfortless effect, and the practice ought to be abandoned. If I recollect rightly, Pugin has in the new catholic chapel at Birmingham, left the surface of the plaster quite plain and rough, a practice certainly not to be recommended; but he may, perhaps, look forward to its being ornamented at some future time, when means will allow. I am quite willing to admit the propriety of plastering interior walls, and also the desirableness of relieving the monotony of a plain flat surface, but there are other and more legitimate means than the one just noticed, of doing this, which may be used according to circumstances. For churches or chapels, where there is a great breadth of bare wall, the best way, as well as the most obvious, would be to impress the plaster with a flat device in the way of seal or stamp, which would at any rate be consistent with the nature of the material, and would afford ample scope for ingenuity and beauty at comparatively small cost. The other methods of avoiding monotonous surfaces of plaster are in common use, viz.:--painting and papering, and are perfectly legitimate when applied consistently. But we frequently see walls and ceilings painted in imitation of patterning, or of some other material, as marble and costly woods, all which are bad, because they are attempts at deception, and for the same reason, paper hangings which exhibit natural objects, raised apparently from the surface of the wall, whether in colours, or mere light and shade, are improper. The ornamental pattern on the paper may be as simple or as rich and complex as the character of the apartment requires, but to be in correct taste, it is essential it should appear as a flat surface. Imitation of woods, marbles, &c. in plaster, either by painting or otherwise, are just as bad as imitations of stone by plaster on the outside of a house; for though the finer woods and marbles possess more beauty than commoner materials, the chief motive for imitating them is the desire of displaying coarseness without incurring cost. If these remarks are well founded, I think the use of scagliola cannot be justified on the strict principles of taste. Even the plainest materials are more satisfactory than the most beautiful imitation of the costliest woods that ever were seen; indeed the more easily the material imitated, the more unsatisfactory the result, as the probability of its being sham is increased in proportion.

But to return to the consideration of brick and stone. Brick is best adapted for plain walls, because if well burnt, it is more durable than stone, more impervious to weather, and in many places is much cheaper. Both propriety and economy, therefore, point to it as the most proper material for general use, in such localities. But on the other hand, brick cannot be used where cutting is required, here its place can only be supplied by stone; but there is a very simple method of ornamenting brick buildings, which seems to be almost unknown or forgotten amongst us, viz.: by imitating the bricks into different forms and ornamental devices, and by using bricks of different colours, as red, blue, and white. In this way a true artist would be able to produce many beautiful and picturesque effects; bands or string courses might be thus formed either by impressed patterns, or by a different coloured brick; chimneys might also be made highly ornamental, all which would be in perfect propriety, and might be obtained at a trifling cost, without the use of stone at all. However, the judicious use of stone in combination with brick, as round the windows, doors, &c., and in cornices, gives rise to many striking effects which could not be obtained with brick alone. This mixture of materials is most properly employed in ordinary dwelling-houses, or where very little carving is required; but where this is abundant and elaborate, as in a church, the use of brick should perhaps be discarded altogether, as it would form too small a proportion of the wall to justify its introduction, on the score either of durability or economy. This was no doubt one reason amongst others, why the churches of the middle ages were almost invariably built of stone; but it cannot be urged as a reason for employing this as a sole material for ordinary dwelling-houses. Here, good taste requires that economy be consulted, and economy will, in many parts of the country at least, point to brick as the most proper material. But for sacred edifices the case is quite different. In these, economy is hardly excusable except in extraordinary instances; and as stone is undoubtedly the most dignified material, great exertion ought to be made to secure it.
As for timber and plaster buildings, I do not think there is much proba-
ibility of their becoming general, though instances do now and then occur of
houses, not indeed of timber, but of brick, painted to imitate the old style of
timber house. This is actually worse than imitating stone in plaster, be-
cause it is disguising a good and honest material in the garb of one decidedly
inferior. Must we then give up for ever all imitation of those beautiful and
picturesque examples of this style, once so ornamental to our ancient
cities? We must: no circumstances can now arise, which can give any oc-
casion, or call, for such a mode of construction. Ancient remains are, no
doubt, very picturesque and beautiful, and their beauty is of a kind too
which cannot be transferred to any other material. But the old builders did
not employ wood in the construction of their houses, for the sake of the
beauty or effect they could thereby impart to them; they imitated stone,
employed for convenience and economy, and its accompanying beauties were
superadded, and were the result of the taste and feeling of the builders.
And as we must discard the use of wood for such purposes, we must also be
content to forego its accompanying and characteristic beauties, and employ
our taste and ingenuity and love for the beautiful, as they did, on the mate-
rials best adapted, by convenience and economy, for our wants.

The legitimate use of timber in architecture forms the subject for
consideration. The nature of this material points so obviously to its pro-
per application, that it would be difficult to go very far wrong. But I must take
this opportunity of noticing the universal practice of concealing it from view.

What reason can there be for this hiding a most essential part of our archi-
tecture? It is only another result of the blind admiration of the classical
styles which has now prevailed so long. What I complain of is the use of
plaster ceilings to conceal the construction of the floors and roof. "What,"
says a writer, in the British Critic, "is the theoretical notion of a flat plaster
ceiling?" What portion of the construction does it represent? It more
nearly resembles "a vast marble slab" than anything else substantial.
This absence of reality gives to a room an appearance and effect of incomple-
teness, and consequently of discomfort. In spite of habit, I am frequently
empirically, when looking up at a flat plaster ceiling, to ask myself whether it
is really safe, for it seems to be suspended in mid air above one's head with
nothing apparent to sustain it, and this effect is not improved, though the
monotony may be relieved, by pencilling, coving, or any other device. Now,
of all the portions of an apartment, the covering ought from its position, to
have an effect of security, and that effect should be at a glance apparent;
we should have time to ask the question, before being satisfied on this point.

Though people in general see nothing amiss with a that clean white ceiling,
this arises altogether from habit, and I am persuaded that were a person to
acquaint himself to compare ceilings as they are, with what they might be
made, if the timbers above were shown and appropriately carved and deco-
rated, he would very soon think as I do. Ceilings in churches are now hap-
pily going out of favour; but as to dwelling houses, I see no prospect of
even a commencement of reform in this respect; and I dare say the very
idea of exposing the floor joists to view will be absolutely ridiculous by many;
nevertheless, I am quite satisfied that were we once to get over the novelty,
the change would add greatly to the appearance of security and complete-
ness in our apartments. I might add more on this head, but shall reserve
further remarks to a future opportunity. I merely mention the practice now,
as an example of the violation of the fundamental rule, that the construc-
tion of a building should not be concealed from view.

In treating of construction, I cannot omit saying a few words regarding
the use of cast iron, which at the present day is so very extensively used in
building. Had we gone on right principles, this material would very likely
have modified considerably the character of our architecture, (for, in all an-
cient and independent styles, the nature of the materials employed has modi-
fied their character more than any other cause ) instead of which we keep
on in the same track of columns, pilasters, architraves, &e., attempting to
emulate and imitate the style of a distant age and country, with totally dif-
ferent wants and climate; while with a false shame we attempt to conceal
our own real constructive resources; from which, under proper direction,
we might rear a national style, in accordance with our national character and
civilization. At the same time, I confess that the question, how far and in
what manner cast iron may consistently be used in constructive architecture,
is not easily solved, but we may safely lay it down as a rule, that its use
must be in accordance with our fundamental rule of fitness and propriety:
and therefore that it cannot properly be used where, if it is seen at all, it
cannot assume the character and appearance belonging to the material itself.

We frequently see portions of stone buildings which are most exposed to in-
jury from being chipped and broken, as base courses, pilasters, balustrades,
&e., constructed of iron, and painted to resemble stone; under the false
notion that the beauty of the parts will remain with, and depend upon, the
sharpness of their preservation. Now, even supposing that the beauty of
stone work did depend (which I by no means grant) on its perfect preserva-
tion, I contend that such contrivances are bad in principle, are never satis-
factory even when quite new; and in a very short time the parts become so
rubbed and polished, as to lose what little character of stone they at first
possessed; and their very sharpness becomes a defect. I would far rather
give some honest stone, even if it were a little chipped; indeed, I do not
think a little damage of this sort here and there, in exposed situations where
it is only to be expected, at all detracts from the beauty of stone work where
there is any. To come at once to the point—I believe that for ordinary
building purposes, in the styles usually adopted in this country, iron cannot
be considered a proper material. We may perhaps, at some future time, have
ingenuity enough to give it an appropriate and characteristic appearance,
and then it may be properly brought into general use.

It must, however, be understood, that the above remarks do not apply to
iron used when a fire-proof building. Here a new element is introduced, and
the style and material have to be modified accordingly. Now, as in this
class of buildings, wood cannot be introduced, iron comes to the aid most
opportunistically, and may be used without reserve as a substitute for wood. It
may indeed be considered a most valuable and indispensable material for such
purposes. It should, however, in all cases assume a characteristic form.
With the above important exception, the chief value of iron is in engineering
and machinery, not in architecture.

We come now to the consideration of character, including form and en-
richment. One of the chief causes of all the bad architecture of the present
day, is a want of propriety and consistency between the outside and the
inside of a building. The proper method of designing, and that which was
followed by the architects of the middle ages, is, first to get a good and con-
venient plan, and on that to raise an exterior possessing the appropriate
qualities of beauty or grandeur, most consistent with its purpose. Our
system is, I might say almost universally, the direct contrary to this; we
either design the exterior first, and adapt the plan to that, or we arrange the
plan or interior with reference to some imaginary exterior; and in either case
we very often spoil both inside and out. We put up with inconvenience in
the plan, for the sake of effect in the elevations; and we so study and con-
strain the latter, that, whether in a symmetrical style or not, they seldom
possess the expected beauty or charm, even if they possess any beauty at all.
This is one of the evil consequences of copying the style of a distant age
and country, and disregarding our own peculiar climate and manners, and the
architecture which arose out of them. Our climate requires high-pitched
roofs to throw off the water; we must have chimneys for the escape of
smoke, numerous and spacious windows, variety in the parts and purposes of
our buildings; all which are utterly at variance with the classical styles.
On the other hand, we have no occasion for columns, entablatures, open por-
ticos, and colonnades, which are absolutely necessary to the classical styles.

Our requirements and wants are all internal; Greek architecture is all ex-
ternal. Hence it follows, that classical architecture is not fitted for this
country; and our surprise at its being so persistently in is the greater, from
the numberless examples still remaining, of a style actually the birth and
produce of our own soil. What can be more absurd, than building private
mansions after the manner of Roman palaces, and Christian churches in the
likeness of Greek temples. Some indeed seem to consider that we have at
length had enough of such imitations, and to think that, for the sake of

1 The whole surface of the ground floor of a pile of warehouses I have
lately noticed to be faced with iron plates. If, in the construction of these
warehouses, convenience, and convenience only, had been consulted, instead
of grandeur of style, we should have had, instead of a mock imitation of a
palace, a plain, honest, substantial, brick and stone warehouse, suited to its
purpose, and telling its own tale. The doors and windows would have been
in effect walled up, by spaying their jambs, instead of being constructed and
made perfectly square for the sake of effect; the sharp angle involving the
supposed necessity of using a false material.

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relief, we had better try what we can do with other stykes; and we accordingly now import from Italy, Switzerland, Egypt; and we shall no doubt very soon have specimens after the Chinese fashion. But, as we cannot import with them the peculiar climates to which they belong, nor the peculiar manners which created them, we detach from that which gives them character another which is more suitable.

Even when the true national style is chosen, the application of it frequently betrays an utter ignorance of the rules of propriety. The many fine remains of castles and abbeys which adorn our land are not so much worthy of admiration, but there is just as much propriety in imitating them in our modern dwelling houses, as there would be in a man going about in a monk's habit and cowl, or adopting the manners and defence of the twelfth century. A great deal might be said on this point, but I shall reserve further remark to a future occasion, when I hope to speak of architectural principles as applied to particular classes of buildings.

As regards enrichment, my limited space will not allow me to say so much as I could wish. The grand rule for its regulation, as laid down by Pugin, is, that "we should decorate our construction, instead of constructing our decoration." All the parts or features of a design should be useful first, and then ornamental or plain, as determined by propriety and costs. No part should be constructed for the sole sake of ornament or effect, or which has not some significance. The essential parts of a fabric should be the only medium for rendering it beautiful. This rule exists, irrespective of any particular style: but in passing, I may mention that it is an additional argument in favour of our own national style. We too often lose sight of propriety and consistency in decoration, which is apt to be regulated more by consideration of expense than anything else. The almost universal desire is "to have as ornamental a structure as the means will allow." This mania for indiscriminate ornament is chiefly owing to the facility enjoyed at the present day of obtaining it without limit by casting. In ninety-nine buildings out of a hundred, where there is any quantity of ornament, it is sure to consist of cast, either in metal, plaster, cement, artificial stone, compo, papier mache, &c.

In general houses, the ceilings and cornices are covered with ornament, (especially if the builder happen to be a plasterer, who has thus a fine opportunity of displaying his taste and his patterns,) and the same character of ornament, if not the same degree, is carried into halls, drawing-rooms, and bed-rooms, and thrust into all sorts of positions where it can be most seen. We see in cottages, and workhouses, grates and fenders literally covered with ornament, and rich enough for a gentleman's drawing-room. But, as it would not do for the same patterns to be used indiscriminately, in the houses of the rich and poor, numerous grotesque and meaningless forms have been devised to increase expense, and thus render the patterns fit for genteel residences.

The same principles are acted upon in other materials, as cement capitals to stone columns, composition trusses supporting wooden friezes, all painted in imitation of stone. I do not mean to censure in toto the use of cast ornament; but what I insist on is, that it should be used consistently with propriety; and the tendency is, without great caution, to apply without discrimination, ornaments which in this manner can be obtained without a corresponding cost.

I think very false and pernicious notions regarding the value of ornament are commonly entertained. A great part of the charm of ornament consists in the importance it gives to the parts where it is used, and in the evidence it conveys of the high estimation in which such parts were held—of the taste, imagination, and love of beauty in the mind which produced it; and of similar qualities together with masterly execution, in the artiste. Now, when ornament is produced mechanically, and consists merely of plaster or cast iron, all the interest derived from the latter source is utterly lost. It ceases to be any criterion either of the liberality of the owner, or of the taste and talent of the artist. Besides, cast ornaments have never that freedom and boldness of relief which belongs to genuine carving.

In conclusion, while I urge the cultivation of the excessive use of decoration into which we are so apt to run, I would remark that if judiciously and consistently employed, its less quantity would be much more than counterbalanced by its gain in value and interest.

Manchester, May 1843.

Henry Bowring.
whom a bluish green predominates. Then the doors and window shutters are coloured dark green, to imitate bronze—a violent contrast to the walls—and over the whole the painter by the device of Raphael's pentecostal draperies of the ceiling is richly coloured and gilt, whilst the walls are comparatively plain. The character of both ought surely to be more consonant—or, if there were any difference, ought not the more attractive features to be on the walls, as the eye is never permitted to lose the true that there are thousands of. The ceiling is richly coloured and gilt, whilst the walls are comparatively plain. The character of both ought surely to be more consonant—or, if there were any difference, ought not the more attractive features to be on the walls, as the eye is never permitted to lose the true that there are thousands of.

The ornament is inconsistent with each other. Some are early Grecian, some Pompeian, some of the age of Louis Quatorze! as in the cornices of the window curtains. There is no objection perhaps to a combination of different styles—but it can only be realized successfully by a principle which, depriving each of its distinctive and independent character, succeeds in making all integral and harmonious parts of a novel creation. In architectural forms Palladio and Wren succeeded in accomplishing this, when they took the severe proportions and adapted the forms for the habitations of the time. But the decorations at the Travellers' Club are very wide of the application of such a principle. Each different part—said cornices especially—looks like an independent empiricism, and has been brought together afterwards, and as the result has no connection with the rest of the room. The window-shutters are painted in imitation of bronze, of a dark-bluish bottle-green hue. The same question suggests itself here as below in the granite facade. What could there be then for real bronze under such circumstances? The doors are subjected to no violations; not even exposed to the weather which in the open air is best. They are unignited indeed. On the panels of the doors are painted imitations of bas-relief metal work. Imitations are tolerable in proportion to their successful approximation to realities. When it was decided to ornament these panels, the use of real metal, iron, brass, or bronze would have been the most adequate. A few shrillings' worth of Mr. Bielefeld's papier mâché ornaments would have at least have given an actually raised surface, and insured natural shadows whenever the door was opened. Now under fixed painted shadows, every time the door is opened a positive untruth is told in the face of the light. What can be said of the drawing-room carpet?—a thing in which the cost of pattern is hardly a consideration: certainly not to such a club as this. It is just the carpet you would want to find adorning the drawing-room of a flourishing cheese-enumerator in Aldgate or the Minories: flowers of every hue displayed in the open air, musician's toms, toms, toms, in a jumble of the ancient or modern; even that lowest of styles, the Louis Quatorze, would not own it. Is it a mistake to attempt any imitations which cannot succeed? If we want the representations of flowers, let them be executed by means which are equally beast. A company of flowers, say on a gilt frame, would have been a beaux arts arrangement of colours almost identical with pattern. But we do not now intend to write an essay on carpets; and we can only dispatch that of the Travellers' drawing-room by saying that it has both pattern and abundance of colours—but combined on such false principles. The effects of Grecian ornaments or Arab combinations of colours rise very far above it.

We have thought it worth while to enter somewhat at length into this matter, because the members of the Travellers' Club belong to a class who will have nothing of that ignorance of the influence of art on the buildings which seem to be likely to be realized at no distant day. Should the parties who are responsible for the taste of the decorations in this club, have any voice in directing those of the Palace of Westminster, we hope our remarks will not induce them to reflect that there are principles in such matters, which cannot be neglected. There have been thousands of pounds spent on these works, we do not scruple to say that a more satisfactory result might have been produced at a much less cost, had a more correct knowledge of the principles of decoration been applied.
are satisfied that they are of comparatively rare occurrence in ancient parish churches, and that properly speaking they are adapted only for very large and rich edifices. As an example, indeed, occurs in the chancel at Trumpington; and in churches of this date circular gable lights sometimes may be found; we think, more frequently than in early-English.

4. The term "meretricious" is here used in this place say nothing, having endeavoured in a former number to prove them inadmissible in small churches. In general, we greatly object to the common practice of coupling or tripping lancets in every position, and not less so to making them of a large size as a matter of course. It is difficult to conceive that what are not found in them. The disposition in just dimensions of lancets in general is a subject requiring the greatest judgment and nicety, and is therefore deserving of the most earnest attention, since there is no detail so generally misnamed as this, in English. It is not an English feature, and by being made too large for a cathedral, and admitting as much glare as perpendicular windows. We may instance the new churches of St. Michael at Stamford, and St. Andrew at Northampton. What a contrast do such buildings as these present to the sombre and subdued light which was eminently characteristic of all early English.

5. Apses. We have often had occasion to remark upon the impropriety of these in any but Norman parochial churches, and even here we by no means recommend their adoption. We believe that no instance of an early-English apse in a small church occurs in England. Certainly, if any can be found, they are but exceptions. Yet our modern architects generally terminate their churches eastward by a semi-octagonal or a semi-circular apse, perhaps only ten or twelve feet deep. This is a cheap and in some respects showy substitute for a full chancel; and is not an English feature, and by being made either a becoming or an inappropriate one, since it is in fact a mere altar recess, and in nine cases out of ten is without an entrance arch. Moreover, as the right position of the altar in an apse is upon the chord of the arc and not against the east wall, the altar is either so placed as to violate the convenience of the main and use of the apse, or brought prominently forward almost into the nave.

6. Parapets and gable-ends. The first are not necessary in small churches. The cave-roofs of most ancient examples, we think, fell simply and unaccountably upon the bare walls, whereas an ornamental parapet, with a coronal of notch-heads, or dog-tooth, or corbels, is now usually considered indigensible. We recently inspected a design for the restoration of an early-English church in Lincolnshire, where very insufficient funds were obtained even for absolutely necessary improvements, and were indeed considered "a most unnecessary expense" (though they did not appear as such) had one, was prominently set forth. There is no need to be ashamed of a great roof, or to attempt any disguised or superfuse decorative concealment. A parapet will often, by its over-acuteness and appearance of affected finish, detract from the bold and picturesque simplicity of a small church. And the lower the roof, the more objectionable a parapet becomes. Modern gables too are generally awkwardly terminated at the eaves by heavy shoulders or prominent saddle-stones, or look somehow as if the architect did not know exactly what to do with them; whereas what he ought to have done with them was simply to let them alone. The ancients seem hellish to have cared much about them, but to have let them fall easily away with a notch-head, or a head, or a chamfer; or at most with gables, as at Stamford; but always plainly, and therefore gracefully and appropriately. The complete gables of a few of the finer churches which have been seen in numerous modern designs are strikingly contrasted with these.

Nothing, in fine, is left to itself; nothing is plain, unpretending, simple, irregular, accidental. Every detail is overdone; we must have nothing but triplicate, quadruplicate, quintuplicate work. What is done must always improve our towers and east and west elevations by pinnacles and flying buttresses. Thus much is affected, but nothing attained; parts are strained and exaggerated, but general effect is rather injured than improved. For what constitutes the most essential is the play of light and shade, the contrast of full and half-light in the various parts of the building, and the play of light and shade, contrast and the plainness and meagreness in church architecture. The former is simply the absence of ornamental detail, the latter is a scanty and stinted development of the essential parts of construction. A building may be large and rich in external appearance without being rich in internal construction and decoration; and the ornamental detail in everything unnecessarily and perhaps unsuitably adapted as applied to ecclesiastical architecture. The appropriateness, solidity, grandeur, honesty, chasteness, boldness; not necessary and meretricious ornament, but the position of a feature just where it is wanted and as it is wanted, without disguise, without hesitation. It is often with us north and south, that in the same church, the nave with 12,000 one exactly opposite, not the making one side exactly of the same size and shape as the other; not having buttresses, windows, and doors of precisely the same height and breadth and design in every part of the fabric. Such were certainly not the principles which guided the ancients and the successors of those in the design of their churches, and we must endeavour to enter fully into their principles of composition and distribution before we can hope to produce the same effect merely by the use of the same kind of details; a truth which has indeed often been urged, but still has not met with the attention it deserves.

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history of the Cranston Hill Water-works, formed by a rival company, with whom for a time a strenuous competition existed, and whose works it became necessary to purchase, are given at length. The paper then describes the natural filter for the water, which was taken advantage of, by driving tunnels along the borders of the peninsula round which the Clyde sweep in the form of a horse-shoe. This spot being composed of sand and gravel, would, it was argued, furnish a filter of great efficacy. As the proposed plan was adopted, the filter was designed in the form of a round wooden model to the company, which model was now presented by them to the Institution of Civil Engineers. These pipes adapted themselves to the form of the bed of the river, and the plan was perfectly successful.

Mr. Telford's experiments upon stone pipes, however, and some results and opinions of Whiteley's, to Mr. Watt, 4th ft. 9 in. long, 18 in. square, with a bore of 5 in. diameter, when subjected to a pressure of a column of water from 60 to 80 ft. in height, split in the direction of the natural bed. Another stone from the same quarry, 5 ft. 2 in. long, 13 in. square, with a bore of 4 1/2 in. diameter in it, did not emit any water until the pressure amounted to 100 ft. head; after that it discharged water freely, and split when the column a little exceeded 300 feet. A Portland stone, 4 ft. 6 in. long, 12 in. diameter, with a bore of 6 in. diameter in it, did not emit any water when the pressure was of 350 ft. Other stone pipes were also experimented upon with various results, which Mr. Telford arrived at the conclusion, that they could not be relied upon, and accordingly recommended iron pipes.

The paper is illustrated by a large map of the city of Glasgow, upon which is shown the course of the river Clyde, of the various routes by which water could be pumped up and conveyed across the river into the city. Many plans were designed for carrying the water; that which was adopted was suggested by Mr. Watt; he proposed the use of cast iron pipes, fitted, where necessary, with revolving ball and socket joints. From the city to the south-west of the company, for whenever the water in the river was low, a corresponding depression occurred in the waters of the filters; and in general, for many hours daily, these two engines only raised as much water as one would support, if the working barres of the pumps were obliged to be fixed so much above the level of the filters, that they ceased to fill when the water in the tunnels was depressed 22 feet below the level of the filters. The spot selected for the junction of the two systems of works was, therefore, very advantageous. Mr. Simpson considered, that this plan was admirably constructed for the purpose intended. The supply of water was conducted to the filter wells, and the pumps were distant from them about 110 yards; this, Mr. Simpson considered, was comparatively of little importance, as he had worked pumps with horizontal suction pipes 500 yards in length.

Mr. Hawkins recommended slow filtering, without pressure; some years since he had been engaged in refining sugar by Howard's process, by which the syrup was applied to the filter under a column of 20 feet in height; out of a certain quantity, 300 gallons were returned unfiltered, and by the time 60 gallons had been clarified, the filter was choked. He reduced the column to 2 feet, and out of the same quantity 6 gallons alone were returned, while 300 gallons were correctly filtered; this was clearly a case where other cases, had convinced him that pressure was injurious to filtration.

Mr. Braithwaite believed, that although slow filtration was generally preferable, yet that the velocity must depend upon the quantity as well as the quality of water, that the filters were to be placed with a certain degree of elevation above the city, and the time during which the filter could be worked without cleansing.

Appendix to the last paper.

"Description of a cast iron Reservoir erected at Carnet Hill, by the Glasgow Water-works Company." By J. Stackman, M.Inst.C.E.

A considerable extension of the city of Glasgow is now taking place to the north-west of the old town upon an elevation of upwards of 100 feet above the river; the water-works, which are situated to the east of the city, are already upwards of 4 miles distant from the extreme point of delivery, which is more than double the distance, and the water supplied to the city is consequently increased. These circumstances rendered necessary the establishment of a new reservoir, which should be sufficiently high and capacities to command and to supply the district. The ground which was obtained for this purpose was on the declivity of Carnet Hill, and had a fall of 20 feet in a mile. It was said, the water, when it reached the reservoir, should be as pure and yet not to contract the space by thick walls, and to erect such a building as should not be offensive to the neighborhood; these considerations induced the author to recommend the use of iron plates for the reservoir, which should be marked by a screen of masonry designed by Mr. James Smith, architect of Glasgow.

The construction is thus described. A bearing wall of 4 ft. 6 in. in thickness was carried up from the foundation all round to within 1 foot of the floor of the reservoir. A division wall was built across the centre to carry the partition for dividing the reservoir into two parts. The space within these walls was filled in with broken stones, over which was a layer of clay, and then a layer of sand, upon which was placed a flooring of Arbroath pavement well jointed with cement, and resting at the sides upon the flanges of the outer case which was constructed of stone, but was covered, in such proportions as afforded ample time for the adjustment to be completed. The lower tier of plates was 1 inch, and the upper tier 1/4 inch in thickness. Their flange joints were made secure by inserting between the face a lead pipe 3 inch diameter, filled with lint-gasket soaked in lead and tallow, in addition to which the whole was caulked with a composition of hot lime and linsed oil, which in a short time became very hard. The reservoir is 125 ft. long by 85 ft. 6 in. and 13 ft. 3 in. in depth; it is entirely covered by a malacable iron roof supported upon cast iron pillars. The paper is illustrated with a drawing and four lithographs, giving the dimensions of every part of the work, and by a specification of the mode of execution.

Remarks.—Mr. Simpson said that he had examined the reservoir very carefully, and that he had the pleasure of noticing the excellent manner in which the work was done. The mode of construction was novel, and had succeeded perfectly, as no leakage had occurred since its erection, nor had any inconvenience arisen from the variations of temperature, or from the unequal
deaths of water in the two compartments. He thought Mr. Mackain was entitled to much credit.

Corodino Tank at Malta.

A drawing of the Corodino Tank, erected in 1841-2, in the island of Malta, was presented by William Lamb Arrowmith, Associate C.E. (Superintendent of Government Works at Malta).

It was described as the largest modern covered tank in Europe, its cubic contents being 700,000 feet, and with its settling reservoir it would contain 15,000 tons of water; the roof was supported by rows of square pillars 15 ft. in height. It was intended to form a part of the works for supplying the island with water, a description of which was promised to the Institution to complete the paper on the supplies of water for cities, the first part of which has already been received.

Artesian Wells.

A letter was read from the late Sir John Robinson, giving a short account of the Artesian Well at the Abbatore at Grenville, Paris.

The Abbatore being at too high a level to obtain an adequate supply of water by the ordinary means, it was proposed, about eight years since, to sink an artesian well within the premises, which proposal having been agreed to, the exact depth to which it should be carried was left to be ascertained by boring a hole in the surface. This was accordingly carried out through many difficulties, the boring being terminated by the auger penetrating the water-bearing strata on the 26th February, 1841, a sudden and violent rush of water occurred, overflowing at the surface of the ground. As the boring progressed, tubes of rolled iron, and subsequently clapper, were inserted to support the sides, the first being 12 inches in diameter, and the lowest about 6 inches diameter, reaching to a depth of 170 feet. The quantity of water thrown up while the bore was in progress was about 800,000 imperial gallons per day, at an approximate surface of 120 square feet; the total amount of water which had been admirably carried through the strata, when the well was being excavated, amounted to £12,000 sterling. Sir John examined the theoretical reasons which had been given for the formation of the tubes, which had been attributed to violent pulsations in the flowing water acting upon the surface of the earth, but arrived at the contrary reasoning, as not being in accordance with the laws of hydraulic pressure, and attributing it rather to mechanical causes arising from the force used in forcing the tubes down the hole, and even more to the violence they were subjected to in being withdrawn from it.

The letter was illustrated by a lithographic section of the well, which was presented by William Cubitt, Associate C.E.

Remarks.—Mr. Cubitt had recently visited the well, and found the water flowing with considerable force through an orifice in the vertical pipe about 8 feet beneath the level of the ground; the nozzle of the orifice, which was 10 inches in diameter, was about half filled, and the stream was reported to be supplying about 2,500 gallons per minute. The water having a temperature of 82° Fah. The water was not clear, it contained a considerable quantity of fine sand, and occasionally stones of about 2 inches cube were brought up. He was informed that the water had at one period ascended to between 70 and 90 feet higher than the ground.

Mr. Taylor observed, that the temperature of the water nearly coincided with that of the small springs in Chelsea, which were 295 fathoms or 1,720 feet deep. The highest temperature recorded there was, he believed, 96° Fah. It was well ascertained now, by the experiments of Mr. Fox, that the heat was not increased either by the decomposition of the pyrites, or the number of men and horses employed in the mines.

Mr. Enys said, that the experiments by Mr. Fox, as published in the report of the seventh meeting of the British Association (vol. ii. p. 153) gave a temperature of 92° in the lode at a depth of 290 fathoms, where it was first reached in the cross-cut; but on proceeding along the same cross-cut, at 10 fathoms from the lode, the temperature decreased to 88° 2', and at 21 fathoms distant from the lode, would give a close approximation to the temperature quoted by Mr. Cubitt.

Mr. Braithwaite inquired at what depth the temperature began to increase; landslips were generally at about 52', and he found the water in wells 600 feet deep usually at 53' or 54'. He had understood that the temperature increased 1° for every 65 feet, after a certain depth.

Mr. Enys said, that Mr. Fox's experiments gave a ratio of increase of 1° of temperature in 48 feet, calculated from the surface. He thought that the close approximation of the British Association's experiments, and that in the wells mentioned by Mr. Braithwaite, might be accounted for by the rapidity with which the water filtered through the strata of the London basin.

Mr. Taylor agreed that the heat of the water was influenced by the nature of the strata; the Cornish miners, when they were taken to the North Welsh mines, were much inconvenienced by the coldness of the water in the latter; although the depth of the mines was in both cases nearly identical.

Mr. Braithwaite believed that his view of the temperature of wells would be corroborated by the coldness of the water in the new well at Southampton, which had now arrived at a very considerable depth, and he understood that the temperature of the water was about 54°.
been built, under the direction of Mr. Darlington, with cylinders of 30 inches diameter and a working height of 2 fathoms, through a descending column of 30 inches diameter; the pumps worked by the engine were 42 inches in diameter, raising water from a depth of 22 fathoms; the usual speed of working was four strokes per minute, but he had seen it attain six strokes. The concussion produced by the closing of the valve at the end of the stroke, was generally very prejudicial to these engines; but in that made by Mr. Darlington, it was diminished by allowing the large valve to close a short time before the stroke finished, and bringing the piston home with a small valve; by this means no noise was heard beyond that of the rush of the water, and the violent shocks were avoided.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

THIRTEENTH MEETING, 1843.—HELD AT CORK.

"On the Application of our Knowledge of the Laws of Sound to the Construction of Buildings." By Mr. Scott Russell.

The object of this paper was twofold—first, to apply our knowledge of the known laws of sound to the phenomena of speaking and hearing in a given building; and secondly, to develop certain laws of sound recently discovered, and not generally known; and to show their application to the same practical purposes. Part I. of the paper contained the application of the known laws of sound to the construction of buildings. The author prefixed this part of the paper by describing a form of building which had been found to be perfectly adapted to the purpose of seeing and hearing with distinctness and comfort. This arrangement of buildings had been described by him in a paper communicated to the Royal Society of Arts of Scotland some years ago, but had not been actually constructed on a large scale until lately, when a young architect, Mr. Cousins, of Edinburgh, having been employed to construct some large buildings, and alluding on this paper, adopted its principles. Buildings were now erected on this plan, and consisted from fifteen hundred to three thousand people, whom they accommodated without difficulty, and with perfect comfort both to speaker and hearer. He had little doubt, from experiments he had recently made, that so many as ten thousand people might be so arranged as to hear with ease and comfort a good speaker. Mr. Scott Russell's principle of construction is to place the speaker in the focus of a curve, which he calls the curve of equal hearing, or the isocoustic curve; and to place the seats of the auditors in such a manner that their heads shall all be arranged in this curve.

"Let A B C D represent the vertical section of a building for public speaking, S the height of the speaker on his platform, D C the floor of the building; then, for the purpose that all the auditors should hear and see equally well, they should be placed on the line S R B of the acoustic curve. This curve is constructed in the following manner:—D C is first divided into equal parts to represent the usual breadth of a sitting, and vertical lines are drawn through these points. R being the place of the auditor 1, the place of auditor 2 behind him is assigned thus—join R S, and produce it to a from a upwards set off a 2—9 inches, and 2 is the proper height of the next spectator. Then join S 2, produce it to 4, and set off 3—9 inches, and 3 is the place of the third spectator, and so on for the place of every spectator. Such was the vertical section of the building. The horizontal section was either circular or polygonal, having the speaker at the centre. This form had been found perfectly successful in affording the highest degree of comfort both to hearer and speaker; therefore he submitted it with confidence to the section, as a practical and established principle, more than as a mere theoretical speculation. The remainder of this paper was then adjourned till the next day.

"Chromatography, a new Photographic Process." By Mr. R. Hunt.

We are indebted to Mr. M. Ponton for the discovery of the first photographic process in which chronic acid was the active agent. He used a paper saturated with the bichromate of potash, which, on exposure to sunlight, speedily passed from a fine yellow colour into a dull brown, giving, consequently, a negative picture. E. Becquerel improved upon this process, by sizing the paper with starch previously to the application of the bichromate of potash, which enabled him to convert the negative picture into a positive one by the use of a solution of iodine, which combined with the starch in those parts on which the light had not acted, or acted but slightly, forming the blue iodide of starch. These pictures are, however, tedious processes, and are never distinct, and failure too frequently follows the utmost care. While the author was pursuing an extensive series of researches on the influence of the solar rays on the salts of different metals, he was led to the discovery of a process by which positive photographs are very easily produced. Several of the chromates may be used in this process; but the author prefers those of mercury, as the most certain effects being produced by the chromate of copper, and, indeed, in a much shorter time than with any of the other chromates. The papers are thus prepared; good writing paper is washed over with a solution of the sulphate of copper and partially dried; it is then washed over with a solution of the bichromate of potash and dried at a little distance from the fire. Papers thus prepared may be kept for any length of time, and are always ready for use. They are not sufficiently sensitive for use in the camera obscura, but they are available for every other purpose. An engraving—botanical specimen or the like—being placed upon the paper in a proper photographic copying frame, it is exposed to sunshine for a time, varying with the intensity of light from five to fifteen or twenty minutes. The result is generally a negative picture. This picture is now washed over with a solution of nitrate of silver, which sets in touch with the parts of the paper which are subject to light. The silvered paper is then washed over with a light dun colour, or sometimes perfectly white ground. This picture is quickly fixed by being washed in pure water and dried. The author remarked that, if saturated solutions were used, a negative picture was first produced, but if the solutions were diluted with three or four times their bulk of water, the first action of the sun's rays was to darken the paper, immediately upon which a very rapid bleaching action followed, giving an exceedingly faint positive picture, which was brought out in great delicacy by the nitrate of silver. It is necessary that pure water should be used for the fixing, as the presence of impurities, as of albumen, and others, prevents the true bleaching of the negative. The surface of the paper was washed over with a little nitrate of silver and then exposed to the sun; the absence of all nitrate of silver prevents the bleaching of the picture, which therefore remains in its true light blue tints. The bleaching effect appears to be produced with the greatest energy by the least refrangible blue rays.

"On the Construction of Lutwyche's Shadowless Gas-burners, and the Shape of Glass Chimneys for Lamps." By Mr. H. Dircks.

The object of the burner was to bring the gas issuing from the small of the burner, which first contact with atmospheric air at the ordinary temperature. Mr. Dircks contended that the heating of the air previously to its combustion diminishes the brightness of the flame; because, while each volume of carburetted hydrogen gas requires ten volumes of atmospheric air for its perfect combustion, the expansion of the air by heat necessarily reduces the weight of oxygen contained in the volume of gas used; unless some means be adopted of increasing the supply of air, the oxygen would be deficient. Another alleged advantage of the burner arises from the small quantity of metal through which the orifices are perforated, for by that means a smaller quantity of heat is abstracted in burning than in the form of the glass chimney consists in having the upper end enlarged. The effect of this enlargement, Mr. Dircks said, was to open the top of the flame and increase its brightness.

Mr. J. S. Taylor explained how the meeting the recent improvements of Dr. Faraday in the combustion of gas; and a short discussion arose, in which Mr. Hawkins and Mr. Scoresby took part, on the advantage of enlarging the upper ends, not only of glass chimneys, but of all chimneys for the combustion of fuel.

Tidal Observations.

Mr. J. S. Russell read a report of his observations on the tides of the Frith of Forth and the east coast of Scotland. The special object of this series of investigations was to discover fully the nature and causes of some remarkable tides which exist in the Frith of Forth, and to connect them with observations on the adjacent tides, and likewise furnish some better data for the construction of practical tidal tables for predicting the time and height of the water at any part of the coast; and lastly to form from that which had previously been made. Instead of merely observing the periods of high and low water, observers were placed to note the rising of the water every five minutes, night and day, for several weeks and months together. This was done in twelve places simultaneously, from Newcastle on the coast to Inverness, so that from 2,000 to 3,000 observations were got from the stations in the course of a day. These were daily transmitted to the central station, and immediately laid down geometrically on ruled paper, so as to represent graphically to the eye the outline of each tidal wave by a curve. From the form of the curve it was that the most important
results were to be obtained, although the undertaking was laborious. The results of the observations were most important and satisfactory. Two distinct set off tide waves visit together the east coast of Scotland, but one of them has hitherto been much neglected. One goes round the north of Scotland and runs south; a second comes northward from the Straits of Dover. These were demonstrated on two charts; the progress of these was exhibited. Their presence was seen in the whole Frith of Forth down to the open sea; but in the upper part of the Channel these double tides were thereby distributed, and rendered more visible. These tides had opposite inequalities which indicated their age and origin. The paper was of very considerable interest, and it was stated by Mr. Russell that the Ordnance survey had just been conducting a series of similar observations in Ireland.

Mr. Hopkins read a paper "On the Motion of Glaciers." Glaciers are formed on inclined planes by the gradual fall of water, which is converted into ice. The ice increases it gradually expands, but in the first instance the motion is scarcely visible. He said he had made several experiments to illustrate this subject. An inclined plane was erected, on which he placed a box of ice, which he then elevated to an angle of 3 degrees; the motion was at the rate of 7 inches per day; on being raised to 6 degrees, the motion increased to 12½ inches; at 9 degrees it increased to 24 inches; and at 12 degrees to 48 inches, increasing in a very large proportion afterwards. He then endeavoured to ascertain the least inclination at which the ice would move, and found that it would proceed down an inclination of half a degree.

OBITUARY.

Mr. James Hakewell.

Died at his apartments in Adam Street West, Bryncaur Square, May 28, 1813, in the sixty-fifth year of his age, Mr. Hakewell, architect. This gentleman, who is known among antiquaries and architects, and the fine arts. His first work was a novel, entitled "Celebs suited; or, the Stanley Letters." 1812. In 1813 he produced a large volume in imperial 4to, called "The History of Windsor and its Neighbourhood," with twenty-one engravings and fourteen vignettes from his own drawings, price 2s. 6d. In 1815 the engravings were re-issued at 1s. 6d. received at the time, and many years after he was much gratified on receiving the thanks of Sir Jeffrey Wyattville for the publication, coupled with the assurance, that in his alterations in that abbey of royalty, he had endeavoured to carry out his suggestions. When the general peace opened the Continent to English travellers, he went to Italy, accompanied by his wife, whose taste and talents qualified her thoroughly to enjoy all the beauties of nature and art that were displayed before them, and there they met the greater part of the years 1816 and 1817, which afforded the materials for a "Picturesque Tour of Italy," which was published, with sixty-three plates, in twelve parts quarto and folio, 1819-1820, illustrated by parths of Dorkton House, Hatfield, Longleat, and Wollaton, in England; and the Pallazo Della Cancelaria, at Rome. This is an interesting work, both in its literary matter and in illustrations. Among the latter are some engravings from fine drawings by Turner, one of which, a composition of Roman edifices, surpasses any picture by Pannini. This work was brought out with great care, and immediately obtained a high rank in the estimation of the public, which it is well qualified to hold. The accurate perspective drawing, it does not yield to any that sprung from that fruitful field. In 1825 he published, in folio, "A Picturesque Tour in the Island of Jamaica, from drawings made in the years 1820 and 1821." In 1826, "Plans, Sections, and Elevations of the Abatours of Paris, with consideration for their adoption in London," 4to. In 1835, "An Attempt to determine the exact Character of Elizabethan Architecture," 8vo. In the year 1810 he was engaged in furnishing drawings for a projected work on the Rhine, which it was intended should have been a counterpart to his "Italy," but which has never been published, the drawings remaining in the hands of the engraver. Gentlemen's Mag.

THE NEW HOUSES OF PARLIAMENT.

The interest which this extensive undertaking has excited in this country, and on the continent, has rendered any information upon its present state and condition, and upon the progress that is now being made towards its completion, a matter of some value. A correspondent of the Times has furnished the following details, by which it will be seen that the undertaking is proceeding in a satisfactory manner.

Without going into the general plan of the work, which is, perhaps, more easily gathered from the descriptive plates, which are to be found in every shop window, delineating the figure and outline as well as the ground plan of the buildings, it may be laid down as a necessary rule, that the several parts of the works as are actually finished, or which are in course of progression at the present moment. In the first place, looking at the river front, the divisions of which it is composed (commencing from Westminster-bridge) will be seen in the following state:

The North Parlour, or Sergeant-at-Arms' Residence.—The greater portion of the parapet is completed and ready for the roof, which is now preparing, and which will be of cast iron, covered with Westmorland slates. The present height from the ground level is about 70 feet.

The North Wing and Tower of Speaker's House, which are intended to be about 140 feet high and are progressing rapidly, their present height being about 66 feet above the ground level.

The North Curtail, or Libraries and Committee-rooms of the House of Commons, are advanced to about the same height as the north return.

The South Wing and Tower, or Black Rod's and the Librarian's of the House of Lords residences, stand about 63 feet above the ground level, and will be precisely the same as the north wing.

The South Return, or the Lord High Chamberlain's apartments, are also about 63 feet above the ground level.

The exterior ornamental work and carving upon those parts of the building just described are perfectly astonishing, both from their extent, their minuteness, and the enormous amount of human labour lavished upon them. No mention, however, could be made of more than a faint idea of the exceeding beauty and elaborateness of this part of the work.

Extending throughout the whole length of the river front or principal elevation, may be observed a band over the principal floor windows, containing a series of bold relief of the principal sovereigns of this country, commencing with William the Conqueror and terminating with those of her present Majesty. In the early aros, where there were no supporters (that is to say, from William I to Richard II), figures in the appropriate costume of the time have been introduced to fill up the spaces, and at the same time to introduce some principal emblem upon each return. The other parts of the roofs are panels composed of sconces and ridans, with motifs and foliage peculiar to each house. Underneath the windows is a narrow band, with inscriptions in the style of block letter, bearing each king's name, when he began to reign and when he died, with its initials on each of the buttresses.

The principal cornice is enriched with figures of grotesque animals over small shafts, and the intermediate spaces are filled in with paterae composed of heads, badges, and foliage, whilst over the whole of this there runs an engraved inscription having the name, dates, and initials, &c. In the central portion above the cornice, and over the two-pair floor window, are badges of the orders of the Garter, Thistle, and St. Patrick, surmounted with crowns; the panels on each side of which are enriched with the roses of York and Lancaster, with labels and mantles.

On the Wing Towers.—On a level with the royal arms are panels with shields and crowns, bearing the crosses of St. George, St. Patrick, and St. Andrew, with the proper mottoes under each, and on either side of them are other panels similar to those on each side of the royal arms. The arms of Queen Victoria are placed on all the windows of the house, and shields with the royal initials outlined with the rose, thistle, and shamrock, surmounted alternately with the crosses of the three kingdoms. On the return of the wing towers in the same level are panels with the badges of the three kings, and a pair of angels with each separate house from the Conqueror to the present time. On the return of the river front, or principal elevation, we see on a level with the royal arms devices of the different sovereigns from the time of the Ileaptarchy to the death of Harold, both included, divided between the buttresses by four tiers of niches, with statues of each king together with their queens; underneath which, on a level with the same, is a small band containing inscriptions of a similar character to those on the river front, divided with shields and ridans, the shield bearing a monogram of "Anglia," and surmounted with a crown. The cornice is similar to that in the river front. In the parapets are niches over each window, containing lions, heraldic shields, bearing initials, &c.

It is necessary to particularise in describing the various ornaments introduced on the external parts of the work already finished, not merely to show the wonderful labour, talent, and richness lavished upon the outside of the building, but to render the description of the work more intelligible. The respective parts of the work are neither of composition or of plaster, but hewn out of the solid stone—but also as an act of justice to a very young but deserving artist (Mr. Thomas), from whose design (subject to the approval of the architect) the whole of these wonderfully intricate ornaments are derived.

The general effect of this part of the work is exceedingly imposing, and in point of beauty and minuteness, is equal to that of any other Gothic structure in this or any other country. Amongst the other parts of this wonderful building, perhaps the most striking is the public sitting-tower, which is now progressing rapidly, and which is at present about 10 ft. above the ground level. Much labour has been required, and great labour required to obtain a proper foundation for this portion of the work, owing to the quicksands and land springs which were found under it, but which have been entirely cleared out to a depth of 24 feet from the surface, to a good gravel bottom, which being surrounded with large tim
piles driven down into the clay, metallic concrete, 10 feet 7 inches thick, was thrown in at a good firm foundation obtained.

In addition and adjoining to this are the Guard-rooms and Sub-hall under the Royal gallery, which are about eight feet above the ground level.

The Sub-hall under the House of Peers is carried up nearly to the principal floor level, as are the central torus and adjoining halls, which are about six feet above the ground level, as are the Commons' residencies, comprising those for the chief clerk of the House and the librarian.

The clock tower at the north-west angle of the building has the foundation and groining to the vaults completed.

As regards the internal decoration of those parts already finished, it will be remarked that the only parts completed are—the Public Hall, with its chimney-piece, with bold jaunts enriched with the several orders of knighthood, with its appropriate decorations, foliage, &c., and having over the chimney-piece, which contains the lion and the unicorn separately holding shields. Over each entrance are the present Royal arms, the supporters holding banners with their respective cognizances. The spandrels and enriched mournings are filled in with national devices, mottoes, and foliage.

In the Central Lobby attached to the Public Hall over the side entrances, are the Royal arms, with helmet and crest. On the sides of the doors are the badges of the three kingdoms in high relief, surmounted with crowns, whilst underneath the windows are pannels with sceptors, swords of state, and ribands, forming a proper device, and filled in with the national foliage.

On the staircase, leading out of the Public Hall are windows with elaborate tracery, with a border of quarter foliis, filled in with pattern, continued down with a series of shields.

These, it would appear, are the only parts which are finished in the interior up to the present time, but still even in this short summary enough is shown to display the magnificent style and character in which it is intended to carry out the plan of the New Houses of Parliament.

In addition to those parts of the building which came under the observation of our correspondent, the most striking object was a portion of the ceiling, which is proposed to place in the two halls, which Peers and Commons are actually to occupy. These ceilings are to be of wood, and are to be formed in 18 compartments, divided by spandrels springing from corbels; each of these compartments is about seven feet square, and have upon their face groining, but exquisitely beautiful, raised pattern, traced from the design of Mr. T. Dighton, the artist. It is understood, also, that these ceilings are to be in colours, and when completed, we have no doubt, they will be magnificent.

Taken altogether, the works would appear to be proceeding satisfactorily. One correspondent states that about 600 persons are employed actively upon them; and it is hoped that the part intended for the House of Lords will be ready for use in about a couple of years.

When finished, there can be no question that there will be nothing in Europe superior to them, either as regards the taste and magnificence exhibited in the design, the magnitude of the building itself, or the exquisite workmanship apparent in every part of it.

**RAILWAY CHRONICLE OF THE MONTH.**

Greewich Railway.—The half-yearly meeting of the Greenwich company was held on Tuesday the 1st. The report showed a falling off in the traffic, as compared with the corresponding period of 1842, of 119,000 passengers and £2327. There was no dividend for the original shareholders, who feeling that the course which had been pursued under their sanction, had been wholly unsuccessful, carried the appointment of a committee of inquiry to consider what means there were of arranging with the other companies as to the toll to be paid over the Greenwich line, what alterations were necessary in the fares, and to investigate into the whole management of the concerns.ab initio. It is to be observed, that the existing board came in under a committee of inquiry some years ago. On the 15th, the meeting was again held by adjournment, when a report only as to the fares was given, recommending reduced fares of 8d., 6d., and 4d., return tickets of 1s. and 10d. for the 1st and 2nd class, and annual subscriptions of 12 guineas and 10 guineas for the first and second classes. Another adjourned meeting was held on the 24th, when it was resolved to accept the mileage principle, but with a guarantee that it should not fall below a certain amount, £13,000 being the amount contended for by the Greenwich.

Grand Junction Railway.—The meeting of the company was on the 3rd; the chief features of interest are a decrease on the receipts of £2,592 11s. 11d., and in the expenditure of £13,653, on the corresponding half year of 1842. Dividend at the rate of 10 per cent per annum. No allowance made this half year for the depreciation fund.

The Manchester and Bolton Railway Company report that they have agreed conjointly with the Lancaster Railway proprietors to supply locomotive power to the Bolton and Preston Railway company. They have also commenced an improvement of the canal navigation, which will render it capable of admitting vessels of 85 feet in length, 15 feet 2 inches in width, and drawings 4 feet 6 inches water, boats hitherto being restricted to about 3 feet draught of water. This is to improve the canal traffic. They state that the colonnade, forming part of the connecting line with the Liverpool and Manchester and Manchester and Leeds at Manchester, is nearly completed, little remaining to be done but to lay the rails. The dividend was 11½ 7s. 6d. per share.

The North Union Railway Company recommends a decrease of dividend, and state the diminution of passenger receipts at £2066.

The Chester and Birkenhead Railway Company mention a decrease of 3079 passengers and 552l. in the expenditure of £2249. The arrangements for the tunnel from the Birkenhead station to Monk's Ferry are mentioned as in progress. The dividend was 7s. 3d. on the original shares of 50l. A resolution was carried in favour of low fares.

The York and North Midland Railway meeting was held on the 4th, and a decrease was stated in the passenger receipts of £2209, an increase in goods of £2682, and a reduction in the expenses of £1000. The dividend recommended was 2½ 10s. per share, taking a small sum from the reserved fund. The Directors recommend the prosecution of a branch from York to Scarborough to join the Whitby and Pickering Railway.

The Leeds and Salkby Railway is leased to the York and North Midland. The dividend declared was 2½ 10s. per share.

The Brighton Railway meeting was held on the 8th. A new board having been appointed, the report was principally directed to the arrangement of the accounts, which were in a defective state. It stated that eight contracts remained unsettled. A new wharf is mentioned as having been completed at Shoreham, for the reception of steam vessels of the largest class, which cross the channel from England to France; and also for the loading and unloading of vessels of greater burden, three of which can be accommodated at one time. An opinion was expressed favourable to an amalgamation of the locomotive power with the South Eastern and Croydon Companies. No dividend was declared, as the Directors had charged the interest account up to the date of making up the books, which had not previously been done.

The North Midland Railway meeting was on the 9th. A diminution had been effected in the working expenses of £11,530. A branch to Bradford was recommended to be prosecuted, and resolutions in favour of an amalgamation with the Midland Counties and Birmingham and Derby Companies. A dividend was recommended of 1½ 10s. per share.

We must observe that with nearly every Company a reduction or prospective reduction of the rate of interest on loans was reported.

The Northern and Eastern Railway meeting was on the 10th. The report states that Mr. Robert Stephenson has been engaged as engineer to the company; that a contract had been made with Messrs. Grissell and Petoe for the entire construction of the Hexford and Ware branch, for £67,000, half to be taken in shares at par; and that the opening was expected in October. The Newport extension was to be begun on the removal of the crops. An extension to Cambridge was urged as necessary, and steps will be taken. The dividend was 12s. 6d. per share. A proposal from the Eastern Counties Railway Company for an amalgamation, not being adequate, had not been accepted.

The London and Birmingham Railway Company's meeting was on the 11th at Birmingham. It was stated that the decrease in the passenger receipts had been £13,113, increase in goods £10,019, and reduction in charges £20,430. Dividend recommended at the rate of 10 per cent per annum. The works of the Warwick and Leamington Railway are stated to be let on satisfactory conditions.

The Midland Counties Railway meeting was held on the 16th. The Directors report the continuance of a contest with the Birmingham and Derby company about the traffic. The dividend recommended was 1½ 10s. per share. A resolution was passed appointing a deputation to confer with the Midland and Birmingham and Derby Railway Companies, as to the Chester amalgamation.

The Great North of England Railway meeting was held on the 8th. There
was an increase of merchandise traffic of £754. The dividend recommended was at the rate of 23 per cent per annum.

The Newcastle and Darlington Railway Company's meeting was held on the 4th. It stated that £135,000 had been expended, that the works were progressing, that the line would be opened on the 1st of July in next year, and completed 20 per cent below the engineer's estimate. A negotiation for the purchase of the West Durham Railway was authorized.

The Sheffield and Rotherham Railway Company's meeting was held on the 12th. A falling off in the revenue of £600 was reported, and a saving of £600, principally in coke, by working the locomotives in conjunction with those of the North Midland Railway Company. Dividend recommended at 5 per cent per annum. Some alteration took place at the meeting as to the Committee of the Company having forced the Company to take some carriage wheels, which were not wanted. The prospect of a junction with the Sheffield and Manchester Company was stated not to be immediate.

The Bolton and Preston Railway Company's report was that they had opened the line to the junction on the 22nd of June, and that the contractors' accounts had been closed. The Directors recommend a double line of rails to be laid throughout the line. They report that they had leased their locomotive power of the Manchester and Bolton Railway Company, and Lancaster Railway Company. A kind of competition was going on with the North Union Railway Company.

The Great Western Railway Company's meeting was on the 17th at Bristol. The dividend was a reduced one of 5 per cent per annum. The passenger receipts had slightly diminished, and goods increased. The general expenses had been diminished £350. The buildings at the Bristol station, for the merchandise department, and at Swindon for the engine department, were represented as completed. The reconstruction of the permanent way between London and Maidenhead is recommended, the timber being of too light a scantling to be traversed by heavy engines at a high rate of speed. The conclusion of the arrangements for the completion of the Cheltenham and Great Western Union line is reported. The arrangements for the joint working of the Bristol and Gloster line are mentioned. The Oxford Railway is reported to be laid out, a contract taken for its completion in eight months; and it is to be laid with a double line of rails. A promise of cooperation with the Devon and Cornwall Railway Company is given.

A company has been brought forward called the Eastern Union Railway Company, for the purpose of extending the Eastern Counties by two short branches, one tobury St. Edmunds, of 13 miles in length, and one to Harwich, of 54 miles in length; and also to embark about 2000 acres in the river Stour. The main line is proposed to proceed from Colchester by way of Manningtree, Hollbrook, Ipswich, Newhall Market, Starmarket, Cotton, Dias, Eye, Scote, and Long Stratton to Norwich. The gradients are represented as favourable, maximum 1 in 152, earthwork very light, no lofty embankments, deep cuttings, or extensive viaducts. Cost estimated at £16,000 per mile.

The Devon and Cornwall Railway Company has received the promise of support from the Bristol and Exeter Railway Company, Bristol and Gloster Railway Company, and Great Western Railway Company. A large sum has been subscribed in Cornwall, Lady Basset having subscribed for £5000, and given the land for two miles in length, Mr. Pemborll, M.P., having subscribed for £5000, and Lord Wodehouse and others having taken shares for their land.

It will be perceived that among other new lines in progress are those from York to Scarborough, and from Newport to Cambridge, and a branch to Harrow gate.

The Blackwall Railway meeting was held on the 22nd. A deficiency in the revenue account was reported, so as to make it inadequate to meet the expenses; the number of passengers had, however, nearly reached the former number. A change was made in the Board—the chairman (Mr. Roath) and half of the Board going out—the remaining five directors and five new members constituting the new Board.

The South-Eastern Railway.—At a special meeting of the shareholders on Friday, July 21, the Directors obtained power to raise loans for the following works. For the extension of the line from Corbett's Lane to the Bricklayer's Arms, a distance of about two miles, and forming a station at the latter place, £177,777; this sum does not include the whole cost of the branch: a portion of the expense is to be raised by the Croydon Railway. For the formation of a branch railway to Maidstone, a distance of 10 miles, £149,000, to be constructed under the supervision of Mr. Robert Stephenson, and finished within 12 months after obtaining possession of the land. For the formation of a branch railway to Folkstone Harbour, and for the purchase and formation of the harbour, £266,500; the sum of £18,000 is the amount agreed to be paid for the purchase of the harbour; it comprises an area of 10 or 12 acres. Mr. Cubitt, the engineer, stated that the largest vessel that can now enter the harbour is 300 tons burthen, that is 250 register. The largest which it will be able to accommodate will be 300 tons, and the number of small and large vessels about 50 to 100. A pier is to be constructed 500 feet long, and which will be carried out 200 feet in 10 or 12 feet water.

The London and Croydon Railway.—At a special meeting of the shareholders on 25th July, the Directors obtained power to raise £70,000 for the formation of the branch from near New Cross to the Bricklayers' Arms, being for £60,000, one third the proposed cost; the other two thirds to be raised by the South-Eastern; and £10,000 for reconstructing a portion of the present line to unite it with the proposed branch. It is expected the branch will be finished by next spring.

Eastern Counties Railway.—The meeting of this company was held on the 24th. The report states that most of the contracts have been closed, and that new contracts have been entered into to fill up with soil the Mountnessing and Shenfield timber viaducts, which it is expected will be effected in six weeks. Orders have also been given to fill up the Lexden timber framing. It is stated that this is not done from any apprehension as to the safety of the viaducts, on the part of the Directors, but on the part of the public. Not the least settlement is, it is said, perceptible. The Directors express their satisfaction with the progress of the traffic, and declared their intentions of again prosecuting the application for the branch from Stratford to the Thames. They also ask power to negotiate with other Companies for the formation of extension lines. They express themselves favouring to leasing the Northern and Eastern. A dividend was declared of 5s. on the new shares and 4s. on the old shares.

Bristol and Exeter Railway.—This meeting was held on the 22nd. The report states the probability of an earlier opening to Exeter than had been before promised, so as to open the line throughout on the 1st of July, 1847, viz. a year before the period anticipated. The dividend was 11, 8s. per share. With regard to the proposed Devon and Cornwall Railway, the plan of assistance is stated. The Bristol and Exeter to contribute £200,000 of the proposed capital, the Great Western £130,000, and the Bristol and Gloucester £50,000, the rest of the capital, £300,000, to be raised from the public. The tunnel on the Bristol and Exeter is the chief work remaining uncompleted. With regard to this some delay had taken place, from the failure of a contractor; but additional shafts have been commenced, and everything done to expedite the work. About one-third of the whole length is excavated, and the work is proceeding at 22 different faces, and will be in a short time at 28 ft. required. The stations are to be let in a few days.

Birmingham and Glasow Railway.—The meeting of this Company was held on the 25th. It intimated a slight increase in the receipts, and a diminution in the expenditure to the extent of £2365. The dividend declared was 12s. per share. One chief feature in the proceedings was a long discussion as to the disposal of the Great Western Railway to lease the line, and as to the mode in which the negotiations had been and were to be conducted. Another feature was the defeat of the Board in the election of Directors. The four vacancies were filled up by the opposition, who carried the day with a large majority, by means of the use of stamped proxies.

Bristol and Gloster Railway.—This meeting was held on the 24th. The report states that the branch at Bristol to join the Great Western has been contracted for. It is 1,100 yards in length, and will be completed in four months. It states too that no arrangement has been made with the Great Western as to the working of the line.

Birninghama and Derby Railway.—This meeting was held on the 25th, when a dividend of 5s. per share was declared. As the question of amalgamation with the North Midland is to come before a special meeting, no feature of interest transpired.

Union of Railways.—The Derby Reporter states that the committees ap-
pointed by the shareholders of the Midland Counties and North Midland Railways have met and agreed upon the terms for amalgamating the three lines, the North Midland committee having had authority to negotiate for the Birmingham and Derby Railway. The terms, we understand, are, that the shares of the North Midland and Midland Counties' Companies are to rank equal, but the 100l. shares of the Birmingham and Derby are to receive 27s. 6d. per annum less dividend—other shares in proportion. It now only remains for the shareholders to assent, for which purpose special meetings will be held as soon as the forms will admit."

| TABULAR STATEMENT FOR THE HALF YEAR, DECEMBER 31, 1842, TO JUNE 30, 1843. |
|--------------------------|----------------|----------------|----------------|----------------|----------------|
| Greenwich 1              | 33,500     | 620,204          | 21,345          | 26,587         |
| Grant Junction 2         | 852,275    | 26,587           | 122,976         | 49,692         |
| Manchester and Bolton    | 110,767    | 12,733           | 17,311          | 6,724          |
| North Union              | 22,162     | 25,537           | 14,686          | 11,154         |
| Chester and Birkenhead   | 141,500    | 2,110            | 1,710           | 9,237          |
| Leeds and Selby 3        | 20,000     | 99,782           | 3,756           | 8,158          |
| Brighton 4               | 56,797     | 12,086           | 11,191          | 12,980         |
| North Midland            | 723,124    | 56,531           | 16,263          | 11,154         |
| Northern and Eastern Counties 5 | 321,857 | 51,895           | 35,547          | 35,547         |
| London and Birmingham 6  | 112,593    | 328,854          | 14,211          | 62,524         |
| Midland Counties         | 37,725     | 9,528            | 9,002           | 7,490          |
| Great North of England   | 73,290     | 13,751           | 13,232          | 32,979         |
| Sheffield and Rotherham  | 9,347      | 7,406            | 5,934           | 8,116          |
| Bolton and Preston       | 14,793     | 2,000            | 1,707           | 4,535          |
| Great Western 7          | 1,666      | 3,468            | 1,468           | 4,128          |
| Liverpool and Manchester| 51,179     | 3,731            | 3,972           | 7,700          |
| Blackwall 8              | 2,101,180  | 43,182           | 3,741           | 5,252          |
| Eastern Counties         | 501,093    | 45,551           | 1,742           | 15,250         |
| Birmingham and Glo'ister | 55,147     | 4,261            | 7,068           | 6,444          |
| York and North Midland   | 27,656     | 5,846            | 5,145           | 1,177          | 42,159         |

<table>
<thead>
<tr>
<th>RECEIPTS.</th>
<th>£</th>
<th>£</th>
<th>£</th>
<th>£</th>
<th>£</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locomotive Power</td>
<td>5,500</td>
<td>3,490</td>
<td>1,044</td>
<td>1,551</td>
<td>3,304</td>
</tr>
<tr>
<td>Carriages</td>
<td>2,110</td>
<td>2,382</td>
<td>1,099</td>
<td>2,377</td>
<td>2,120</td>
</tr>
<tr>
<td>Maintenance of way and Reprs.</td>
<td>1,210</td>
<td>567</td>
<td>414</td>
<td>477</td>
<td>2,279</td>
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<tr>
<td>Office Department</td>
<td>9,168</td>
<td>18,150</td>
<td>4,980</td>
<td>3,417</td>
<td>3,063</td>
</tr>
<tr>
<td>Taxes and Rates</td>
<td>7,021</td>
<td>13,221</td>
<td>9,112</td>
<td>1,400</td>
<td>2,659</td>
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<tr>
<td>Total Charges</td>
<td>36,529</td>
<td>21,290</td>
<td>956,000</td>
<td>1,181</td>
<td>2,181</td>
</tr>
<tr>
<td>Interest</td>
<td>7,175</td>
<td>12,813</td>
<td>7,365</td>
<td>3,378</td>
<td>3,124</td>
</tr>
<tr>
<td>Profit</td>
<td>48,844</td>
<td>48,844</td>
<td>956,000</td>
<td>1,181</td>
<td>2,181</td>
</tr>
</tbody>
</table>

1 Greenwich Railway received for foot passengers £457, and toll £4,746.
2 Grand Junction paid Liverpool and Manchester Railway £8,016, and for rent £2,000.
3 Leeds and Selby locomotive power is included in York and North Midland.
4 Brighton paid Creedon and Greenwich Railway for toll £11,100.
5 Northern and Eastern paid Eastern Counties Railway for toll £3,479. It should be observed that the office expenses cannot be separated.
6 London and Birmingham paid Aylestone Railway for rent £1,259. In addition to the total outlay there is the sum of £13,906 carried to the depreciation fund.
7 Locomotive power not kept distinct.
8 Great Western paid Bristol and Exeter and Cheltenham Railway for Rent £35,484. In addition to the outlay £5,000 is carried to the depreciation fund.

**MISCELLANEOUS.**

**The Prince of Wales.—** This new iron steamer, built by Messrs. Miller, Ravenhill and Co., and fitted with a pair of beam engines of 130 h.p. also by them, taken out of one of the old Margate steamers, and with new tubular boilers, is the fastest boat on the river Thames. Her symmetry calls for the admiration of all who see her, and she has made the passage from Blackwall to Margate in the astonishingly short space of 3 hours 56 minutes, true railway speed. We must not abstain from mentioning the beautiful manner in which the saloon has been decorated, and which we understand was executed by Mr. Bielefeld, with the assistance of Mr. Stedman, who painted the beautiful views adorning the sides. The accident which lately happened to the vessel was caused by one of the middle side beams of the engine breaking, and before the engine could be stopped, they made six or seven strokes, which caused part of the machinery to punch a hole through the bottom about 6 or 7 inches diameter, through which the water rushed and filled the engine room to the depth of 2 feet; but in consequence of the vessel being built with water tight bulk'heads not a drop of water entered either cabin: this incident proves how desirable, nay, absolutely necessary it is that all passenger steamers should be thus built, the engine room being the compartment perhaps most liable to casualties. The vessel was immediately taken into dock and examined, the aperture quickly repaired, and when she left the dock she was reported to be as sound as when first built. Her engines also when repaired were in equal condition, and the vessel is now running again with as great success as before the casualty occurred.

**The Cartoons.—** The Exhibition will be closed on Saturday the 2nd inst. The premium of 300l. awarded to Mr. Armitage for his Cartoon, representing "Cæsar's Invasion of Britain," was withheld in consequence of the drawing having been executed in Paris: and, agreeably to the conditions originally laid down by the Commissioners, Mr. Armitage was required to execute another drawing, the subject of which is "Ancient Briton defending his wounded Son from the attack of a Roman Soldier." This he has done to the entire satisfaction of the Commissioners, who have now paid him the premium.

**Russian Steamers.—** Messrs. Rennie have just completed an order for the Russian Government consisting of an Iron Sailing Vessel, and an Iron Steamer, with a pair of 50-horse direct-action engines; the latter is a splendid specimen of workmanship, and no doubt will be equally as effective on trial as their appearance leads us to expect; both the engines and the iron steamer will be sent out in pieces in the iron sailing vessel, and put together in Russia. The steamer is intended for one of the inland lakes.

**Traplagar Square.—** The bronze ornaments of the Corinthian capital of the Nelson Monument are now being fixed. The stone-work of the enclosure and the terraces are finished, and the two basins are in a forward state; they are to be supplied with water from a well, to be sunk down to the chalk at the back of the National Gallery, and which is to be forced up by engine power to the cisterns on the top of the National Gallery, and thence by pipes to the fountain. The water will also be made available for other purposes, such as supplying the Gallery and Barracks, and also for watering the roads: there is some talk of supplying the public offices of Whitehall with water from the same source, which will cause a great saving to the public, as these offices are all supplied by the water companies.
LIST OF NEW PATENTS.

(From Mears, Robertson's List.)

GRANTED IN ENGLAND FROM JULY 31 TO AUGUST 25, 1843.

Six Months allowed for Enrolment, unless otherwise expressed.

William Davey, of Bath, slate merchant, for "improvements in covering the ridges and hips of roofs of buildings with slate and other materials."—Aug. 8.

Charlton James Wollaston, of Welling, in the county of Kent, gentleman, for "improvements in machinery for cutting marble and stone."—August 1.

Peter Borrie, of Prince's-square, St. George's, in the East End, and Mayer Henry, of Cruched Friars, merchant, for "improvements in steam-engine boilers and propelling machinery."—August 3.

Frederic Stainer, of Lyndburn Cottage, Lancaster, Turkey red dyer, for "a new manufacture of a certain vegetable matter, commonly called garance." (A communication.)—August 4.

James Hume, of Regent's Park, esquire, for "improvements in the manufacture of horse-shoes."—August 8.

Charles Bourjot, of Coleman-street, London, merchant, for "improvements in apparatus for obtaining the profile of various forms or figures." (A communication.)—August 12.

Richard Archibald Broome, of 166, Fleet-street, London, gentleman, for "the manufacture of paper, cordage, matting, and other textile fabrics, from certain vegetable materials not heretofore made use of for that purpose, as also for the application of the said materials to the stiffing of cushions and mattresses."—August 10.

John Wood, of Pockfield, Chester, merchant, for "improvements in machinery or apparatus for affording additional or artificial buoyancy to vessels or other vessels, and for rendering their draught of water, and which said improvements are also applicable to raising vessels or other heavy bodies, and for securing or supporting the same."—August 14.

Archibald Horn, of Aldersgate-street, zinc worker, for "improvements in the construction of shutters for windows, and other purposes."—August 15.

George Bennett, of Gannis Lake, Cornwall, civil engineer, for "improvements in steam-engines and boilers, and in generating steam."—August 15.

Thomas Young, of Queen-street, merchant, for "improvements in obtaining power."—August 15.

James Brown, of High-street-place, Stepney, engineer, for "improvements in tackle and apparatus for working and using chain cables in ships and other vessels, and also improvements in the tinders of rudders and ships and other vessels."—August 16.

William de Gohorte, of University-street, gentleman, for "an hydrostatic engine part whereof are applicable as improvements to other engines and other purposes, and also improvements in railway carriages."—August 17.

John Collard Drake, of Elm-tree-road, Saint John's-wood, land surveyor, for "improvements in laying out of walls of houses."—August 22.

Mark Freeman, of Sutton, gentleman, for "improvements in card cases."—August 22.

Gaspare Conli, of Sherard-street, Golden-square, gentleman, for "improvements in hydraulic machinery, to be applied as a motive power."—August 22.

William Fletcher, of Moreton House, Buckingham, clerk, for "improvements for the purpose of securing cords, or substitutes for cords, in the months of balusters, or vessels of the nature of vessels, whether made of pottery, or of pottery of the kind called stone ware, or of glass."—August 24.

Alexander Commissio, of Evertt-street, Brunswick-square, engine, for "improvements in steam-engines."—August 24.—Dated March 3.

Mr. Knott, of Regent's Park, gentleman, for a certain patent vessel. The vessel and its fittings are warranted to be of iron, and not to require the assistance of two men to work the same. The patent was not sealed till the 24th of August, but bears date the 3d of March last, the day the patent would have been sealed if the same had not been opposed, by order of the Lord Chancellor.

William Wilson, John Hothome Browning, John Cockerton, and Sir George Gerard de Lart, Bart., all of Belmont, in the Wands- worth-road, patent cocoa-nut oil and cake manufacturers, assignees of a patent granted by his late Majesty King George the Fourth, unto James Soames, jun., of Wheeler-street, Spitalfields, for "a new preparation of cocoa oil, by means of which certain material is obtained from a vegetable substance, and the application thereof to the purposes of affording light, and other uses."—For the term of three years from the 9th day of September next, the expiration of the original grant.—Aug. 24.

Edward Coreman, of Great Horseferry-street, in the city of London, merchant, for "improvements in the grading of wood and other substances."—A communication.—Aug. 25.
ST. GEORGE'S HALL AND THE ASSIZE COURTS, LIVERPOOL.

H. LONSDALE ELMES, Architect.

(With an Engraving, see Plate XII.)

Perspective View.

Block Plan of Situation.
Ir afford us much pleasure to be able to furnish our readers, through the kindness of the talented architect Mr. H. Lonsdale Elmes, with a copper-plate engraving of the principal façade of St. George's Hall, Liverpool, now in course of erection, and which, when finished, will justly be the pride of Liverpool; and from what we have seen of the designs of the interior, we can safely say that it will stand pre-eminent as one of the most noble buildings of this country. It is a pleasure to find, which we desire to see more general, that the Committee very ably support Mr. Elmes in his designs, and do not attempt to mar the general effect on the score of pecuniary or false economy.

The judicious appropriation of the spaces with the recesses between the pilasters, for figures and bas-reliefs, is excellent; it will afford the Liverpool people an opportunity to display their patriotism by erecting statues with appropriate tablets below, in commemoration of men who have devoted their talents to the extension of the arts and sciences, to commerce and manufactures, such as Watt, Davy, Dalton, Brindley, Woole, Arkwright, Stephenson, et c.

The general dimensions of the building, with some very appropriate remarks, have already appeared in the "Companion to the Almanac" for 1842, of these, and the wood engravings, we shall avail ourselves, with some addition and correction; the wood engravings, although not strictly correct in all their details, are sufficiently so to show the general character of the building and its situation.

It was originally intended that the "Hall" and the "Courts" should form two separate structures; and ground for the purpose having been given by the corporation in the spring of 1839, premiums were offered for designs for the first-mentioned and shortly afterwards for the other building; and in both competitions (the first of 75, the second of 85 candidates) the first premium (250 and 300 guineas respectively) was awarded to Mr. H. Lonsdale Elmes, whose design for the "Hall" presented a Grecian Ionic colonnade, while that for the Assize Courts showed a Grecian Doric façade, consisting of a central portico and lateral colonnades immediately connected with it. According to the instructions first given, St. George's Hall was to have been on the site near T in the annexed block plan of the situation, while the courts would have been at present, so that the two buildings would have stood at right angles to each other, the "Hall" with its principal front facing the south, the façade of the courts being to the east, and opposite that of the railway terminus, which is also shown in the plan. This arrangement was, however, subsequently abandoned, as St. George's Hall must have been overtopped by the other at its western extremity, it being impossible to set back the latter so as to clear the façade of the hall, and allow the whole of it to be seen in a front direction. As the successful competitor for both buildings, Mr. Elmes was accordingly instructed to remodel his plan, when it was finally determined to unite the two into a single pile, and, so altered, his design was finally approved by the Town Council (May, 1841), and the foundations shortly after commenced. The following perspective sketch will serve to show the general style and composition of the design. The order now adopted is Corinthian, continued throughout, and arranged so as to produce a very rich poly-styled composition, possessing more than an ordinary degree of variety and contrast. In order to make up for the unfavourable impression attending the minuteness of the scale of the drawing, it must be borne in mind that the eastern façade, or the longer side of the building, is 420 feet, or only 28 less than that of the National Gallery, and much loftier, the columns being 45 feet high and 4 feet 7 inches in diameter. The south front, which owing to the great fall of the ground at the end of the site (about 16 feet), has the appearance of being raised upon a terrace, and thereby acquires both additional dignity and picturesque effect, consists chiefly of an octastyle diptyle portico, recessed within so as to make its entire depth 28 feet. The columns are raised upon a stylobate 10 feet high, and continued along the other fronts, and the height from the ground-line to the apex of the pediment is 95 feet, which is only 6 or 7 less than that of the dome of the National Gallery. This front alone would constitute an imposing piece of architecture—and is upon a scale greatly surpassing anything of the kind yet erected in the metropolis—yet it appears little more than a subordinate portion of the whole when compared with the eastern façade. Independently of its beauties of design, this latter has the merit of clearly expressing the general internal arrangement of the plan: the advanced or monostyle colonnade in the centre is 200 feet in length, and, being recessed, forms within an ample sheltered ambulatory 26 feet in depth; this corresponds with St. George's Hall, which comes in between the two Assize Courts, and defines itself externally in the composition, by being carried up higher than the rest. This division of the front consists of 15 intercolumns, and the one on either side of it of 5 more. The architect has placed here square pillars, between which an ornamental screen is carried up below, while the upper part of their shafts are insulated; thus a double contrast is produced, first between the columns and the square pillars, next in respect to the closed and open spaces between the latter. The north front presents a projecting hemicycle in which the order is continued in attached columns; thus, while that part is so far in keeping with the rest, a very agreeable variety is produced, and the view of the building from the north-east differs considerably from that from the south-east, given in our cut. Whether contemplated or not, one advantage resulting from the north end of the building being brought out semi-circularly is, that that projecting part will catch the sun much earlier than it would else strike upon a front so unfavourably placed as to aspect. This portion of the plan will form a concert-room to which there will be a separate entrance, and it makes the entire extent from north to south, including the steps leading up to the south portico, 500 feet. Taking into account its unusual altitude, this structure will in point of magnitude alone have very few rivals in the kingdom; and how far it will have any for beauty and magnificence as an example of modern Grecian architecture, we will leave our readers to judge.

As regards the interior, we shall at present content ourselves with merely pointing out its principal divisions and their intended purposes. St. George's Hall (indicated in the plan by the letter G), measuring 169 by 75 feet, and 53 high, will be further extended along the upper part of its sides by a series of recesses 13 feet deep, apparently obtained out of the thickness of the walls, but in reality coming over the corridors which surround this part of the interior, and both separate it from, and connect it with, the two Law Courts AA. On the west side of the hall the light will be admitted laterally through windows within those recesses, and on the opposite side through small doorways, one in each recess. During the assizes this spacious hall will be opened to the public as the approach to both the courts. At other times it will be appropriated, at the discretion of the council, to public or private meetings. The two courts, which are lighted from above, are similar in size, viz., 60 by 50 feet, and 45 high; and the concert-room at the north end of the building is 75 feet from east to west, and of the same extent in the other direction, measured through the spacious hemicycle on its north side. The other principal apartments and their dimensions are as follows:-

<table>
<thead>
<tr>
<th>Room</th>
<th>ft</th>
<th>ft</th>
<th>ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vice-Chancellor's Court</td>
<td>25</td>
<td>29</td>
<td>18</td>
</tr>
<tr>
<td>Sheriff's Jury Court</td>
<td>29</td>
<td>25</td>
<td>13</td>
</tr>
<tr>
<td>Grand Jury Room</td>
<td>41</td>
<td>25</td>
<td>22</td>
</tr>
<tr>
<td>North Entrance Hall</td>
<td>74</td>
<td>63</td>
<td>19</td>
</tr>
<tr>
<td>South ditto</td>
<td>40</td>
<td>25</td>
<td>19</td>
</tr>
<tr>
<td>Barristers' Library</td>
<td>43</td>
<td>25</td>
<td>18</td>
</tr>
</tbody>
</table>

The whole of the building will be thoroughly ventilated under the joint direction of Dr. Reid and the architect, and in such manner that the whole power of the apparatus may be directed to any one or more of the apartments according as circumstances may require.

The building will be entirely faced with stone from Stancliff Quarry, Darley Dale, near Matlock, Derbdshire, one of the specimens recommended by the Parliamentary Commission for the new Houses of Parliament. It has been obtained in very large blocks, which is an advantage for this style of architecture. All the walls are 13 ft. from centre to centre, the architraves will be in one length. The great hall is to be vaulted with a semicylindrical vault of solid
brickwork, over a span of 75 feet, and springing at a height from the foundations of 73 feet, the crown of the arch being 110 ft from the same. It is proposed to extend this permanent mode of construction to the two courts adjoining, which, if executed, will present a grand vista ofvaulted ceilings upwards of 300 feet in length. From this we may hope that the architectural character of the exterior will be fully maintained in the interior.

The building is now rapidly advancing, and is carried up as high as the bases of the columns, and the contractor has undertaken to complete the exterior in 1843. The estimated expense, exclusive of ornamental fittings and finishings, is £125,000, of which sum the foundations and basement story have cost nearly £12,000.

CANDIDUS'S NOTE-BOOK.
FASCICULUS LIII.

"I must have liberty
Within, as large a charter as the winds,
To blow on whom I please."

I. The group of three houses or mansions which are now erecting in Grosvenor Place, on the site of what was the Lock Hospital, although intended to be a superior specimen of the Italian palazzo style, à la Barry, with microstyal ionic windows to the principal floor, as in the Reform Club-house, is very unsatisfactory, owing to the narrowness of the piers between the windows, which certainly do not allow space sufficient for such extended dressings to the windows as are here applied. The consequence is, the fronts look too much overdone in that respect, the parts being so much crowded together, as to lose their value; and the effect cannot, perhaps, be better described than that of a tasteful style treated without taste—which, odd as it may seem to a great many, is by no means an uncommon thing.

Appropos of architectural taste, it seems to be migrating eastward and cityward. There is a new stone-fronted building—as yet unappropriated—just by the church in Lothbury, and facing the Bank, which, though but of moderate size, being only four windows in breadth, is not a little remarkable for general elegance of character, and for careful finish of detail. This charming little specimen of the Italian palazzo style, would be an ornament even to Pall-Mall, for except, perhaps, just there, it has not a rival at that end of the town for refined simplicity and gracefulness. It deserves to be noted, also, that though the return on the west side faces a mere alley, the architecture is carried on there consistently with the front.

The new Brighton terraces, with its campanile, near London Bridge, will also, in point of design, be a more than ordinarily tasteful specimen of Italian. The bold ruffianship of the quoin contribute in no small degree to the expression and finish of the principal building, more especially as it is not confined to the external angles of the façade, but is repeated at some of the slightly projecting breaks, at the ends, in each of which is a door below and a window above; and in the intermediate part there are three windows on a floor.

II. There is, just now, an excessive deal of cant afloat about the moral influence of the fine arts, just as if the fine arts were not worth cultivating for their own sake, without any hypocritical pretence. Fudge! Talk of the moral influence of waltzing, or of the ballet as viewed from the pit at the Opera! I should like to know, if any one could explain it, what has been the amount of moral influence for good of all the fine arts, drama and literature included, in the civilized stages of society. Was the court of Leo. X remarkable for its correct morality? Was the "divine" Raphael himself a bright exemplar of moral purity? Only consider how many Madonnas have been painted from ladies who had qualified themselves for turning Magdalenas. If, on the one hand, art has mainly served to perpetuate the puerilities of pagan mythology, so, on the other, it has kept alive the puertilities of papistical superstition. To us, therefore, who can sympathize neither with the one nor the other, it can have little value than what it derives from its mere aesthetic influence. All the rest is but mockery and delusion, carried on by gulliullity on the one side, and humbug on the other. If art has no intrinsic worth in itself, and deserves to be encouraged chiefly as a means, not as an end, let us be honestly told so; and let us have done with cant and make-believe, and with all that frothy burnumy with which penny-a-liners descent on art for the nonce in newspapers.

III. To what purpose do we take such pains to collect architectural and similar specimens of ancient art? or why should there be such a prodigious cackling on any thing of the kind, no matter how worthless it may be in itself, being brought to light, when some of the finest studies of the kind are neglected as soon as they come into our possession, without being turned to account in any way whatever? The examples, of ancient or antique columns and other architectural ornaments, to be met with either in museums or inserted in Italian buildings of later date, are almost infinite, both as to number and variety, yet who ever condescends to derive a hint from them? There are some fine things of the kind in the British Museum—which of our architects has taken a lesson from them for any thing he has himself done? Of nearly all our modern buildings in the Grecian and Roman style, the detail looks as if it had been supplied from some "furishing warehouse" for the purpose, where it is kept ready made. It is just the same with columns and entablatures, and it frequently looks as if they had been bought at different shops, or were very ill-matched. Hence it is little to be wondered at if so mechanically treated and with such wearisome sameness, those styles have greatly fallen in public esteem within the last few years. Notwithstanding that we know that even the best preserved examples of Grecian architecture are reduced to little more than the skeletons of what they originally were, quite dismantled and shorn of their splendour, and seen, some of them, in all but total eclipse, we content ourselves with copying their remains, without attempting to supply those beauties which are no longer to be traced in the faded originals. Perhaps were we to set about making trial of it, we should find that a very great deal might be done with painted glass, even in the Grecian or Roman style. It is not to be supposed that any Pecksniff could discover how it ought to be done; neither could it be done by adopting Gothic patterns and Gothic character; yet it might be made to have a sufficiently expressive character of its own, by being introduced as a species of transparent mosaic. In such case the apertures ought, perhaps, to be double glazed, so that the painted window would show itself only as a mere panel or compartment on the face of the wall, decorated after such fashion—which would, to a certain degree, be a substitute for other polychromy, or else a suitable accompaniment to it. But it would be a most scandalous innovation.

IV. Much of our modern Angle-Grecian architecture is chiefly remarkable for extreme suilliness of look; this, however, may be a merri, for it may be strongly characteristic of our unfortunate climate. And though the sun does really shine now and then in this country, perhaps about half a dozen days in the course of the year, its brightest beams cannot dispel the gloom and dullness of some of our ultra-classical buildings. We have among us, more especially,

"Han, the great master of the sulky style," whose buildings have one and all a strange Mawworm physiognomy, no matter whether it be intended for Grecian or for Gothic.

V. At present, the new Conservative Club-house in St. James's Street does not promise to be very much better than the one in Pall Mall, either as to composition or style; or to be treated with particular gusto. It might have been thought that, coming after such an example as the Reform Club House, a certain spirit of rivalry would have stimulated the members of the Conservative to take care this second time that their building should, if possible, take precedence of the Reform in public opinion, as a finished work of architecture; yet the new Conservative certainly does not challenge comparison with the other, for the architect seems to have most carefully avoided whatever might look like borrowing an idea from Mr. Barry; though he might, allowably
enough, have taken a lesson from him in regard to general refinement of taste. As yet the building is not carried up higher than the top of the ground-floor; neither is that portion finished, still enough may be made out to convince us that whatever may be the case with the upper part of the façade, there will be very little beauty below. In fact, the ground-floor is not only plain, but rather bald in style, consequently, if much richness be affected elsewhere, there can be but very little general harmony of character. Although the principal floor of a building requires a higher degree of decoration than the one below it, it does not follow that the last is to have scarcely any, or that what there is may be treated as of no importance: on the contrary, well studied and careful detail are there more especially called for, as being in such situation so much more distinctly seen—in fact the only parts that are seen by those passing along on the same side of the way, or in order to have a proper view of the whole of a front and its upper part, it is necessary to look at it from the opposite side of the street. Another reason for paying particular attention to finish in those parts of a building which are nearest to the eye, is that it will be taken for granted that equal care of execution has been bestowed throughout, though the ornaments and details at a distance from the eye may be less highly wrought up—however richer and more ornamental they may be in point of design. All this is, of course, to be taken grano salis, because circumstances must decide when and to what extent it is desirable to treat the ground-floor or lower portion of a building as an important part of a composition.

In the case of the new Conservatory, such mode might very well have been adopted; for now, the lower part of the front will be at least very fine, if not decidedly poor, in character, yet at the same time the reverse of sober as to design, for at each end of front is a sort of loggia or recess between two Italian Doric columns, placed excessively wide apart; and one of these recesses, viz., that at the north end, has a second smaller recess within it, also between two columns, and containing the entrance door; while the south one encloses a bay-window, which is segmental on its plan. Owing to the prodigious interval between the columns, these loggias, or whatever else they may be called, have the appearance of being square gaps, and that, too, precisely when there ought to have been a decided expression of strength and solidity. In one respect, the building manifests neither originality nor improvement, having mean horizontal stripes after the ordinary fashion of those on the parlour floor fronts of suburban “speculation” houses, without even moulings of any kind being substituted for rustication. To be sure, this is only matter of taste, but it would be well were such taste wholly exploded, or at any rate abandoned to speculation builders. One vast comfort is, that the façade of the British Museum will make ample amends for all other mishaps—for all our blunderings and all our failures—our National Galleries, Buckingham Palaces, Nelsonian Monuments, and all the rest of the tribe.

THE EPISCOPAL CEMETERY CHAPEL, WISBEACH.

One prevalent flaw of the age is Fussiness, a sort of bustling, bigotry, over-acted parade, mixed up with a good deal of maudlin cajolery, manifested ridiculously, and sometimes still more offensively, so that what ought to be works of charity and sober-minded piety, frequently appear, in the eyes of the sober-minded, to be acts of simpering self-laudation, estreatments display, and almost of self-worship. Charity, now-a-days—at least fashionable charity, cannot put its hands into its pocket, without a flourish of trumpets announcing to all the world its own prodigious goodness. A very remarkable instance of the kind occurred at Wisbeach, in August last, when that place presented the spectacle of a general carnival, for about a week, and kept up with great gaiety and crowning, there being a fancy-bazaar, ball, concert, picture-exhibition, and, most strange to say, a “grand display” of fire-works, also, on the occasion of laying the first stone of a small cemetery chapel! We had hoped that “fancy hazards” and all such equivalent—or, we might say, farcical—doings in the aid of charitable or religious purposes, had gone out of fashion, at least were greatly on the decline; for we cannot help looking with great suspicion on the charity which requires to have the bait of amusement and excitement thrown out to it. To make a trading speculation of what professes to be a work either of benevolence or public spirit, to resort to such a mode of raising funds as was adopted at Wisbeach, is, to say the least of it, in particularly bad taste, a succession of festivities and holiday rejoicings being altogether out of character with the actual occasion, which would have been more appropriately celebrated by a masque of the “Dance of Death,” than by feasting and fireworks. Besides being altogether unsuitable in themselves, the “performances” got up for the occasion were upon a scale so wholly out of proportion to it, that it was an affair of a mountain bringing forth a mouse. Were the edifice that has been commenced at Wisbeach intended to be such a pile of Gothic architecture as Cologne cathedral, there would have been an excuse for the extraordinary rejoicings which attended the ceremony of laying the first stone; but as its internal dimensions will not exceed 30 feet by 10, somewhat less than those of a not particularly large dining-room, the fuss made by the good people of Wisbeach does partake somewhat of farce.

What was expended one way or other without any advantage all at to the funds for the building, must have amounted to a sum that would nearly have defrayed its total cost without further contributions. The fireworks alone, as we are informed by the Cambridge Advertiser, which has minutely chronicled all the “small beer” of this mighty affair, cost the “worthy vicar” not less than 40 pounds; and as the same gentleman kept open house during the week, with banquetting parties of “distinguished guests” to the number of sixty in one day, and a hundred-and-thirty another, he would hardly have been a loser, had he erected the chapel at his own sole expense, and thereby have secured to himself some more permanent fame than his “pyrotechnic treat” is likely to obtain for him. Perhaps this last, by the bye, was not altogether so inconsistent as it at first appears, for it may have been intended as a sort of pyrotechnic sermon, symbolizing the brevity of human life, the transitoriness of all worldly splendours, glaring for a brief moment in dazzling radiance, and then bursting and vanishing altogether into extinction and darkness; thereby serving as most impressive monument-nori!

As mere amusements, those at Wisbeach were innocent enough in themselves, but were rendered unbecomming, by being altogether at variance with the occasion, which was made to serve as a pretext for them. They may also be taken as one strong manifestation of that strange spirit now rife in society, which seizes on every opportunity as one for indulging a passion for heated excitement and montebank display, whether it be that of Father-Matthewism, or Puseyism, or Newmania, or any other mania of the day. Still, we certainly should not have bestowed any notice on the doings at Wisbeach; or at most should have pointed to them only as a caricature of the idle and nonsensical “ceremony of laying the first stone” of a building, as it is called, were it not that there is something else connected with the building itself of more immediate interest to our readers.

Notwithstanding that the chapel itself will be in a mere miniature fabric, two gentlemen are employed upon it in the capacity of designer and architect—not a Wisbeach Pecksniff and Pince, but persons of some note in the architectural world, viz., Professor Willis and Mr. Basevi, the first of whom has furnished the design, while the other merely acts as clerk of the works. Such application of the principle of division of labour and combination of talent, may in certain cases be proper and advantageous enough—for instance, in such an extensive and complicated pile as either Windsor Castle, or the “Palace of Westminster”: but in that of so very small a building there was no occasion for it—one at least for formally avowing it. The design being his, Professor Willis might have been allowed to pass as its architect, for it would have been taken for granted that he was not the operative one, but had professional assistance of some sort or other. As for, indeed, as he is concerned, the circumstance of another
name being mentioned, is not surprising; but it is somewhat singular that the architect of the Fitzwilliam Museum should have consented—not to lead his name to the Professor, but to allow it to be formally made known that he acts in such subordinate capacity on so thrilling an occasion. It certainly amounts to a formal acknowledgment on his part that there would be nothing objectionable in occasionally deviating from the present system, and applying to amateur architects for designs, and trusting to them for all matters of imagination and taste, a professional man being employed merely to execute the ideas of the other. That such course would be wholly preposterous and unwise, we do not say; on the contrary, we are of opinion that had there been some "Professor Willis" to many of our public buildings, they would have been far more satisfactory, in point of design, than they now are—perhaps the British Museum among others. It might, therefore, be not altogether amiss, were professional men occasionally to consult non-professional opinion and taste.

In the case of the Wisbeach Chapel, these are considerations which give it more importance than it might have else had in itself, because the course which has been adopted seems to emanate from the Camden Society, and the authority they assume and would fain establish for themselves in all matters of Ecclesiology—even to the extent of pejorative, bybody interference, and dictation. We may be mistaken, but it does look in some degree as if Mr. Basevi has lent himself, perhaps unsuspectingly, to the views of the Camdenists, in the hope of securing their patronage; and what he has done may now be set up as a precedent by which others are to be misled. If the profession once allow that Society to get upon their shoulders, they will find them quite as difficult to shake off again, as Sindbad did the accursed old man who fastened himself upon his. In regard to encouraging greater attention to the proprieties of church architecture, the Camdenists may do some good, but they are by far too bigoted and intolerant—rigid in their ideas and preconceived notion of what is and what is not a church, and placed under a phalanx of ecclesiologists. They appear sad and averse to recognizing as lawful any other style or mode of treating it, than such as are by them privileged; every thing else they repudiate as partaking not only of architectural, but almost of religious heresy.

As to Professor Willis, he has distinguished himself as an able and intelligent architectural antiquary, notwithstanding that Mr. Gwilt has not thought his "Remarks on the Architecture of the Middle Ages," worthy of being enumerated along with other publications of that class; but of the Professor's skill or taste in design we are unable to form an opinion, for the wood-cut of the Wisbeach Chapel, given in the Cambridge Advertiser, is so miserably drawn, that no reliance can be placed upon it. Making the utmost allowance, however, for that, the design itself looks very queer, and as if it greatly needed touching up by Mr. Basevi, unless together with bad drawing positive mistakes have been committed.

OBSERVATIONS ON ARCHITECTS AND ARCHITECTURE.

By Henry Fulton, M.D.

No. I.

In the present era of improvement and invention, the science of architecture is least improved and least understood. I have conversed with many persons well conversant with all the other branches of art, who, on the introduction of the subject, have met it with "Oh, I know nothing of architecture." I have met architects, who acknowledged they had no professional library; and I believe they felt this as no loss, for they seemed to consider any drawing tastefully got up, and calculated to catch the eye of their employers, quite good enough: in short, want of knowledge in the employer, begets carelessness in the employed. Feeling this strongly, I ventured in 1842 to deliver a public lecture 1 on the subject, to which the architects of Dublin were invited; but they met in conclave, and decided not to countenance the attempt of a mere amateur, or even to permit their pupils to attend, alleging that it was quite improper for a physician to attempt giving a lecture on architecture. The intention of delivering a course of lectures was announced. Why has it been given up? It was declared publicly that "the highest in rank in Italy were not ashamed of being professors of an art which Vitruvius taught and Palladio adorned." Are the architects of Dublin now ashamed of Vitruvius and Palladio?

Unless we look for something better than the works of either Palladio or Vitruvius, the science of architecture will profit but little; and as contrasted with the taste displayed in the Pantheon, the Pantheon of Agrippa, or the Minster at York, should only be considered as a mere trade in building, and not as one of the fine arts: and its professors, instead of ranking with painters and sculptors, should be classed with decorators and wax-work wig-block makers. It is to be regretted that traces of this Palladio mania are to be found in too many of our edifices in London. If Palladio had not adorned his buildings with coupled columns, would we have had them in the exterior of St. Paul's? If Palladio had not placed portico over portico, would Sir G. Wren have left us—not us, but feathered bipeds—an aerial entrance facing Ludgate Hill? If Palladio had not misplaced pediments, calculated only for the terminus of a gable end, over his windows, would we have them, both acute and obtuse, stuck in every possible variety, over those of the turretted hall, and five hundred other halls and houses in London? If Palladio had not reviled in rustic quoines and rustic fronts, would we have had these receptacles of dirt and dust meet our eye so often in our streets? If Palladio had not crowded his cornices with balustrades, would we have had these caricatures of columns entering into composition called Grecian? If Palladio had not broken up all his buildings and all his cornices, destroying all repose, all dignity, all simplicity, would our own buildings of the present day have presented us with so many examples of the want of dignity, unity, and simplicity? But we shall not swell this catalogue of Palladian beauties, but proceed to state the grounds of objection to them.

Corporal Trim's illustration of the disadvantage of placing too many sentinels on one post, may serve us as to the first, as no architect that loved his columns would crowd too many of them together; and further, no employer who loved his purse, would consent to it. One column, well proportioned to the superincumbent weight, is better than two slight ones, and two well proportioned columns are in excess, where one would suffice. It is true the ancients slightly contracted the distance between the columns at the angles of the buildings, but the coupled columns are a caricature of this, when the eye should have uniformity instead of variety.

Secondly, a portico should be an entrance to a building; and if so, how can the one portico of St. Paul's be so considered, unless for a set down from an aerial machine? but it will be time enough to provide for such contingencies when the plans for the machine itself shall be matured, and in the meantime, let us recollect the point of view in which columns should appear, and not violate good taste by placing them too high, either on stilts, or by making one row of columns and its architrave support another set and accessories.

Thirdly, a pediment is a true and legitimate termination, crowning the gable of a building in its entire extent; and according to the laws of fashion, a hat is a proper crown for a man's head; but it by no means follows that a hat is a suitable ornament (however diminished) for his shoulder, his eye-brow, or his upper lip; neither should the hat be of such dimensions as only to cover the centre third of the caput. But that great authority, Palladio, turned these window pediments to more account than his followers now do, for he placed a colossal figure in a half-siding, half-reclining, though perilsous posture, on each side, like two sentinels on one post. Improve on this, I beseech you, ye Palladians, and place one figure astride your door and window pediments, and turn them forthwith into hobby horses. If Mr. Barry had left out of the design for the Reform Club House those miserable window pediments and the rustic quoins, that building

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1 See lecture in Journal, Vol. V., p. 78.
would have added to his fame. If these pediments were to serve any useful purpose, they ought to have been placed over every window, and not those of the first floor alone; and if intended only for ornament, (?) all should have been thus ornamented. As representations of military cocked hats, they might have been selected by the more warlike clubs; but mere civilians have no right to such emblems.

Fourthly, besides rustic quoins and rustic fronts, we have the thing carried out still further; I do not know what name it rejoices in, but it may be seen on Burlington House and the Town Hall at Birmingham: this is intended, no doubt, to give us some idea of rocks. I do not know that Palladio is accountable for this latter; I rather believe it had its origin in the times of cutting yew trees into figures of things animate and inanimate. It may be very proper that a house should be built on a rock, but that a tree should represent a man, or a house a rock, is not so evident: the exterior of an edifice should represent one whole, not made up with a show of patches, but as a composition, stable and secure, concealing, not thus exposing, the smallness of the materials, by the introduction of rustic work, either as quoins or fronts. As receptacles of dirt and moisture, such work is unsuited to our climate, and can only be of use to the builder by swelling his bill of charges.

Fifthly, it is difficult to say why modern architects crown their cornices in almost every instance with balustrades. Surely the advocates of this practice do not think—if indeed they think at all about the matter, that a pigeon column can harmonize in a composition with columns of due proportion, or that a cornice is at all ornamented by this tasteless expenditure; but in truth the necessity for balusters, can only occur when the cornice itself is meaner, and does not sufficiently mask the roof.

Sixthly, broken lines and cornices are the most glaring faults of modern architecture. The only defence of the practice which I have heard given is, that it relieves the eye! Relieves the eye from what! The eye can take in a straight line easier than a broken one. When an officer wishes to show off his regiment to advantage, does he not dress his line? I wish our would-be Grecian architects would observe the same rule in dressing theirs. In order to observe the contrast between broken and unbroken lines, let us take a model of the Parthenon, and break up its cornices, &c., according to modern practice, and then look at the result. No—in the Greek style, and all those which attempt to approach it, simplicity must exist where dignity is desired, and this simplicity is not inconsistent with the highest state of finish, and with ornament, so rich, as to be beyond our ability to produce anything similar, as for instance, the marbles of the Parthenon; but all ornament should, as they did, harmonize with the edifice.

I believe I have seen all the urban edifices of Palladio as to the suburb, I did not see many of them, nor did I think they were worth going out of the way to see, as I could not observe a single heapity in any of those I did see. Did Palladio draw on those works of the ancients, which he measured and delineated? Oh, yes, he did, just, as Sir Fretul Phaigory, took the worst parts of the works of others; and yet these appropriations, when placed beside his own productions, seemed like patches of silk embroidery on a fleecy-hobservy ground!

As in the lecture before referred to, most of the public buildings in Dublin are criticised (but not more severely than they deserve) I would wish to do justice to one erection made since the delivery of the lecture. And in truth, the breast wall carrying out the improvements in Nassau Street in that city, is every thing that could be desired, and although of humble pretensions, yet calculated to give more pleasure than a view of any of our ornate buildings. A plain straight breast wall (130 feet in length) of well-tiled Hanna, surrounded with a plain and suitable moulded coping on which the rail is placed. No breaks, no rustics, nothing in the cant of false taste to relieve the eye: no, the eye needs it not, for all is repose and harmony. I wish I could say as much of the railing, but perhaps it would be too much to expect perfection in it also, and as a contrast it is broken up by the heads of 19 trunery pilasters, on which the arms of the College are introduced 91, and the name of the iron founder 47 times. From this locality we may say that this ostentations display of the name of the man of iron, is the foundation of the bad taste of the superstructure. If the railing and the ornate stable at the east end of the screen corresponded with the chasteness and simplicity which characterise the breast wall, the entire might have been hallowed as the harbinger of improved taste.

Mr. Gwilt, who admires Palladio more than I do, will doubtless cry havoc, and let slip his pen against the attempt of a more amateur to write on these subjects; but I am ready to stand up for my order, and ask who designed York, and the many other Gothic cathedrals of the same class and date? were they professional architects or mere amateurs? Was William of Wykeham an architect? and yet have professional architects since the age of the Parthenon and the Pantheon, produced any thing to equal them? St. Peter's itself, the pride and glory of modern Rome, is perhaps twice as large and cost ten times the amount required for York, and although, from its vastness, it is beautiful, yet it cannot stand a comparison with York or the Parthenon, or even the Pantheon of Agrippa.

But the amateur of the middle ages found the state of architecture degraded and delased; fortunately for posterity they knew nothing of Vitruvius, or of Grecian art as handled down by the Roman school, else, like Palladio, they might have attempted its restoration, and, like him, have failed. No! from the confusion into which the art had fallen after the age of Dioclesian, they did not attempt to rescue it, but out of this chaos created a new style, which, in after times, architects in derision called Gothic. Perhaps those amateurs may not have left us any thing equal, certainly nothing which surpasses, Grecian art, still they have undoubtedly left, at an immeasurable distance, all their revilers of the Palladio-Vitravian school.

After the practice of the art had passed from Grecian into Roman hands, the decline was gradual but complete, and the age of Dioclesian exhibits its total decadence. That much, both of the Palladian or Vandal and Gothic architecture, arose out of the Dioclesian, is evident. In the ruins at Spalatro we have the swelled frieze, arches raised on slender columns, these latter supported by cawsals, which are ornamented with representations of the human face, just as we see in the Gothic, as the following, taken from Adam's work on Spalatro, plate xvi, will show.

It is remarkable that the zig zag moulding on the consol is to be found on many of the early specimens of Gothic; and also, as pointed out to me by my friend Mr. Peter, on some of the Irish round towers. The moulding on the archivolt of the other figure will also suggest a strong resemblance to the deep doorways of the Gothic.

Let not the profession imagine that I want to transfer the working of the art from their hands into that of amateurs. Architecture is a profession the details of which require much experience and study, and few amateurs will be found capable of working out these details; but the same judgment which is necessary to enable a purchaser to feel the merits of a painting or a statue, is absolutely necessary in the science of architecture; and unless that taste exist, it is in vain to expect any thing like improvement in the design for either our
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gines, the existence of the Yarborough's engines does not appear to have been known, otherwise their similarity with the Dugon engines no doubt would have been noticed.

In 1831, a caveat was lodged by Mr. Yates, and a patent would have been obtained for this construction of engine, but for various reasons, that it is unnecessary to enter upon here. It appears that in 1825 the Portsmouth and Ryde Steam Packet Company gave Mr. Yates an order for a pair of these engines of 15 h.p., and they were made as represented in the annexed engraving. The cylinders are 24 in. diameter and 2 ft. 8 in. stroke, the radius of the crank being 12 ft. The power, at 17.5 ft. per minute, equals 10½ h.p. each cylinder. Paddle wheels 11 ft. diameter, and length of paddle equaling 5 ft. Beam of vessel 13 ft.; draft of water 5 ft. 9 in.; immersed section equals 33 ft.

This kind of engine certainly possesses many advantages; among others may be mentioned, small space occupied, light construction, and principally, their position in the vessel, near to the centre transversely, and bearing chiefly on the kelson or strongest part of the ship, the most important part of the machinery being below the water line, all which points were duly considered by Mr. Yates 22 years since.

Mr. Yates also furnished drawings of a three cylinder engine, designed in 1831, at the request of Captain Borne, of the London Engineer steam vessel, to increase her power from 70 h.p. to 105 h.p., without requiring additional space, but it was rejected on account of the shortness of the connecting rod; this arrangement might be applied to large powers with great effect. On the whole, we cannot but highly applaud Mr. Yates for his ingenuity, and see that the opinions and views he entertained 20 years since, have been lately adopted by others.

ON STREET MAINS OF CAST IRON, FOR GAS AND WATER CONVEYANCE.

The present unprecedented low price of iron offers an opportunity for the extension of gas and water works, which it is surprising has not been urged with avidity by such places as are yet destitute of the luxury of either; and at the same time, considering that the furthering of such works is one of the occupations of the civil engineer, I am induced to send you a paper on the subject of street mains, being the collection and collation of examples which have fallen under my notice during an attention of upwards of one third of the useful portion of human life. First as to the direction of the pipes or mains. They should be laid in as straight a course as possible, and their inclination should be uniform and not to exceed one in a hundred, if it could be avoided by any possibility; and where descending mains meet and form an angle, syphon pipes or receivers should be placed to collect deposition of mud, &c. The names main and sub-main are given to leading pipes from 4 in. to 18 in. diameter, and for smaller, the term service pipes is used. Pipes are of two descriptions, socket and flanged, a table of each description is given; in measuring socket pipes, the socket is excluded from the measurement. Pipes above 4 in. are all cast 9 ft. long, and under 4 in. down to 1 in. are usually 6 ft. long, and 1 in. are 4 ft. long. The pipes are generally delivered at the works, and then previously to being used, are proved by hydraulic pressure equal to a column of water 250 ft. high; and in warm weather it is desirable in proving pipes to use warm water. Practice will enable a skilful prover to tell by the ring of a pipe, from a tap with a hammer, whether it is faulty, either from being cracked, or deficiency in thickness. It is usual for pipes all above, say, 4 in., to be charged by the ton, and for the smaller, a certain price per yard, varying as the size, the socket being excluded from the measure; the price for straight pipes in 1834, was 150s. per ton, the bends and branches, or particular pipes, being 40s. additional, and the boring of the fire plugs also being extra, say, 15d. each. In 1839, from the same note book, I find the cost of straight pipes was 138s.
per ton, the difference of 12s. per ton being altogether due from the
cost of digging trenches, they will vary as the depth; and I
know they have been done as follows, 3 ft. 4 ft. and 5 ft. respectively,
and the price will vary with the nature of the material, as Macadamised
road, square paving, and random paving, which I have done at per
year, and for the pavement, a third for the trenches, and fourth for pipe-laying.
the pipes are usually made with hollow lead, but other ma-
terials are also used for economy, viz., wooden wedges, (see Journal,
Vol. 1, p. 242.) also wood with iron wedges interspersed; a mixture
of cast iron boring with sal-ammoniac is sometimes used for socket
pipes. For flanged pipes a weuse or washer of yarn or sheet lead,
smear with red or white lead, is used, and the pipes being cast
with a flange at each end and screw bolts inserted, and when screwed
tight the joint is complete.
In the appendix I have given a table showing the weight of flanged
pipes and the number of holes in the flange. In the second table
Is. 4¼ in. or 12s. per pipe the cost per yard delivered, and the total cost per yard including pipes
and laying, and in the third is a table of detail for 3, 4, 5, 6, and 15
inch pipes, from actual execution, and from which the cost of the pipes
in the 2nd table has been computed. It must be borne in mind,
that the weight of pipes is also applicable to columns or pillars.
In that very useful work Laxton's Builders' Price Book several tables
are given of pipes, and one in particular gives the usual lengths and
different diameters and weights of lead service pipes.
It has been previously noticed that the boring of fire plugs and partic-
ular pipes are charged extra, but the most costly appendages yet
remain to be noticed, viz., slide cocks with brass and copper facing,
which will cost 21s. per inch of the pipe's diameter for all sizes of pipe,
and for the smaller size as high as 35s. per inch. The when, why,
and wherefore, of the introduction of these, as also the size of the
mains and their gradual diminution to suit particular localities, must be
left to the hydraulic engineer, but, as a general question, I may be
allowed to state from 11 in. to 15 in. diameter of pipe will be suf-
icient to supply a population of from 70 to 100,000.
The subject of the flow of water through pipes of different lengths,
both horizontal and vertical, has occupied a good deal of your pages,
and a paper was read to the Institute of Civil Engineers by W. A. Provis,
Esq., in the session of 1838, and reported in the Journal,
Vol. 1, p. 383, containing the following deductions. "In level pipes
the quantity of water discharged is nearly in the inverse ratio of the
square root of the length; but the departure from this rule is greatest
in the shortest lengths and greatest heads. In inclined pipes, the in-
creased discharge is greater in the long than in the short pipes. The
increased discharge for an increased head is nearly in the same pro-
portion through the long and short lengths." The above extract is the
result of several experiments forming a direct appeal to nature for
facts. At page 467, vol. 5, of the Journal, commences your review of
Mr. Shuttleworth's Patent Hydraulic Railway, which has led to
your pages being so fully occupied, perhaps unprofitably, with the
subject of the flow of water down vertical pipes, which has also been
defined by yourself, and a correspondent T. F.—S., in Vol. 6, pages
57, 123, and page 149, by 1. T.—S., which as connected with this sub-
ject, I have noted for future reference. The following rules as to
the quantity and velocity of issuing water, I have collected from
various sources; the first was given me by a friend who is an hy-
draulic engineer, viz., formula for calculating the quantity and velocity
of issuing water. Let \( h \) be the head of water in feet, \( d \), diameter in
inches, \( l \), length of pipe in feet:

\[
15 \sqrt{\frac{h d}{l + 5 d}} = \text{velocity;}
\]

\[
30 d \sqrt{\frac{h d}{l + 5 d}} = \text{gallons discharged per minute.}
\]

To find the weight and quantity of water in full pipes, square the
diameter in inches, which will give the weight in pounds in a yard of pipe;
and if one figure be cut off on the right hand, it will give the
number of gallons.

Quantity of Water discharged by Iron Pipes.
Multiply twice the fall in inches per mile by one-fourth of pipe's
diameter in inches; extract the square root; take \( \frac{1}{4} \) of root for ve-
cocity in inches per second. Divide by 12 for feet per second. This
is the velocity that will be maintained if the pipe be fully supplied.
For a head of water the velocity will be increased as the square root
of the height.
The manner of laying, direction, usual size and dimensions, depth
below surface and cost of trenches, and making good pavements, have
been alluded to, as also the manner of proving; but the description
of metal and mode of casting has not been noticed. Many parties are
content with casting on a sloping bench, others insist on perpendicular
casting, with a head of metal above the top of the pipe; and as re-
gards the metal, it is now commonly run direct from the blast furace,
and not from the cupola of little foundries as was formerly the case.
In conclusion: I think this a rambling collection, but trust the tables
will be a sufficient apology, as also the wish of contributing, in how-
ever small a degree, to promote the cleanliness, and consequently the
health, of the poorer, although not less useful, portion of the com-

St. Ann's, Newcastle-upon-Tyne.

O. T.

APPENDIX.

Detail Cost of laying Pipes.

<table>
<thead>
<tr>
<th>3 in. Pipes, cost of 9 ft. length.</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6 lb. of lead in joints at 14s.</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>4 oz. of yarn or gaskin, 5d. per lb.</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Labour in laying</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Excavation, refilling and paving</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Labour per yard, 1s. 2d.</td>
<td>3</td>
<td>61</td>
</tr>
<tr>
<td>Metal per yard, 2s. 1d.</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Total cost</td>
<td>12</td>
<td>34</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4 in. Pipes.</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8 lb. of lead in joints, at 14s.</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>5 oz. of yarn</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Labour in laying</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>Excavation, filling and paving</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Labour per yard, 1s. 3d.</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Metal ditto, 4d. 1d.</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Total cost</td>
<td>16</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5 in. Pipes.</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10 lb. of lead in joints, at 14s.</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>6 oz. of yarn</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Labour in laying</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Excavation, filling and paving</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Labour per yard, 1s. 4d.</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Metal per yard, 5s. 9d.</td>
<td>17</td>
<td>3</td>
</tr>
<tr>
<td>Total cost per yard, 7s. 1d.</td>
<td>21</td>
<td>5</td>
</tr>
</tbody>
</table>
1843.

THE CIVIL ENGINEER AND ARCHITECT'S JOURNAL.

337

6 in. Pipes.

12 lb. of lead in joints, at 1s. 2d. ... ... 1 6
1 lb. of yarn ... ... 0 24
1 yearner, 1 layer and rammer, 1 pelter up, 3s. 6d. each, ... ... 0 32
2 labourers, 2s. 6d., 1 fireboy to 55 joints ... ... 0 10
Excavation per length ... ... 1 0
Filling and paving ditto ... ... 1 6

Labour per yard, 1s. 6d. ... ... 4 61
Metal per yard, 6s. 9d. ... ... 2 3

Total cost per yard, 8s. 3d. ... ... 24 94

15 in. Pipes.

32 lb. of lead ... ... 3 10
Excavation per length ... ... 1 104
Filling and paving ditto ... ... 2 9
2 lb. of gaskin ... ... 0 10

Labour per yard, 3s. 8d. ... ... 1 9
Metal per yard, 24s. 2d. ... ... 3 12 54

Total cost per yard, 27s. 10d. ... ... 4 3 6

Table of Weight and Dimensions of Flanched Pipes.

<table>
<thead>
<tr>
<th>Diameter of</th>
<th>Thickness of</th>
<th>Distance of Flanch</th>
<th>Number of Bolt Holes</th>
<th>Size of Hole</th>
<th>Diameter of Flanch</th>
<th>Thickness of Flanch</th>
<th>Weight of a 9 ft. Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inch.</td>
<td>in.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>cwt. qr. lb.</td>
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<tr>
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<td>3</td>
<td>61</td>
<td>4</td>
<td>6</td>
<td>43</td>
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<td>0 3 0</td>
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<td>4</td>
<td>71</td>
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<td>79</td>
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<td>4</td>
<td>91</td>
<td>4</td>
<td>6</td>
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<td>4</td>
<td>3 2 1</td>
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<td>4</td>
<td>15</td>
<td>6</td>
<td>1</td>
<td>105</td>
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<td>4 3 17</td>
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<td>14</td>
<td>6</td>
<td>1</td>
<td>112</td>
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<td>10 2 0</td>
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<td>6</td>
<td>1</td>
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<td>25</td>
<td>6</td>
<td>1</td>
<td>128</td>
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</tr>
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<td>16 1 15</td>
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<td>17 2 13</td>
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<td>18 0 26</td>
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<td>29</td>
<td>6</td>
<td>1</td>
<td>132</td>
<td>4</td>
<td>18 0 26</td>
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<td>6</td>
<td>30</td>
<td>6</td>
<td>1</td>
<td>133</td>
<td>4</td>
<td>18 0 26</td>
</tr>
<tr>
<td>23</td>
<td>6</td>
<td>31</td>
<td>6</td>
<td>1</td>
<td>134</td>
<td>4</td>
<td>18 0 26</td>
</tr>
</tbody>
</table>

Cost of laying pipes, including digging, filling in, and lead for joints, but exclusive of pipes and carting superfluous earth, and making good roads, per yard.

<table>
<thead>
<tr>
<th>Inch.</th>
<th>s. d.</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>s. d.</th>
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<td>2</td>
<td>1 0</td>
<td>8</td>
<td>2</td>
<td>0</td>
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<td></td>
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<tr>
<td>3</td>
<td>1 1</td>
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<td>1 2</td>
<td>12</td>
<td>2</td>
<td>3 6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1 3</td>
<td>12</td>
<td>2</td>
<td>3 6</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>6</td>
<td>1 4</td>
<td>15</td>
<td>2</td>
<td>4 0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>1 6</td>
<td>18</td>
<td>2</td>
<td>5 0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Relaying, paving, or making good roads, per yard ... ... 0 9
Boxes for plugs, each ... ... 2 0
Ditto with flaps, each ... ... 3 0
Spiggots, each ... ... 0 6
Boring Plugs, each ... ... 1 0

ELECTRO-GALVANIC BLASTING.

Sur—Having read with much interest, in your Journal for August, the account of the various applications of the electric fluid to the useful arts, by Mr. Alexander Bain, I beg to communicate to you another application of the conducting power of water, which, with the approval of Major-General Pasley, I have lately adopted in firing sub-marine charges over the wreck of the "Royal George," at Spithead, and which the General and myself both consider a great improvement on the mode hitherto practised.

My attention had been for some time led to this subject, in carrying on some experiments in June and July last, on the relative power of different lengths of wire conductors in use over the wreck, for transmitting the electric fluid. These conductors consist of two stout copper wires, separated by an 11 inch rope; the wires are carefully insulated and paid over with tape, yarn, and waterproof composition; the rope is saturated with the same composition, being immersed in it while boiling, and yarn is then bound round the whole with a second coat of the composition over it.

The apparatus used for the experiments was the voltmeter, consisting of a glass vessel with inverted tubes, two pieces of platinum wire were fixed into the sides of the vessel, and bent at right angles, to enter the tubes; on connecting the two ends of the conducting wires at one extremity, placing a voltaire battery at the other, and the voltmeter within the circuit, the water in it was rapidly decomposed, gas was emitted and passed into the tubes, which being graduated with a scale divided to tenths of inches, showed the relative power of each length of the wire conductors by the quantity of gas delivered in a certain time.

I was, however, surprised to find that decomposition of water ensued, even when the ends of the wires furthest from the battery were disconnected, and it soon became evident, that as these wires had been frequently used for firing charges at a depth of 13 fathoms under water, a certain degree of moisture must have been forced in by the great pressure at that depth through the exterior coating, notwithstanding the precautions used to make it and the wires waterproof, and thus the electric fluid must have been led from one wire to the other, causing action in the voltmeter; this became still more apparent on applying the voltmeter and battery to a length of wire conductor which had never been under water, as unless the ends of the wires were connected, there was no gas emitted. There was another convincing proof of the power of water as a conductor, though it in some measure frustrated the object of my first experiments; but prosecuting the subject still further, I have since been enabled to turn this power to account, by using the water as a conductor in conjunction with a single wire for firing charges, which are daily required over the wreck.

The method of doing this will now be stated.

From Mr. Bain's experiments as well as my own, it appeared that using water as a conductor in conjunction with a single wire, a certain metallic surface must be present at each extremity of the wire, to ensure the transmission of a sufficiently powerful current of electricity. In the case of sub-marine explosions, it would therefore be necessary to have one surface of metal at the bottom of the sea, and another at the top, the depth of water forming the conductor between them, and as the greater part of the charges used at Spithead are common oil cans of tin, (a good conducting metal), varying from two to five gallons, it occurred to me to make use of the tin can as the metal required at the bottom, and at the surface of the water to use plates of zinc.

Before lowering the charge to the bottom, the single wire is connected to one of the priming or short wires inserted in the bursting tube of the charge, and the other priming wire is turned down on the tin and connected with it. The charge is taken down by a diver, who places it, and after he has come up, the zinc plates are immersed, (I found by experiment, that three plates of 10 in. by 7 in. were required) connected by copper wire passed through a hole in the top of
MUSEUM OF THE HERMITAGE, ST. PETERSBURG.

Oy it being first of all rumoured that Klenze had been commissioned by the Emperor Nicholas to prepare designs for a Museum at St. Petersburg, the natural supposition was, that the building was to be an entirely new and distinct one, as was the case with the Glyptothek, and the Pinakothek at Munich, the reputation of which most probably led to the architect's being employed by the Russian sovereign. It turns out, however, that the structure will not add to the number of the architectural monuments of St. Petersburg, as it is only a rebuilding and extension of the Hermitage Palace, in which the "Raffaelle Gallery," so called from its being a fac-simile imitation of the Loggie of the Vatican, is retained. Still, if description may be trusted, it is very greatly superior to what has been removed to make way for it; and though only an appendage to the imperial Palace, it is in itself much larger than many palaces, the general plan forming a parallelogram of 320 by 380 ft., English measure, which is not very far short of the area of the whole of the quadrangle and buildings of the upper ward of Windsor Castle. The largest of the inner courts is 215 by 130 feet; the general height of the façade 74 ft., and that of the pavilions at the angles, 105 ft. In regard to the character of its details, the style of design is Greek, and it would seem the design itself is in some respects similar to the architect's idea for the Pantechnikon, at Athens, published in his "Entwürfe." Of the actual composition, however, it is impossible to speak from the verbal description given of it; for let the last be ever so correct as it goes, so many circumstances indispensably requisite to be understood, are passed over in it, that it is more tantalizing than satisfactory, leaving altogether doubtful some very material points. The stone, which is of reddish granite, is 11 feet high, and must therefore be of colossal proportions, and produce a most imposing effect, if it be rendered so by the latter applied to it—impurities, a solid substructure, in appearance at least, without windows of any sort. Nothing being said to the contrary, we are left to suppose that such is really the case; but it would have been far more satisfactory to have been distinctly assured of it, since it makes a most prodigious difference indeed whether it be so or not. Colossal must also be the effect of a mass, nearly the same in thickness as the Reform Club House, but with only two ranges of windows, reared on such a basement. This part of the structure is of greyish stone, with some intermixture of reddish granite for the details, yet to what extent the latter is applied is not said; hardly at all, we should think, can it have been employed for any of the more delicate and enriched parts, as the engraving does not appear to have been at all exact, for we are told of arabesque panels, sculptured friezes, statues, some supported on consoles, others within niches, hermes-pillars, &c. &c. In short, the description makes magnificent promise to the ear; but whether the structure itself would keep such promise to the eye, is what we will not pledge for. Description is equally favourable to the interior, but equally perplexing as to the latter. A vast deal of magnificence is spoken of—variegated marble columns, inlaid pavements of Grecian design, and other matters of that kind, but it is all shapeless. Almost the only part which we can figure to ourselves at all intelligibly is the grand staircase, 130 ft. long, by 50 in breadth, with its twenty marble Corinthian columns, and three successive flights of marble steps (22 feet wide), ascending in a direct line. At any rate, in such a staircase there must be an air of extraordinary pomp. The rooms on the lower floor are intended for the reception of sculpture, vases, and miscellaneous antiquities; those above for a picture-gallery, distributed into a series of rooms, some very spacious, and lighted from above, as in the Munich Pinakothek, for larger pictures; others as cabinets, for smaller pictures, besides various lobbies and corridors. The contents of the museum will be so arranged, that the apartments will have more the air of being decorated with them, as in a private palace, than of being the exhibition-rooms of a public museum, which sometimes give the idea of a bazaar, at others, of a cabinet-house of art, stored with works, immortal, perhaps, in fame, but perishable, and even perished; interesting, but utterly illegible inscriptions, limbless statues, featureless busts, and pictures touched and retouched by time, till they have become only so many grim blackened canvasses, and melancholy memento-mori's. Although the building was not begun until the spring of 1830, the Museum and the Hermitage is expected to be completed by the end of the present summer, notwithstanding its great extent and the prodigious solidity of its constructions. In some places such an edifice would have been the work of a quarter of a century.—Art Union.
In this report the architect pointed out the various accidents which had occurred since the commencement of the works, and in reference to the danger of passing in the neighbourhood of the town, expresses himself in the following terms: "All human prudence cannot prevent occasional masses of various sizes and in various stages of decay, from detaching themselves and bringing down in their fall the outer parts of the structure, to the serious risk of the public safety. I think, then, that every precaution should be taken by the administration to avert the danger. At the same time, although accidents are to be feared from the fall of loose stones, I firmly believe that the mass is solid, and that there is more danger in the counterforts than in the walls.

Towards the 7th of April the symptoms increased, and during nine successive hours M. Petiau was personally engaged in superintending the works and in hastening the evacuation of the neighbouring houses. At a quarter before 4 o'clock he was still within the tower, examining all the symptoms of ruin which it presented, and was not able up to that time to detect any immediate danger. Scarcely, however, had he quitted the place, when several loud cracks were heard, and the whole tower fell bodily over, while a huge cloud of dust expanded in every direction, giving to view, as it slowly cleared away, a scene of destruction impossible to describe. The once lofty tower was now reduced to a stunted irregular pile, varying from 3 to 10 feet in height. Many of the neighbouring houses were seriously injured by the fall, and several dead and wounded victims were buried beneath a mountain of ruins. One unfortunate man was precipitated from the top of the tower, where he was 250 feet in height; he was immediately killed, as well as several who were left in the adjoining houses.

This frightful catastrophe, the occasion of so much misery, both public and domestic, could not escape the notice of justice, and accordingly the procur~ general was speedily on the spot. An inquiry was instituted, and the architect who had been directing the work became the subject of judicial proceedings. A commission of architects appointed to examine into the occurrence and to present a report, found that it was a matter for which he should alone be held responsible, and enumerated various precautions which he should have taken. The greater part of these criticisms, however, failed to have any effect, in consequence of the contradictory evidence which was afterwards adduced.

Notwithstanding this, the Tribunal of Valenciennes, in its judgment of the 12th October, 1843, after admitting in favour of the accused several extenuating circumstances, such as the activity he had displayed, the care with which he had conducted his operations, and the inspection which he had made at the peril of his own life, only half an hour before the fatal occurrence, yet adjudged him guilty of homicide through imprudence, and condemned him to pay a fine of 100 francs. They imputed to him the fault of not having sufficiently announced the dangerous state of the entire structure, although according to the opinion of other architects, this danger was sufficiently obvious.

The affair has since been tried before the Cour Royale, in consequence of an appeal from the inferior tribunal. On this occasion the accused was defended by M. Huré, who made an able speech in his behalf. The advocates for the arts thereupon at once time great rewards to their professors and at another great punishments. At the end of some perilous enterprise, the architect has sometimes to boast of the palm of victory and the chaplet woven by honourable success; while too frequently an unhappy victory overthrows him with shame, and hurls him mercilessly down from the precipice of fame. Mark with what sobriety and caution, therefore a vindictive public should descend into the arena, where the champion lies already conquered! With what timidity should justice herself invade the temple of the fine arts, to slight over again the already vanquished hero? Let us inquire who is M. Petiau, the person here accused. He has lately returned to his native city of Valenciennes, from the School of Fine Arts at Paris—he is one in whom the most brilliant talents have been developed by the most skilful masters, and who, decorated in five successive contests with the most illustrious of modern distinctions, at length returned to fix himself in his own country at the foot of this fatal tower, with the modest but honourable title of Architect to the town.

I shall not pretend so to interpret the ancient usages and laws upon this subject as to contend through them for the irresponsibility of the accused, but I do boldly maintain that it is in architecture as in medicine, in surgery, and in military strategy, that the innocence or guilt of men is not to be measured by their success or failure, but by the degree in which palpable error can be proved against them. Before an unfortunate artist can be made the subject of punishment, it must be established upon clear evidence that some inexcusable fault has been committed, some gross offence against the principles of art, some error of omission or commission so obvious as to fall under the notice of the senses, and then, when this has been clearly proved by corroboration of cause and effect, to have led to the accident in question, it is time to condemn."

Proceeding, then, to the special circumstances of the case, the advocate shows that M. Petiau is not even the author of the project of reparation
deration of this question, it may be desirable to examine the opinions that have been expressed elsewhere in similar circumstances, reserving for the concluding observations the comments which particular passages may appear to require. An Essay in the "Revue Générale de V'Architecture" 18 was quoted first. The remarks of the writer are suggested by the celebrated work of M. Passe de la Roche, painted in oil on a semicircular wall in the Ecole des Beaux Arts at Paris. It is unnecessary to refer to the opinions relating to that particular work, but some of the more general observations may not be undeserving of attention. The following is a translation.

"When first the architect opened to the painter the doors of a recently finished edifice, and showed him the walls which were to be adorned by his skill, an elevated art arose, the essential principles of which were at once simple and profound conditions of this union. This art may be called mural or monumental painting. It is on this account so different from easel-painting, that perhaps the relation between the two might be aptly expressed by the circumstances attending their respective modes of execution; by comparing the eternal walls of a temple with the fragile stretching frame under which the easel trembles.

"Painting being employed to decorate large and solid surfaces, the artist is no longer intent on the re-production, however ingenious, of reality in its most limited sense. A dignified subject is essential, and to this genius is required to add ideality or elevation of treatment. Lastly, simplicity, the indispensable characteristic of great works, must be apparent in the composition and in the execution. Hence arises the special condition of excluding from mural painting all that may interfere with grandeur of ells— all that tends at once to imitation and affluence. Thus, in the case of the painter, is in this case, not alone; his art is employed, together with that of the architect, in decorating the same interior. There can be no difference of purpose between the two: two objects of one and the same thought; and if one art is dependent on the other, it is that of the painter. It is further to be remembered that the walls must always be felt to exist under the decorations that cover them, and the skillful and magic effects by means of which the painter gets rid of the flat surface would here be out of place.

"Thus, under whatever point of view this question is considered, monumental painting must still be limited to an elevated region, where all is grand, simple, and unaffected. It is thus that its style was defined by the great masters who, from Giotto to Michael Angelo, covered the walls of the palaces of Italy with their works. They painted in fresco and Michael Angelo, foreseeing the decline of the greatest style, had reason to call easel-painting an occupation for women. 2 From this period (the middle of the 16th century), the tradition of elevated art was unstable. Succeeding painters, down to Pietro da Cortona, poured over vast surfaces their crowded compositions in which the qualities of fresco became useless. To complete the decline of monumental art, it remained only to neglect the process itself. Accordingly, from the beginning of the 17th century, oil-painting was introduced commonly on walls, particularly in France; and the artists looking on this mode of painting as an opportunity for displaying the effects of foreshortening, perspective and colour, produced what the Italians called vast 'machine,' differing only from the decorations of the theatre by better forms and a more fine trick of illusion. We have no right to consider the modern artists responsible for this practice; it is to be dated from those painters who first lost sight of the conditions which regulate the style of painting when that art is applied to architecture.

"The rich and varied effects which characterize oil-painting are all applicable to a severe style of architecture. The brightness of tints, powerful relief of details, are resources easily abused, especially when the artist has been long accustomed to them. Such means require, on the contrary, to be subdued and simplified, so as not to transgress the limits of a well-understood style of decoration. To these objections it may be added that oil painting applied to walls has no principle of durability or solidity, specially when employed on large surfaces. The experienced chemist, M. Dumas, 19 has made an entire science available for selecting the materials which he has remedied this defect by preparing walls with new grounds for painting.

"The more often misrepresented expression of Michael Angelo appears to have been uttered in a moment of irritation, and to have been intended as a rebuke to Sebastian del Pioral. Vasari thus explains the occasion, in his life of that artist: "A misunderstanding arose between them, in consequence of Fra Sebastiano having persuaded the Pope (Paul III.) to direct Michael Angelo to finish the Last Judgment in oil, whereas he only intended to complete it in fresco. But as he was silent at first, the wall was prepared for oil painting, under the direction of Fra Sebastiano. Michael Angelo suffered several months to pay without saying anything; and being at last pressed to proceed to the work, he declared that he would not undertake it unless he was allowed to execute it in fresco; adding that oil painting was an art for wretches and in essay. He was in the habit of despising numbers and of indolent habits, like Fra Sebastiano. The Fane’s painting was therefore removed from the wall, and the surface was prepared anew for fresco."

"This paper forms Appendix No. 6 to the Second Report of the Commissioners on the Fine Arts.

1 This paper forms Appendix No. 6 to the Second Report of the Commissioners on the Fine Arts.
"We here find pictures in which the subjects, importance, number, treatment, and distribution have depended on the situations which the architect's arrangements afforded, all as if guided by one directing thought. 

In contemplating the harmony and majesty which these churches present in their masses, and the poetic and moral impression produced by their decorative details, the spectator at once feels that this is the highest unity of creation. It is also easy to conceive that this impression would have been destroyed, or would have been far weaker, if the decorations had been subdivided and allotted to a great number of artists, whose works would have been variously conceived and executed. The merit of such productions, in individual instances, would not have compensated so great a defect.

The authors proceed to express their conviction that the similarity of the grounds on which the figures were painted, in addition to the similarity of style, contributes to the effect of the whole.

The use of gold for these grounds shows, besides, that the artists did not then attempt to do away with the walls, but only to give to the stone the appearance of a precious material. The simplicity and sedateness in the attitude and expression of the figures, as well as in their execution, are not calculated to disturb the impression as to the reality of this wall of gold. Hence we find none of those abrupt effects produced by grounds of all colours and varieties, nor those attempts at illusion which in historic moral painting are so injudicious, presenting hollows where there should be solidities, undefined and uncharacterizing the architectural forms—forms which painting should preserve and assist, but never alter or suppress.

The authors then refer to three kinds of art which have been revived or invented of late years, namely—encaustic painting, painting on glass, and enamel painting. The last, it is observed, combines all the qualities of mosaic and porcelain with many important advantages. The authors remark, that

Painting even on the exterior of sacred public edifices was not confined to the south, but had been abandoned in severer climates. Germany and the old and new capitals of Russia contain examples. Such external decorations lasted better in Egypt than in Greece and Italy, and better in the south of Europe than in the north. Hence more durable materials are required in the latter cases. Mosaic had been first adopted with this view; porcelain, treated as it was at the revival of art, could in some degree have answered the same purpose, but nothing could fill all the desired requisites so satisfactorily as the enamelled lava. More durable than mosaic, more under the command of the painter, so as to enable him to give the greatest perfection to his work, this beautiful invention, in its application to the exterior of the Church of St. Vincent de Paul, may rival the most remarkable effects of the kind that art has produced.

The authors afterwards propose that Raphael's compositions from the Old Testament should be executed in enamel, to adorn the cells of the portico of the new church.

In the decoration of the interior they recommend encaustic painting, and say

"Now sufficiently tried at Fontainebleau, at Munich, and in Notre Dame de Lorette and in the Madeleine, at Paris."

MM. Lepère and Hittorff next recommend that certain prominent portions of the internal decoration in the nave and sanctuary, and which belong to the general coup d'ceil should be entrusted to one, or at most to two artists; but the side chapels and various other places, they admit, might be allotted to various hands. They assume, however, that the universal gold ground which they propose to adopt, will compel all the artists to a sufficient unity of style and effect. The observations on sculpture are dictated by the same principle of preserving a harmony in the general effect and in the style of those works that are seen together.

The opinions of German artists and critics, on the adaptation of painting to architecture, correspond with those above quoted. Mr. Wilson states in his notes—

"Professor Hess observed to me that great care must be taken to avoid correcting defects in a series of pictures on the same wall. The same spirit, he observed, must pervade the whole in the design and colour, and as nearly as possible in the light and dark. If, for instance, an artist were to represent a broad daylight in his first picture, in the next a fairy sunet, and beside that again a night scene, such contrasts would interfere with the architectural unity which is essential."

Lava slabs of large dimensions are obtained at Volvic in Auvergne; they are fine-proof, and figures the size of life are executed on them in enamel.

The trials of enamels that have been made in many cases have been far from satisfactory, chiefly owing to the effects of damp in ill-prepared walls.

See the article Fresco, in the "Conversations Lexionale".
After noticing the works in the church of the Madelene, before referred to, Mr. Wilson quotes some defective Italian examples, and adds:

"Paul Veronese, as might be expected, from his all pictures, is more effective, and perhaps may be said altogether to be the truest painter of colour the world has yet possessed; but his taste in design is open to criticism. In the Villa Mazar he has everywhere annihilated the architect's intentions, and has so painted the walls and ceilings as to convey the idea that the spectator is looking out to the country and up to the heavens, while the windows in the room contrast the reality with the artist's intentions. Such extravagances, perhaps pardonable in the fanciful decorations of illusion which borrow their ideas from taulian art, are totally unknown in ceilings of churches or rooms; were frequently painted with perspectives of gorgeous edifices, while portions of clouds and figures were brought down, by means of express plating, over the real cornices and mouldings. In S. Andrea della Valle in Rome, even Domenichino has indulged in such perverse and unworthy conceptions."

Advertising to the decoration of churches at the revival of art, Mr. Wilson proceeds:

"Blue is substituted at a later period for gold, and this is exemplified with peculiar completeness in the Cappella degli Scrovegni at Padua, painted by Giotto, which may be deemed a perfect example of Italian Gothic church-painting. In this building, as in other Italian Gothic edifices, the vaulted roof is painted blue, and is divided into compartments with stripes of ornament; in other buildings where there are ribs, the vaulting ornament, which is of a geometrical character, is confined to these, and to a small space on either side of them. In each compartment of the vault there are circles of characteristic ornament, in which are painted heads and even whole-length figures of the Evangelists, or their symbols. At a subsequent period the circles were diminished, and the figures were painted standing on light thin clouds; at all times the blue background, sometimes very dark, but at other times light, was spangled with gold stars, frequently executed in relief. In Sta. Maria del Popolo, in Rome, Furrinichio has introduced a beautiful variety in this mode of decoration; he has seated the figures on thrones, and dispensed the blue background with a rich gold pattern. To return to the Cappella degli Scrovegni: the paintings on the walls are divided from each other by broad ornamented bands vertically, and by narrow ones horizontally; and, for the greater part of the architectural ornament, with heads of saints, coats of arms, and subjects composed of two figures, and all these bands are richly painted with various colours. The figures are all on a ground of plain blue, of the same tone as that of the vault overhead.

"In the Farnese, Raphael has restored the ancient mode of treatment, which had been departed from even by Giotto himself. The walls of Amiens and all the other great cathedrals were never revived by any other artist till Raphael adopted it in the above instance."

The extreme opinions of the continental artists and critics above quoted, are to be tried by a reference to the masterworks of Italian art, and by an examination of the conditions resulting from the union of painting with architecture.

Fresco having been decided on for the decoration of portions of the Palace at Westminster, the question of methods used for the present be further discussed; but it may be remarked that the arguments for or against particular modes appear to depend on the following considerations:—the influence of the practice of a given method on the style of the artists; the inclination of the artists; duality; applicability to architecture; the resources of the method; and other conventional characteristics. The absence of a shining surface for paintings on walls seems to be generally considered desirable, and in the present case is especially recommended by the architect. It is easily attainable in all modes, the enamelled surface above referred to excepted. The employment of other methods than fresco, has been considered as giving rise to objection; in which case, being inserted on a canvas, to be afterwards inserted in walls, thus avoiding the objections to canvas; but panels of the sizes required could not be easily introduced into painting rooms of ordinary dimensions. M. Paul de la Roche, who recommends painting in oil on the wall itself admits that, to avoid the black and heavy appearance which old oil-paintings thus executed present, it is necessary to adopt a light style of colour, and to adopt the principles of Venetian and Byzantine illuminations; and especially to the consideration of the question of style, and of the restraint to literal imitation which are supposed to be necessary.

The gold ground, recommended by the writers above quoted, might be at once dismissed without comment, as it has never been proposed as a background for figures in the intended decorations; but it is to be observed that there is here a distinction between the paintings of the great masters, with the exception of Raphael's first work in the Vatican, viz., the ceiling of the Camera della Segnatura. It may have been objectionable to them, even in works where no background was introduced, because, as is evident from the instance just quoted, the least objection to imitation is the extreme dulness and heaviness of the colours contrasting ill with the splendour of gold. It is just, however, to state that all who have seen the works of Professor Hess, thus executed on a large scale at Munich, have been no less struck by the general splendour of effect than by the grandeur and beauty of the inventions.

In the suite of apartments or Stanza in the Vatican painted by Raphael, the compartments for pictures are as large as they can be consistently with the size of the rooms. In the first work there executed by him, even the foreground figures are not larger than life. As the great artist proceeded in his labours, he increased the size, and reduced the number of the figures, till his eye was satisfied. The unified disposition of their size, at which these works are seen, may in like manner have determined the style of execution, and ultimately in some degree even the subjects. In the Camera della Segnatura, which at first appeared to be the only room which could be allotted to Raphael (the others being then occupied by other architects), the subjects such as the philosophy of poetry, &c. are abstract, being directed to repaint the remaining rooms, the experienced artist adopted or approved of a class of subjects which required various details, such as it is natural to look for in objects seen near.

On the same principle differently applied, when Michael Angelo began the ceiling of the Sistine Chapel, he filled three compartments with numerous small figures and a variety of incidents; but finding that such a style produced no effect from below, he suddenly enlarged
the figures of the next compartment to a colossal size; they thus occupied the whole space, leaving no room for background. Having once satisfied himself as to the necessary size, he adhered to it throughout.

The tapestries executed from Raphael's cartoons were originally destined for, and ultimately hung up in the Sistine Chapel, round the Presbyterium. In the cartoon which, from the intended situation of the tapestry and from other circumstances, appears to have been executed first, viz., the Miraculous Draught of Fishes, controlling Peter, the figures are comparatively small; in all the rest, the size of the figures is greatly increased.

These examples may suffice to show that the distance from which the spectator is supposed to contemplate a work (sometimes as a part of an extensive decoration), not only defines the size of the figures, but also fixes the great degree of quantity of detail and consequently the selection, or at least the treatment of the subject.

In the instance of the Stane of the Vatican and the ceiling of the Sistine Chapel, the great artists made their own arrangements respecting the spaces or compartments. In the Palace at Westminster the distribution of the spaces has already been fixed by the architect. The distance at which paintings in the Victoria Gallery will be seen will be considerably greater than in the Vatican, not so much from the difference in the dimensions of the rooms (the Victoria Gallery being 45 feet wide, and the Hall of Constantine, the largest of the suite in the Vatican here referred to, being not much short of that measure), as from the smaller space which the architect proposes to allot to each painting. As it is, the moderate size of 12 feet is fixed.

The apartments of the Vatican to which the Hall of Constantine forms the approach, vary in dimensions and are not all rectanglar. The room called the Camera della Segnatura measures about 35 ft. in the longest dimension. Single frescos, with the addition of a painted frame, are here placed; and the paintings called Theology and Philosophy (or the Dispute of the Sacrament and the School of Athens) measure, without reckoning the painted frame-work, about 26 feet 8 inches wide; so that the utmost distance to which the spectator can retire from either is not sufficient for the eye to embrace the whole composition. The base of the paintings is, however, above the height of the eye (in the other rooms higher than this), which somewhat increases the distance; but in the Hall of Constantine, measuring about 60 feet by 12, the large fresco of the Battle with Maxentius, about 36 feet in extent, on one of the side walls, cannot be viewed at the minimum of distance which is necessary to see the whole of a picture.

The ceiling of the Sistine Chapel is about 60 feet from the ground; the size of the single compartments has no relation to this distance which would admit of pictures measuring from 30 to 40 feet wide; but the size of the figures (with the exception of those in the three compartments before mentioned) is perfectly well calculated for their situation. Those in the above compartments are still larger, as painted maps with a view to counteract the effect of the curve. The head of the Delphic Sybil measures about 2 feet, giving a height for the entire figure, if it were erect, of nearly 16 feet.

Thus, even where single paintings and compartments can be only embraced by the eye, the Italian painters seem to have considered that the effect of each should be subservient to that of the whole wall or ceiling, though that whole, distinctly speaking, could not be comprehended at once. Instances, also, appear, not wanting in which the size of the apartments does not admit even of single paintings in it being embraced by the eye at once. This may be a sufficient excuse for the absence in such works of any general effect of chiaro-scuro. The principle of making the effect of the various compartments subservient to the whole scheme of decoration appears therefore to be one of the points in which the equality of architectural embellishment may, in some degree, require to be extended to painting, and in which the picturesque principle of repetition is in danger of being over-concentration. The resource of the painter, as exhibited in all the examples quoted, is effective composition, through

which, elevation, isolation, &c., may render the principal objects striking, and a gradation of importance may be attained by skilful arrangement. There are, however, instances in which the effect of mural painting of various, and which are seen alone, approach the concentration of effect common in easel pictures. A cupola seems to suggest this treatment; a single painting occupying the end wall of a chapel, or of a hall, and which may be seen at a sufficient distance, admits of the principle of concentration (subject to the conditions mentioned above) being advantageously employed. The spectator, in itself. Thus, judging from its present remains, there appears to have been a treatment of light and dark in Michael Angelo's Last Judgment different from that of the ceiling subjects. The enlargement of the figures in the upper part of the fresco is rather to be accounted for by the principle before followed by the great artist in the ceiling of the Hall of Constantine. This was also allowable in Raphael's cartoons, which, once seen, will fix in the mind the real distance from the spectator; for it may here be observed, that the progressive diminution of figures is confined to narrow limits in the works above mentioned, and in those of most of the Italian masters, Coreggio and his imitators excepted. This restriction is a necessary consequence of the general aim of the soberer schools—an aim which was only rat-looked by Coreggio in a wall.

With respect to the attempt to do away with the real surface of ceilings by perspective appearances, a practice so much abused in the decline of art, it would be a mistake to suppose that the representation of an immeasurable space overhead, with violent foreshortening, as seen in the cupola of Coreggio, was not already accomplished in Italy, at the time when Raphael was brought up in the art. Michael Angelo, of all artists, would have been the last to shrink from the difficulty of foreshortening, but he preferred the more judicious, because more intelligible and expressive representation of figures, seen as if opposite to the eye, and not as they would appear above it. In his as well as in Raphael's ceiling pictures, the horizon is often lost, and the whole scheme is carried out in a twodimensional space, elevated apparently above the eye, as in the case of a cartoon. But to what extent, is the characteristic aim of painting, viz., the representation of roundness and depth on a flat surface, to be sacrificed or limited in the adaptation of painting to architecture, and how far are the observations, on this point, of the writers above quoted to be looked upon as valid? The answer may be furnished by the examples and reproductions here presented, and the larger the dimensions of the figures, the more it requires to be reduced to expressive essentials; that, on the other hand, where the spectator can only retire a few feet to contemplate the work, as a whole, may be truly seen. But this progressive enlargement is confined to significant forms and objects; things less important are gradually omitted, notwithstanding the general increase of size. The extreme effects of proximity and distance correspond in some respects, for works of art may be so small that their leading features only can be perceived; this effect of diminution of objects is an effect of diminution of the whole work, as well as of the ground. But in no case can the imitation descend to the style of cabinet pictures, inasmuch as the compartments, however small, are always to be considered as portions of an extensive whole.

The apparent contradiction of the omission of detail, in proportion to increase of size, was adverted to in a paper on the question under discussion, and referred to by me in my former report, and, hearing it as it does on the question under discussion, may be more fully stated on the authority of various examples, as follows:

The representation, without reference to its frame or boundary, is required to expand as it recedes from the eye; this increase of size with distance (or of distance with size) being imperative, in order that the work, as a whole, may be duly seen. But this progressive enlargement is confined to significant forms and objects; things less important are gradually omitted, notwithstanding the general increase of size. The extreme effects of proximity and distance correspond in some respects, for works of art may be so small that their leading features only can be perceived; this effect of diminution of objects is an effect of diminution of the whole work, as well as of the ground. But in no case can the imitation descend to the style of cabinet pictures, inasmuch as the degrees of distance to which the style of highly-finished cabinet pictures may be said to belong, are defined by the average range of most distinct vision. Beyond and within that limit, whether the pictured plane diminishes

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10 The cartoon of Paul preaching at Athens may offer an exception: the subject demanded a display of architectural magnificence; but even here the principal figures are much larger than in the cartoon of the Calling of Peter.

11 Passed into a life of Raphael, gives the dimensions 21 ft. by 15 ft., French measure.

12 Passavant (ib.) and Bumes (Beschreibung der Stadt Rom), give the dimensions 50 ells of the eye. Ill.

13 Once and hall the width of a picture is the minimum of distance to which the spectator can retire to see its whole surface. A circle cannot be embraced by the eye till the spectator retires to a distance equal to three its semidiameter.

14 Part of this work is now preserved in the Vatican.
as it approaches, or expands as it recedes from the eye, detail is either less compatible with effective representation, or is less perceptible.

The following considerations may tend to explain the practice in art, upon which this statement refers. The scale of measurement still increases with increasing distance, as the picture becomes enlarged, and it would at first appear that, at any and every degree of distance, the eye must continue to receive an equivalent impression. This cannot, however, be literally the case; for the scale of other qualities, such as sharpness and softness, and light and darkness, may be already consumed in a picture requiring but little, consequently, that scale cannot be increased by increased dimensions, while it must be reduced by increased distance. But as it becomes reduced—as sharpness, force and gradation become impaired, notwithstanding the increase of dimensions, the omission of detail becomes unavoidable, or, if to completeness that the quantity of parts should not surpass the existing technical means of expressing their relative importance.

The restrictions which in this instance are a consequence of distance and dimensions, are more or less expedient in all modes of imitation in which the organ of sight is less fully informed. The incompleteness in the appearances, as in the ease of the absence of colour in sculpture, being compensated by greater general distinctiveness, and by a representation unencumbered by accidents.

Perhaps the most remarkable examples of this relative completeness or independence of style occur in the outlines and monochromes of Grecian vases. In these works, the line being assumed to vary but little in thickness, the means of representation may be said to be reduced to the lowest degree. Yet a certain gradation is still preserved. The quality of smoothness in forms is expressed by the omission of internal markings; without background, the scene is indicated by a significant topography. Parts only of some objects are indicated. Of backgrounds, which may be inferred or imagined, from the position of the figures are entirely omitted; an instant which reduced figures to a mere outline, rendered subordinate objects invisible altogether.

Flaxman has shown that the language of abstract form (apparendy requiring no addition of light and shade to assist its meaning) can be employed quite as effectually with less convention; but the same general principles are recognised in his designs.

The consistency which is maintained even on so limited a scale, is not less apparent in the works of great artists, in modes of imitation which afforded ample means of expression. From the restricted department of art referred to, in which so much beauty was nevertheless confined, to what is generally extended, the truth of the proposition is still more apparent. In the works of Raphael, the figures, loaded with effective force, are reduced to a mere outline, rendered subordinate objects invisible altogether.

Sir Joshua Reynolds observes that Michael Angelo, in the Sistine Chapel, has treated figures as more than could be attained in sculpture; nevertheless, it has been remarked with great justice, that, as an example of decoration and of the due adaptation of painting to architecture, has never been surpassed. The inference is, that distance, large dimensions, and the grandeur of style which is the result, are not immediately conducive to the fulfilment of the union proposed. But although there are few examples of this character in backgrounds in architectural positions of the Sistine Chapel, the individual figures are remarkable for roundness, and the fresco of the Last Judgment may originally have exhibited the quality of depth in a remarkable degree.

The extreme doctrine which assumes the necessity of aiming at flatness, because a wall is flat, may therefore be pronounced erroneous on the authority of the best mural paintings, and may be considered unnecessary, even as regards the end proposed. As a proof, it may be sufficient to remember that examples of oil-painting in which the effects of aerial perspective have been represented with consummate mastery, when hung up in a room are immediately seen to be flat surfaces, and less agreeably coloured. At the same time it is apparent that the breadth of treatment which must ever be an attribute of "monumental" painting, must tend to reduce the fulness of relief. The limitation of chiaro-scuro which this supposes, involves, however, an especial attention to colour, and it is to be observed that the practice to which we are accustomed, is to imitate, but to surpass the productions of large figures, calculated to be seen at a considerable distance, on the exterior of buildings, may have led those painters to feel the importance of depth of local hues, and the necessity of laying a stress on the permanent rather than on the mutable qualities of nature. The requisites which M. De la Roche thinks essential, viz., the predominance of light masses, is quite compatible with this aim; and the lightness of effect, without deficiency of force, which is the result, is a quality seldom wanting in Italian frescos. Those by Annibale Carracci, in the Farnese Palace, form a remarkable contrast to the heaviness of some oil-pictures by the same master.

With respect to the alleged expediency of intrusting the execution of a series of pictures to a single artist with a view to unity of effect, it appears, from the examples before given, that the change of style consequent upon first experiments, which may be exhibited in a series, but must be kept, can never, in consequence, be seen; consequently, that the quantity of parts should not surpass the existing technical means of expressing their relative importance.

But Walpole, in the Stucchi of the Staglio, has so far failed to observe the lessons which his own experience has taught him. For the Stucchi of the Staglio, which may have been executed, elsewhere, and is seen almost a miracle of execution, among a certain extent exists is not apparent. Again, the architectural and other back grounds, which are sometimes elaborate, might have been too prominent had the compartments been of the ordinary shape; as it is, their semicircular form sufficiently reduces the space above the figures.

The condition of a peculiar style of architecture is altogether a question of taste; even authority here fails, the greatest Italian masters never having been called upon to paint in a Gothic building. The example which is most applicable may be found in the works of Luca Signorelli, at Orvieto. In those works there can be no doubt that the artist's object was to imitate, rather, as much as to be noticed, and yet his works, while he has been so far as possible had the design of fullness of art, and the equal size, as compared with that of the figures in the principal compositions, involves no inconsistency. Such, with occasional exceptions, examples of which have been before noticed, was the practice of the Italian painters.

Archæological Institution of Rome.—The annals of last year's proceedings of this Society have been recently published, and contain drawings and description of the Temple of Mount Ochla, near Crystus, in Euboë, communicated by Professor Urlichs, of Athens. This temple is generally believed to be the oldest and best-preserved specimen of the kind in Greece, and is particularly remarkable for the massiveness of its walls, and the peculiar structure of its roof. The prize proposed by this Academy in 1842, for the best essay on the Coinage of Italy, has been gained by Dr. Achille Gennarelli, author of the text of the "Museo Gregoriano." He expresses many of the opinions advanced in the works published by Marche and Tesi, whilst the title of "Ars Gratia Del Mitare vivere," which although up to this time the standard work on Italian coinage, was yet to fall short of the Archæological Society to propose a prize for another on the same subject.

St. Mary's Church, Reading.—During the course of last month three very ancient sepulchra, of the early English architkecture, were discovered in ruins behind the sandstones of the south side of the chancel, the fresco painting at the back of them and the encaustic tiles being still in excellent preservation.
THE PHILOSOPHY OF CORAL FORMATIONS, AND THEIR ARCHITECTS.

CORAL (Cornuillum, Lat. from cornu, a horn, and also, the sea; so derived by Minshew, because it is generated from the sea;) generally described as an animal growing in a plant-like form, or a congeries of animals of the polybe kind; there are 15 genera at present known to us, embracing numerous species. The ancients were wholly silent on the subject of coral reefs and their architects, their knowledge, according to Dioscorides and Pliny, being confined to the white and red corals of commerce, of which they enumerate six varieties or various shades, from dull white to bright red or scarlet; the latter being held in the highest degree of estimation by the Romans, who classed them among the most valued gems. But although silent, it cannot be supposed that they were altogether ignorant of their existence, the Red Sea, sometimes termed by the Hebrews the Sea of Zoph, or Wretts, having been navigated from the earliest ages by the various tribes bordering on the coasts, the dwellers of ancient Mesopotamia carrying on a constant trade of drugs, spices, &c., with Egypt, Syria, and Palestine, and eventually with European nations. We are therefore to assume that the perilous reef and its beautiful architects were well known to them, as they are to the Arab and Abyssinian traders of the present day, under the general term of stony plants or weeds. Csesalpinus, Drcocene, Ray, Tournefort, Georgii, and Hill, class corals among marine plants, maintaining that it is propagated by seed like unto vegetables, and Count Marsigli, who was a very attentive observer, supposed he had discovered its flowers and fructification; but the more minute observation of M. de Peyssonel led to the discovery that what Count Marsigli mistook for flowers, was no other than a congeries of minute insects inhabiting the coral: for upon taking the branches out of the water, they immediately retired into the cellular cavities, re-appearing on immersion in water. Recent observations by Linnaeus, Ellis, and others, confirm these latter views to a certain extent only, for in the face of these authorities, and of many indubitable facts, it is still a subject of dispute as regards fungi, sponges, and other species, and throughout the whole, the link of life between the animal and vegetable kingdoms is so finely drawn as to be indivisible, the beginning and the end being lost in the solidity of nature's workings.

The coral polybes, which are invisibly minute in their atomic structure, perform a most astounding part in the production of earths, and of fossil and mineral compounds. Governed in their distribution by habit and generic character, they generate in groups and families in localities favourable to the propagation and increase of their kind; or they are disseminated by the tidal currents, or by organic or inorganic substances to which they attach themselves, throughout the various regions of the element in which they live. In the colder latitudes, or in the lower depths, they are known as naked polybes, being of the lowest order of organization and simplicity of structure, gelatin and albumen together, or gelatin alone, with sea water, being the chief, and in many instances their sole elementary compounds; but, as they approach the surface of the waters in temperate or tropical regions, their organic structure becomes more rigid, and to the above simple material is added, calcium, magnesium, sodium, iron, ammonia, marine acids, and other well known products, by which, in warm and tranquil seas, they become the unconscious architects of hills and chains of hills, mountains and chains of mountains, rising above the waters as islands and portions of continents.

The coral polybes are living but not sentient bodies, being more impulcations of life; they are rapidly generated in warm and tranquil waters, and as the grasses of the field, as rapidly disappear before the influences of climate, of disturbance, and of the countless creatures of the deep; that prey upon them. Preserved from those contingencies common to all forms of life, such is the peculiar economy of their structure and organic action, as to admit of a very brief period of individual existence, the tender offshoot, like that of the flowering shrub, being soon hidden in the more consolidated structure of the compound body; every simple body, however minute on its parts, having limits to its extent, such limits being defined by and depending on its nature, quantities, and qualities, and the influences by which it is generated and governed: every compound body having also limits to its extent, such limits depending, in like manner, on its nature, quantities, qualities and local influences, the same being perfect results of the day, still perfecting by acquisition of parts and quantities, and passing through the brief but successive stages of development, from birth to maturity and from thence to decay.

Many of these bodies propagate their kind by separation of parts, every particle of the body having capacity, under favourable circumstances, to produce life: thus species are propagated and sustained; so are the naked polybes. Other species increase by the multiplication of their parts until they have attained a certain size, defined by the accidents of climate and association; and becoming matured, their gemmae or buds drop off, and carried by the waters, are generated therein, affixing themselves to some organic or inorganic body where they increase and multiply their species; others are permanently fixed to their primary bases, and increase by multiplication of parts in a manner precisely similar to the growth of plants, ramifying into shoots and branches, and becoming eventually one peculiar body of a plant-like form, and having the appearance and qualities characterizing species. The progressive development and growth of fungous or mushroom species in the ocean and on the earth is precisely similar, although the one is said to belong to the animal, the other to the vegetable kingdom; both the one and the other spring from corruption or decomposed organic matter—both are developed by a gradual enlargement of the entire body, stem and crown produced by multiplication of parts—both attain a defined size and form distinguishing species and characteristic qualities—both multiply by their seed given forth through their cellular cavities—and both are incapable of propagating by clips and cuttings. The same beautiful coincidence may be remarked in many of the madrepores and millepoires, their organic, mechanical, and chemical action simulating with terrestrial plants, each having root and stem, branches and leaves, each having its ascending and descending sap, and a governing action embracing the whole system; the stems of the corallines are composed of capillary tubes whose extremities pass through the calcareous crust, and open into pores on the surface, and such is the disposition of plants. Many of the corallines consist of a single tube, as for instance, Tubulina, or pipe coral; here the tube rises in the form of a finger, such as the primrose: at first it is merely a flesh-like film contrasting towards the base when taken from the water, and expanding when replaced in it; this film, consisting of gelatin, calcium, and sometimes a small portion of animal oil, is the germ of the body, which strengthens with its growth, and finally becoming rigid, its individual organic action is impeded, its progeny appear and close the apex, and thus they continue to ramify into joints, and when united in groups and families, the whole contribute to form one vast entanglement, many of these jointed tubes rising up together, the living crowning the whole, and still continuing to increase so long as they are uninterrupted by destroying causes. These polybes have the usual characteristic of animal matter, but their mode of generation and development fully justify Dr. Paris and others in insisting upon their belonging to the vegetable kingdom. The same may be said of other species of the Polyplyes Calfieres, which in the place of a woody fibre have a calcareous substance mixed with their animal juices, or forming their outward covering, the like organic action and development being common to the vegetable kingdom.

Polybes pass through the like gradations of change with shell fish or tender succulent plants; those of most calcareous nature not excepted. The stony polybes develop two distinct stages of existence; in the first they are naked and flexible, and it is in this state that they are mistaken by naturalists, on the one side, as tentacles of the animal, on the other as the flowers and fructification of the vegetable body. The fungous matter covering some, and the flesh-like matter exuding from or covering others, is the rising progeny of the consolidated mass beneath, convertible, and converted in the course of time into like consolidated matter; the basis beneath the external covering of fungous matter consists of consolidated matter in which vital action is still manifest, and consolidated matter in which vital action is extinguished, the latter being in many cases converted into solid limestone rock, or is as manifest in the corals of commerce, the degree of organic action similar to that of forest trees. The Madrepore Fungiits, as Rumphius observes, while living is covered with a thick viscid matter like starch, the more elevated folds or plates having borders like the denticulated edges of needle-work lace, which are covered with innumerable oblong vesicles formed of the same gelatinous substance. This and the course visible in, is the active portion of the compound body appertaining to its calcareous bases, and drawing its
vital action therefrom, as well as administering nourishment thereto, as it consolidates by abstracting its food from the medium in which it moves, so its lower portions gradually assimilate to the calcareous basis on which it is placed, and new offshoots arise to vegetate in turn their fleet existence, until they enter the second stage, and eventually into the fossil kingdom. It is upon the gelatinous viscid matter covering the surface of corals and corallines that the animals of the deep feed, it is to the vast plains covered with half naked and naked polyps, that whales, turtles, and other species repair to revel in abundance, cropping the surface, which is rapidly renewed again. Mr. Darwin is decidedly in error when he talks of fishes bawling upon the coral branches; it is true that calcareous matter is often found in the stomach of fishes, particularly those of the coral species, but it is equally true, as previously observed, that many of the polyps, while in their soft state, contain a great portion of calcareous matter, and to the continued increase of this matter the coral owes its eventual solidity. On the other hand, the generality of species while living, are filled with a milk-like fluid, fat, sharp, and astrin gent; and in some of the Gorgonia in particular, so powerful are its effects, as to draw blood when applied to the tongue, for while in the living state a strong electric excitement is evident in the living system: it is also a fact that minute or poked animalculae are seldom, if ever, found located on the coral branches, the intruders being generally shell-bearing animals of like constitutions with themselves. And finally, months of observation among the coral reefs have convinced the writer of this article that the delicate branches always remained uninjured by fishes, which feed upon them as ants feed upon the aphides, robbing them of their sweets alone, and leaving the body uninjured.

Lythophyta, Tubipora, Millepora, Madrepora, and Fungiota, propagate their kind through the means of their juices, which exuding from the parent trunk, fall upon the surrounding soil, become attached thereto, and if circumstances be favourable, are speedily generated, being governed in their first development by electro-chemical action, where light and heat are necessary adjuncts; in their increase, by the forces which govern vegetable bodies in their multiplication of parts; and, in their advance towards maturity, by the laws of organic life as their organical structure becomes developed. Their food is received through the cellular pores, and consists of water and the atomic particles floating therein, which, received into the living system, undergo chemical change, forming products simulating with the organic body, eventually converted into the milk-like fluid, which, like the sap of a tree or the blood of an animal, pervades the whole system. From the development of the gemma or buds in many species to their full maturity of growth, they exhibit all the phenomena of terrestrial plants, being uniform in their development, growth, and decay, and propagating by their seeds and cuttings.

This similarity of action and organical arrangement would at once identify them with the vegetable kingdom; but it was not for the animal matter manifest in all of them; it is certain that they differ little from fucuses and carnivora, and like them are uniform in their growth, development, and decay; we can therefore only come to the conclusion that Life throughout nature is one, although differing in degrees; that by nature animal has no distinction above vegetable life, but acquires powers, under favourable circumstances, from the superiority of its elastic compounds and peculiarity of its organic action, which is not distinguishable in lower organisms: that when organic action is impeded by the rapid secretion of calcareous matters, the body or form, unless under intense energy of light and heat, and other favourable circumstances, is not enabled to pass the boundaries of simple organization, such as distinguish vegetable bodies: and so far as respects the stone polyps, the mixed qualities which compose the juices and the animal framework, as lime, soda, magnesia, &c, are inimical to their attaining any considerable size, or to the development of nerves, marking an advance in organic character. As regards life, they may, therefore, be considered as one with the vegetable kingdom, and that while the animal matter secreted by the functional operations of life identifies them as belonging to the animal kingdom; the action of life by which their animal matter, carbon, lime, amonias, and other compounds are produced, and the organs of reception, retention, and motive power, by means of which they draw their nourishment from the medium in which they live, as also the act of propagation by division of their parts, and the ultimate development of peculiar form to a definite extent only, and the organical arrangement of the several compounds of which the body consists, as strongly identify them with the vegetable kingdom.

The colourless pellicle which distinguishes many species of the zoophyta planata, and is also distinguishable in some of the stony species, is formed in every individual of the vegetable kingdom; the cellular texture is formed from the membranous in like manner, varying in form in different genera and species; the ligneous fibre is substituted by the stony matter, which supports and constitutes the solid part of the body, being also formed by a series of depositions, which, after the body has attained maturity, gradually encroach upon the vascular vessels, and, by arresting further circulation, destroy the vital principle. In like manner with vegetables, many species are permanently fixed upon bases, advancing in their growth towards the rays of the sun in the direction of light and heat, and this vegetative process is manifest, not only in the Zoophyta Planata, but also in numerous species secreting lime, as sea ferns, sponges, madrepores and millepers.

Many of the stony polyps, while in the living state, continue soft and yielding to the touch, but as the sap vessels fill up, they gradually indurate, and if this take place beneath the waters, they become converted into limestone rock; thus it is with the beautiful Meandrina spreading over its consolidated bases in moss-like clumps; its external covering is exceedingly soft, simulating to the living sponge, and as it enlarges, so it enlarges on every side; its animal matter is converted into a kind of bony substances, which is filled with living juices passing to and fro through the whole system, until the entrance to the cellular pores becoming filled up, the lower portion dies, but still remains attached to the living body.

The time that each species requires to perfect its growth is very variable, necessarily depending upon latitude, dip, and inclination: and again, upon its preservation from those numerous accidents to which it is subject in common with all forms of life, such as local or general disturbance of the medium in which it is placed, or the predatory warfare urged against it by almost all the living species of the deep. An erroneous idea is entertained by men of science, that the stony polyps are of exceeding slow growth, such being the natural consequence of their consolidated nature; but Ehrenberg calculates that the specimens of Meandrina seen by him in the Red Sea were at least 2000 years old; but these, it would appear, were of the dead and not of the living coral; and even if living, the calculation is ridiculous, for, in fact, they attain a very great size in 20 years when uninterrupted in their growth. In tropical regions, where they enjoy heat and quietude, their growth is exceedingly rapid, rivalling, in this respect, terrestrial plants and grasses; but like the latter they are the food of myriads of creatures which greedily crop off the flesh-like surface, and thus retard their growth. In the lower depths and beneath temperate climes, like the leaves of the forest, they die off annually, or, otherwise, their growth is retarded by adverse circumstances of low temperature and local disposition. Much also depends upon their freedom from tidal disturbance, for the tender and delicate gemma or buds of many species are easily washed away by the ocean tides, or destroyed by the intrusion of sands, or other matters inimical to their freedom of action or alien to their nature.

Some idea of the time required to mature their growth, may be derived from our knowledge of the growth of the white and red corals of commerce, in the Mediterranean Sea. Marsigli informs us that the white coral of this sea is most abundant in caverns to the south, and where the sea is smooth and tranquil; that it is seldom found in a western exposure, and never to the north, that when the caverns are despoiled of it, ten years are allowed by the fishes for its regeneration, and in this time it attains its extreme height and thickness; at greater depths it disappears. This is confirmed by Spagnolani, who says that in the neighbourhood of San Stephano the coral does not attain half a foot in 10 years, and in proportion to its depth so it deteriorates in quality, and gradually disappears; that the greater quantities are at depths varying from 60 to 125 ft., and some fisheries are carried on to the depth of 300 ft.; at this latter depth it is said to require 40 years to attain the same size which, at the depth of 60 ft., it attains in 10 years. In all parts of the ocean, local influences determine the time requisite for maturing the coral. M. de Peyssonel found that the coral grows in different directions, sometimes perpendicularly downwards, sometimes horizontally, and sometimes upwards, and in the caverns of the sea open to every exposure. Lamentous remarks: "we find some polypidons placed always on the southern
slopes of rocks, and never to that towards the east, west, or north; others, on the contrary, grow only on those exposures, and never to the south. Sometimes the position is varied according to latitude, and the shores inclined towards the south, in temperate or cold countries, producing the same species as the northern exposures of equatorial regions." Again, it is evident that the duration of their existence is variable; some are but the creatures of an hour, of a day, of a few months, falling off and disappearing according to their nature, and to the climate to which they are subjected; thus in the colder seas, numerous tribes are cut off every winter to be renewed in spring. Some continually throw off their parts, and thus new generations are produced, and these gemmules being carried away by tidal action, or by attaching themselves to locomotive animals, cause such tribes to be more generally diffused. But although, as Lamouroux remarks, many species are periodically destroyed, it must not be supposed that entire destruction takes place, the matured portion of the compound body remaining, as a tree stripped of its leaves, being reclothed with verdure in the ensuing spring, and still adding to its strength and size by multiplication of its imperishable parts. In tropical countries, where the heat is general, the polyps spread abroad over the valleys and troughs of the deep, without reference to inclination, as in colder seas, their nature and qualities being determined by the temperature and depth.

The present accepted term of polype is much too vague and undefined to be rightly understood, being made to embrace many animals of higher organization; thus, according to the present acceptance of the term, every plant and every animal may be classed as polype—every organic body, whether it be animal or vegetable, increasing by the multiplication of its parts. The term polype ought, therefore, to be confined to those simple organic bodies which act independently in their parts and quantities, so that on separation, the several divisional parts, as in the hydroa and other species, they experience no loss of power in this division, but still continue their functional operations, being perfect in their separate state, and perfect results as one whole. On the other hand, there are species of coral and corallines where life is in entirety as in shrubs, and some of these cannot be propagated by slips or cuttings.

Numerous species are, from their nature, confined to particular localities of the water, or to certain depths; others are generally, and some are universally, diffused, maintaining their form and qualities under every latitude; but with few exceptions, locality has a marked and determinate influence in their organic structure, and in their qualities and quantities, which almost invariably depend on food and temperature, in concomitance with the known laws governing all animated nature, for beneath all latitudes like causes produce like effects; when the temperature and local and general action simulate, the results simulate also. Thus the stony corallines and corals ascending in eastern seas, are of similar conformation and character to those dwelling within western and southern seas; and thus it is in the uniformity of living species, there is a uniformity of matter produced by the functional operations of life, the depositions of matter forming strata composed of oceanic organic bodies and their decomposed particles, being the unerring indication of the temperature under which they lived and propagated in their generations. Thus the fixed or locomotive animals or animo-vegetables which secrete lime, and by deposition age upon age, form hills and mountain chains of calcareous matter and of solid limestone, (such, for instance, as much of the British strata is composed,) make us acquainted with the primary causes of effects produced, being unerring indications of the vast and wonderful changes which this planet has undergone, and which it must still undergo ere the end of nature is accomplished; such organic beings as are hourly manifested to us, having of necessity existed and propagated within a medium and beneath a temperature adapted to their habits and character; thus it is that every formation of chalk, oolite, ocean marl, and calcareous matter, however remote from those latitudes in the present day, however far removed, however high it may be elevated above the present level of the sea, however changed and disguised by time or circumstance, must, while generating and perpetuating their species, have been beneath tropical and quiet seas during those ages requisite for the completion of so vast a mausoleum.

The calcareous polyps, comparatively speaking, are scarcely known in the depths of northern seas; the delicate corallines are equally scarce in the depths of tropical seas, species being most abundant in latitudes where there is warmth and tranquility; all in their growth advance towards the rays of light and heat; but where the sun is nearly vertical, they extend themselves in every direction, without reference to latitude and dip. The sponges, sea mushrooms, millepores, and many species of madrepori, together with echinita, sea worms, and numerous other species, are seldom found at any considerable depth, intense heat communicated through the shallow aqueous medium and refracted from the calcareous bed, being most favourable to the full development of many species, and essentially necessary to the existence of others. In proportion to the degree of heat, so is the quantity of lime, soda, magnesia, and other compounds.

To those who have seen the splendid collection of corals in the British Museum, I would observe, that in many of the beautiful specimens, such as Astrea and Mendarma, they behold the skeletons alone. The beautiful convolutions of the one, and the star-like appearance of the other, were once covered with their animo-vegetative covering, exhibiting varying colours, as green, blue, purple, white, &c.; the now empty cells were then replenished with living juicers circulating throughout the compound body; the demetropilia, sensitive to the slightest touch, contracted its beautiful flowery head; and Gorgonia, approaching nearest to terrestrial shrubs, interposing its dark twigs, gave relief and additional interest to the fairy scene, mimicking the fairest gardens of the earth; the sponge too, light and tremulous to the touch, was then filled with a thick viscid juice, and many species, now rigid as marble, while living, waved their branches to and fro as agitated by the tides, or by the passing monsters of the deep.

In all and through all, we find the link of animal and vegetable life to be so finely drawn as to prove inapplicable; the nature of the material may differ, but the mechanical action of the one and of the other at all times assimilates, and in both we observe a beautifully graduated scale of life, from the simple spark or mere impulsion, to the most elegant and complicated form, from the simplicity of union of primary principles to the development of innumerable proximate principles and atomic compounds. Philosophical observers of polyps may discover in their elementary properties, actions, and sensibility to external impressions, identifying their animal organization, but the body formed is one body, and, in numerous genera, is governed by one influence; and in these, the act of the tentacles is extrinsical and involuntary; not depending on the will of matter placed within the cellular cavity, but upon the internal filament which passes through and connects the whole in place of nerves, or upon the vital fluid, whose action pervades the whole. It is of no real importance to man to be assured that the leptheris and keratophyta are animal or vegetable; the great and important question, is, what part do these minute developments of living action, fixed or locomotive, simply gelatinous, or converting into stone, perform in the economy of nature? From whence is derived the material of the animal or vegetable body? The important part they perform in giving increase to the earth and to the most ponderable bodies of which it is composed, is manifest at every step we tread, in every region of the waters; the simply gelatinous and allogamous animals attach themselves to every consolidated substance, and propagate like the grass of the field, thus are the oyster has attainted maturity, its calcareous covering becomes the basis of a world in miniature; the rock, the mineral body, and the ocean bed are concealed from observation by the incrustation of countless myriads; the waters teem with animals, with numerous organic species, destroying, becoming the prey of others: as local influences determine, so they propagate or are destroyed; and, flavoured by heat and quietude, so they diverge into species, and exhibit new phenomena.

In my next I shall proceed to consider the importance of the lime secreting polyps in the economy of nature, and the results manifest in all parts of the earth.

H. G. M.

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PROCEEDINGS OF SCIENTIFIC SOCIETIES.

INSTITUTION OF CIVIL ENGINEERS.

April 11.—Joshua Field, V.P., in the Chair.—(continued.)

Screw Cutting.

Some specimens were exhibited of screws cut in lathes constructed by Messrs. Shanks and Co., of Johnstone, near Paisley. They were sent by the late Sir John Robison, who described the principal advantages of the arrangement of the lathes for their purpose in commencing during the incursion as well as the exclusion of the slide, and when forming long screws, in their being alternately stayed on the side opposite to the tool which was in action; that by these means, good work could be produced with much speed, as reduced the cost of turning new bolts, as low as that of similar articles produced by screwing machines, which worked with dies acting by compression.

A drawing of the lathe used in cutting the screws was presented with the specimens.

Mr. Field observed that the machine was ingenious and appeared to do the work well; but as far as could be ascertained from the drawing there was not any novelty in it. A similar machine made by the late Mr. Mauds- dy, had been in use in Maudsay and Field’s manufactory for the last 10 years. The screwing dies invented by Mr. Whitworth, cut out the threads of screws as clearly as if done by a chucking tool, and entirely without compression.

April 23 and May 2.—The President in the Chair.

"An Account of the Brick-making at Blechingley Tunnel, during the winter of 1840 and summer of 1841." By Frederick Walter Simms, M. Inst. C. E.

As the forming of this part of the Dover Railway was not let by contract, it was necessary to make extensive preparations previously to commencing the work, and amongst these the brick-making department was one of the principal, the whole being under the personal superintendence of the author. The bricks were all made on the surface along the line of the tunnel, the brick-grounds being arranged on each side of the shafts, that when the bricks were delivered from the kilns and stacked, but little labour was necessary to convey them to the spot, whence they were lowered to the underground works. The mode of manufacture adopted was that of "slope-moulding," in which process the mould is dipped into water previous to its receiving the clay, instead of its being slung as is the case in making sandstock bricks; the workman then throws the clay with some force into the mould, pressing it down with his hands to fill all the cavities, and strikes off the overplus with a stick; an attendant boy, who has previously placed another mould in a water trough, when the mould is filled, and carries it to the floor, where he carefully drops the brick from the mould on its flat side and leaves it to dry; by the time he has returned to the moulding table and deposited the empty mould in the water trough, the brick-maker will have filled the other mould, for the boy to convey to the floor where they are allowed to dry, and are then stacked in readiness for being burned in clamps or kilns. Minute details of the manufacture are then given. The average results are then shown in the following table.

<table>
<thead>
<tr>
<th>Force employed.</th>
<th>Area of Land.</th>
<th>Duration of Season.</th>
<th>Produce per Week.</th>
<th>Produce per Season.</th>
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<tr>
<td>One moulder.</td>
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<td>One temeperer.</td>
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<td>One wheeler.</td>
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<td>11½</td>
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<td>15,100</td>
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<td>One carrier boy.</td>
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<td>34,200</td>
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<td>One picker-up boy</td>
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A careful comparison is then made between the two modes of sandstock and slope-moulding, from which it appears that while the production of sandstock is as 18 to 16 of the slow process, the amount of labour is as 5 to 14, and that the quantity of land required and the cost of labour per thousand are nearly the same in both processes. The bricks were all burned in close stacks constructed with soft bricks set in pegged clay, the quantity burned in them at a time varying from 30,000 to 40,000. The fuel employed was that known by the name of the Bell Robinth Netherton, or South Haltley coals, and for the purpose of more accurately determining the cost of this element, the author caused the quantity of coals consumed in burning 94 bricks of bricks to be carefully noted; this is given in a table accompanying the communication; the average of it is, that 10 cwt. 8 lb. of coal were used, in burning each thousand of bricks. The floor of the drying-houses was made of pugged clay about nine inches thick at the furnace end, and gradually diminishing to two inches at the extreme or chimney end, so as to equalize the heat of the floor. The temperature of the interior of these drying-houses when in full operation varied from 50° to 70° Fahrenheit. The estimated cost of the bricks delivered at the shafts was 15 1/2d. per thousand; but the actual cost, obtained by dividing the total expenditure by the whole number of bricks made, was only 21 1/6d. per thousand, which includes waste and all other expenses that were incurred.

The author notices the substitution of Mauritius sugar mats for the ordinary hack-caps made of straw, and that they were durable and serviceable.

The paper is accompanied by two drawings showing the elevations and sections of the kilns and drying-houses with their flues.

Remarks.—In answer to questions from several members, Mr. Simms stated that the price of moulding bricks by the slope process was 5s. per thousand; that slop bricks occupied less time in drying than sandstock bricks; that the former kind were full one pound each heavier than the latter, which he attributed to the greater amount of pressure they received when being moulded; for this reason also the sandstocks were made somewhat quicker. The price of the ordinary hack-caps made of straw was 4d. each, and they lasted one season; the Mauritius sugar mats which were substituted for them, cost about 1½d. each and would last two seasons.

Mr. Bennett thought that the quantity of bricks which could be produced by each gang of men was under-rated, for, at Cowley, the average number of sandstocks moulded was 32,000 per week; while his men very frequently made 37,000, and sometimes they reached as far as 40,000. The space occupied for moulding at Blechingley appeared small; in Mr. Bennett’s brickground, the depressions occupied 20 acres in extent, and he was in the habit of more time being allowed for drying in the sandstock process; he believed this to be an advantage; the principal part of the shrinkage took place while drying previously to being burnt. The total amount of contraction in his bricks was 3/8 inch in 10 inches; but all clays differed in the amount of contraction.

Mr. Farley directed the attention of the meeting to Hunt’s improvements on the Marquess of Tweeddale’s machine for making bricks; it had not, however, been brought into general use in England, but it was employed extensively at Hanover and other places on the continent, and was stated to produce stronger and better shaped bricks, of more uniform quality than those made by hand moulding; the process was a kind of intermediate one between slip and sand-moulding; the moulds being wetted as in the former process, while the clay was tempered in a muff-pig-mill as in the latter process.

A very ingenious system of moulding without wetting the clay had recently been introduced by Mr. Prosser of Birmingham. At present the system was confined to the production of bottom, small tiles, and slabs for painting; but the patentee asserted that the machine could be advantageously used in making bricks. A few had been made which in burning only shrunk 3½ of an inch in 9 inches.

Mr. Bennett said the Marquess of Tweeddale’s machine had not been adopted generally, because of the first cost, and that the necessity for employing horse power, or a steam-engine, for working them, rendered the bricks more expensive than when made by hand.

Mr. Hennersham stated that steam or horse-power was not indispensable; that Messrs. Simpson and Co., had used several of Hunt’s machines for the Tweeddale Brick Company to be worked by manual labour, and that they succeeded perfectly. He found the bricks so produced about one-sixth stronger than those made by hand, which he attributed to the degree of pressure to which they were subjected.

Mr. Simms objected to the use of machinery chiefly because it would only affect an economy in the moulding, which was but a small part (about one-eighth) of the expense of making bricks.

The contraction of the bricks varied according to the nature of the clay employed; the sandstocks used at Worfield were 3½ inches wide and 3½ inches thick, and the bricks when burned were 9 inches long by 4½ inches wide and 2½ inches thick. The chemical constitution of different clays, and the relative proportions of alumina and silica contained in them, would be a subject of much interest and practical utility, to be brought before the Institution by some member possessing the necessary chemical knowledge.

Mr. Bennett mentioned the existence of a brick machine invented by Mr. Ainslie, and now working in Scotland; it was, he believed, somewhat cumbersome, and required to be driven by steam power, but he had understood Mr. Ainslie had produced very good bricks and tiles, and was chiefly employed to make the latter.

In answer to a question from the President, Mr. Simms said that the bricks at Blechingley had been made without any cavity in the top and bottom, in order not to waste the cement in which they were laid. Everyone entertained very opposite opinions as to the utility of the cavity in the bricks.

Mr. Cubitt preferred the bricks having a cavity, if they were to be laid in mortar; with cement it was of less importance.

Mr. Farley believed that when the cement was stronger than the bricks,
of the crockery-ware sides the tons. thus leaving crucibles it to;

Mr. Fary exhibited specimens of tiles, &c., made by Mr. Prosser, of sitting-hall, and described the process of making them. The clay was first dried upon a slip kiln as if for making pottery, then ground to a fine powder, and, in that dry state it was subjected to heavy pressure in strong metal moulds: by this means it was reduced to about one-third of its original thickness, but the clay appeared to retain its natural strength, moisture and the perfect sharpness at the edges— they were then carried direct to the kiln, and baked in "saggars" or crucibles, without any previous drying, and they did not appear to crack in baking. A brick of the usual dimensions, which was exhibited, had been made by this process from two brick-clays of Staffordshire. Its thickness was 2 in.; it was of a clear red colour and of homogeneous texture, and the edges were sharp; its weight was 6 lb. and the specific gravity was 2.5. Mr. Fary stated that this brick was not vitrified, but merely baked, and that it had acquired its density from the great pressure used, which was equal to 250 tons.

Mr. Pollatt had seen Mr. Prosser's machine at work, making buttons and other small objects; the ground clay appeared to retain a certain degree of moisture which, combined with the pressure, gave it such tenacity, that on leaving the mould it could be handled and carried direct to the kiln—it was compressed to about one-third of its original thickness.

The clay of the Staffordshire potteries contained chiefly siliicate of alumine; it was principally valuable for, and was employed in, making "saggars" or crucibles wherein the clay was baked. The clay from which the chino and crockery-ware was made, was brought from Devonshire, Dorsetshire, and Cornwall. No brick or other object was made from certain mixtures of siles and other substances according to the manufacture.

Mr. Blashfield stated that of the specimens of Prosser's manufacture on the table, the small hexagonal tile 3 inches diameter and three-eighths of an inch thick, had sustained a pressure of 30 tons, without the edges being crushed; the ordinary hand-made brick, when dried out and dried in the tegula, and the 9 inch stock brick remained perfect under a pressure of 90 tons: the largest sized slab hitherto produced by the process was 34 inches long by 8 inches wide, and half an inch thick; but he believed that as soon as the new hydraulic presses were completed, it was Mr. Prosser's intention to make larger slabs of clay for architectural purposes.

In reply to a question from the President, Mr. Cowper explained that the tiles, &c., after being subjected to the pressure, were released by the action of a treddle, which raised the bottom of the mould, and thus brought out the object without injuring its edges.

Mr. Hunt exhibited a model of the brick-making machine (see Journal for June last, p. 202) used by him, and described its construction and action. The principal working parts consisted of two cylinders, each covered by an endless web, and so placed as to form the front and back of a hopper, the two sides being iron plates, placed so that when it was filled with tempered clay from the pug-mill, the lower part of the hopper, and consequently the mass of clay within it, had exactly the dimension of a brick; beneath the hopper, an endless chain traversed simultaneously with the rotation of the cylinders; the pallet boards were laid at given intervals upon the chain, and being thus placed under the hopper and the clay brought down with a slight pressure, a frame with a wire stretched across it, was projected through the mass of clay, the clay being compressed by the weight of the chain, and it was removed at the same time by the forward movement of the endless chain; this operation was repeated each time that a pallet board came under the hopper. Mr. Hunt stated that the chief object of the machine, which was worked by hand, was to produce good square compact bricks, of uniform quality, using only a slight pressure. He had found that it was very difficult to dry bricks made by machinery where considerable pressure was employed; because, before the evaporation from the centre of the clay was completed, the surfaces were over-dried and they frequently sealed off. These machines were in operation in several parts of England, producing usually about 1200 bricks per hour, and each machine required two men and three boys to feed it, turn it, and to take off the bricks; the clout moulders were dispensed with, and all the persons employed were common labourers; professed brick-makers were not trusted, and had not the advantage of the contracts which he had taken for making bricks, both in this and in foreign countries.

The machine for making tiles (Journal for June, p. 202, Fig. 2) is on the same principle as Fig. 1; it consists of two iron cylinders that revolve round which webs or bands of cloth revolve; by this means the clay is pressed into a slab of uniform thickness, without adhering to the cylinders. It is then carried over a covered wheel, curved on the rim, which gives the tile the necessary form; it is then cut off by passing through three iron moulds of a horse-shoe form, shown in the centre of the plan; they are at the same time moistened from a cistern placed above them. The tiles are then cut off, to such lengths as may be required, and carried away by an endless web, and are placed by boys on the drying shelf. Flat tiles, or slates, are formed in nearly the same manner, being divided into two portions while passing through the moulds; the quantity of clay used for one draining tile being the same as for two solids. In answer to questions from the President, which it was explained that the density of the bricks could be augmented, but in that case, the time required for drying them must be increased, and frequently artificial means were resorted to, which rendered them more expensive.

Captain Bull believed that any advantage was obtained by the production of bricks of such a density as that exhibited by Mr. Prosser; whether builders would not consider objectionable from their great weight, the difficulty of handling and cutting them, and the increased expense of carriage. He had understood that the lightness of the London bricks, which was chiefly owing to the ashes used in their composition, was considered an advantage, and that they were sufficiently strong for all building purposes.

Mr. Parkes was of opinion that the weight of Prosser's compressed bricks would be objectionable for ordinary purposes, and he did not think that the mortar generally used would adhere to such smooth surfaces as they possessed. Mr. Prosser replied that Roman bricks or Roman tiles were produced in the proportion of 1 part of clay to 3 parts of ashes, and that they were used with mortar or cement which had been carefully prepared for a long period before it was used. The Dutch clinkers, which were so very durable, were small in proportion with their density; and the same might be observed of all foreign bricks, some of which were made with great care; for ordinary work he should prefer a brick of a less dense quality than the compressed ones.

Mr. Blashfield explained that Mr. Prosser's bricks could be rendered lighter, by an admixture of ashes or other substances with the clay, if it was considered desirable.

Mr. Newton had recently examined a wall which had been built with very dense bricks, and had twice fallen: the bricks appeared to have absorbed the moisture from the mortar, before it could adhere to their surfaces. He proposed to exhibit on a future occasion, some bricks which were brought from the pyramids of Egypt; they appeared to be composed of sand with mixed chopped straw, and had not much cohesion; yet they were strong enough for the construction of such massive buildings, as they were small in proportion to their density.

Mr. Hunt said that engineers generally preferred dense bricks as their works required strength; he had found it advantageous to use mild clay instead of a stronger quality as, compact bricks made from the former, when well-weathered, were better than those of the same density made from the latter.

Mr. Fowler said that the value of bricks depended upon their strength: but he doubted whether density and strength were in this case synonymous; and he thought that bricks of a cellular structure would not only be stronger, but would unite better with the mortar. He thought, however, that Mr. Hunt's machine would prove advantageous, as the bricks produced by it would be of more uniform character than those made by hand moulding.

Mr. Pollatt believed that light bricks were generally porous, and that when they were used for building external walls the moisture soon penetrated; this was not the case with dense bricks, and if they were generally made more compact, thin walls would resist damp as well as thick ones.

Mr. Cowper believed that for architectural purposes so much density was not necessary. He thought the story was constructed by the mode of building called "Pica" work, which was merely ramming down tempered clay into moulds of the thickness of the walls, and allowing the mass to be dried by the sun as the work proceeded. In countries where the climate was very dry, the brick was simply rammed together and dried by the sun.

Mr. Braithwaite understood that several kinds of brick were made for the London market, that they were devoted to different uses and were sold at various prices; some qualities were capable of supporting a great amount of pressure, and were generally used with cement, while others were almost rotten.

Mr. Bennett said that the principal varieties of bricks were called "malan paviers," "stocks," "grizzles," "places," and "shuffs"; for the first kind the clay was washed and selected with care: the bricks so produced were of superior quality. The other kinds were all made from the same clay merely tempered, the difference between the sorts being produced entirely in burning them; common stocks were good enough for all ordinary building purposes; but the inferior qualities could not be trusted for important works. As to the relative prices of the several sorts, the difference between malan paviers and stocks was 1s. or 2s. per 100 lb.; between stocks and places 1s.; the grizzles obtained a price midway between the two last named, and the shuffs were sold for an inferior price governed by their quality, as they were frequently quite rotten.

Mr. Lowe inquired what object there was in the mixture of " breeze" or ashes, with the clay for making bricks; was it intended to render them less dense, or to assist the combustion, when in the clamp or the kiln? Mr. Prosser believed that the principal advantage of using a mixture of ashes was that when the bricks were made, that is midway between the two last named, and when the bricks were burned in open clamps; the sifted breeze was employed for fuel instead of coal, which would otherwise be used for burning in close kilns. Mr. Hunt explained that the method of making bricks in the vicinity of
London, differed from that of almost all other places, because the material employed was not pure clay; it was a substance nearly resembling loam, of a slightly cohesive nature, which would not admit of its being used in the manner of brick-making. The clay used in those kilns with coal, in contrast, had an admixture of ashes, which became sufficiently tenacious to be formed into bricks; the ashes performing the same office as the chopped straw did, in those made by the ancient Egyptians. Of the sixteen hundred millions of bricks made annually in England and Wales, about the greater part, if not all, were made according to the London method, with a mixture of ashes. As to the density, he did not think that the weight of bricks should be received as an index of their quality; for bricks made by exactly the same process and equally compact, would be heavier or lighter, as they were made of strong or of mild clay, and yet their strength would be equal.

Mr. Pellatt observed that nearly if not all argilaceous or aluminous earths were, with certain modifications or admixtures, suited for making bricks. The term siltaceous of alumina, might include the various earths, whether deno-

minated clay, marl, loam, argill., &c. The best fire bricks were made from native aluminous clays, which were included by the French under the general term of "ciment." The most useful properties of "ciment," when well puddled or kneaded with the clay, were to hasten the drying, and to diminish the contraction, and the consequent risk of breaking in the kiln; the object of "ciment" was economical for fire bricks, particularly when they were manufactured at a distance from the mines; the fire clays of Stourbridge, Newcastle, and Glasgow, were found amid the coal strata; Stourbridge clay was the most esteemed, and when carefully picked, ground, sifted, &c., would bear, for brick-making, two proportions of clay to one of "ciment," to one of native clay. The sagger clay from the Staffordshire potteries was also a fire clay, and was well suited for making tiles or bricks of a compact character, but was probably more liable to be vitrified than the Stourbridge clay. Chinese clay, or the "kaojin" of the Chinese, was often employed, as well as the pottery "Cornwall stones;" the undeveloped felspar was interposed with it, and used by the French and the Chinese as porcelain glaze, the term used for it by the latter was "petusco." The constituents of "kaojin" were—

<table>
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<tr>
<th>According to Dr. Ure</th>
<th>Murray quoted Vaquelin's analysis</th>
<th>Murray stated Vaquelin's analysis of Hessian Clay to be</th>
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<tr>
<td>Silica... 52</td>
<td>Silex... 74</td>
<td>Silex... 69</td>
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<tr>
<td>Alumina... 47</td>
<td>Alumina... 16.5</td>
<td>Alumina... 21.5</td>
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<td>Oxide of iron 10-33</td>
<td>Linscarce...</td>
<td>Oxide of iron 8</td>
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<td>Water... 7</td>
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Mr. Parkes believed that in addition to the ashes giving a cohesive character to the material of which the bricks were composed, they were of advantage in the process of burning, because they enabled the fire to spread gradually from the lower tiers, through the mass in the kiln, without permitting an intense partial heat, such as sometimes occurred where coal alone was used. The use of ashes was, therefore, generally resorted to, and in those cases, their surfaces became glazed. He had given some attention to the subject, and had tried experiments, by ascertaining accurately the quantities of ashes and water which were incorporated with the loam in a certain number of bricks, and had found that the evaporation, during the process of burning, was much greater than at any other rate, as much as 14 lb. of water by 1 lb. of breeze. The mode of making bricks near London was peculiar to the district, and the workmen did not understand any other method; the blue clay was not used because they did not know how to work it. In a paper published by Mr. Aikin, which was a selection from the papers read before the Society of Arts, the subject of brickmaking and pottery were very correctly treated.

Mr. Dickinson observed, that the ashes used in making stock bricks, could not supply the place of the straw now discovered in the Egyptian bricks, because the process of burning would have destroyed the straw as it appeared to do the ashes; he had burned bricks extensively in clamps and in kilns, and it appeared to him that the ashes assisted in fixing the brick earth, for on burning with a small admixture of ashes what before appeared to be vitrified, and was extremely hard, and he remarked, that if the ashes worked in with the clay in pugging, either exceeded or fell short of the ascertained proper quantity, the bricks were fragile and less durable.

May 9.—The President in the Chair.

"Observations on the periodical drainage and replenishment of the subterranean basin of London."—Continuation of the paper read at the Institution, May 31st, 1842. 2

The author commences by answering an objection founded upon a passage of Coneybear and Phillips' Geology (Book 1, chap. IV. sec. 11) which was urged against the term "sill," in the former of a paper relating to the rise in different places to different heights—at Mile End it stood at the level of high-water mark in the Thames; at Tottemham 60 ft.; at Epping 314 ft.; and at Hunter's Hall, two miles beyond Epping, at 190 ft. above that level. Especial stress was laid on the height to which the water was supposed to have risen in the well at Epping, namely, to within 26 ft. of the surface, and to 314 ft. above high-water mark. It appeared from a note appended to the statement referred to, that the first 2 ft. from the surface of this well, was gravel and sand, and was afterwards sand and chips, and that the water rose to a height of 200 ft. above the surface and boring 220 ft., as no water was found, it was considered a hopeless labour, the boring was discontinued, and the well covered over; that at the end of five months, it was found that the water had risen to within 26 ft. of the surface, from which it might be inferred, as was afterwards proved, by inferring the same distance only, that a common place of the water was to be attributed to a landslip, and was not derived from the sand of the plastic clay formation, to which the boring had not penetrated. Having thus answered this objection, it is shown that a line drawn from the water level at Hunter's Hall, 100 ft. above high-water mark, would cut the level in the other wells, and give a water level dipping at an average inclination, very nearly coinciding with that insisted on in the statement to which the objection was raised. It appeared that the proportion of the rainfall entering the earth, the dip of the water level between the river Colne and London, being in some places, nearly removed by the sinking of three wells in the direct line of the author's observations, namely, from the river Colne one mile N.E. of Watford, in a straight line to Edgware, and thence by the high road to London; the information thus obtained, proved the descent of the water to be less than in the line that would represent the natural water level. It is then shown that a line drawn from a point three miles south of the Colne, at the level of that river, or 170 ft. above Trinity high-water mark, to mean tide level in the Thames below London Bridge (a dip of about 180 ft. in 14 miles, or an average inclination of 13 ft. in the mile) cuts the water level at the point whence it is drawn, at Henden Union Workhouse, and at Crockfieled, between that place and Kilburn, whence it may be inferred that up to this point there is no apparent trace of a depression of level caused by the exhaustion of water under London. At Alperton, a place that stood some years since about 20 ft. higher than at present is considerably depressed below the line so drawn, which depression may be attributed to the influence of the London pumping—it is suggested, that it is desirable that the wells on the confines of London, and throughout the district, should be periodically measured, to ascertain at what distance, and in which direction this yearly increasing depression may be found to extend. The author proceeds to describe a phenomenon connected with the periodical replenishment of that portion of the London basin which underlies the London and plastic clays, and which cannot, as in the upper or chalk district, be fed by infiltration. This phenomenon is by him called the "oscillations of the water level," caused by the irrigation of rain water, which runs from the surface of the London and plastic clays, and which sinks into the subjacent chalk through s"wallow holes," on its arrival at the outcrop of the sand of the plastic clay formation. This point of irrigation lies to the southward of the river Colne, and forms the line of demarcation between the clay and chalk portion of the surface of the London basin, leaving a belt of clay between the latter and the chalk, varying from two to three miles in width, between the river and the outcrop of the clays. The water level rises to a point within the outcrop (called the fixed summit level) at an angle of not less than 10 ft. in the mile, when most depressed by the springs; below an angle fixed as the lowest line of inclination of the water, the chalk will fall. From the fixed summit the level declines towards London; in the line taken, it is found at the level of the Colne, three miles from the river. After heavy rains, when the clays throw the water from the surface, the irrigation of water may be seen at the outcrop of the sand of the plastic clay formation;
the level will then be raised in proportion to the quantity of water which passes through the sand into the chalk beneath it; the elevation of level extending towards the river in a ratio increasing with the distance from the river; and the raising of the level of the surface of the chalk by the seepage of water from the springs which have broken through the clay.Following the assumption of this natural inclination, it has been calculated that the supply of water to the river may be affected by the London pumping, the daily increasing demand of which will, if (as is contended) there be any ground for this supposition, very soon put this question beyond a doubt.

Remarks.—Mr. Dickinson said, that Mr. Clutterbuck's observations had been carried on with very great care, and he confessed that he had been unable to find any other case of a decrease in the level of the water under London, except that much greater extent of the chalk is now free from wells to be sunk in the valley of the Colne. It had been stated, in support of the plan, that the rapidity with which the rain water percolated into the bowels of the earth, in a great measure prevented evaporation, and hence it might be assumed, that the quantity which descended upon the surface of the chalk found its way, with very slight diminution, into the underground.

This reasoning was not in accordance with the deductions of Mr. Dickinson, who had drawn from an extended series of observations, and, hearing that his skill property might be injured by the diminution of the supply of water, he had opposed the formation of a noticeable percolation line in the chalk district. He, therefore, in order to investigate strictly the nature and extent of the supply of water to the springs and rivers of the district. Mr. Dickinson presented a tabular statement of the comparative result of his two gauges for the last eight years, pointing out, as was generally the case, that none of the rain-water penetrated to the springs between the 1st of April and the 30th of September. He also stated that the indications of the gauge were not only peculiar, but that they presented generally by about two months, anything that could be deduced from the observation of wells, with reference to the effect upon the springs; and that, as to the latter, the only guidance to be derived from the state of the wells, was from those in the highest points of the district. From the same reason, the weekly level of the wells continued nearly the same throughout the year.

Mr. Clutterbuck perfectly agreed with Mr. Dickinson as to the satisfactory results yielded by Dalton's rain-gauge; but he had, from the first, expressed himself in favour of the creation of a narrow line in the chalk representing the natural inclination of the various watercourses. He had, indeed, observed in past years, that the water broke into the chalk below the surface, and that the height to which the water rose fell, would indicate the quantity which had actually percolated to the water level, and would give the relative quantity to be delivered out by the springs. The ratio of alternation throughout the line of the water level, therefore, bore a direct proportion to the depth and number of the wells at the two extremes, the rise or fall of all between them might be calculated with the greatest exactness.

He had chosen, by way of illustration, a portion of the line, of which a section, three miles in length, the water level, and the rain-gauge indicated the percolation of less than 5 in. of rain, a quantity which might be short of the rise of the water level. The gauge recorded no percolation of water immediately after the melting of the snow on the 16th of January, 1841, within a month of which time the level rose in some localities more than 15 ft. To make a proper estimate of the extent and duration of the period, it was necessary to ascertain the state of the level before the percolation commenced; to this the rain-gauge was no guide; but by Mr. Clutterbuck's observations he was enabled to determine the exact relative depression of the level. The first day taken was September 13th, 1841, between which period and November 8th, the level had at one point 15 ft., and at other points in due proportion, which distinctly proved that the indications of the rain-gauge do not precede by two months any thing that can be deduced from observations on wells. His next observation was February 14th, 1842, showing the highest point at which he measured the level, giving a total rise of 34 ft.; though from observations elsewhere it must previously have risen even higher, and have fallen to that point in consequence of the accelerated drainage caused by the breaking out of springs at higher levels, which were not observed by him.

On the 7th of May the level had fallen considerably, and on the 24th of October it was defined to within a few inches of the same level as in the September of the previous year. In the season 1841-42, Dalton's gauge indicated the percolation of 17-96 in. of rain; in 1842-43, 10-64 in.; but from the causes before mentioned, he had no opportunity of comparing the percolation of the level continued to rise until May, consequently the quantity of water then in the chalk was greater in proportion, than as 10 to 17. He conceived that the great practical question was, what supply might be reckoned upon from the 1st of May to the end of October? The reply to this, he contended, more distinctly given by his observations than by the indications of Dalton's rain gauge.

With reference to the rapidity with which the water found its way from the surface to the level, except when there was a great quantity of rain within a very short period, the percolation would be gradual, as the water gradually, by steady percolation, filled the cavities of the chalk, and did not seem to be certainamount to sometimes 1 or 2 in. a day in the upper district, and continued generally to the beginning of May. The blackishness of the swallow-holes level rose very rapidly: a well sunk 50 ft. in the chalk, in which the water stood at 40 ft., from the surface, was affected within 15 hours after a late heavy rain commenced; the quantity of rain, which amounted to 1 in. in 12 hours, appeared to have retarded by a short time the exhaustion of that portion of the level to the south of the Colne, which is fed by the irrigation of water through the swallow holes. On a former occasion, he had between 15 and 20 ft. of water seen on the surface near 388 in. of rain; the level near the swallow-holes rose 6 ft. within the same space of time. When the water had reached the level, the influence of one part on another was very rapid; thus when the distant level was reached, the water from the lakes flowed over the chalk, and by the level under London. The continuity of the level, as shown in his section, was the best evidence in favour of the supposition, that the water to London was mainly supplied from the source to which he had attributed it. He had not met with any evidence in favour of the supposition that a district was to be drawn between the waters from the chalk and that from the sand; he believed that it was all derived from the chalk, whence it rose into the sand, to which there appeared no impediment. At the points where the water broke through the sand, it invariably sunk into the subjacent chalk layers, with sufficient force to break open the surface of the chalk and, following the water level, it might be traced in the chalk, and rose into the sand when the water the chalk sunk below the inclination at which the water level dipped towards London; from whence he inferred that the whole level of water might be called the "Chalk water level."

Mr. Simpson reiterated his opinion respecting the waters in the sand and in the chalk being different. He had seldom found the water from those strata at the same level, and in the majority of instances, the water from the chalk rose to higher levels than from the sand. Towards the west of London, prior to 1830, there were numerous cases of overflows from beneath the sand, which he believed were created by the natural inspection of the wells when they were sunk, or soon afterwards, and which he presented to the Institution, it would be found that in the majority of instances of overflows wells the water proceeded from the chalk. This paper gave an account of 67 wells, detailing in several cases the various strata passed through, and in all the total depth, the levels at which the different qualities of water were met with, the quantity of water yielded, and the height to which the main supply rose in the well. He had found from recent inquiries, that in many of these wells the water had now ceased
to overflow. It would appear that as the number of wells and bore-holes had increased in some districts, the water levels had been depressed; in several cases, the cause of this had been traced to wells which had been bored at extremely low levels, and in others to the increased pumping.

Messrs. Braithwaite observed that, Messrs. Braithwaite, and Messrs. Braithwaite immortalised well-sinking extensively some years since, were most successful in wells where their competitors had ceased working when they had pierced some distance into the sand strata, whence the water only rose to some distance beneath the surface; by continuing the boring down into the chalk, they obtained overflowing wells.

Mr. Scalan said that the difference between the water from the two strata was easily discovered by analysis: the water from the sand contained common salt and no lime, while that from the chalk contained lime and no common salt.

Mr. Cattermole said, in answer to Mr. Simpson's objection as to the identity of the chalk and sand water levels, the disparity of level that he spoke of, occurred in localities where there was an exhaustion by over-pumping. Artesian fountains, in which a case of discharge of water created below its natural level, which would cause the same kind of depression either in the sand or the chalk, as that which was caused by pumping the same quantity of water from a corresponding level where the water would not flow above the surface; the only difference being, that in the former the depression was permanent, and in the latter it was coincident with the temporary exhaustion of the pumps. As the water was discharged from the Artesian fountains more rapidly than it rose through the sand from the chalk, a permanent depression was sunk beneath the surface where it occurred in the chalk, and thus caused a disparity of level. Thus the water level, in the wells sunk into the sand, was temporarily depressed by pumping from others in the neighbourhood, and the level was regained when the pumping ceased.

Mr. Braithwaite enquired the industry and observation of Mr. Cattermole, said, he hoped the hole would extend his investigations to the point of the outcrop of the basin of the river Thames, which he stated to be near Woolwich. He must, however, dissent from the author's views as to the supply of water to the sand under the plastic clay, being derived from the chalk, and also, that if no rain fell during a period of three years, the water in the wells referred to in the section, would retain their relative levels, at an inclination of not less than 10 ft. in a mile. He believed that any continuation of dry weather, which would affect the land springs, would also diminish the filtration, and the upper part of the basin on both sides would affect the lower part; and it was not a great thing, if Mr. Cattermole's remarks would be of some use to Mr. Milner's work on the supply for the overflowing wells at Kingston, Mitcham, and other parts, being from the chalk; on the contrary, he was of opinion that it proceeded from the sand under the plastic clay, and he instance Mr. Palmer's well at Kingston, and that sunk by Mr. Clark at the Kingston Union. The latter well was within 100 yards from the former: it was 420 ft. deep to the sand spring, and the water rose to within 7 ft. from the surface. While the water stood at this level in the well at the Union, it overflowed at Mr. Palmer's; but when the level at the Union was reduced by pumping to 20 ft. from the surface, the water at Mr. Palmer's well ceased to overflow: thus, he contended, establishing the fact that the water in both wells was derived from the sand, and not from the chalk.

Mr. Cattermole observed that the reason why there was a depression observed at Kilburn, and not at Cricklewood, was easily explained, if the depression occasioned by pumping in London was laid down on a diagram. In the course of the London branch of his communication he would refer to the Triangular water mark; at the Hampstead Road, to 38 ft.; and at the Zoological Gardens, to 25 ft. This line, if produced, would show a depression below the natural water level at Kilburn, and fall into the non-depressed level about Cricklewood. Though it was ascertained that the level in the chalk would never assume a less inclination than 10 ft. in the mile, he was led to the supposition by observing that the level ceased to decline when it became depressed to that extent; and many wells at a distance, still held by the action of the same depression contained only 3 ft. of water, were never known to become dry.

Mr. Clark stated that he had found the water rise from the chalk to very different levels in the various wells and bore-holes which he had sunk, and he had not observed that the supply of water was affected so immediately after rain as had been described by Mr. Cattermole. He presented a paper containing a section of the Admiralty cross-section from the River Thames, showing the water level at various points on both sides of the river Thanes. This document gave the depth at which the chalk was arrived at and the water was found, and the height at which it stood in several wells round London. It stated also, that in London, the depression of the level of the water in the chalk was such that the water level rose to within 70 ft. of the surface, but that near the river it rose to within 50 ft. In some particular cases, such as the Lunatic Asylum at Wandsworth, the depth to the chalk was 323 ft., yet the water rose to within 30 ft. of the surface.

Mr. Davison presented a copy of a drawing made in the year 1822, showing the depression of the level of the water in the chalk. It was remarkable was exactly Trinity high-water mark. It appeared also that the water did not now rise in the same wells to within 50 ft. of that point, showing a depression of nearly 2 ft. per annum.  

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

THIRTEENTH MEETING, 1843.—Hebld at Cork.

(From the Athenæum.)

TIDAL OBSERVATIONS ON THE Firth OF FORTH, AND OF THE EAST COAST OF SCOTLAND.


These observations extended over several seasons, and no complete report had been hitherto presented, as the observations of each former season had only shown the necessity of further extending the observations. The observations of the first season had proved the existence of certain anomalous tides, which had not formerly been accurately examined, and proved that these anomalies were more extensive than was at first conceived. Next season the observations were more widely extended, so as to comprise the whole phenomena, including many adjacent places, to which the same anomalies were traced; and thus the general nature and extent of the phenomena were determined with accuracy and precision, and reported to the last meeting. But it was found that great differences of opinion existed with reference to the cause of these ascertained phenomena. It was obvious that the observations required to be extended still further, in time and extent, in order to settle conclusively the questions which had arisen out of the former inquiries. But this last season, from their extent and completeness, had now been so fully examined and discussed, as to afford ample means of deciding on the cause of the phenomena, and determining their origin. Simultaneous observations had been made at nearly twenty stations on the east of Scotland, from Newcastle and Shields to Inverness, and as many as 2000 observations a-day registered and discussed. The results of these are published in the special report which Mr. Scott read; and the result of the whole had been to elucidate, in a remarkable manner, the mechanism which propagates along our shores and rivers the great ocean wave, which carries from one place to another the successive phenomena of the tides, in which a constant cause, such as the drainage system of observation less extensive than that which had been adopted. It is pretty generally known that the phenomena of the tides with reference to their generating cause, the influence of the mass of the sun and of the moon in the various relations of distance and direction of these luminaries, have recently been examined with great success, in a series of researches carried on, first by Mr. Lubbock and then by Mr. Whewell, partly with the co-operation of this society. By means of their labours we are now enabled to predict, with unlocked-for accuracy, the time of high water, and the height of the tide in many of the harbours of Great Britain. But many of the local phenomena of tides remained unaccounted for, and these had been the object of a special series of researches, of which the present formed a part; the object being to determine in what way the conformation of the shores, and of the bottom of the sea, and the union of these two features, rivers and friths, affect the phenomena of the tidal wave. The rivers Dee and Clyde had been formerly examined with this view. To these were now added the Forth, the Tay, and the Tyne, and the northern shores of the German Ocean. The manner in which these observations were conducted, is not the usual one, of noting down simply the hour at which high water occurs, and then the hour of low water, along with the height at which the water stands at these times. Such a method had been found quite inadequate to the purposes for which the observations are required, and, indeed, held it of importance that all tide observations should, if possible, be made in the manner he was now about to describe, especially all tide observations made for scientific purposes. This plan was, to carry on simultaneously at the places examined, a series of continuous observations, every five minutes night and day, by successive observers, without intermission, for the period of a month, or of several months, as might be required. Printed forms were sent to all the stations, and in them, the observers simply noted down every five minutes, the height of the tide on a graduated scale placed before him.
Every day at noon all these papers were sent by post to the central station, and immediately on their arrival, the papers of the different stations were compared, and their observations laid down on paper, so as to give a graphical representation to the eye of all the observations, by means of which, they might have been very easily compared and a tabular arrangement of these tide-waves thus laid down, certain characters of the tide-wave peculiar to each locality had been discovered. As in the former observations of the Clyde and the Dee, it had been found in this series, that the form and dimensions of the tides, and also the variations of the same, were different in different parts of the sea. Where the sea was deep and the shore open and abrupt, the form of the tide-wave was symmetrical, and of the form predicted by Laplace, where he says, that in rising and falling, the water covers equal times equal arcs of a vertical circle. This is the form of the ocean tide-wave; but, on approaching a shallow shore, and travelling along a shelving coast, the tide-wave undergoes two changes—its summit becomes displaced forwards in time, its horizontal chords become dislocated, and the wave ceases to be symmetrical. This peculiar dislocation and displacement are characteristic of a line of coast, where the incoming stream of water is forced to rise and fall, and to effect the tide-wave, and to give it a peculiar distortion characteristic of tidal waves. To these were further added the exaggeration and elevation of the tide, by means of narrow channels. All these phenomena were fully proved by the present series of observations. The author of this paper also considers it to have been fully established by the observations on the Firth of Forth, that there exists on the eastern coast, satisfactory evidence of the presence of a second tide-wave in that part of the German Ocean, and that the southern tide-wave, a day older than the northern, having its maximum, or other manifestation of that period, is of the same nature as that which he attributes the double tides of the Firth of Forth, the nature of which he fully explained. Regarding these double tides, various theories had been formed—and there were various ways in which such tides might happen, whenever tide-waves arrive by different paths in different places. But it was clear, that it would be a difficult task to explain a method he had adopted, and which removed the difficulties in which the subject had formerly been involved. He then proceeded to explain the mode of discussion which had been adopted. It was the semi-diurnal inequality, so accurately examined by Mr. Whewell, which enabled us to decide upon the ages of two tides. If the two tides which appeared together, presented opposite inequalities both in time and in height, regularly alternating, varying with the moon's declination, disappearing with it, and re-appearing with it, and following it regularly, without regard to other simultaneous changes of a different period, then it became plain that no other inference could be drawn, than that which he had mentioned; when, further, he had proceeded to treat these tides as compounded of two successive tides, one due to a transit 12h 24m later than the other, and had used for this purpose two simple sine curves, in time corresponding to that at which the northern and southern tides could enter the Firth, he had obtained a close representation of the double tides of the Firth of Forth; when these two methods of examination ended in the same conclusion, he conceived that it had obtained a very high degree of probability. By means of these observations tide-tables had been formed, which were designed to afford a more accurate means of predicting the local tides of the east coast of Scotland than any we now possessed.

Dr. Robinson and the President put several questions to Mr. Russell, for the purpose of eliciting the facts more clearly.

Lord Mountcashel enquired whether Mr. Russell had observed and accounted for any of the tides phenomena which were denominated borers, and described by Locke, as well as by Mr. Clay, and which are observable in some channels where the water is so slack, that in the bottom water, which far outstripped that of the steam-boat in which they were proceeding. Mr. Russell said that he had frequently observed this phenomenon, and described the borers of the river Dee, and of the Solway Frith. He then briefly accounted for it on the principal of the tidal wave coming with enormous rapidity from deep water, where it was freely propagated into shallow water, where the upper part, retaining its velocity unimpaired while the bottom was retarded, it toppled over, at length, breaking in its rapid onward course.

Captain Larcom observed that the ordnance survey would contain a very full account of the tidal phenomena along the coast of Ireland. Captain Larcom hoped before long to lay before the Association the result of the observations made by the Royal Society of Ireland in their channel survey. Gauges were established at different stations, and observations have been made every five minutes during the course of three lunations. The direct object of them was to obtain data for the plane of mean sea level; but they also, he said, which are of direct importance of (reduction) are likely to decide this, they also give much valuable information as to irregularties like that just mentioned. He might mention that in Lough Swilly the spring tide high water was eight feet higher than in Lough Foyle.

Mr. Hawkins read a paper on the Friction of Water on Water, as exemplified in the well-known experiment of empyting a vessel full of water by sending a jet of the fluid through it. This friction of the particles of fluid against each other, and against the vessel, is proportional to the motion of ships through the water; and he conceived that it would be advantageous to grease the bottoms of ships to diminish the friction.

On the Form of Ships.

Mr. Scott Russell read the "Report of the Committee on the Form of Ships."

The report was voluminous; it contained the reductions of a large number of experiments, and about 20,000 observations, made on more than 100 vessels of different forms; accurate drawings of all of which, on a large scale, were laid before the committee. The authors of the report state that this report might be published, in order to give the public all the benefit which accurate knowledge on this point was likely to convey. He did not, therefore, enter fully into the details of these voluminous results, but would confine himself to a general statement of the object of this inquiry. In this view, the methods of inquiry which they had adopted, and a few of the more general conclusions to which they had been led. These experiments had now occupied the attention of the committee during a period of five or six years, and it afforded him peculiar pleasure to be able to present the results of this investigation. This paper, he said, was written in consequence, of which a communication in the society a few days before. As the subject of the present inquiry, the form of the hull of a vessel, the effect of the height of the keel, the length of the body, the breadth of the beam, and the line of the hull, were the points considered. It was found that the effect of the height of the keel was not so important as had been supposed. It was demonstrated that a greater variety of forms could be obtained by suitably altering the height of the keel than was imagined to be possible. Another important point was the effect of the length of the body of the hull, which was of great importance in this inquiry. It was found that the effect of the length of the body of the vessel was very great, and that a more considerable effect was produced by the length of the body than by altering the form of the stern. The effect of the height of the bow and stern was also considered, and it was found that the effect of the height of the bow was greater than the effect of the stern. Another important point was the effect of the breadth of the beam, which was of great importance in this inquiry. It was found that the effect of the breadth of the beam was very great, and that a more considerable effect was produced by the breadth of the beam than by altering the form of the stern. Another important point was the effect of the line of the hull, which was of great importance in this inquiry. It was found that the effect of the line of the hull was very great, and that a more considerable effect was produced by the line of the hull than by altering the form of the stern.
pared the common forms of merchantmen and other ships. The class of fast-sailing craft which are in the same way, the object always being the determination in given circumstances of the method of giving such a form to a ship as shall enable her to pass through the water with the least resistance, the greatest velocity, and of course the smallest expenditure of force, power, and money. The methods of drawing these vessels through the water, varied with the scale on which the experiments were made. Those on the smallest scale were drawn by a weight arranged in such a manner as to supply a uniform force through any given distance—and on the largest scale, the experiments were made on the sea by means of powerful towing vessels. In fast way the experiments were made on a wide range of magnitudes, both as regards the vessels themselves and the sheet of water on which they were propelled, as element of resistance not always sufficiently taken into account. The resistance was accurately measured by dynamometric apparatus of great accuracy, through which the moving force was communicated to the vessel; the velocity being determined, in certain cases, by a peculiar apparatus designed for this purpose, and in other cases by instruments for measuring and marking time with accuracy. After the observations had been reduced by independent calculators, and not till then, were they made the subject of special examination, with reference to any theory; and thus it was conceived that the greatest amount of authenticity had been secured. The author then proceeded to give to the meeting a number of specimens of the results which the experiments afforded, such as he knew were likely to interest those members of the section who were acquainted with the principles of naval construction. He demonstrated a remarkable law, by which it appears, that each velocity has a corresponding form and dimension peculiar to that velocity; and he showed, in a variety of diagrams, the means of constructing such forms. To show how much influence, alongside of without any other element, or dimension, affects the question of resistance, he added the following as one of the most important experiments. Four vessels were taken, having all the same length, the same breadth, the same depth, the same area and form of midship section, and all loaded to the same extent; and of draft of the same depth. The only difference being in the character of the water-lines; No. 1 being of the new form indicated by these experiments as that of least resistance; No. 3 the old form, very nearly the reverse of the first; No. 2 intermediate between them, and No. 4 intermediate between No. 1 and No. 2. The following table shows the result of the comparative trial—

<table>
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<tr>
<th>Speed in miles per hour</th>
<th>Resistance in pounds</th>
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<tr>
<td></td>
<td>No. 1</td>
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<tr>
<td>3</td>
<td>10</td>
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<tr>
<td>5</td>
<td>22</td>
</tr>
<tr>
<td>6</td>
<td>39</td>
</tr>
<tr>
<td>7</td>
<td>52</td>
</tr>
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</table>

These differences showed how much might be gained; everything else being equal, by the adoption simply of judicious form in the construction of the water lines of a ship. The vessel No. 1 was constructed on the wave-line; the methods and rules for which he proceeded to explain in diagrams, too numerous to be here admitted. But in the space to which he was limited, giving the speed of publication of the report itself may soon remedy this omission.

Mr. Perry observed that the position of the paddle-wheels in steam vessels was an important subject, which required to be determined, especially as different opinions were entertained by practical men whether the paddles should be nearer to the stern or to the head of the vessel.

The Marquis of Northampton remarked on the importance of these experiments, which, he said, would be the subject of the British Association. He thought it would possibly produce a change in the naval architecture of every country in the world; and if the British Association had done nothing else than carried out these experiments, and attained those important results, all the efforts they had made would have been amply rewarded.

Mr. J. Taylor observed that these experiments had been carried on for five years; and that the late Sir J. Robinson, who had been associated with Mr. Russell in their prosecution, had watched them with great anxiety till within a short period of his death. The Association had expended £859 in making these experiments, and now came the question, what was to be done with the valuable body of information that had been collected? It ought not to lie idle on their shelves, but ought to go forth to the public; and the best manner of accomplishing that would be a subject of consideration for the Council.

Mr. Russell said, that with regard to the position of paddles, the subject had been already taken up by the government, and some practical results might shortly be expected. In publishing the results for the British Association, Sir J. Robinson and himself having satisfied themselves as to the correctness of their system, they had endeavoured to get it introduced without exciting opposition. The experiments were made in a ship-building country, and ship-builders every now and then borrowed the forms of the boats that had been found to move the fastest through the water, and thus they had been gradually introduced. The Flambou, which was built on the Clyde in 1839, on one of the experimental lines, beat a vessel of greater tonnage through the water, having only one hundred and thirty feet of water. In smooth water, in deep water, and in a deep and heavy sea the experimental vessel beat the other by two miles an hour. There had since been constructed in that part of the country a whole class of vessels built on the same principle. The Great Eastern of the Ingranger, with which her passage last week from Duhlin to Cork in two hours less time than had ever been previously accomplished, was constructed by the same builder who had made the models for the British Association experiments.

**Elasticity of Materials.**

"Experiments to prove that all bodies are in some degree elastic, and a Proposed Law for estimating the Deflexion." By E. Hodgkinson, F.R.S.

Mr. Hodgkinson said it was a principle generally acknowledged in the present day, and employed by those who have written on the subject of elasticity, that, when bodies are acted upon by forces tending to elongate or compress them in a small degree, the changes produced are in proportion to those forces; and that equal extensions and compressions are produced by equal forces. Although this is true in one case, that is, when the body is very small, it is not to be doubted; and as regards extensions it is the basis of the early investigations of Jacques Bernonulli on the elastic curve; of Hooke who was its author (Theory of Springs, Phil. Trans. 1666); and of M. Poisson's limit (Recherches sur la Théorie des Elastiques, 1841), elastic force was employed under the name of force, as the term elasticity, it was adopted in the profound inquiries of Euler on the strength of columns, which were corroborated by Lagrange (Berlin Memoirs); and with respect both to extensions and compressions, it forms the basis of the calculations on the strength and elasticity of bodies in the principal theoretical work on mechanics of H. Cauchy, the works of M. Poisson, and the works of Whewell, — the practical treatises of Navier, Poincelet, Tredgold, Barlow, Moseley, &c. He hoped, however, to convince the section that this principal does not operate alone in the resistance of bodies subjected to tension, or to compression, or to both. He hoped, too, to show the law which the element, not considered by writers, nor generally known to exist, is subject to. This element is a defect of elasticity, or a set, to which all bodies made to undergo a change of form, however small, seem to be liable. The defect here mentioned was this, that, when the body had been strained to a considerable force, or as such to be equal to one third, or upwards, of the breaking weight. But the experiments which he should adduce would show that the defect commences with the smallest changes of form, and is increased according to the square of the extension, or compression, or of the weight. Thus, if $e$ represent the extension or compression which the strained body had undergone, and $a$ the force which would have produced that extension or compression if the body had been perfectly elastic, the real force necessary to produce this change, $e$, will be $e' = a + a''$, where $e''$ is the force necessary to produce the former $e$, reckoned on the principle of elasticity. Hence the force required to produce a change, $e$, is $a = 2a''$, where $a$ and $a''$ are constant quantities. He had found this law to obtain when the change produced in the body arose from extension or compression alone, but when the change arose both from extension and compression, as in the case of a ring, the force necessary to produce the change $e$, will be $a = 2a'' + a'''$, where $a'$ and $a'''$ are the height applied, and $a''$ a constant quantities, as before. In proof of these statements, Mr. Hodgkinson mentioned that having remarked, in his experiments made for the British Association, on the subject of hot and cold light iron, that the elasticity of bars broken transversely was injured much earlier than was generally assumed, he paid particular attention to this circumstance in his future experiments, and had bars so formed that he could separate the elasticity of extension from that of compression; he discovered that the bars, which were very long and of small depth, he perceived that one-fiftieth or one-eighth of the breaking weight was sufficient to injure the elasticity. He mentioned the matter to his friend Mr. Fairbairn (who was associated with him in the inquiry), soon after he had made the discovery; and Mr. Fairbairn's subsequent experiments made on iron bars, 1.1844 of the length of northwestern bars of iron, from all parts of the kingdom, were conducted in the same manner as Mr. Hodgkinson's had been; the deflexion and quantity of set, or defect of elasticity, from each weight being always observed. Mr. Fairbairn's experiments were made on bars cut from a barn, made with the utmost care; Mr. Hodgkinson has, therefore, adopted their results with respect to the "set," and taking means both from Mr. Fairbairn's results and his own on the same sort of bars, he has sought for the relation between the weights and the mean sets from those weights, and sets being the deflexions or deviations from the original form of the bar, after the weights have been removed. To ascertain the relation above, Mr. Hodgkinson has curves described from the results of the experiments, making the sets the abscissae, and the weights the ordinates; and the similarity in appearance between the results and the theoretical curves, in all cases where they have been fairly examined, shows whether they were not in reality represented by that curve. The examination was successful—the parabola was the curve; and the mean weights were used.
of the observed sets, together with the calculated ones, from equal additions of weight, from 56 to 418 lb., derived from 41 kinds of cast iron, and from 90 to 100 experiments, were as follows:

<table>
<thead>
<tr>
<th>Weights</th>
<th>56</th>
<th>112</th>
<th>158</th>
<th>224</th>
<th>280</th>
<th>336</th>
<th>392</th>
<th>448</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean sets</td>
<td>603</td>
<td>013</td>
<td>026</td>
<td>017</td>
<td>069</td>
<td>102</td>
<td>136</td>
<td>197</td>
</tr>
<tr>
<td>Computed sets parabolic</td>
<td>603</td>
<td>012</td>
<td>027</td>
<td>047</td>
<td>072</td>
<td>102</td>
<td>138</td>
<td>181</td>
</tr>
</tbody>
</table>

Mr. Hodgkinson made experiments on stone, timber and wrought iron, and observed the quantities of iron lost, all the more so, as when the results and these were constructed, all gave the form of the parabola, though less perfectly than in cast iron, as the experiments on them were but few. It appears, from the above-stated experiments, and others that were made, that the sets produced in bodies, are as the squares of the weights applied. Hence, there is no weight whatever lost, or permanent change in a body; all bodies, when heat, have the arrangement of their particles altered to the centre; and when bodies, as the axles of railway carriages, are alternately bent, first one way and then the opposite, at every revolution, heat is generated, and the alteration of the elasticity will cease. It appears, too, from the results of these experiments, that all calculations hitherto made, on the stiffness and elasticity of bodies, have been only approximations. Mr. Hodgkinson stated, that he laid the results of this communication before a meeting of the Literary and Philosophical Society of Manchester a short time ago, soon after he had made the discovery which it contains. In the prosecution of the experiments he had received every assistance which the works of his friend, Mr. Fairbairn, could supply; and Mr. Robert Rawson had kindly assisted him in the reduction and management of the results of the experiments.

His communication gave rise to much conversation, in which the President, Prof. Lloyd, Dr. Robinson, and other persons joined, and in which agreed, that these experimental inquiries were of the utmost importance in supplying a solid foundation for the speculations of the mathematical investigator, which would necessarily produce the most beneficial results. Dr. Robinson also inquired, if Mr. Hodgkinson had observed whether the molecular structure of the bodies, on which he had experimented, was altered in any manner, and if so, how did the change take place, during the progress of the experiments? Mr. Hodgkinson stated, that he had no evidence of any change, but that where subjected to strain, long before it broke, had its molecular structure permanently deranged. He exemplified this by the axles of locomotive engines, which, as they turned round, had the parts that were extended and compressed successively undergoing change. After this action had been continued for a longer period, they were found to become of a kind of crystalline structure, internally, and of course were much impaired in strength.—Prof. Stevely said, that the forces to which they were subjected were in kind, though not in degree, something like the alternate bending back and forward of a piece of wire under which it at length broke.—Mr. Hodgkinson assented.

"On Changes in the Internal Construction of Metals."

Mr. Lucas, in the absence of Mr. Fairbairn, reported the progress of the Communication, and stated that most remarkable to him was the fact, whether any and what changes take place in the internal constitution of metals exposed to continual vibration and concussion. (The results of these experiments were stated by Mr. Hodgkinson in the last paper.)—The effect of concussion on ships has been very remarkable. The shafts made of the best ash, but after three or four months use the streight of the wood is so much deteriorated that the shafts break off short as if they were rotten. Copper is also similarly affected by concussion, and in working copper articles, and in rolling silvered plates of copper, the workmen find it necessary to anneal the metal to prevent it from breaking.—Mr. J. Taylor observed that this subject had been much discussed at Manchester, and with the same results. He alluded to the difficulty of procuring good chains, and said it occurred to him that probably it might arise from the chain maker being too good a workman, and that the evil was caused by too much swaging in finishing the work. If, however, the quality of the iron could be restored by annealing, as might be inferred from these experiments, that would preclude the means of obtaining good chains in the first instance and of strengthening them after use.

On Contoured Maps, by Captain Larcom.

It is important that maps constructed by the government should exhibit the levels of the country in the most intelligible manner; showing heights not merely on lines of latitude, but also in the valleys through which they traverse them. Such a system is offered by those contours, which are a series of horizontal lines, at a certain distance asunder, and at a certain height above a fixed datum. The datum most commonly used is the level of the sea, doubtless fixed, where the line being the limit of the land, and the point at which roads converge, and the impression or depression of the sea itself a level line; and therefore, as the first contour, the most appropriate and natural zero, from which to reckon the others. The Section were aware that it has been a point much discussed, whether the high water, the low water, or the mean level line, should be the first level line. This is a point which would be out of place to discuss here, but it may be stated that, in order to determine it, as far as Ireland is concerned, a series of lines has been very accurately levelled across the island in various directions, and permanent marks are left in all the towns, and on numerous public buildings; and at the end of each of these lines on the coast, tidal observations have been made every five minutes during two complete lunations. These observations, and the connecting lines of level, are made with such precision, that the degree of accuracy attained is such that a discrepancy of 2 of an inch is immediately apparent—and from them we may expect many points of interest. The steeper the northern slope of the ground is, the closer together the lines are, and the more oblique the roads; where, on the contrary, the ground slopes gently, the contours are further asunder, and the road may be proportionately more direct. By examining the maps of the Irish Survey, on which contours have been drawn, it will be seen that the appearance is on an equal footing, with the general tides of the conditions. Every one of which ascends and descends frequently, instead of keeping on a gradual slope for its whole length. In order to exhibit these lines, it is proposed, instead of adding them to the original copperplate, which has a peculiar value as an official record of boundaries, to make a copy of the plate by the electrolyte, for the purpose of receiving these lines. Contour maps were thought of early in the progress of the survey, but means were wanting for their execution; at present, however, the outline survey being complete, and the general map, or map of the surface, being in progress, affords a convenient opportunity, which it is hoped will not be lost.

Dr. Robinson inquired of Capt. Larcom whether the process of contouring the maps was proceeding, and how soon he supposed it would be completed for Ireland.—Capt. Larcom replied, that for the present it had been suspended.—Dr. Robinson observed, that whether he considered the value of the map as a whole, or the interest of Ireland in the most important practical economies of the country at large, he could not but deeply deplore the suspension, temporary though he hoped it would be, of this great national undertaking; and he trusted that, before the British Association closed its present sitting, the most energetic steps would be taken to make the necessary arrangements. Mr. Larcom said, perhaps something more to this effect, but his speech was cut short by the proposed adjournment.

"On a Method of ascertaining Inaccessible Distances at Sea or Land."

Mr. P. Leahy read a paper on a method of ascertaining inaccessible distances at sea or land, for which he claimed the advantages of greater accuracy and expedition than by the method of measuring a base line by the method of triangulation. On his plan two small telescopes are fixed at the greatest distance the vessel will admit of, and so as to form some multiple of ten feet. This distance forms the base line on which the calculations are to be made.—Mr. MacNeill being requested by Mr. Scocey to state his opinion in the invention, the latter said that it was sound in principle, but he thought with so much attention and wide and varied use of taking simultaneous observations at sea, it would be liable to inaccurate.

"Formation of Concrete."

Mr. Hawkins made a communication on the formation of Concrete, showing more particularly the importance of having the stones of the proper sizes, so that the smaller ones should as nearly as possible fill up the interstices of the larger. Where the sites were properly adjusted, he found that one proportion of lime to twenty of shingle, formed a stronger concrete than when larger proportions of lime were used. Some engineers are in the habit of using one of lime to six of shingle, and the proportions generally used are as one to eight. A specimen of concrete made in the proportions he recommended, and with shingles of proper sizes was found after a short time to be stronger than an old Roman wall.—Mr. MacNeill said he preferred artificial cement to lime, and he had found great advantage to result from allowing the mass of concrete to fall from a height, by which means the shingle became more compressed with lime together. Mr. O'Sullivan mixed with lime, made the perfect concrete.—Mr. Jessop and Mr. Taylor also approved of mine dust. The latter observed, that it was probably from the quantity of iron in mine dust, that its adhesive properties were derived.

"Raising Sunken Vessels."

Sir T. Deane explained the method adopted by his brother. Mr. Deane, to raise the Iniscale steam vessel, of 50 tons, which sunk by collision with a rock a few years ago. The ordinary methods of raising sunken ships having proved ineffectual, a coffer-dam was made round the vessel in the middle of the river; and pumped dry by means of eight or nine chain pumps. The leak was ascertained by digging up and observing the bottom. The vessel was finally lifted free, and had a good trial before it was righted. The coffer-dam was removed as quickly as possible, when the Iniscale again floated by her own buoyancy, and the steam having got up, she was taken to Passage to undergo the necessary repairs. The whole cost was 400L., and the work was done in the course of four tides.
KYANIZING TIMBER.

Anti-Dry-Rot Company, (Kyan's Patent).

(An Advertisement,*)

Mr. Editor—Mr. W. B. Prichard has recently published a letter in several periodicals, in which he expresses astonishment that I should state that both his report and letters are inaccurate, and, because I used so mild a phrase, he has thought proper to make further statements of a like character; I therefore feel it my duty to state and prove, that in some instances he has omitted to state the whole truth, and in others he has challenged what is decidedly untrue.

He omitted to state that the sleepers that had shown symptoms of decay were prepared, by way of experiment, with solution only half the strength required by the patent.

He stated that, at Shoreham Harbour, a walking piece, the very heart of English oak, Kyanized, in use only four years, was like honeycomb, completely eaten away by the teredo navalis.

A full board of the commissioners of the harbour, appointed a committee to view, who have reported the Kyanized timber as sound as when first put in.

He stated that he had removed the oak walking, and that the decay was below water mark. I annex the certificate of five witnesses, three of them gentlemen of unquestionable character, and the other two are his own witnesses, who assert that he could not have taken an oak walking from below water mark, as those walkings are exclusively of beech, and that no Kyanized walking has been removed within the last six years; they also report, that after a careful survey they can find no symptoms of decay in any of the piles.

Mr. Prichard has inserted a certificate from Mr. Buckwell and Mr. Butler, in confirmation of his assertion, that the piles are decayed, which I have ascertained was written before the inspection took place, and objected to afterwards, and nevertheless published in its original form; how much dependence can be placed on this certificate may be ascertained from the annexed letter, (No. 3,) from the gentlemen who signed it.

Mr. Prichard also inserts a certificate from the workmen at Shoreham Harbour, that they inspected the piles in the presence of Mr. Meredith, engineer to the Brighton Railway.

The workmen positively deny that Mr. Meredith did accompany them during the survey.

Mr. Prichard asserts that Lord Mansvers has impugned Kyan's process. I am authorized by his lordship to state that "after very extensive experience of its effects, his early impressions in favour of the discovery have been absolutely confirmed," and that he continues to have "unshaken confidence in its efficacy as a preservative of timber of every description."

Mr. Prichard intimates, that Mr. Brunel, under whose directions immense quantities of timber were Kyanized for the Great Western Railway, is now opposed to our process.

I annex a letter (No. 4) from the engineer's office of the Great Western Railway, from one whose name will be well vouch for the truth of the statement, "that after Kyanizing upwards of 49,000 loads of timber he is well satisfied with the result, as after six years' trial, the timber, on every examination, has proved as sound as when first laid down."

Mr. Prichard asks how many hundreds of the sleepers on the Brighton Railway have decayed.

I submitted his question to the chief engineer on that line, and he stated in reply, that he is not aware that one Kyanized sleeper is decayed.

Mr. Prichard states, that the opinion he has given about Kyanizing is perfectly disinterested, although he strongly recommends the process belonging to his friend and solicitor.

These statements of Mr. Prichard are so void of truth, that I feel it my duty to expose them, and having done so, am convinced that any further statement Mr. Prichard may make will prove innocuous, and not require any reply from me on behalf of the Company.

2, Line Street Square. Taswell Thompson, Sec. 6th Sept., 1843.

Letters and Certificates above referred to.

No. 1.

We, the undersigned, having at the request of Mr. Taswell Thompson, this day minutely inspected several of the piles of the east pier of Shoreham Harbour, embracing all those represented to have been Kyanized, and many which have not been subjected to that process, do certify that we find no symptom of decay whatever in any.

We have carefully surveyed the whole of the two lower walking pieces, and find no indication of any of the original having been removed. The material employed for this purpose is beech exclusively.

* We cannot allow this controversy to be continued unless the communications be paid for as Advertisements.—Editor.

We further report, that the piles both descriptions, on the east side of the said pier are slightly touched by the worm, just above the sand.

J. B. Bailey, Ship Builder.

William Tate, Timber Merchant.

Thomas Thornton, late Harbour Master.

Shoreham, August 29th, 1843.

No. 2.

We, the undersigned, have worked as carpenters at Shoreham Harbour for the last six years, and well know all the Kyanized wood, and can state positively that not one of the Kyanized walkings have been removed since they were first fixed in the pier; and we can also state positively, that the two lower walkings are formed of beech.

Witness, Wm. Jingle.

Robert Burt.

Shoreham, August 29th, 1843.

No. 3.

Sir—In reference to the report of our view of the piles of Shoreham Harbour, on the 3rd June last, published by Mr. Prichard, we beg to state that its contents, both surprising and annoyed us, as we did not intend to say that any of the piles referred to are decayed, but requested Mr. Prichard to erase the words "gone through several stages of decay," and state instead, that the unprepared and prepared were in a like state of preservation; and we beg to add, that in giving our opinion, we were led to believe, that the Commissioners of the line had not requested us to report upon the condition of two chips of wood submitted to us, and not for the purpose of publishing our report as to the efficacy or non-efficacy of Kyan's Patent: and that we had no means of judging which was the prepared wood and which the unprepared, but deemed Mr. Prichard's word sufficient authority, as he was at that time an officer under the commissioners.

Shoreham, Chas. Dowlen Buckwell.

George Butler.

Mr. Taswell Thompson.

Line Street Square, London.

August 29th, 1843.

No. 4.

Great Western Railway, Engineer's Office.

27, Portland Square, Bristol.

Dear Sir,—I have sent you by the carrier a section from the centre of one of our longitudinal timbers of the permanent way; it was Kyanized and laid on the line about six years ago, and you will perceive it is as sound as the day on which it was first put down; it is not singular, with us but in all my examinations I have found it equally sound. I think this simple test will be highly interesting to you, and you will not begrudge the expense of the carriage.

I would remark that the pickling having been entirely under my management, I was very particular in having the strength of the solution maintained. Upon first immersion the strength was 1 in 14, at a temperature of 62, and the time of immersion for seven-inch timber was eight days, during this time the solution was kept at a uniform strength by pumping. In this way I have pickled upwards of 46,000 loads of timber, and the quantity of sublimate consumed comes out at about 1 lb. to the load.

T. THOMPSON, Esq.

August 31st, 1843.

Your's truly,

J. Hammond.

THE PYRAMIDS OF GIZEH.

The last monthly meeting of the Egyptian Society was very fully attended, as it was announced that Dr. Lepsius would give some description of the researches made by the Russian Expedition. Mr. E. W. Lane being unanimously called to the chair, Dr. Lepsius commenced by stating that he felt it to be his duty, whenever he had the opportunity of visiting Cairo, to communicate any information that he might consider interesting to so useful and liberal a Society. He felt assured, from the great progress already made in the few years since its establishment, that it was destined to fill an important place in the history of scientific research in this country. The Doctor then alluded, in proof, to the valuable memoir lately published by the Society, contributed by M. Linant "Sur le Lac Moris." He offered some observations on the mode of constructing the pyramids, and enumerated the many theories that had been advanced concerning the objects and the construction of these vast monuments. He, however, considered the fact established, that their object was simply to mark the places of tombs, and he then proceeded to explain to the meeting the manner in which they were constructed.

The great pyramids of Gizeh are (in comparison with many others) in a good state of preservation. From the largest, little besides the
The masonry of the pyramids of Abouisir and Saccara is very inferior to that of the pyramids of Gizeh—in all of these the step construction is clearly seen, and also that the steps are separate walls built against each other. The pyramid at Merdoon, again, exhibits this mode of construction. In its present form it rather resembles a huge square tower, the walls of which are slightly inclined, than a pyramid: the outer layers having been mostly removed, the core or central part is left standing alone. In short, in the examination of a great number of pyramids, from Gizeh to the Fayoom, the same mode of construction was found.

To explain a mode of building apparently so contrary to sound masonry, we must suppose a chamber A for the tomb, in or under the small pyramid B B, built over it; by filling up the angles of the steps, and adding the fine smooth casing-stone, this small pyramid would be completed; but if it were desired to enlarge the work, instead of filling up the angles to prepare for the casing another step, of the same height and depth as the first, being added to each step of the first-mentioned pyramid, the outline touching the exterior angles of these steps, C C, &c., would be parallel to the outline of the first pyramid; and so on, by continually adding steps of the same section, the pyramid would be increased to any size. The foregoing sketch thus shows five pyramids, one within the other. Dr. Lepsius stated that he was indebted to Mr. J. Wild, architect, for this suggestion, and it agrees with and explains the account given by Herodotus, that states that machines were placed upon the steps, and the stones raised from one step to another. The Doctor then explained, in confirmation of his views, the remarkable pyramid of Dashour; he considered the obtuse angle of the upper part, as the original angle intended. Moreover, Dr. Lepsius observed that this mode of proceeding is in harmony with that adopted by the Egyptians in their tombs excavated in the rock. It is found at Thebes that the first care of the reigning king was to excavate in the rock, and complete and decorate, a chamber for his tomb. If his life continued after the end of this labour, another chamber was added, and then another, and so on; and it is found that the largest tombs are those built by the kings who have reigned the longest. In the same manner, the pyramids may have been continually enlarged during the lifetime of the kings for whom they were intended. All the evidence that remains shows that the largest pyramids were of kings who reigned a long time. It must be remembered, that among the Egyptians it was the duty of the individual to provide a tomb for himself; his successor was immediately occupied upon his own, and thus we find many tombs either hastily or imperfectly finished, and chambers left in all states of progress. Could a monument of such stupendous size as the great pyramid of Gizeh, have been contemplated as an original plan, to have been finished, or nearly so, in the lifetime of one man? but it is easy to conceive that by perpetual additions during a long reign, such a building may have been completed.

Dr. Lepsius then exhibited a selection of beautifully finished drawings of the subjects and inscriptions decorating the tombs round the pyramids of Gizeh and Saccara, architectural plans, sections, &c. The time allowed was too short for more than a slight examination of them. The explanations given of some of the subjects was very interesting.

The Doctor did not refer to his researches in the Fayoom. I am, however, enabled to inform you, that he has fixed satisfactorily the place of the labyrinth near the pyramid of Howarrah, and has traced, from what remains, a general plan of it. Its complete ruin is owing to the walls having been built with rude brick, and merely faced with stone; from the same cause, the tombs at Saccara are nearly all destroyed, while those at Gizeh, which are entirely built of stone, are in good preservation.

By the liberal regulations of the Society at whose rooms this lecture was delivered, strangers are permitted to use the library and attend the lectures, if introduced by a member. I had thus the opportunity of hearing the paper I have endeavoured to report to you. The library, although not very large, contains nearly all the valuable works on the antiquities of Egypt and the surrounding countries, the works of the best travellers and historians, some upon Arabic literature, &c.

Dr. Lepsius left Cairo to-day for Upper Egypt.—
Althaeaum.

Cairo, August 17.

ST. GEORGE'S CHAPEL, WINDSOR.

The extensive alterations and embellishments which have been in progress since the early part of May last (from which period the chapel has been closed), at an outlay of several thousands of pounds, throughout the interior of this sacred edifice, having just been brought to a close, the following description of the ornamental and newly embellished portions of the chapel of St. George, the curious discoveries made during the progress of the works, and of other objects of interest connected with the late repairs, will, no doubt, be interesting to a numerous portion of our readers.

It is now nearly a century since this chapel had undergone any repairs. At a chapter held by the dean and canons in February last, it was resolved that the chapel should undergo a thorough cleansing and renovation; that the stained glass windows should be introduced in various parts; the organ repaired, ornamented, and many additions made to it; the whole of the elaborate wood carvings and the alabaster and marble monuments in the several private chapels and aisles, restored to their original state; and other embellishments added, so as to render this ancient building one of the most magnificent sacred edifices in the kingdom.

The beautifully groined ceilings of the nave and choir has been thoroughly cleaned by means of immense scaffolding reaching from the floor to the roof; and the whole of the defective parts carefully painted and restored by experienced workmen. The groined ceilings, also, of the side aisles, chapels, and transepts, have undergone the same careful and extensive renovation, and likewise the organ-lofts, and that portion of the chapel at the back of the altar. The whole of the whitewash and colouring matter upon the stone pillars, windows, jamb, arches, and piers, and upon the hitherto half-hidden Gothic screens to the Hastings, Beaumont, Lincoln, and other chapels, have been removed, restoring the stonework to its rich and varied natural tints, producing a most beautiful effect. The numerous monuments, and the interiors of the private chapels, belonging to noble and distinguished families, have also been carefully restored.

The whole of the splendid Gothic oaken stalls of the Knights of the Garter (on either side of the choir and those facing the altar) have been cleaned, and repaired where necessary, so as to render them strong and firm as at an expense. The rich and most elaborately carved canopied over the stalls of the knights (above which are suspended their banners, with their mantles, swords, helmets, and crests, were taken down to undergo a similar renovation and repair. They have also been re-stained and varnished.

The dark and dingy-looking point which covered the exquisite wood carvings of the stalls, has been carefully scraped off, and the wood left in its own tint, which has considerably improved and heightened the general effect of this portion of the interior of the chapel.

It may here be mentioned that on the pedestals of the stalls the life of our Saviour is represented in richly carved work, and on those under the organ-gallery are the adventures of St. George.
an addition was made to the number of knights, and six new stalls were in consequence added, in front of which are carved representations of the attempt of Marguerite Nicol, to assassinate Charlotte, the procession of the King to St. Paul's on the day of thanksgiving for his recovery, in 1789; the interior of the cathedral on that occasion, and of Queen Charlotte's charity school. On the outside of the upper seat of the stalls, a broad gilt, continued round both sides of the chimney, is grouped, in Simon's characters, with the 20th psalm, supposed to be intended as a supplication for the sovereign of the Order of the Garter.

The projecting front of the Royal closet (over the north side of the altar, and above the tomb of Edward IV.), which had always been considered to be composed of carved stone, was discovered, upon clearing away the masonry of the partitions between the arches of the great oak, of a very early date and in a most excellent state of preservation. Such is the rare character of the style of its carving, that there is but one other specimen of its kind in the kingdom, and that is to be found in the Cathedral at Lincoln. The wagoned carved front of Her Majesty's closet has been stained and varnished, and it has now a most pleasing effect as it strikes the spectator upon entering the choir from the west.

The three principal lines of the heraldic bosses on the vaultings of the nave and transepts have been emblazoned with the arms of former Knights of the Garter, and of the most ancient and distinguished families in the empire, and the entire of the bosses, pendant, and knots of the oak, with the characters of the Latin verses which were incised upon them, and in the same rich and gorgeous style, under the immediate superintendence of Willement, of London, to whom the whole of this portion of the embellishments of the chapel, the restoration of the vast west window, and the introduction of new windows of stained glass, had been confided by the Dean and Chapter.

A magnificent and highly wrought brass lectern (upwards of six feet high), which had lain in a dilapidated and neglected state, amongst some rubbish, in a vault of the chapel for upwards of a century, and which had been fortunately discovered by the Dean, has undergone a perfect restoration, and now occupies its proper place in nearly the centre of the choir, at the upper end of the vault over the tomb of Jane Seymour, the Queen of Henry VIII. The top, which is in the form of a double desk, constructed to hold the sacred volume on one side and the Book of Common Prayer on the other, turns round upon a pivot, and from this lectern the lessons will, in future, be read by the minor canon at divine service in the morning and afternoon.

The stained windows (five on either side), of stained glass, containing in compartments the heraldic bearings of all the Knights of the Garter from the institution of the order, have been completed by Mr. Willement on the north and south sides, and at the eastern end of the choir, some portions being over the banners of the Garter Knights. Four other windows (two on either side at the western end) only remain to be similarly emblazoned with the arms of the Knights of the Garter.

A most pleasing and picturesque effect is produced throughout the choir by the introduction of these stained glass windows, which give a rich, yet soft and subdued tone, to the whole of the interior, in perfect harmony with the religious character of the sacred edifice.

The great west window, which may now be classed amongst the most splendid and magnificent in the kingdom, has been carefully and skilfully restored by Mr. Willement, and an entirely new and improved arrangement of the ancient and scriptural figures and devices has been effected under his superintendence. Within the four chief compartments, at the upper part of the spacious arch, are the bishops, saints, and emblems of the following sovereigns: Edward III., Edward IV., Henry VIII., and Queen Elizabeth. In the centre of the window are the arms of the patron saint of Engand, with the initials "S. G." (Sanctus Georgius), and at the apex the initials "I.H.S." The whole of the numerose figures contained in the other compartments represent saints, prophets, and apostles, but from the state of the vaulting in the north transept, from which the arms or inscriptions, it is difficult to distinguish others than St. Luke, the physician, St. Catherine, St. Dunstan, St. Edmund, St. Edward the Confessor, and St. George.

The general appearance of the sacred edifice, viewed from any one point, is now graceful and magnificent in the extreme. The removal of the present wretched specimens of coloured glass in the east window over the altar, and the restoration of its fine tracery and old stained glass, somewhat similar to that at the west end, are nearly all that is now required to render perfect the labour which has been so liberally commenced, and, thus far, so admirably brought to a close.

THE FACADE OF THE BRITISH MUSEUM.

Sir—You may probably be of opinion, that having already called attention more than once to the subject of the British Museum, it is unnecessary to return to it so soon again, more especially as it has since—and, perhaps, in consequence—been taken up by other journals. But I venture to impress upon your attention the necessity of not desiring you not to desist from the good work you have begun, since it must convince you that there exists in other quarters a disposition to support the same views, and, if at all possible, yet secure for us such a facade to our National Museum, as shall eclipse every thing hitherto attempted in the same style, in this country, and triumphantly vindicate the character of British Art.

A good deal has been said as to the beneficial and widely extended influence which the example of the "Palace of Westminster" will have upon architecture and art generally among us; let it then now be shown: let us have a decisive proof of such in our next greatest national edifice—one where all refinement of art will naturally be looked for, where an extra great position will be accorded to it—more than properly characteristic of the purposes to which the building itself is devoted. The one at Westminster is hailed as a very great stride in architecture, and as leading to a very much better system of management than has been hitherto observed in regard to our public edifices; are we then now, to step back all at once to our old courses, and to the old methods, and to the old construction?—Shall we lay the blame, in this instance, on the Trustees of the Museum for their supineness, and their indifference as to what its facade may prove as a piece of architecture, provided there is house-room enough within its walls for the various valuable collections deposited in it? Do we yet know if the design has been examined or approved of by the Trustees; or are any one of the Trustees, of course, excepted, or has been more than merely assented to as matter of form, without a thought being given to the design itself?

All that can be said at present is, that they appear to have placed themselves entirely in the hands of their architect, to do exactly as he may direct, or as is given to him, and that this may confide in him, he does not appear to have any great confidence in himself, else wherefore does he maintain such suspicious reserve? It is true, he has not been called upon formally to produce his design, before the public, neither has he formally refused to do so; yet he must be aware—now at least, if not before—that there exists an earnest desire to be so acquainted with it in some way or other that might very easily be done by a model in relief of the facade, upon rather a large scale, which might be placed for public inspection in the Museum itself—either in the entrance hall, or in one of the galleries. The very circumstance of the design having up to the present time, been kept a profound secret, is a strong reason wherefore we should now be plainly informed what it really is; and on an occasion of such high importance, it would be a piece of very false and misplaced delicacy, to refrain from demanding of Sir Robert Smirke to let us see his design beforehand, and judge for ourselves if it be really worthy of being carried into execution, because if not, or is incapable of being rendered so, it had better be laid aside altogether, could qui conque, and some more satisfactory one be now prepared in lieu of it, either by himself or some one else.

The facade of the Museum might even now be made the subject of competition: there may, indeed, be no precedent in this country for such course of proceeding, and it might accordingly be considered a strange innovation, but it would at all events be a judicious and safe one. Let a liberal premium—say five hundred guineas—be offered for the best design, on the understanding that that will be the sole emolument derived from it, the carrying it into execution being left to the present architect, unless he should prefer to withdraw himself altogether from the business. That he would not suffer himself, and perhaps less in reputation than he is now likely to do, if allowed to proceed as hitherto, and produce what, when completed, will be found to be a signal failure, and will occasion quite as much public dissatisfaction as Buckingham Palace and the National Gallery. Far more, as I believe, would it be in him to acquiesce, however unexpectedly, at which might be construed as a tacit acknowledgement of his incompetency, to than to leave a lasting monument of such incompetency behind him.

How do we know, it may be asked, that such will prove the case, when no one as yet knows any thing of the design itself? Justly or unjustly very few are entertained, and I would see some attempt is made to dispel them, by producing the design and convincing us how idle are our fears and apprehensions, it is but natural to conclude that such argument is felt to be a very dangerous one to
resort to, and by no means calculated to secure our admiration for the intended façade.

Surely the institute might, on such a highly important occasion, exert themselves a little, and stepping a little out of their ordinary course, might venture, in their character as a public body, to recommend that satisfactory information should be communicated relative to the completion of the British Museum, and all pains be taken to secure its being completed in such manner as to stamp it a national edifice worthy of the nation and of the name it bears—which it is not likely we can do, it being of the highest degree of importance, in making no pretensions to any sort of beauty. The subject is one which affords ample scope for the display of imagination and refined taste; and to what purpose, I would ask, are subjects of that poetical class—one so very unlikely there should be any after occasion for, proposed to architectural students at the Academy, if, whenever an actual occasion does occur, nothing better than ardent common-place, and dull humdrum, without even a particle of poetry in it, can be provided. Leaving you and your readers to crack me this question, I remain,

Yours, and all that,

BARTOS BRITANNICUS.

[For inserting the above, in addition to what has already been said in our Journal on the same subject, apology is unnecessary. It is one of exceedingly great importance, if not to architects in particular, to architecture and to our national credit in it. Either very much greater importance is attached to the Houses of Parliament and their embellishment than is consistent with public economy, or equal liberality ought to be shown in the case of the British Museum—that is, in regard to what now remains to be done to it. Whether it be now rendered a worthy monument of art, or not, a monument it will be, for ages to come, unless it should happen to be destroyed by fire—a calamity to be apprehended with an equal degree of consternation as if we can obtain no other pretensions. The obstinate silence maintained in regard to the design for the façade, is, however, of most evil omen in itself, and speaks a determination neither to show, nor to make any appearances of showing, the slightest deference to public opinion, unless upon the extreme compulsion of a general public outcry to that effect. We ourselves have done, and shall continue to do all we can to force the matter on the attention of our readers, but it is one that ought to be taken up earnestly by the whole of the public press—at least by that portion of it which affects to attend at all to the interests of art. Yet such is not the case at present; for although we do not stand exactly alone, in our anxiety as to the British Museum, there seems to be a strange reluctance on the part of the daily press to bring forward, or even touch upon, the subject in any way. We say “reluctance,” because a correspondent informs us that he addressed a letter to the Times newspaper, relative to the intended façade of the Museum, but it was neither inserted, nor made use of as a hint for any remarks on the part of that paper.—Ed.]

"THE LIGHT FOR ALL NATIONS" LIGHTHOUSE.

Sm.—He who builds a lighthouse on the Goodwin sands, builds an impenetrable name and a monument to his fame, not only as a skilful and Sublime. He is also as the enviable deliverer of thousands, and most probably of tens of thousands, of his fellow creatures from the jaws of destruction. The Goodwin bank, about 10 or 11 miles long from north to south, and between 3 or 4 broad, consists of finely comminuted particles of sand, firmly compacted together, offering a great resistance to the introduction of smaller bodies, but quickly entombing ships of burthen which are so fortunate as to be driven upon them, being, as William Lambert remarks in his Perambulations of Kent, written in the year 1570, "a most dreadful gulph and shippe swallower."

Many years ago the Corporation of the Trinity House formed the design of erecting a lighthouse upon these sands, but the idea was abandoned when, after boring to a very great depth, no solid foundation could be obtained; and since then, the most careful attention has been made to build a solid structure until the recent one of Mr. William Bush, whose plan was certainly an excellent one as adapted to sands of known superficial depth: but wholly irreconcilable with the con-

stitution of this particular embankment. Not having these experimental borings of the Trinity House before his eyes, and forgetting the golden maxim "Never to begin a thing until the end is well considered," he launched his caisson in an unknown void, to rest eventually on he know not what: for although he speaks of a rock bottom, this, at best, is but problematical, and our geological ideas lead us rather to infer that the under soil is analogous to the low coast around Pegwell Bay being intersected with chalk cliffs: be this as it may, it was absolutely necessary to the success of this particular plan, that the exact depth of the quicksand should have been previously as-
certained.

For carrying out the plan I am now about to propose, this preliminary step is not necessary, either than in choosing the site upon which to commence operations; and here I am far from thinking that the most elevated portion of the bank is the best for the purpose, from the simple reason that being the apex of the submarine hill, the sands are here most probably the deepest, but I would rather choose that portion of the bank which presents the most precipices front to the sea, for here it is highly probable the sands rest upon chalk hills or cliffs. The site chosen, let

A B C D, be a given area or superficial square, the angle A being towards the most violent action of the waves; at E, the centre of the square, let a circular well about eight feet in diameter be commenced, the masonry about two feet thick to be firmly cemented together, and so secured as to resist the pressure it must experience as it descends. Commencing at the lowest depth convenient, let the building be rapidly carried on until above high water mark, still continuing as the lower portion disappears, every means being used to facilitate its descent, should this be requisite. There is little doubt, however, of the building gradually sinking, the increasing weight giving the necessary impetus to its descent, and thus must it continue without reference to the depth, until it meet the consolidated bed on which the quicksands rest; this object attained, the sands are then abstracted from the well, and after the foundations are properly examined the whole is to be filled up with solid masonry.

Having by this central well ascertained the depth of sand, and the nature of the lower bed, proceed to form wells of magnitude and strength proportioned to the depth of sand to be passed through, at points, A, B, C, D, and simultaneously or consecutively the connecting well, as exhibited by the accompanying section, to be filled up in like manner: thus a coffer dam of solid masonry will be formed, from the midst of which the sands, if not very deep, may be abstracted, and solid masonry introduced in their stead, binding the whole as one vast solid foundation capable of supporting a noble edifice.

The idea above given, so far as regards building upon quicksands, is not original; for during my travels in India, my admiration has been more than once excited by vast piles of solid masonry having their foundations within the dry quicksand, a much more difficult undertaking I presume, than building upon the Goodwin Sands, which, from their compactness must offer great opposition to the intrusion of bodies of this nature. The beautiful Scotch Church at Madras may also be quoted as having its foundations laid within the quicksand, being pillared on a great number of wells, as suggested by native architects.

The whole of the walls, and the entire foundation being completed,
immense blocks of stone, contributing to bind the whole together, will then be laid upon it, beginning as far beneath the sand as practicable, and continued full twelve feet above high water mark, and upon this the shaft will be raised, the whole superstructure being left to the skill and taste of the engineer. I have only to add that the expense of the wells, however numerous they may be, will be comparatively trifling, and wholly unworthy consideration, taking into account the vast importance of this truly national undertaking.

ENGINEERING IN IRELAND.

IMPROVEMENT OF THE RIVER SHANNON.

Sir—I shall feel obliged by your inserting the enclosed paper, referring to a portion of the extensive improvements which are in progress in the river Shannon in the forthcoming number of the Journal. I forward with it a small plan of the site, shewing the weir A, B, and describing (by dotted lines) the three large portions into which the works were divided by dams, for the convenience of their execution.

I am, Sir,
Killaloe, County of Clare.

4th Sept. 1843.

Your obedient servant,

THOMAS BARTON,
Resident Engineer.

C.C.

C.T.

Scale, 500 ft. to an inch.

REFERENCE.

* C. C., County of Clare. C. T., County of Tipperary. A. B., The Weir. The bridge which crosses the river leads from Killaloe, county of Clare, to Fallafo, county of Tipperary. C., canal.

On Tuesday (22nd ultimo) the gallant Colonel returned to Killaloe for the purpose of witnessing on Wednesday, according to arrangement, the admission of the water to that part of the great regulating weir, which had lately been completed, but Old Shannon, grown impatient, would no longer be held in artificial bonds, and bursting forth, resumed his dominion, sweeping with magnificence and easy flow along the improved level of his bed, and thus anticipated the spectacle intended to have taken place on Wednesday.

In October last, a portion of the weir, on the Clare side of the river, amounting to 600 ft. in length, had been finished, and the water being turned over it, dams were made, and the Tipperary side of the river was laid dry for the purpose of reducing the shoal, and constructing the remaining portion of the weir, during which operations the river had been confined to a channel of one half its usual capacity.

The Shannon, at Killaloe, now flows over a line of weir 1100 ft. in length, and it is anticipated that this erection will effect a very considerable permanent reduction of the winter flood, and solve the problem (somewhat difficult to be understood by persons not conversant with the laws of fluids in motion, but which is clearly appreciated by the hydraulic engineer), that a Bar or Weir may be constructed across a river in such a manner as to obtain an increased discharge.

There is in the apex at the weir, a small deviation of level at one period, so formed as to assist in the annual migration of the salmon, a deep pool being constructed at the foot of the weir, opposite this point, for the purpose of facilitating the leaping of the fish, and at the termination where the weir adjoins to the rock on the Tipperary side, there is a roughly formed inclined plane, by which the young eels, spawned in the estuary, will be enabled to climb the summit of the weir, and pass into the upper waters.

Leaving the question of navigation untouched, some notion may be formed of the improvement likely to result with reference to drainage only, when it is stated that the maximum height of floods at Killaloe, have been known to attain to 9 ft. above the level of the apex of this weir, and that hereafter their utmost height will scarcely surpass three feet above the same datum.

It must be a source of peculiar gratification to Mr. Rhodes, the commissioners' principal engineer, to see, after years of unceasing study and anxiety, that his arrangements are attaining completeness, and evincing success such as could only follow the workings of a genius like his, so particularly fitted to this abstruse branch of the profession, and of which Lord Stanley, (then the Rt. Hon. E. G. S. Stanley) seems to have been so well aware, when, in 1831, he directed this eminent gentleman's attention to The Shannon, or our own Shannon, the dominant stream of Ireland, and the pride of British rivers!

T. B.

REVIEWS.


We have here an elaborate memoir of one of the greatest works of our Anglo-American brethren, a work entailing an expense of upwards of a million sterling, and of that colossal character as to take a high rank among the triumphs of engineering science. It is one of those works which the people of English race on both sides of the Atlantic can look upon with equal pride. We have no doubt that the elaborate and extensively illustrated volume of Mr. Tower will be acquired by many of our readers no less as a record of the Croton aqueduct, than of the high standing which the engineering profession has been taken in America, and of which its reputation is mentioned. To do adequate justice to it, it would be necessary to give several illustrations, and we hope at some future time to be able to do this. We make the following extract, to show the reason why the aqueduct form was adopted.

"Having fixed upon the Croton River as a stream possessing the requisite advantages for a supply, questions naturally arose as to the manner in which it should be conveyed to the city. The distance being about forty miles, over a country extremely broken and uneven, and following a direction for a portion of this distance, parallel with the Hudson River, encountering the streams which empty into it and form deep valleys in their courses. It will be interesting to notice the different plans which were suggested for forming a channel-way to conduct the water. The following modes were presented:—

1. A plain channel formed of earth, like the ordinary construction of a canal feeder—open channel, protected against the action of the current by masonry;—an arched culvert or conduit, composed essentially of masonry;
and iron pipes. In deciding which of these modes should be adopted, it was necessary to make a comparison among them as to their efficiency for conducting the water in purity, and in the quantity required, their permanency as structures, and their cost.

The advantages attendant upon an open canal were, that by filtration through the banks there would be a heavy loss of water,—the difficulty of preserving the water from receiving the wash of the country, and preventing injuries from the growth of aquatic plants. Avoiding these sources of injury, it is clear that the canals might be adapted to furnish the several consumption points, with the water which might be conveyed by passing through different earths. Evaporation would also occasion a serious loss of water. The banks would be liable to failure in seasons of long-continued rains, and the city depending upon this for a supply, would be exposed to the necessity of furnishing a supply during the period of repairs. The canal could never be subjected to a thorough repair, because of the necessity of keeping it in a condition for furnishing water constantly during the whole year, so that all repairs would be done under great disadvantages, and the channels would be perpetually subjected to the influence of the calimal climate. In regard to the open channel having the sides protected by masonry, the objections were found to be such as would apply equally to every species of open channel; namely, that it would be exposed in many situations to receive the wash of the country; that it would be unprotected from the frost, and liable to be interrupted thereby, and lastly, that there would be a loss by evaporation. It was supposed that these objections might be obviated by certain precautions; for example, the wash could be avoided by making sufficient side drains; and the interruption liable to occur from frost and snow, and the evaporation to a certain extent, could be prevented by closing the channel entirely with a roof over the top. The close channel or culvert, composed essentially of masonry, seemed to possess all the requisite advantages for conducting the water in a pure state and keeping it bền, strong, and durable, without any danger of failure, or giving rise to public calamity. In point of stability this plan had a decided preference over either of the other plans proposed, and the only objection offered was the cost of the work constructed in this way. To avoid too great expense it was proposed to make use of a mixed construction, using the open channel in situations where the requisite advantages afforded by the culvert could not be realized, and it would be desirable to fill in the earth again to the natural form, also where the line of aqueduct intersected villages, and using the open channel with slope walls for the residue of the distance.

In regard to iron pipes for conducting the water, it was found that a sufficient number of them to give the same sectional area as would be adopted by either of the other plans would be more expensive, and considering the great distance and the undulating surface over which they would extend, other objections were found to be inherent in this species of construction. In the opinion of the plan was considered inexpedient. Could a line be graded so as to give a regular inclination from the Fountain Reservoir to one at the city, then the expense of laying iron pipes for conducting the proposed quantity of water, would be greater than for constructing a channel-way of masonry; and when laid, the pipes were thought to be less durable. Should the pipes follow the natural undulations of the ground, there would be so much resistance offered to the flow of water that the discharge would be diminished in a very great degree.

The close channel or culvert of masonry was adopted as the plan best calculated to answer all the purposes of conducting the water to the city.

We should like the managers of the New River to read this, and see if they could not take a lesson from it with regard to their receptacles for dead dogs, ditch-water, and diseased baths, with which they supply the metropolis with pure water. The sooner that concern is centered over the better, the more creditable will it be to the managers, and the more acceptable to the community.

Illustrations of Indian Architecture from the Muhammadan Conquest downwards, selected from a portfolio of architectural drawings, from buildings at Agra, Delhi, Jaunpur, Benares Chunar, and numerous other places, by Mr. Kittoe Esq. (Parts 9 to 17, containing 21 plates.) Calcutta: W. Thacker and Co. 1845.

To us it affords great gratification to receive these new fruits of Mr. Kittoe's labours, whether we consider them as the productions of a gentleman of great taste and unexcelled skill, or whether liable to be commended with regard to their architectural influence. If there are still those who doubt that no new resources exist for art but in the plagiarisms and piracy of Greek design, let them examine these drawings, and see how oriental artists have avail'd themselves of the architectural ideas of the Greeks, and if possible, have improved upon and neglected by us alone.

The Greek, the Roman, the mediaeval were all alike, the Moor, was perpetually engaged in the delineation of so gay forms and the re-adaptation of well-known objects, while we, design ever we tread in the path of antiquity, find nature, as it were, Sir, acting beneath our fingers, and preserving no resource but the re-adaptation of objects formerly used, we have profited against such an ingenuity of industry and want of genius, against such invidious and thievish degradation of art; and we are glad to be reinforced by arguments so practical as those which are afforded in the works of Mr. Kittoe. If our reader be a lover of the classic or of the pointed style, he will find in the numbers before us numerous beautiful studies from objects which lie dismembered, broken, and scattered. In fact, where several of the plates of the present work laid before the connoisseur, he would be tempted to refer their subjects to the buildings of Athens, or the internal decorations of Pompeii, rather than to the far East. There are candelabra, tombs, arabesques, to which our associations would allow no other birth-place than the Pelasgic lands. On the other hand, there are monuments from Europe and America, where we retrace every lineament of the pointed styles. There is a great west window, which we might think of European origin. If we want to be convinced that art is catholic, and catholic because she must look everywhere to the beauties of nature for her inspirations, we find ample illustration of these far removed from European sympathies and European studies. We cannot, however, bring ourselves to believe that the monuments of classic genius to be found in western Asia, have been unstudied by oriental architects, and on the contrary, we are inclined to look here for another proof of the vitality of Hellenic principles. We do not believe that those who dwelt in the labours of Aristotle, and who preserved and reproduced the literary and scientific monuments of Greece, at the same time that they actively cultivated the liberal arts, could have been uninpressed by the material monuments or Greek genius, which were within their reach. We know that bigotry prevented many of the Mahometan literat, the geographers particularly, from availing themselves of contemporary information; but that certainly did not operate with the mass of enlightened and educated men, who showed every disposition to profit by those labours of the Greeks which were within their reach. We therefore believe that the architecture of the Moors was no more without the impress of Greek influence than was their science, and what we see in their various monuments tends to confirm us in those views. To all this antiquity led to a student of art we therefore recommend these engravings of Mr. Kittoe, for we cannot but believe that it must act as an encouragement to exertion, when it is seen how much has been done by those labouring under less advantages, and possessing less cultivation. Although the monuments described in those parts are principally of the Muhammadan period, yet they abound in features of interest, and Mr. Kittoe is particularly useful in giving numerous examples of details. In one or two of the plates will be found ingenious combinations of the dome and the pyramid or spire, producing a novel and striking effect.

In conclusion, we leave the work to the study of our readers, with an expression of our obligations to Mr. Kittoe for this employment of Indian residence. We sincerely hope that these labours will be continued, and that he will find his exertions have not been fruitless in calling attention to the state of the fine arts in our vast and neglected Indian empire.

The “Prince of Wales” Iron Steam Vessel. Built by Messrs. Miller and Ravenhill, Blackwall.

People are not generally fond of recording misfortunes and mishaps, though such a record would often be productive of great public advantage in preventing the recurrence of such events. Messrs. Miller and Ravenhill know, however, how to make the best of everything, and they have in a lithograph given us a representation of the “Prince of Wales” iron steamer, in a most perilous position.

“The vessel is entirely of iron, and is intended for the Margate station; she is 180 ft. long between the perpendiculars; in launching, the clerks on the bow gave way, in consequence of the bolts breaking, and let the vessel down, so that the bilge came in contact with the wharf; she was ultimately forced off by screw jacks and two tug vessels, cutting her away deeper into the concrete and planking of the wharf, until she assumed the position represented in the drawing, and at that period the distance measured from the face of the wharf to the point of contact of the vessel and the surface of the water was 110 ft.; the whole of the deck in the centre of the vessel was left unfastened for the reception of the machinery; when completely afloat, it was found that the sheer of the vessel was not broken, and that she had received no injury except that the bow was twisted in consequence of letting go the stern rope, and thus exposing the vessel to the sweep of a strong ebb tide. On examination it was found that three of the angle iron ribs or frames were broken, and one of the plates cracked, occasioning a considerable leak, which was accompanied by no other inconvenience than that of filling the bow compartment as far as the first bulkhead; and after bailing the vessel into dock, the necessary repairs were completed in 48 hours.

This shows what iron steamers can and do, and we feel indebted to Messrs. Miller and Ravenhill for giving us this record of an occurrence which only served to test the powers of the vessel in question, and to prove the care with which they had provided for its future efficiency.


The designer of these plates has been impressed with the necessity of a better popular acquaintance with the locomotive engine, now that it has become, as it were, a material institution of the country. He has consequently brought forward the present work, which consists of four lithographs drawn in chalk upon a bold scale, representing the external and internal structure of the engine in every detail. We only wish the letter-press had been more copious; however, it will be an acceptable work to those for whom it is intended.

View of the Parish Church of the Holy Trinity, with its proposed improvements, now in progress. By John Bloke, Architect.

This is a beautiful lithograph by Hawkins, and printed by Day and Haghe, in light and shade; the improvements have been judiciously introduced, and will add considerably to the beauty of the church; we could wish to see similar additions to more of our modern cheap-built churches, in which they are much wanted.

Old London Wall.—We are glad to be able to state that, in consequence of Mr. G. Godwin’s representation to the Institute of Architects, and a letter which that gentleman afterwards published in the Journal, a memorial signed by Mr. Hudson Gurney, Lord Melthon, Sir Henry Ellis, and other office-bearers of the Society of Antiquarians, and by Mr. Donaldson, Mr. Poynter, and Mr. Bailey on the part of the Institute, was presented to the Society for promoting the building of churches in the metropolis; and that on the motion of Sir R. H. Ingles, it was resolved that the wall should be preserved entire.

Improved Drawing Scales.—Mr. J. Smith, lecturer and teacher of perspective, has prepared for the use of the profession drawing scales, formed in brass and ivory, of very superior workmanship, and at an unusually low price, when compared with those in common use. They are divided with great accuracy, and although several scales are upon some of them, there is not that confusion in the figures too often witnessed. Nos. 1 and 4, are arranged for architects; Nos. 2 and 5, for land surveyors and civil and military engineers, and No. 6, is expressly prepared to simplify the practice of the geometrical, perspective, a system of drawing which ought to be in more general use than it is at present.

Improvements on Bromielaw Harbour and River Clyde.

The following interesting description of the works that have been executed on the River Clyde, and for which we are indebted to the Glasgow Herald, shows what continuous exertions directed in the right way will do in effecting improvements of rivers, there are several of our most important rivers which might be equally improved, no being silted up, and which in a few years will be almost useless as harbours.

“We are delighted,” says the Glasgow Herald, “to observe the rapid progress made the last two months in the works which have been for a considerable time in operation for the improvement of the river Clyde at the Bromielaw, and which, when completed, will most amply supply the wants of the trade for years to come. The works upon which the Clyde Trustees, by means of their able engineer, have of late been bestowing their principle attention are—first, the new harbour below Napier’s Dock; second, the new basin and sluices for the Glasgow and the accommodation Bridges; third, the additional timber wharf at the Glasgow Bridge for river steamers; and, fourth, the cutting of a new deep channel through the Port-Glasgow bank. Having seen the state of the works so recently as Saturday last, (Sept. 16) we should say that all of them will be finished within a week or ten days from this day, and some of them finished, too, in a manner so massive and substantial, that they promise to resist the action of the elements, and the wear and tear incident to the operations of commerce, for ages to come. The accommodation within the harbour will then stand as follows:—

- Length of quay walls on the north side of the harbour 3700 feet.
- Length of quay walls on the south side of the harbour 2300 feet.
- The new quay in the course of formation on the north side, below Napier’s dock, 550 feet.
- The new timber wharf in the course of formation on the north side, between the bridges 530 feet.
- Total accommodation at the Bromielaw 7050 feet.

In addition to this, a ruble dyke has been formed on the river-side ground recently acquired below Todd’s mill; which, by the excavations made, has added a space of 100 ft. to the breadth of the river for 800 ft. downwards, and from which 25,000 cubic yards of earth have been removed in the course of the excavations. This, it may be observed, is only the first step in a series of operations which will eventually have the effect of widening the harbour from 160 ft. (its present breadth at the Kinning-house Burn) to as near as may be 400 feet throughout. The excavations at this spot have already extended to nearly 200 feet below water, and it is expected that further operations will be carried on and deepened until there is at least 12 ft. below low water line, which at high water, in ordinary tides, will at all times afford from 19 to 20 feet in the harbour. In addition there is the basin at Bowling, 10 miles below the Bromielaw, which is employed for the laying up of large ships and steamers during the winter months. The basin contains an area of 11 acres. The extension of the harbour between the bridges for small craft is generally looked upon with much satisfaction. It has been long batted for, and is now effected.

In the weir which so long obstructed the navigation at the Glasgow Bridge has now been as near as may be removed, and a new weir has been placed down at the Stockwell Bridge for the maintenance of the top level of the river for the purposes of the Water Company at Dalarnock. The removal of the old weir has been very effectually accomplished, considering that 15,000 cubic yards of stone and earth have been carried away, and from 500 to 600 tons drawn. The depth of water already obtained between the Bridges at full tide is 11 ft. and that the weir is nearly removed, it will afford accommodation for timber rafts, and all the small craft without danger of any kind; and the time is not far distant when the river steamers will be provided with tumbling funnels, as upon the Thames and the small craft with folding masts, so that the benefits of steam navigation and of commerce may be brought almost to the heart of the city.

In the operations during the present summer, in cutting a channel through the long obstructing Port-Glasgow bank, have been of the utmost importance to the navigation of the river. The cut formed by the dredging machines extends to about 700 yards in length, by 400 feet in breadth, and the depth of water is 22 to 23 ft. which there is now a depth of 12 ft. of water at low tides, there is no less than 22 to 23 ft. 6 in. at high water in spring tides. Last year not fewer than 90,000 cubic yards of stuff were excavated in making the cut through the bank, and this season the excavations amount to 70,000 cubic yards, giving a total of 160,000. When it is considered that this was one of the greatest obstructions in the river, and that there have been some times from 10 to 15 vessels lying aground on it, we cannot too highly re-joice at its removal. Since last summer there has not, so far as we know, occurred any vessel capsize in this course in sailing river or through the other channel; and when we mention that this season the Commodore 16,730 tons, and other ships in the American trade, sailed up the Clyde to the Bromielaw, drawing 17 ft. 9 in. water, it will give one instance, out of many, of the lengthened which the capabilities of our river now extend. In addition to the local requirements which will be derived from the cut in the Port-Glasgow bank itself, it may vastly facilitate the navigation of the river in other respects, permitting;
upward passage of a vastly additional quantity of tidal flow. We cannot con-
duct these works without bearing our warm testimony to the liberality and
enterprise of the members of the River Trust, who have directed and
the ability of Mr. Bald, their engineer, who has planned and executed, these
stupendous works, and when we consider that within a comparatively recent
number of years, more than half a million of money has been sunk in these
operations, and that the revenue varies from £42,000 to £47,000 per annum,
we may well say that there is scarcely a similar instance on record of such
vast enterprise and such rapid advancement."

ORDNANCE SURVEY.

We are not of those who entertain prejudices against or for the Royal
Engineers or any other class, we are staunch supporters of that eminent
body, when engaged in the discharge of their legitimate duties, but we could
not have been so many years employed in watching the interests of both
military and civil engineers, without seeing that a very general demand has
been made to introduce the government officers as competitors with their
civil brethren. Government no more wants an exclusive corps of civil en-
gineers than it wants an exclusive corps of architects or lawyers; but as a
matter of economy, it is of course right that it should avail itself of the
services of the military officers at its disposal for its own works. It is, how-
ever, quite clear as a settled principle of political economy that it is most
dangerous for a government to meddle at all with the general market of labour,
for the competition of the open market is greater than is required for the discharge of military duties, and work has not only to be made for them, and to be made at the expense of private professional
parties, it becomes a great grievance. The want of adequate responsibility of
the royal engineers, and the evil attendant upon their employment where
they are not required, is well shown in the following letter; and it must be
obvious to every man of common sense that the deployment in experi-
ence of Survey, of England, Ireland or London, must have the same ulti-
mate effect, upon the members of the engineering profession, as the employ-
ment of paupers from workhouses to ruin the existence of the poor semp-
stresses and shirtmakers, about which so much outcry has been made. At
the present moment there is a greater dearth of employment in the engineering
profession than at any time for the last thirty years, and when a legit-
imate occasion for occupation occurs it is to be given to men who have no
impulse to adequate exertion, and no prenary penalty to check their errors
or their ignorance. We say with the writer, that this state of affairs chains
redress.

TO THE RIGHT HONOURABLE SIR E. PEEL, Bart.

Sir—It appears by the Parliamentary reports in the newspapers, that you
have moved for leave to bring in a bill relative to a survey and the construc-
tion of maps, on a large scale, of the city of London: I trust it will not
be deemed the impertinent intrusión on my part to make a few observations in
connexion with this undertaking. It has not yet been formally declared who the parties are that will be
entrusted with the execution of this important work; conjecture, however, has
awarded it to the Royal Engineers, setting nominally under the Board of
Ordnance. I have watched the proceedings of these men for years with a
lively interest; early associations have, in some measure, excited that inte-
rest and kept it alive. Being intimately acquainted with their modes of
operation, and enabled thereby to form correct conclusions relative to their
value as practical men, I now come forward to depreciate the measure which
would entrust to them the survey of the city of London, and to contend for
the propriety of its being left open to competition.

You, doubtless, will be furnished with an estimate of the time and expenses
necessary for the execution of this important service. But the estimates by
which these rates were the data which would determine your choice of parties, the
Royal Engineers would at once crush the pretensions of all competitors; but per-
mit me to ask, have the estimates heretofore made by the Royal Engineers,
relative to works of this nature, proved correct? It is most notorious that
they have not. You are aware that the survey of Ireland has been executed by
these persons; this undertaking was commenced in 1824, the estimated
time for its completion being seven years, the actual time three years,
£300,000, had subsequent experience proved the truth of this? No, it proved
its utter fallacy: you, perhaps, will be surprised to hear, that far from bear-
ing out the previous estimate, the scientific operations of these seven years
were almost, if not entirely, useless; the maps and other documents proved so
grossly incorrect—so utterly unfit for the purpose for which they were
designed, that the greater part of them were ordered to be destroyed. Thus,
Sir, and for these reasons were the materials which bore the impress of the
concentrated talent of five captains and twenty-five lieutenants of the Royal
Engineers, for a period of seven years, reduced to their primitive elements:

the survey of the island was not completed till 1832, and it incurred an ex-

But a specious objection may here be started—It may be said that
the above would be unfair premises to draw conclusions relative to the
present claims of the Royal Engineers, insomuch as they were at the time
alluded to comparatively inexperienced. I shall not wait to discuss the merits of
this plea, but I shall meet the objection on its own ground. In 1841, an act
was passed for the survey of the six northern counties of England, the
estimated time for its execution being six years; this period has now
already elapsed, and there is not one county finished yet. The expense, up
to the present time, is about £120,000, or £60,000 a year; the quantity sur-
veyed at present amounts to about 2,000,000 acres, and before the mapping
and calculation of this will be finished, three years will have expired. We
are here furnished with data to find the expense of this survey, and the
time of its completion. The counties of the six northern counties were

Then, by a plain statement in the rule of three, if 2,000,000 acres require
three years for its completion, 8,327,200 acres will require about twelve years.
So that though the Act contemplates that this survey will be finished in
1847, it will not be completed till 1858, and will incur an expense of
£700,000.

You may now judge, Sir, what effect the experience of the Royal Engineers
has upon their estimates. And will you, Sir, permit the continuance of such an
expensive system at a period of such financial embarrassment as the present?
Let an examination be made before the House of Commons into the past
history of the Ordnance survey of Ireland, and the history of the Or-
DANCE survey of England, which is at present in a state of progress—let per-
sons be examined who will give plain facts as to the progress of the work
and the outlay of public money—let some of the most intelligent of the Royal
Sappers and Miners, and assistants, be examined before the House, and
afterwards you can judge of the propriety of entrusting to the Royal
Engineers the survey of London. Captain Boldero's reply to a question
lately made by Lord H. Vansittart, on the present state of the
Government gross misconception relative to the present state of the survey
of the six northern counties. The proceedings of the Royal Engineers have
been ever miscellaneous; in 1835, an Honourable Member moved for an exami-
nation into the state of the Ordnance survey of Ireland, but Sir H. Vivian
assured the Honourable Member that the work was getting on rapidly, and
that an examination would only cause delay. When this assurance was
given the Ordnance surveyors were plodding their weary way over a district,
the survey of which had been previously executed so incorrectly as to need
a complete revision.

Since their arrival in England the Royal Engineers have adopted a line of
conduct which strikes at the very vitals of a respectable profession—on the
introduction of the competition with the civil surveyors of En-

and I refer to their contracting for the surveying of townships for tithe
commutation, their estimates of which work are so low as to wither in the
breast of the civil surveyor every hope of successful competition. But, Sir,
in point of accuracy, they may be ranked with the other estimates spoken of
they are utterly false. I challenge contradiction when I assert that the
actual expense of the tithe plans executed by the Royal Engineers is far
beyond the estimated expense, so that the public service must suffer from such
undertakings.

Now, Sir, contrast the case of these men with that of a body of civil sur-
veyors similarly circumstanced: the latter have a professional character at
stake—the former need not rely on theirs. The Royal Engineers may cal-
culate on their salaries, manage all their blunderings—the civil surveyors
have no such prop. The Royal Engineers have a ready salvo to their mort-
make—why the public curse is their panacea—the civil surveyors have nothing
but their talents to bear them out, and a single error such as those which are so
common with the Royal Engineers would injure their professional charac-
ter for ever.

These, then, Sir, are the grounds on which I contend for the survey of
London being left open to competition. I am satisfied that the civil pro-
Fession are able to do it as correctly, as quickly, and more cheaply than the
Royal Engineers. Let engineers and surveyors put in tenders for certain
sections in the metropolis, all to be executed on a uniform system;—let all
parties be bound to a certain time;—let the Ordnance surveyors put in
tenders also, but let them stand on their own merits—let them have no funds
to fall back on, nor have the secretory loss be the result of any error in their
estimates, and the issue will prove that

the civil profession are able successfully to compete with them.
I would not have you infer from what I have stated that the Ordnance survey is altogether wanting in point of talent; I am free to admit that there are many intelligent, respectable men connected with it; but I do contend that the portion of the public which has been best able to procure the best draftsmen in Europe at the rate of 2s. 6d. and 3s. a-day. I willingly admit that, at the present moment, there are first-rate draftsmen on the Ordnance survey, who are condemned to tell for this miserable pittance; but does not the individual glory in his shame? He would thus make a boast of his ability to crash merit and I appeal to you, Sir Bobert, what interest will a man of talent take in that situation, the pecuniary elements of which amount to no more than 2s. 6d. or 3s. a-day, and even that much lessened by travelling and other expenses incidental to the emigrating life of the operative Ordnance surveyor? I could abundantly prove the fallacy of a system of economy which would treat deserving men thus; and could show that the best, and ultimately the cheapest, mode of proceeding would be, to make a situation on the Ordnance survey worth holding, to pay the man of merit properly, and thus excite in him an interest in the work entrusted to him for execution.

Another cog on the proceedings of the survey is the employment of persons at a still lower rate of pay than the above; several of whom are utterly unfit to take any part in the undertaking; the great majority of those employed belong to this class, and their misery beggars description. If the limits of a letter would permit me, I could detail to you the sufferings of numbers of unfortunate Irishmen, who, after having been lured from their homes by *a quid futura hanc* hope, have been dismissed without a fault from their employment, and thrown upon the world hopeless and penniless, in a country where the majority of the people are of the name of Irishman. I could show you the quondam Ordnance surveyor starving at the Workhouse door for a morsel of bread, and more than once repulsed as an impostor. I could show you the faithful servant of the survey toiling along a mire road on public business, on a tearful sight in D-cember, the rain and snow beating in his teeth, until, overpowered with toil, he sinks and dies, while his helpless body, instead of receiving decent interment, is thrown like a cowardsly clog to the grave, at the expense of the parish in which he lost his life.

I know there are persons whose interest it would be to damn the credibility of what, in their parlance, will doubtless be dubbed "an anonymous scribbler;" but with reference to such I have to say, let them contradict me if they can. Why, I would ask, is there not a single Englishman employed on the Ordnance survey—because he would spend the paltry meed which the rulers of the survey would offer for his services. The Ordnance surveyors are, to a man, natives of Ireland. I have before stated there are many men of talent to be found among them, but the most unfair advantage has been taken, both of the peculiar circumstances of these men, and those of their country. It may be thought that I have wandered from the proper topic in the course of this letter—that I have forgotten the subject with which I commenced; but this, Sir, is not the case. The revealing, though partially, of the machinations of the Ordnance survey, and the treatment with which those employed on it receive, at the hands of its lords and masters, will, I trust, strengthen the creed of what I have before stated—that *The civil profession are not able to execute such works as the Government propose, unless they have the power of compelling, by Royal Engineers,* and that, therefore, the work should be left open to competition.

Election of City Surveyor.—A Court of Common Council was held on the 19th of September for the purpose of electing a clerk of the works, in the room of Mr. Montague, deceased, when Mr. Bunning was chosen by a majority over Mr. Young, who had been several years principal clerk in Mr. Montague’s office. The numbers were—

For Mr. Bunning, or Mr. Young—

Mr. Bunning—120
Mr. Young—100

Steam Plough on Loch Lomond.—Lately Mr. Curtis, the eminent engineer, invited about 20 of his friends to witness the machinery connected with this plough put in motion; and it was truly astonishing to see such an immense fabric travel with the greatest facility over ground so soft that a man can scarcely stand upon it without sinking. Mr. Curtis politely explained the objects of the different parts of the machine; and, so far as an unprofessional person can judge, the principle of the construction appears sound, and we have no doubt that when completed (which it will be in a short time), it will fully answer the purpose.

Reclaiming Land from the Sea.—The sea banks at Long Sutton, Lincolnshire, under Sir John Licmee’s direction, are now nearly finished. The contractor for the work is Mr. Henry Sharpe.
South Western.—The accounts of this Company showed a slight increase in the traffic, but the savings in the working expenditure had been counteracted by the great increase in parochial rates. The dividend was 3s. 6d. per share for the half-year. The major feature of the discussion was the division of the branch being likely to be made between the secretary, a Mr. Mitchell, who was a country school-master, having ousted the engineer, had installed himself in that capacity too, so that the profession is likely to see some strange performances. The traffic, and the whole concern, is in a wretched condition, but the reports published do not admit of particulars being given.

Glasgow, Paisley, Kilmarnock & Ayr Railway.—The passenger traffic is reported to have remained stationary, the goods to have advanced. The Kilmarnock branch was opened on the 4th of April; an arrangement with the competing canal company had been effected. The subject of steam boats in connexion with the railway, was recommended to the proprietors, but nothing effective seems to have been done. The proceedings principally relate to this subject, and the means of effecting a saving in the working expenses were urged.

West London Railway.—The works on this line were reported at the half-yearly meeting to be going on well, and the opening is promised for November. The total disbursements are £14,967.

London and Croydon Railway.—The half-yearly meeting of this Company was marked by a long inspection from Mr. Wilkinson of the conduct of the Croydon Board as to the toll transactions, and the announcement of the Glasgow offer alluded to above. The traffic had of course, in the state of the toll question, shown no improvement.

Manchester and Birmingham Railway.—This line is not yet finished, and the secretary, a Mr. Mitchell, who was a country school-master, having ousted the engineer, had installed himself in that capacity too, so that the profession is likely to see some strange performances. The traffic, and the whole concern, is in a wretched condition, but the reports published do not admit of particulars being given.

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BERRYSBERY and Eastern Railway.—A meeting of this Company has been held for the purpose of authorizing a loan of £67,822 for the extension to Newport. At this meeting it was announced that measures were in progress for an extension to Brandon, so as to make a complete line from London to Norwich and Yarmouth.

REGISTRATION OF DESIGNS ACT.

A new act of Parliament came into operation on the first day of September last, which promises to be of some benefit for many purposes, but not so that to that extent of which our contemporaries imagine, since the articles only obtain a protection so far as the configuration goes. The act does not in any way protect a principle; therefore, if the article manufactured parake of the form of a circle, and another article for the same use be made in the form of an ellipse, there will be no protection. The following is the principle clause of the act—

"And with regard to any new or original design for any article of manufacture having reference to some purpose of utility, so far as such design shall be for the shape or configuration of such article, and that whether it be for the whole of such shape or configuration or only for a part thereof, be it enacted, That the proprietor of such design not previously published within the United Kingdom of Great Britain and Ireland or elsewhere shall have the sole right to apply such design to any article, or make or sell any article according to such design, for the term of three years, to be computed from the time of such design being registered, according to this Act: provided always, that this enactment shall not extend to such designs as are within the provisions of the said Act, or of two other Acts passed respectively in the thirty-eighth and fifty-fourth years of the reign of His late Majesty King George the Third, and intituled respectively an Act for encouraging the art of making new models and casts of boats, and other things therein mentioned, and an Act to amend and render more effectual an Act for encouraging the art of making new models and casts of boats, and other things therein mentioned."

The following is the Table of Fees which since the passing of the Act have been authorized by the Lords Commissioners of the Treasury.

<table>
<thead>
<tr>
<th>Stamp</th>
<th>Fee</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>£ s d.</td>
<td>£ s d.</td>
<td>£ s d.</td>
</tr>
<tr>
<td>Registering Design ... ... ...</td>
<td>3 0 0</td>
<td>3 0 0</td>
</tr>
<tr>
<td>Certifying former Registration ...</td>
<td>5 0 0</td>
<td>5 0 0</td>
</tr>
<tr>
<td>Registering and Certifying Transfer ...</td>
<td>5 0 0</td>
<td>5 0 0</td>
</tr>
<tr>
<td>Cancellation or Substitution ...</td>
<td>1 0 0</td>
<td>1 0 0</td>
</tr>
<tr>
<td>Inspecting Index of Trials ... ... ...</td>
<td>1 0 0</td>
<td>1 0 0</td>
</tr>
<tr>
<td>Inspecting Designs (expired Copyright) each ...</td>
<td>1 0 0</td>
<td>1 0 0</td>
</tr>
<tr>
<td>volume ... ... ... ... ... ... ... ... ... ... ... ... ...</td>
<td>1 0 0</td>
<td>1 0 0</td>
</tr>
<tr>
<td>Taking Copies of ditto, each Design ...</td>
<td>2 0 0</td>
<td>2 0 0</td>
</tr>
<tr>
<td>Inspecting Designs (unexpired Copyright) each Design ...</td>
<td>5 0 0</td>
<td>5 0 0</td>
</tr>
</tbody>
</table>

We know not upon what authority a £5 stamp is inflicted by the Lords Commissioners, not one word in the act authorizes it; we therefore contend, that they have no power to order one to be affixed, and that if the person concerned refuses to register a design without the £5 stamp, upon the fees being tendered, he will, no doubt, render himself amenable to the law for damages, and that, if an application be made to the Court of Queen's Bench, it will grant a mandamus to compel him to register and certify.

LIST OF NEW PATENTS.

GRANTED IN ENGLAND FROM AUGUST 31, TO SEPTEMBER 28, 1843.

Six Months allowed for Enrolment, unless otherwise expressed.

Charles Louis Felix Franchot, of Arundel-street, Middlesex, engineer, for an improved method of connecting and laying pipes or vessels beneath the surface of water, for the purpose of forming therewith tunnels or windfalls for the conveyance of passengers and goods.—August 31.

George Callio, of Queen-square, Bloomsbury, Middlesex, artist, for improvements in the construction of vessels for navigation, designed to prevent the loss of life in cases of shipwreck or other accidents at sea.—September 4.

William Thomas, of Cheapside, merchant, for an improved fastening for wearing apparel, and which may also be applied as a fastening to portmanteaus, bags, boxes, books, and other things. (A communication.) September 4.

Alexander Spears, of Glasgow, merchant, for an improved fastening for vessels to fasten to, a glass bottle proper for vices and other liquids. (A communication.) September 6.


William Denly, of Hain street, Sloane-street, bricklayer, for improvements in the construction of fire-places, flues, and chimneys. September 21.

John Baptist Wickes, of Leicester, framework knitter, for improvements in machinery employed in the manufacture of framework knitted and bugged fabrics. September 21.

George Robert D'Harcourt, of Argyll-street, Middlesex, gentleman, for improvements in sorting, checking, and delivering letters, newspapers, and other articles. September 28.

Omitted in last month's list.

John Charlton, of Birmingham, factor, for improvements in castors for furniture. August 17.

MISCELLANEA.

Midland Counties Railway.—The platform across the Trent at the Weir, building by the Midland Counties Railway Company, has all been carried away by the floods; the works are going on slowly, and in a different manner from the first. September 6.

Canals in France.—A canal is now in progress in the south of France, under the direction of Mr. Thomas Woodhouse, C.E., formerly resident engineer on the Midland Counties Railway.

Manufacture of Bricks.—A description of brick is made in the neighbourhoud of Nottingham called copper mond. They are compressed after partial drying in hatches; the arris is very sharp, and equal to dressed bricks.

Derry Drainage.—The Commissioners intend to apply to Parliament for a new Improvement Act, and several plans have been proposed for improving the drainage, relieving the town from flood waters, and improving its present dangerous and unhealthy state. Two reports have been published, one by Mr. Henry Harrison and another rather lengthy by Mr. John Rees, Assoc. Inst. C.E.

Steamers on the Trent.—A twin boat is building at Lenton, to ply between Nottingham and Gainsborough, to carry both goods and passengers.

Newcastle-on-Tyne.—An opposition boat is to start between here and London. It is expected to be a rival to the Steam Navigation Company, the fare to be 30s., instead of as at present 42s.

Edinburgh.—A tunnel is being driven from the present terminus of the Newtyle Railway to the centre of the market place; and a line has been projected to Berwick, under the auspices of Mears, Grsnger and Miller, engineers.

The East Church adjoining the Steeple Kirk, which was burnt to the ground about two years ago, is now beautifully restored, and will be shortly opened for use; it is in the florid Gothic style, and of excellent workmanship.

Sir Walter Scott's Memorial.—It is now completed to a short distance above the arches, which carry the cross or about one-third of the whole height; the situation, on the south side of Princes Street, is well chosen, and when complete it will be the boast of Scotland as to masonry.

Incorporated Companies.—At the head meeting day of the company of house carpenters, a vote of thanks was passed to Mr. Henry Glyn, for a presentation of five pipes of books, bound in the Civil Engineer and Architect's Journal from its commencement in 1837.

St. James's Palace.—We understand that the whole suite of State apartments, at St. James's Palace, is about to undergo an extensive and thorough repair, cleaning, and decoration. It is expected that the apartments will not be again ready for royal use for several months, probably not until the early part of next spring.

The Princess Alice.—A new iron steamer, built by the well known firm of Messrs. Ditchburn and Main of Blackwall, for the Folkestone and Boulogne station made a trial down the river Thames, on the 2nd ult.; she is 12ft. long, 20ft. in beam, and the upper deck is built two-thirds on the main deck, as all steamers ought to be; her lines are very fine and of that form which is sure to obtain a good velocity. The engines are 120 horse power collectively, and have the annular cylinders patented by Mr. Joseph Maudsley, drawings of which are to be found in our Journal for 1841, Vol. 4, p. 364. The object of this form of engine is to obtain direct action and a long stroke, but we are not admirers of the principle, nothing but the superior workmanship of the firm of Messrs. Maudsley & Field could ensure its working; in such an exposed station as crossing the channel she will have some rough work to encounter. The water tanks are 19 ft. 3 ins. in diameter at the extreme edge of the boards, they are a modification of Morgan's wheels, excepting they have three of the boards connected in such a manner that by the aid of an eccentric on the shaft, the paddle boards enter and leave the water vertically, these wheels are spiral cut, and are engaged like a thin cog wheel, and is turned by means of a pinion worked by one or two men on deck to each wheel; by this means a vessel might get out of dock without getting up the steam. At the trial of the vessel the engines made 30 to 31 strokes per minute, and it is stated to have obtained a rate of 14 miles per hour. Her engines are fitted with an alarm whistle which we have selected at some of our provincial ports.
DIRECT ACTION ENGINES.
(With an Engraving, Plate XIII.)

Description of a pair of George Forrester & Co.'s improved Double Cylinder Marine Engines, constructed by them, and fitted on board the "Helen Mon Gregor," Hull and Hamburg steamers. Engines invented by Benjamin Hicks, of the above firm, Liverpool.

These engines are of the form usually denominated "Direct Action Engines," but differing considerably in arrangement, and possessing many advantages over the various forms of direct action engines heretofore made.

The collective power of the engines is 220 h.p. The accompanying engraving represents a perspective view of one of the engines when looking towards the boiler, with part of the boat in section. Each engine consists of two inverted cylinders, a, a, mounted upon four strong wrought iron columns, b b, &c., which are secured at the lower ends to the foundation plate, e, and passing through suitable boxes on the sides of the cylinders, and secured by means of nuts at their upper ends immediately to the entablature plate and crank pedestals, d, above. The cylinders stand "athwart ships" with their stuffing boxes, e e, looking downwards, and at such a height from the bottom of the vessel as to allow the main cross bar, f f, which connects together the two piston rods, g g, to work the full length of its stroke below them: the stuffing boxes are made double; that is, they have a space for packing, both top and bottom, and are fitted with self-acting oil cups for lubricating the rods: h is a long connecting rod, by means of which the power is transmitted directly from the main cross bar below, to the crank, i, above the cylinders. In order to ensure an equable action of the two piston rods and their connecting cross bar, they are further secured and made to work uniformly together, by means of a strong cast iron vibrating frame forming part of the parallel motion, and which, with side levers, K K, serves also to work the air-pump, l l, as well as the feed pump, n n, and brine pumps. The paddle shafts, p p, wheels, and bearings, are constructed in the usual manner. The slide valves are of the usual, 12, form. The condenser, m, is placed immediately underneath the slide valve case, and the air pump, foot and discharge valves, are arranged as shown, being very similar to those of the ordinary side lever engines. The connection between the air pump and condenser is underneath the foundation plate, r, so that the hot-water from which the waste water is discharged by an overflow pipe through the vessel's side in the usual way. The cross forming the support of the side levers is of wrought iron. When working, these engines are remarkably steady, there not being the slightest perceptible tendency to motion in any part of the framing. It is well known that in all reciprocating engines, of whatever form or construction, the parts of the engine subject to the greatest strain, are those which lie between the point at which the cylinder is secured, and the centre of the crank shaft, to which the power of the engine is communicated; hence in this engine, only the portion of the framing through which the power of the engine is transmitted, is from r to s, and there is no other part of the engine framing whatever subject to the strain of its power, except the short space intervening these two points. The elevatcd position of the cylinders also secures them from liability to water from the boilers, as they are at a higher level than the water in the tanks, and accidents from the above cause (to which marine engines are frequently subject) cannot occur. The space occupied by the cylinders is so much above the engine house floor, that there is considerable more space below in the ordinary engine, to get round about the working parts, which are all below, and occupy a comparatively small space underneath each set of cylinders; both the upper and lower covers of the cylinders are removable, and by taking off the upper ones only, there is clear room (without the intervention of the piston rods) to examine and clean the pistons, or adjust them, without disturbing the stuffing boxes below, or uncoupling any further part of the engine. The position of the condenser and air pump is such, as to render them accessible on all sides, and the condensers being directly below the slide valves, the exhaustion is rendered more immediate and perfect, by its proximity to the openings of the cylinders. The connecting rods are necessarily of great length, and the strain and consequent friction to which engines with short connecting rods are subject, is thereby overcome. The motion of the air pump, as in the side lever engines, is effected upwards whilst the pistons are descending, and the weight of the air pump, bucket, cross head, &c., counterbalance that of the connecting rod and its appurtenances. There is a clear passage between the engines, below the cylinders, on the engine floor, and from this point all the working parts of the engines are within reach of the engineer. The saving of weight and space is very great as compared with that of the ordinary marine engine. The total length of room occupied by the above engines and boilers is 90 tons of coal, is only 31 ft. 6 in. from bulkhead to bulkhead. The centre of gravity of engines and boilers is not higher than that of the ordinary marine engine, and the saving of weight renders that of engines, boilers, and boat considerably lower.

It may be observed, that in principle of action there is nothing new in these engines, steam of 5 lb. pressure is used in the boiler, and the slide valves cut off steam at three-fourths of the stroke. The novelty consists merely in using two inverted cylinders, and in the particular mode of Disposeing the different parts, and so arranging them, as to confine all the requisites for a more effective and durable engine with the greatest possible saving of weight and space.

The boilers are of the tubular form, and are the first of the kind made at Liverpool; they generate an abundance of steam, and have brine pumps attached. An apparatus is fitted to each fire-place for consuming the smoke, upon the principle of admitting heated air.

The following are some of the principal dimensions, &c., of the engines:

<table>
<thead>
<tr>
<th>Engine</th>
<th>Diameter</th>
<th>Length of stroke</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinders</td>
<td>42 in.</td>
<td>4 ft. 6 in.</td>
<td>33 lb.</td>
</tr>
<tr>
<td>Air pump</td>
<td>33 in.</td>
<td>4 ft. 4 in.</td>
<td>41 lb.</td>
</tr>
<tr>
<td>Capacity of condenser</td>
<td>as air pump</td>
<td>41 cubic ft.</td>
<td>41 cubic ft.</td>
</tr>
<tr>
<td>Wheel</td>
<td>3 ft. 6 in.</td>
<td>as air pump</td>
<td>36 cubic ft.</td>
</tr>
<tr>
<td>Number of revolutions</td>
<td>180</td>
<td>as air pump</td>
<td>36 cubic ft.</td>
</tr>
<tr>
<td>Pressure of steam in cylinder</td>
<td>33 lb.</td>
<td>as air pump</td>
<td>as air pump</td>
</tr>
</tbody>
</table>

The vessel is of iron, and one of the strongest hitherto constructed. She is divided into five compartments by strong water-tight bulkheads; her speed by the log during a late trial trip, was 12 knots, (engines making 23 revolutions per minute,) and having 200 tons of coal and cargo, dead weight, on board.

Dimensions, extreme length, 175 ft.; breadth, 25 ft.; depth, 16 ft.; burthen, 573 tons; draft of water with 400 tons dead weight, 11 ft.

This vessel is the last of between 50 and 60 built by Mr. John Laird, who, we are happy to hear, has now on the stocks an iron frigate of 1400 tons for Her Majesty's service, as well as several for the Honourable East India Company, and other parties.

REMARKS UPON THE PRESENT STATE OF THE HARBOUR OF CORK AND THE RIVER LEE.

Communicated by George White, A.I.C.E., &c.

The eligibility of Cork as a harbour is so generally known, that it would be superfluous, on the present occasion, to dwell at any length upon its merits. It may not, however, prove uninteresting to take a short notice of its capabilities as a place of refuge. Considering the spaciousness, security, and other advantages which this harbour possesses, it appears difficult to account why Waterford should have received such favour in the late inquiry before a select committee of the House of Commons, instituted for the purpose of determining the most proper station for a mail communication with the south of Ireland, the latter being, as is well known, a bar harbour, having only ten feet water over it at low spring ebb, besides other disadvantages, with which nautical men are well acquainted.

Cork is the only place on the south coast of Ireland fit to accommodate ships of the line, with the exception of Bantry Bay. There are, perhaps, few natural harbours so perfectly devoid of danger; the

* See Evidence of William Preston White, Esq., Harbour-master, in the Parliamentary Reports of 1812.
only obstruction of any note (if such it can be called) is the Harbour Rock, which is a pinnacle of such small dimensions as to be easily removed by blasting; accidents are, however, of such very rare occurrence, as to render such a precaution unnecessary. The soundings outside the mouth of this harbour are so regular, as to enable ships to run it in thick fog or foggy weather by using the lead, an advantage which Waterford does not possess, the entrance being very rocky, and the soundings consequently irregular. The accommodation which Cork is capable of affording is great beyond conception, as many as 500 sail of vessels having frequently enjoyed its shelter. Its storehouses are on an extensive scale, occupying the greater portion of the island of Haulbole. The most interesting part of the subject, however, in an engineering point of view, is the river, which it may be advisable to pass on to, rather than dwell upon the advantages which nature has so lavishly bestowed on this harbour.

The River Lee, the subject of the present memoir, rises on the confines of an adjoining county (that of Kerry), at a considerable distance from Cork. It does not, however, become of sufficient importance to be considered in connexion with the navigation until it approaches a large weir within a mile of the city, which has been erected for the purpose of damming up the river, the town being supplied with water from this place, which, as may be expected, has the effect of doing the navigation considerable injury. The river is here divided into two branches, which do not again unite until they reach the Custom House, a part of which is marked on the accompanying plan, D. Before proceeding to describe what has been effected in the deepening of the channel by the dredging operations constantly going on, it may be useful to take a cursory glance of the various proposals which were made to improve the navigation. The first attempt worthy of note appears to be the building of an embankment or wall, marked DH, for which the Irish parliament advanced £4000 in 1761. It was erected for the purpose of confining the flood waters of the Lee, and in this way it was expected to keep the river from filling up. However well it may have preserved that portion of the channel along which it was formed, it appears to have done so at the expense of other parts, for large deposits of sand were constantly taking place below it; and the navigation was becoming so much obscured from shoals, that it was found necessary to consult Mr. Alexander Nimmo, and to invite him to report upon the best means of remedying the existing evils. Accordingly we find this eminent engineer, in 1835, complying with this request by making a most elaborate survey of the river, accompanied with a report.

The principal works suggested by him appear to have consisted in forming a still-water navigation, one end of which was to have terminated in the deep water of Lough Mahon, below Black-rock Castle; the other at some waste land near the Custom House, which he proposed forming into net docks, for which purpose the locality appeared to offer peculiar advantages. The expense of such an undertaking (about £160,000) at a time when the funds of the corporation were by no means great, was most probably the cause of this proposition not being adopted. It has not been marked on the accompanying sketch, fearing that it might have become confused from the smallness of the scale. It was likewise intended that the present channel should have been deepened by dredging so as to admit vessels of greater burden to come to the quays. He was also of opinion that the building of an embankment at the north side of the channel, where it bends towards the King's Quay, would have been most beneficial. The position of this wall would be well represented by suppose the present embankment, HE, removed to the other side of the channel. There can be no doubt that such a work would have been most advantageous to the navigation, as the current on the ebb setting in the direction of this embankment would have the effect of materially deepening the channel. It would also afford an opportunity of reclaiming nearly 200 acres of waste land, which, from its proximity to the city, would, in course of time, become valuable property, and handsomely repay the expenses incurred. From its running parallel and close to the channel, vessels could have used it as a towing-path until they came up as far as the old wall, DH. It is much to be regretted that Mr. Nimmo's recommendation in this particular was not followed: expense in the present case cannot be pleaded as an excuse, as we find the harbour commissioners building such an embankment, HE, but unfortunately at the wrong side of the channel. It would require no very great amount of foresight to perceive that the erection of such a work in such a situation would have been attended with the most injurious consequences to the navigation. This does not appear, however, to have occurred to the Cork Harbour commissioners; for a line of railway from Cork to Passage being then in contemplation, we find them proposing to continue this wall for the purpose of carrying the railway over it; the projectors of which, it would appear, considered the railway of much more importance than the navigation of the river. The scheme, however, not succeeding, the wall was not finished, and in this condition it now remains, a monument of disgrace to its projectors.

About the same time a railway was proposed from Cork to Cove, a part of which is marked AB on the plan. The promoters of this speculation appear to have had the improvement of the river more at heart, for and in the report a plan proposed for the improvement of the navigation by Mr. McNiel, in which the subject is treated with his usual ability. The principal improvements consisted in cutting a new channel, as represented by the parallel dotted lines, from the Custom House to Black-rock Castle; this would be nearly a straight line; and it was intended that the embankment for the railway should have formed a great portion of its northern boundary, to which might have been added a towing-path for the accommodation of vessels. It may be well to premise that this new channel was to be cut entirely through the slabs, which consisted of a material well suited for filling up the embankment. The works were thus to be carried out in concert, each being made subservient to the other, and the expense would have necessarily become in this way very much reduced. The part of the wall represented as being cut in two places by the new channel, and which it would have been necessary to remove, would have gone towards forming a barrier at H. The northern boundary of the channel would, under this arrangement, have been well defined. At the south side it will be seen that there is a great extent of slab, probably from 300 to 400 acres in extent, over which the tide ebbs and flows twice in every 24 hours. This vast body of water, which may be regarded as the possession of a power of great value, was proposed to be usefully employed by scouring the channel; this was to be effected by building jetties (marked CCC, &c., on the plan), over which the water was to flow at every half tide, which, returning on
SUGGESTIONS FOR THE MORE EMPLOYMENT OF CONCRETE.

(Concluded from page 158.)

As a former paper on this subject will be found the particular of a dwelling house constituted entirely of concrete. As this is only an introduction to a great subject, and the use of this material began to be employed in France, for general building purposes, it cannot fail to excite astonishment that it has never yet been tried in this country for building cottages and dwelling houses of the humbler class. The price of concrete is less than one-third that of either brick or stone, so that the proprietor of the soil or the speculating builder would effect a great economy if it were employed here; and this is the case in many parts of this rich and highly favoured country,—to say nothing of the unhappy sister kingdom—those miserable mud hovels in which the honest labourer is compelled to rear his family. And yet there is no hope of amending such a condition of things unless some material be substituted, which possesses the solidity and durability of brick or stone, without at the same time being nearly and expensive as either of these. Such a material is concrete with respect to the two former qualifications, while in point of expense it can probably be built at least as cheap as a good wall of mud. The construction of mud walls, in fact, although common in many of the northern counties, in Scotland and in Ireland, has never been practised amongst us with the same degree of skill, nor so in so many parts as in France, in southern Russia, and in many parts of Asia. In these countries the method of building *en pise*, as it is called by the French, has been carried to considerable perfection, by skill in the tempering and padding of the clay, and by mixing with it various ingredients, such as chopped straw, hair, &c., which increase its strength and cohesion. It is important to observe, and this is a point that has not been sufficiently practised, there has been the advantage of a nearly tropical sun to bake and indurate the newly formed walls. On the other hand, in this country, the walls of mud, however well formed, are subject to destructive atmospheric influence, before they can well be hardened, and it is therefore no wonder that they are far inferior to the *pise* walls of warmer climates.

Concrete as a Foundation for Roads.

The first account we have met with of the use of concrete for this purpose, occurs in Hughes' Treatise on Roads. It appears to have been used by him on a most extensive scale, under Mr. Telford's direction, as long ago as the year 1828. Mr. Hughes' practical experience on this subject is extremely valuable, as he tried on the same road another kind of concrete foundation, made of Roman cement and gravel, and although the latter is of course far more expensive, he decidedly gives the preference to lime concrete, owing to its greater durability and ease of preparation. He remarks that after this using of the slab or foundation of concrete, does not require—that a bed of lime concrete six inches in thickness, be laid all over the breadth of the road, and that this bed afterwards covered with six inches of the best flint or pit gravel that can be procured, in two courses of three inches at a time; or what in my opinion would be much more lasting and serviceable material, four inches of broken granite stone; and I am convinced that a road so constructed, however bad the under stratum may be, will prove one of the hardest, most durable, and at the same time one of the cheapest roads ever formed in the neighbourhood of London."

Of late years concrete has been occasionally employed as a foundation for the street pavements of London, and in some few instances, road surfacing by combinations of rich material, which has been introduced it into their practice with very great success. All those who have tried it for keeping down the subsoil of the London clay, have been highly gratified with its success, wherever the proper precautions have been taken to prevent traffic until the concrete has completely set. We have heard of one instance where a concrete foundation was laid down for a road near London, when the adjoining buildings being being immediately allowed to pass over it. The wheels of these vehicles were actually in contact with the raw unhardened concrete, and it is scarcely to be wondered at that it wore into holes and became almost impassable. In this case the concrete was pronounced a failure; but it is scarcely necessary to observe how unfair were such a trial and such a condemnation. We could mention

1 The Practice of making and repairing roads. London: W. 1828.
several other instances where considerable lengths of road, passing over the very worst descriptions of subsoil, have been successfully treated with a concrete foundation, which has ever since kept the clay from rising, and served more than any other contrivance could have done to keep the road in a sound and effective condition. At the same time it is deplorable to witness the miserable and barbarous expedients which are resorted to, even at the present day, to form a foundation for the roads in the neighbourhood of London. It is generally known that the tough blue clay of the London basin, in common with the yellow plastic clays, on which the former rests, is one of the worst provoking materials which it is possible to be formed in consequence of its tenacity to work up amongst the metallising. When the clay has thus become mixed with the metallising—whether consisting of gravel or broken stones—the most favourable condition for grinding down the crust of the road is at once realised, because the stones are separated from each other by a soft yielding matter, so easilyqueezed and subjected to a very strong motion, that every pressure on the road necessarily unseattles more or less the stability of part of the crust. The constant grinding of the stones against each other of course effects a destruction much more rapid than where the stones contain no more matter mixed up with them than just what is sufficient to fill up their interstices, and where this filling matter is hard and strong tend to keep it at rest, and prevent it from working up so rapidly. It is evident, however, that this effect of broken bricks will be only temporary, for they cannot resist the repeated saturation of the clay, which must at length cause the latter to rise up through any thickness of broken bricks which may have been laid on. There are probably some of our readers who may be sceptical as to the employment of such a subsoil as broken stones for the foundation of roads at present, and in the immediate neighbourhood of the metropolis. Such barbarous expedients, however, are by no means rare, and as an instance, we may mention the well known cemeteries on the south side of London at Norwood and Nunhead Hill. The approaches to these cemeteries and the paths made through them, have been executed according to the most approved system of laying, as it is called; that is to say, upon a foundation composed of ashes covered over with a huge depth of clean sharp angular flints, without one particle of binding matter to unite them together. We need not say how much cheaper and more effectual it would have been to lay a concrete foundation, which might have been done for 3s. per yard, and to cover it over with six inches of metallising about half the thickness which is laid on at present. When a concrete foundation has been once formed for a road, the subsoil is effectually cut off and for ever prevented from rising. Therefore it is of little consequence whether the top covering be rather clayey in its character, or whether it contain rather gravelly clay. The fact is, that the concrete foundation, the latter will soon work through the stones up to the surface, and during wet weather may be scraped off in the shape of mud. Where the concrete, however, is not intermixed between the subsoil and the metalling, all the labour that can be bestowed in selecting good materials and in reducing these materials to a close, dry, hard, and compact state for it will be entirely counteracted by the rising of the subsoil, which it must be remembered is quite inexhaustible, and will continue to rise through successive layers of gravel or broken stone, however thick they may be. Even in the best macadamised roads in London there is more mischief done by the working up of the clay, and by the consequent grinding of the stones together than by any other cause. The grinding action on a soft subsoil, is at least double what it would be on a hard foundation of concrete.

MATERIALS PROPER FOR MAKING CONCRETE.

There is no part of the country which is destitute of materials for this purpose. Amongst them may be mentioned any kind of pit, river, or sea-side gravel, any kind of granite, sandstone, or limestone, broken bricks, fragments of pottery, oyster shells, and in fact every description of hard mineral substance. Should none of these be easily procurable, a very good substance for concrete may be made by burning clay in open heaps with any description of refuse coal. Clay burnt in this manner is called 8, per yard, measured in the heap when burnt, and will be found a very good substitute for stone, when the latter cannot be procured for making concrete.

Sand is an important ingredient which should never be neglected, but there are many substances which will answer equally well for mixing with the lime in concrete. Where sand, properly called, is made use of, it should be clean, sharp, and not too fine, should feel gritty when rubbed on the palm of the hand, and should not soil the fingers, otherwise we may be sure it contains clay or loam, or some other substance which will injure the concrete. Among the substitutes for common sand may be mentioned the scales of iron, mountain charcoal after roasting, brick dust, road drift, or powdered cinders. Any kind of clean sand may be used, whether from the sea shore, from pits, or from the beds of rivers.

The varieties of lime, or what is the same thing, of the limestones which yield a lime proper for concrete or mortar, are so well known in this country, as not to require enumeration.

There is scarcely a locality in England where lime of some kind or other cannot be procured at the distance of a few miles, and although these limes are by some not so perfectly pure as those used in Paris, they yield a very surprising effect. The common limestone, which if properly burnt is called is, will take 3 or 3½ sand, may be used with the same proportion in concrete, whereas the grey chalk limestone should not be used with more than 2 or 2½ sand. The common chalk lime should never be used for concrete where it is subject to water or even to moisture in the ground; but the grey chalk lime may be used with perfect confidence in situations however bad. For making concrete or mortar, it should always direct that the lime is to be ground into powder, otherwise it will not go nearly so far in the concrete, as innumerable small fragments will remain unslacked. This is of the highest importance, and should never be neglected, because no care, however great, bestowed upon the slaking, will so effectually bring out the virtue of the lime and when it is slacked.
Underpinning Walls.

Concrete has been employed with great success by G. L. Taylor, Esq., Architect to the Admiralty, for underpinning walls of considerable extent. At Chatham the walls of a storage 540 feet in length were underpinned with concrete in about four months. The walls of this building had been founded about 40 years before on timber sleepers and planking, which had since decayed. It was necessary to fill the space each side of the walls to a depth of from 18 to 26 feet to take out the decayed timbers, which varied from 2 to 6 feet in height, and were 6 or 7 feet wide. The concrete was put in a liquid mass to within a foot of the bottom of the old walls; at this level a large slat was bedded on the concrete, and the remaining foot was pressed in by an iron frame with two strong screws on each side of the slat. When this was put in, the concrete was allowed to cure for four days; on the next day the weight of the superincumbent wall, 50 feet high and 5 feet thick, was allowed to come upon it, and no subsidence has ever been observed. In another building at Chatham which had settled about three inches, Mr. Taylor raised the part affected to its proper level, by forcing concrete under it in a similar manner.

Ranger's Concrete Stone.

Notwithstanding the failure of Ranger's patent cement stone when injudiciously used, it is said to have been successfully employed on several occasions. The Architect to the Admiralty, G. L. Taylor, Esq., has used it for building a school at Lee, on the model of the Propylaea at Athens.

In the concrete dock which was built at Chatham, Ranger's stone was used in the form of blocks for the bottom, but the sides were formed of a mass and aggregate proportioned so as to fill the voids of the dock as illustrated to have been barely one-tenth of the amount which a dock built wholly of masonry would have cost.

The patent stone has also been partially employed at Woolwich in a river wall at the east end of the dockyard. This wall is 270 feet in length, 26 feet high, 7 feet broad at bottom, and four feet at top. The work was at first commenced on the plan of the concrete wall at Brighton, namely, by laying the concrete in mass behind a fence of boards placed in front of the face. Latterly, however, the face of the wall was formed of concrete blocks cast in boxes, with the massive concrete filled in behind as a backing.

Use of Béton by the French.

When béton was first introduced into France, it was made up in heaps and allowed to set. The heaps were then broken up, and the broken lumps of béton or concrete thrown into the foundation which they were intended to form. The following translation from Belidor explains the method in which the béton was prepared for the works of the Dock at Toulon.

"Having fixed upon a spot where the ground is firm and solid, take 12 parts of puzolana and 6 parts of sharp sand free from earthy particles; having mixed these together with a circular border about 5 feet in diameter. Then fill the interior with 9 parts of well burnt pounded quick lime, which is then to be carefully mixed with it. For maritime works sea water is to be used, and the lime is to be turned over from time to time to facilitate the process of quenching. When the lime has been thus reduced to a paste, the border of sand and puzolana is to be incorporated with it. The whole being well mixed, throw it into 13 parts of broken stone or stone chippings and 3 parts of broken iron cinder or scorine. When this latter cannot be obtained, 16 parts of broken stone may be employed, or 16 parts of pebbles may be used, provided they do not exceed the size of a hen's egg. The whole composition must then be turned over and mixed together with shovels for about an hour, until every part is thoroughly incorporated, and then the mass is to be made up into small heaps. These heaps must remain untouched till they acquire sufficient consistency to render a pickaxe necessary to break them up. The time occupied in acquiring this consistency will be 24 hours in the summer in warm countries, and in winter time about three or four days. The heaps should be covered to protect them from rain."

Speaking of béton formed in this way, a writer in the French Encyclopédie Méthodique, states that by way of experiment, a box containing 27 feet cube was filled with it and plunged into the sea, where it remained for two months. When taken up the cohesion of the heap was so great, that it was more difficult to break up than a block of the best stone.

On Warming and Ventilation.

The objects proposed to be accomplished by the different methods of warming apartments, namely, those of producing an economical heat, and at the same time of ventilating them, by causing a continual circulation of air, in which both systems, in regard to health and comfort, are certainly of great importance and difficulty.

In all the different methods by which these effects are usually more or less produced, there are involved two very distinct principles, which produce corresponding changes in the condition of the air contained in the rooms where they are brought into operation. One of these principles may be termed that of changing the state of the air in the forms of heated and heated surfaces, and the other that of heating air and making the diffusion of it a vehicle for conveying heat to the places where it may be required. The alterations produced in air by heat, so as to render it more or less salubrious, according as one or other of these principles is brought into operation in the different modes adopted to warm and ventilate rooms, will now form the subject of consideration.

When rooms are warmed by radiated heat as from ordinary fires, the temperature of the air which they contain is not so greatly raised as when heated air is made the vehicle to convey and diffuse heat. By radiation heat is diffused independently of air. Air, like all other gases, is eminently a bad conductor of heat; and hence it is that any process of air, being heated by contact with hot bodies, does not appear to communicate any portion of the heat so acquired to the contiguous particles, but its repulsive energies becoming developed, it pushes the adjoining particles to a greater distance, and thus increasing their volume and rendering their specific gravity less, they necessarily rise and make room for others to follow the same course.

Nor is the mass of air in a room warmed by radiated heat being transmitted through it, but this heat meeting with more solid forms of matter, as with walls, &c., is absorbed by them. These walls and other bodies thus becoming heated, radiate in all directions, heating the air in contact with them; and this heated air then translates itself as when heated in contact with fire. There is thus a continual but gradual warming and circulation of air from all heated surfaces.

Now if we suppose a room of the following dimensions, 30 X 20 X 20 feet, its cubic contents will be 12,000 feet. Let us suppose 1 foot to be the sectional area of the flue by which the products of combustion and draft escape to the atmosphere, say with a velocity of 10 feet per second. There would then be transmitted through such a flue in 10 hours, 360,000 cubic feet of air, which would renew the air of the room 30 times in that period, or 3 times in each hour during the day, an extent of ventilation sufficient for the most crowded apartment.

It follows, from the non-conducting and non-absorbing power of air in relation to heat, and from its being so frequently renewed, that the temperature of air contained in rooms heated by ordinary fires can never rise to what it would in the case of a heated body, in a great degree the effect of radiation, and not that of heated air. This process of warming and ventilation is exactly that adopted in the general habitations of man and all organized beings—a strong a priori proof that their physical organization is adapted to such conditions of the air as this process induces, and to no other. That such conditions are or are not the best for the health of the animal is evident. If air absorbed the heat of the sun it could not reach the earth, but would produce a temperature in the upper part of the atmosphere, that might precipitate showers of rain little short of boiling heat, and cause tempes of the most violent character, owing to the great extremes of temperature to which it would be liable, for under such circumstances the temperature of all bodies must be as the quantity of heat they inter-
subject; a condition which justly and generally considered the reverse is of what it should be.

But by far the most important and injurious are the effects which heat produces on the air with respect to the quantity of aqueous vapour which it contains, for on this depends its power to absorb more, or to precipitate that which it holds. According to Dr. Dalton, the amount of aqueous vapour which the atmosphere can contain at any given temperature in a state of invisible steam or vapour, is a fixed and definite quantity for that particular temperature. If that temperature be lowered, the point of saturation is also reduced, and the particles of vapour losing a portion of their repulsive power, coalesce and form sensible humidity or dew. If, on the contrary, the temperature of air be raised above any given point of saturation, the constituted tendency of water to become vapour is permitted to take effect, with an energy proportional to the increase of heat; hence the desiccation of all surfaces exposed to its influence proceeds at a rapid rate, when they are immersed in air raised much above the temperature of dew point. At all times and places of the atmosphere, is generally at or near the point of saturation with aqueous vapour.

Taking two rather extreme cases, Glasgow in Scotland with a humid state of air, and Puncal in the island of Madeira, the mean temperature of which are 47° 75' and 60° 3', the mean dew points are 45° and 67°, indicating forces of elastic vapour of 93° and 658 inches of mercury, all respectively. We thus see in a moist and also in a dry climate of great salubrity the near approach of the air to saturation with aqueous vapour, so that its general tendency to absorb water is not great.

It will probably be thought by some, that the general state of the atmosphere in the consideration of this subject, is inapplicable; but it should be recollected that the same wisdom which contrived the organization of all living beings made also a state of atmosphere adapted to that organization.

Now, suppose air in the cold of winter at a temperature of 20° raised to that of 70°, by passing over coils of heated iron, or in any other way, it must absorb with avidity, every particle of moisture thrown upon the surface. At all times and places of the atmosphere, we may say that there is great possibility of the air being in a state of partial or actual unsaturation, which, in any given locality, at any moment, must be of great importance.

Persons who pass large portions of their time in apartments heated and ventilated in this way, feel extreme dryness of the skin, flatness and throbbing of the head, soreness of the eyes, a dry and kind of asthmatic condition of the mucous surfaces, general excitement, and in some degree prostration of strength.

Medical men have frequently employed hot air baths for their stimulating effects; but that which generally exercises a beneficial power in such cases is the stillness and absence of a disagreeable influence when permanently in operation, even in a lesser degree than that commonly employed for medical purposes, and especially in states of bad health of an opposite character to those for which it is employed as a remedial agent, as for instance, when any tendency to apoplexy exists.

It has been proposed to remedy the dry state of hot air, by evaporating it, conveying steam with the heated air, &c.; but all such means are too complicated for the intended purpose, and incapable of adaptation to the circumstances of the case. For during the time when the apparatus is not in use, if the air had been near a state of saturation with aqueous vapour during the day, a large precipitation of dew would take place on cooling, and also during the day, owing to considerable changes of temperature. From these facts and circumstances it is evident that an ordinary fire furnishes all the principal objects of warming and ventilation, better than any of the unnatural modes which science, ingenuity, necessity, or desire for novelty has yet given birth to.

W. G.

The Forms of Ships.

The great importance of naval architecture induces us to return to the report of experiments conducted by a committee of the British Association for the Advancement of Science, which was read at their last meeting at Cork. The account copied into the last number of our Journal, from the Athenæum, was chiefly limited to the notice of the experiments themselves, and merely adverted casually to the deductions founded upon them, without describing the form of least resistance which the committee recommend as the result of their five years' labours. We have since been supplied with a further account of Mr. Scott Russell's exposition, and as the experiments have been more numerous, and have been conducted on a larger scale than any previously made on the subject, we think it desirable, in the absence of the voluminous report of the committee and drawings, which may not be published for years, to state at least some of the results of these long-continued and carefully conducted experiments.

In Mr. Scott Russell's exposition of the labours of himself and Professor Robison, after mentioning minutely the mode in which they had conducted their experiments, and their results, he proceeded to describe the form of construction which they had determined to be the best, not only as offering the least resistance to motion through smooth water, but that which was best adapted to vessels of various sizes. It is to be regretted, however, that in this, the most important part of his exposition, Mr. Russell was less explicit and not so minute as in describing the preliminary experiments. He stated facts, but did not explain the principles by which they were regulated, therefore it is difficult from one isolated form of construction, which was all he exhibited, to determine how far it is adapted to vessels of other sizes. He observed, that the great point which, in the first instance, was endeavoured to be gained was to get rid of the wave at the bow, which has the same effect in retarding a vessel as if it were immersed so much deeper in water. It was found that this object might be attained by lengthening the ship, and that whenever speed was required, there must be an absolute inertness without regard to the form of water-line required.

Mr. Russell having stated that each velocity has a corresponding form and dimension peculiar to that velocity, he exhibited the form of the light-water line of a steam-vessel intended to be propelled with a velocity of 17 miles an hour, and explained the mode of constructing it. Suppose the breadth, C D, of the vessel to be 20 feet, there must be fore and aft from the main midship-section 120 feet, and for the after part, 55 feet. To make room for the engines, there is no objection to putting in a piece in the middle of the vessel, called the middle depth, or equal width to the greatest midship section. On half the breadth of the vessel, fore and aft, describe the semicircles C D, E, G. Divide the fore part, a A, into a given number of equal parts, and divide the semicircles also into the same number of parts; in the accompanying diagram, we have divided them into not more than four, for greater distinctness. Then draw lines parallel to the keel, A B, from the divisions o, o, o, of the semicircles to the corresponding divisions p, q, r, and s, r, r, of the keel, and the points where the lines intersect show the form of water-line required.

The form thus attained, it will be observed, is very sharp both fore and aft, though the after part, or bow, being shorter, is necessarily more full than the entrance of the vessel. This form is much opposed to the ordinary practice; insomuch that the line is hollowed out or partly concave, instead of being of the convex form, or full bow, which old ship-builders so much admire.

Having thus described the form of the light-water line, Mr. Russell promised to give the view he entertained of the principle on which the superiority of its construction depended; in this particular, however, he failed to make himself very clearly understood. He first alluded to the notions entertained of the manner in which the water is displaced by the motion of a vessel. It is commonly supposed, by ship-builders, that the water passes round the vessel; some imagine that the fluid is rolled under it; whilst, according to the French philosophers, the impact of water obeys the same laws as the impact of hard bodies, and the water is reflected from the bow at an angle equal to the angle of incidence. From the latter assumption they deduced that a round full bow is best adapted to meet with least resistance. It had been proved, however, in the course of these experiments, that the particles of water displaced by the bow of a vessel move into new places, that peculiar motions are given to them, and that they never return to their former positions. The motion of displacement, also,
was found to be not confined to the vicinity of the vessel, but that it had an extensive effect in a region anterior to the bow, and extending to a considerable distance on each side; and some time before the bow approaches a particle of water, the fluid has commenced moving. Viewing the sea as composed of innumerable vertical columns of water, the effect of the approach of a vessel is to produce greater pressure on one side of such columns than on the other. In addition to the vertically speaking, the particles pressed against will move only in a vertical direction, and thus a heaping up of fluid is produced before the bow of the vessel, sometimes ranging as far as half its length. The next object the committee in view had was to examine the motion of the particles of water displaced by a vessel. It was found that when the form was that of least resistance, the motions of the particles of water were in semicircles; and that they deviated from that curve when the form departed from that of least resistance. It was also determined, that the replacement of the water as a vessel moves forward, takes place entirely from below. The result, therefore, to be attained, as appeared from these experiments, was to ascertain the form of vessel which would communicate these motions to the particles of water. In experiments on the forms of waves, conducted also at the expense of the British Association, it had been ascertained that the motion of water itself is that which the committee had endeavoured to give to the water when ships passed through it. Thus it happened, that the form best adapted for least resistance in smooth water, being itself the form of the waves of the sea, the vessel of that shape moved through the sea with the least motion and the least resistance. The consequence was, that in the course of these experiments it was found that a vessel built in the form of least resistance in smooth water, instead of being, as was formerly supposed, likely to be wet and uneasy in a rough sea, in fact passed through the waves without doing more than modifying their motion, and that in proportion as ships approached to the form of least resistance, they were dry, easy, and good steers. The concluding experiments were made on ships of 2000 tons, differently formed, and the same law which was found to prevail in smaller vessels was also followed in the large ships and in the rough seas.

We have endeavoured, on the foregoing report, to give as intelligible an account of the deductions from the experiments on the form of ships as could be collected from Mr. Russell's exposition. It is evident, however, that there are many points of importance not sufficiently elucidated; and though the principle on which the advantages claimed for the wave form is attempted to be established as regards ease of motion in a rough sea, the reason why that form is the one of least resistance in smooth water, is by no means clear.

It is a very difficult, and perhaps an impossible task to extract the pith from a voluminous mass of papers, calculations and drawings adapted to differing circumstances, so as to present, to a comparatively small compass, a satisfactory view of the whole; nevertheless, we wish to arrive at the general truths, and the principles on which they are founded. It appears that in all the experiments the object aimed at was to ascertain the form of least resistance in cutting through the water, and that no attention was bestowed on the form best adapted to cause the vessel to glide over the head-wave. The experiments, however, were made a few years since on the Scott canal with passenger boats, in which we believe Mr. Russel himself took part, show that the head-wave may be prevented by the boat being raised in the water by the oblique impact of its bow with the fluid.

"Any glaring defect," it says, "in the front, ought to be amended, as far as it may be, by Sir Robert Smirke; but we question if it would be right and just to take the work out of his hands, and intrust the completion to another architect, even if the Trustees of the Museum would do so—which is not very likely.

Certainly not; for the Trustees—who have shown themselves not fit to be trusted with the undertaking—to whom the architectural task is now committed—appear to care nothing about the matter. They are satisfied themselves, and whether the public is or will be satisfied, is to them perfectly indifferent.

The Spectator, too, thinks, that as things have already gone so far, we ought now to be reconciled to what can't be helped, stipulating only that "Any glaring defect should be amended!" Now, in the first place, Sir Robert Smirke is not at all the man to commit "Glaring defects!" much less is there any danger of his violating the decencies of common place, he knows what the mere good-breeding of his art requires, too well, to shock us by gross improproprieties—he has "绅士 manners!"

In the next place, it is truly astonishing to find a writer professing to be a critic in art, well content, if instead of a facade worthy to rank high as a finished work of art, we do get one free from "glaring defects."

But just now, I said that Sir Robert was not the man to commit glaring defects, yet must correct the observation, for one most glaring, pervading defect stamps all his buildings; they are all alike clumsy and soul-less—all unphilosophic—the very best of them of that kind whose highest praise and damnation are condensed into the epithet "Respectable!"

His designs are of a sort that do not admit of being corrected, otherwise than by being remodelled and recast, and having some spirit—some ideas, infused into them.

The Spectator concludes with saying, "let us hope that the facade will be 'respectable'!" and in this there may possibly be a sneer of contemptuous irony; for hardly is it possible to conceive that any one should seriously mean to say we ought to consider ourselves well off, if, instead of a magnificent edifice capable of challenging any other work of its kind in any part of Europe, we do but get what will barely pass as "respectable."

For Sir Robert Smirke himself I have no pity; he deserves none; he merits all the obloquy and ignominy he is about to draw down on his devoted head. Fortune he has made—fame he has missed; why does he not now distinguish himself in the only way left for him. Let him act the Roman part—let him claim if not the applause of his country as an artist, its gratitude as a patriot willingly immolating himself for the public weal. Let him heroically resign the British Museum to some one worthier of the task, and then, be all his sins forgotten.

C.—.

OBSERVATIONS ON ARCHITECTS AND ARCHITECTURE.

By Henry Fulton, M.D.

No. 2.

The Houses of Parliament, the Exchange, and the Conservative Club in St. James's Street, are in progress; and the facade of the British Museum is spoken of. I trust Mr. Barry in the first will avoid an error in his otherwise much to be admired school of King Edward at Birmingham, and give us windows of a bolder and broader character.

There are only three orders of columnar architecture worthy of imitation, viz., the Grecian Doric and Ioue, and the Corinthian. I most sincerely wish that the knowledge of all others was lost. The indignation of a man of taste should be hot, at seeing the ornaments and emblems of these beautiful orders prostituted, by being coupled with the vile trash which is given to the public as their imitation: the triglyph indicates symmetry and stability in the Doric compositions of the Greeks; but in the lower order of the Exchange, weakness and an overburdened architecture. Could not Mr. Tite remove this index of overweight and undue proportion, and call his order Tuscan, a name more to be honoured than any other form of debased Doric?

At least the Conservative Club in St. James's Street aims at having one advantage over the Reform in Pall Mall, namely, the representation of a collection of the boxes used by Her Majesty's ministers, (for such is the shape of the quoin,) intended by this, perhaps, to show the determination of the Conservatives to retain their places: if such
be not the indication, we must seek the reason, for the rustic work, in a similarity of taste with New Zealanders and other polities nations of the Pacific, who tattoo their faces, and consider scars and scratches as so many lines of beauty; for my part, as I prefer the face human with the rustic arch rather than one without the rustic lines and gashes. A writer in this Journal, with much wit and truth says, that lawyers and architects are the only men who are the slaves of precedent. I wish that some high authority, in addition to experience, could be brought forward to show that as the savages in vain attempt to hide the nakedness of their bodies by taking off so do some architects, by treating the building in every way, in vain attempt to hide the nakedness and meanness of their designs.

Much dissatisfaction has very reasonably been expressed at the severity observed with regard to the expected façade of the Museum. Sir Robert Smirke, no doubt, says, "From the character of my other works, you may safely rely on the fitness of the forthcoming façade." The delineator of Magna Grecia said the same thing under similar circumstances with respect to the National Gallery: for my part, my faith in Sir Robert is not so strong; the only work we have of his (I believe) in Ireland, is the Wellington testimonial, and a decided failure it is. Of all the works of a monumental character which the ancient Greeks executed, and I suppose the pyramids are the least, and the obelisks the most pleasing: the Wellington testimonial partakes of the character of both, but approaches more nearly to the deformity of the first, than the beauty of proportion to be observed in the latter; the height of the shaft is only about 51 diameters, instead of being 9 or 10 as in the obelisks. If we have no accurate information on the subject, we can easily say what the façade will be—a portico of six columns, with plenty of triglyphs on the frieze, in compliment to the Lapithes and Centaurs of the Elgin marbles, and to show the possibility of having an architrave which shall appear to be overburthened and yet not give way to bow in the description of civic façades, like the tables loaded with viands it shall appear to groan. Then we shall have a pseudo portico at each flank by way of wings, with sham pediments also, stolen from the gable end of some Greek temple, not to surmount another gable, but a long colonnade like the river front of Somerset House, requiring three, and spaces between. Our old galleries, or the then usual piled columns with looking windows, copied either from those of Somerset House or from the antique models to be found in the Museum. These three porticos will be advanced a little in front, for the purpose of showing that they do not belong of necessity to the building, but on the contrary, may safely be removed for any other purpose as opera sit. No, Sir Robert avoid the same peculiarity, and by no means suggest something, even in the Berlin Museum; and do not be afraid of the spectator's eye requiring to be relieved by broken lines and cornices, nor seek to give your design a military character, by the introduction of cocked-hat pediments over your doors and windows.

I formerly made some observations on these ornaments, (2) to which a critic under the auspices of G. W. R. in the fifth volume of this Journal, page 125, says in their defence that, If these gable tops be absurd in Palladian architecture, shall we not be obliged to condemn quite as much the beautiful pedimented canopies over the windows of York cathedral. This does not appear to be a sequitur any more than that it should be argued that because pointed arches, flying buttresses, pinnacles and finials are introduced into such edifices, with complete success, it would be advantageous to mix them up in a Grecian composition. But although G. W. R. truly says I was unable to discover the use of these window tops, yet he might have observed that, with great disinterestedness, I gave Palladio all the merit of the discovery, and that I merely suggested that our figure would show such a Paladian design; if any architect that adorns these window pediments so much, would have the kindness to exhibit himself undressed, and Baccus like, ostride one of those at the Reform Club House during certain hours of the day, admiring spectators might on a glance decide on the advantage of my suggestions, as compared with the practice of Palladio, the effect of whose plan might be shown by two other and adjoining window.

I have to complain that the same critic misrepresents me, (and critics do some times misrepresent,) by making it appear that I derived the pointed style directly from the Roman. Now I asserted no such thing, but referred to the ruins at Spalatro for the origin of the semi-circular arch on slender columns, supported by consoles, (see Vol. V., page 70 of this Journal) and as it is generally admitted that the pointed arch was formed, and in point of fact can be formed, by the interlacing of the semicircular arch, it is not going too far to say that even the beautiful pointed style may owe its origin indirectly to the debased Dioclesian.

I cannot see the force of G. W. R.'s objection to my saying that the graduated basement of a Doric temple might be considered as the base of the columns; the observations made by me on that head were with reference to a portico, which has no basement raised above the level of the street, (see page 50.) But if G. W. R. had read the paragraph preceding the one he censures, he would not have raised an objection.

To return to the Museum—if pure Greek architecture must abide its stipulated form, I do not think that we are not yet fit to appreciate its merit, yet Sir R. Smirke consult the magnificent works on Egyptian antiquities, published by the Imperial Government of France, and give us an Egyptian front. No building ever was, or perhaps ever will be, erected in London, more suitable for that style than the Museum. But I speak of the court yard as it was when I last saw it three years ago.

In College Green, one of the best situations in Dublin, there is course of erection a gin palace—I beg pardon, it is intended for a bank, but the fitness of the thing might well excuse the mistake, and indeed it is quite impossible to look at it without being struck with the resemblance. I had intended to give a drawing of it, but as there is no lack of palaces in London, it would be a waste of space in this valuable Journal; besides, the building, although of cut stone, is of such a nature, that it does not appear intended to remain very long. The architect of it, (if such there be), with a taste which does him credit, and with a spirit of chivalry worthy an architect belonging to a free and enlightened people, viewing the over-burthened state of columns in the hands of modern architects, has in the present instance relieved his from any such irksome tasks, and not obliged them to support anything, for the perpendicular line of the edifice falls behind them; to be sure there is a kind of cornice on a level with the commencement of the first floor; but what of that, the whole is in a "fee unbounded condition?" and by this expedient he has been enabled to make the columns more slender and graceful than any example with which I am acquainted. And after all, the idea of making the edifice resemble a palace was not a bad one, for with little or no alteration, it can at any time be turned into one, should it no longer be required for a bank, or should its neighbours of Trinity College, the Bank, or the Royal Irish Academy, require a gin palace in their vicinity, see triumph gloria mundi, that is, "to what base uses may we return, Horatio."

THE PALACE OF WESTMINSTER.

Sir—Reports both official and popular relative to the Palace of Westminster are all highly favourable and satisfactory; still there is one point, and that of no small importance, in regard to which nothing has yet transpired, nor have any questions been put. Far as the structure is now advanced in appearance, it is appearance chiefly—along the east side of the plan: considering, therefore, the immense mass of inner buildings and courts there will be behind, and that all the present buildings on the west side will have to be cleared away, a very great length of time must elapse, before the entire pile can be constructed in its main walls, roofs, &c.

If I mistake not, the Peers' House is to be finished within about two years from the present time; but surely that does not include decoration, supposing that fresco-painting is to form any portion of it. But, in this case, the regulation for public business, so far afforded, will be very limited and imperfect, unless all the contiguous parts of the plan can be carried on at the same time. Should that not be possible, no small inconvenience is likely to be felt, both by their Lordships, and by the architect, who will have to exercise a good deal of management and contrivance, for which there would be no occasion, were none of that part of the building required to be taken possession of, until it was thoroughly completed. 1

The question—when is, or when can, the work of embellishment commence is perhaps one which no one can yet answer; neither may any one be as yet prepared with a reader reply to that of—If there is to commence the fresco-painting will at first be somewhat of an experiment among us, surely the artists will not be allowed to try their "prentice hands" on any of the principal rooms intended to be so decorated. It is most probable, therefore, that they will begin

1 A similar sort of inconvenience is now experienced in the British Museum, where temporary passages and partitions are obliged to be erected while the workmen are employed on those parts of the building which have to be added or adapted to those already finished.
their operations in the corridors; yet if they are to be carried on
to the extent now contemplated, it must be either very rapidly
or very slowly: either the whole work must there be executed with
all dispatch possible when once begun, so that it may be got out of
hand; or, it must proceed very gradually indeed, and perhaps only
at intervals during a long series of years.

Our artists, I conceive, are likely to have ample time to prepare
themselves for study, ere their services will be required for the Palace
at Westminster, which may not be till some of them are grown grey-
haired. As a last question—one which deserves to be well considered,
will it be possible to grant the public that free access to the interior of
the building, which it now seems to be taken for granted will be
the case? The very plan shows that it is not at all adapted for the
purpose of a public gallery of art, and that to convert it to such would
be incompatible with the more important purpose for which the
building is destined.

I remain,
Your obedient servant,
J. B.

THE BRITISH MUSEUM.
(With Plan of Parade.)

Whether or no any positive beneficial result ensue from public at-
tention being kept alive to the British Museum, the subject is one
that is very far from being yet exhausted, and which ought not yet to be
dropped. In fact, with the public generally it is but just begin-
ing to make any sort of stir, and interest—at least curiosity, has been
so far excited, that several inquiries have been made as to the possi-
bility of obtaining a sight of the model which is deposited some-
where in the building itself. It was not very long ago rumoured that
it was open to public inspection there, yet this turns out not to be the
case; applicants being informed that the model cannot be seen without
an express order from the architect himself: which is tantamount to
civil sort of preceptory refusal, since it compels individuals to solici-
t as a particular favour and indulgence what ought to be matter of
public right, for if there be no general claim of that kind, the ap-
plying for the favour is no more than what might be done with equal
propriety in any other case.

We were told that we might write to Sir Robert Smirke, but we
were not at the same time assured that such application would be at-
tended to; so thinking that it might after all, be very much like summon-
ing spirits from the very deep, we declined making the attempt,
as, we suppose, most others have done. The precaution adopted, is
in itself a very politic one, for while it makes a show of a little lib-
eralty, and renders it impossible to say in strictness of truth, that the
model is not allowed to be seen by any one, it effectually excludes
those who are the likeliest to be able to judge of the design, and to
express their opinion of it. It requires some sort of assurance to ask
a man as a favour to be permitted to inspect a production of his, that
you want to see for the express purpose of telling the public your
opinion of it—be it ever so unfavourable. Accepted as the bonn
of courtesy, the permission itself becomes a bribe to criticism—a pad-
lock upon its tongue: at any rate one does not feel at liberty to ex-
press one's opinion altogether so freely and independently as if he had
paid his admission shilling at the door, or as where gratuitous admis-
sion is universal.

That the refusal of this last should still be persisted in is strange,
yet by no means inexplicable, on the contrary, it suggests at once to
the dullest apprehension, both of what kind, and how powerful the
motives are which prevent compliance with what is but a reasonable
demand on the part of the public—more especially as it is impossible
to allege in this case the slightest difficulty or inconvenience in
granting facility of access, nothing in the world being easier than to
remove the model from its “prison room,” and place it in the hall of
the Museum. In general, architects and artists rather rejoice than
otherwise, when they find the public take particular interest in, and
make inquiries as to the progress of the works they are employed
upon. So far is it from being usual to show such excess of caution,
So, too, in the case of the façade of the Museum, it proves on examination to be very far from fulfilling the promise made to the eye at first sight: the circumstance of there being windows at all must prove, if not fatal, a very serious drawback, where the most stretched classicism is affected as far as the mere order is concerned. Such apertures must inevitably destroy one essential characteristic of a Grecian colonnade—breath and repose. Hardly any skill can reconcile together the style represented by the columns, and that by the windowed wall behind them: at any rate purity of style is forfeited, and a mixed one substituted for the original, therefore it becomes indispensable to render that mixed a compound one, wherein the respective conflicting elements shall be brought into harmony—the whole into keeping. Having passed the Rubicon it is of no use to halt, for then to stand still is to have done nothing; so when an architect has not scrupled to violate the simplicity of Grecian architecture, by introducing windows he must either convert them into features of positive beauty in themselves, or leave them to be reprobated as solecisms and blunders. No excuse will it be for him to say that he has no sufficient authorities to guide him for windows of rich and ornate character in the Grecian style; since neither has he any authority for introducing windows at all, and if he can break through authority as to the one, he surely need not scruple to do as to the other—especially when by so doing he would have an opportunity of showing his taste and invention, and convincing us that his study of antique design had furnished him with resources not at every one's command.

We admit that we are here setting up a high standard of taste, and exact much more than is generally to be looked for; yet not at all more than the occasion both demands and admits of. Surely it is not at all unreasonable to expect that a Museum—a National Museum—one perhaps the first in the world in regard to the treasures it contains—should be also a splendid and perfect work of art, as a piece of architecture. Are we to be content with merely having something tolerable—decent—respectable—passably good, and so forth? That humble degree of merit could be obtained much more cheaply—without such an array of columns, without so much pretension, the effect might perhaps be all the more tolerable in consequence. We have had quite new samples of tolerable Grecian architecture before; and now, we fear are about to have one again, where it, to be no more than tolerable, will be actually insalubrious and disgraceful.

That the plan will be exactly followed in regard to there being windows within the colonnades and poricæ, is now but too evident, for the main walls of the building forming the west pavilion or wing of the façade, are now raised—that is, in rough brickwork, to be afterwards faced with stone, just as an old building might be refaced with new material; and from them we perceive that there will be a single range of windows, on about the same level as in the quadrangle or inner court; and they will, no doubt, be nearly of the same character, with no more dressing than will just be sufficient to prevent our saying that they have absolutely none. In this respect, therefore, the colonnades of the Museum will be almost exactly such compositions as is that which forms the centre of the Custom House, with all the less excuse, because if Sir Robert could not foresee the effect before, that experiment ought to have convinced him that it would not do to be repeated in the Museum, more especially as the public will naturally look for greater refinement of taste and display of imagination than in a Custom House or a Post Office—even for some evidence of poetic inspiration; but we suspect that the architect of the Museum is better acquainted with per-centages than with the muses.

Were the number of the windows in the façade reduced half to the plan should have been so contrived that there should have been no necessity for any—corresponding with the alternate intercolumns; there would have been some degree of breadth and repose, whereas now they will cut up the background, and what is more, they will not correspond with the intervals between the columns, at least not on the sides or returns facing east and west, for there, instead of falling exactly in the axes of the intercolumns, there will—according to the official plan, at least—no regularity in that respect, for in some instances the windows will be partially, and in two others, exactly behind columns: besides which, there will be some windows thrust quite into the inner angles of the plan. How such a very strange disregard to the most ordinary rules of symmetry should have arisen, it is easy enough to perceive, it being evident enough that being unable to hit upon any mode of keeping up symmetry of arrangement in his windows, both internally and externally, the architect has sacrificed exterior to interior appearance, thereby incurring, we think, the far greater evil of the two, since defects of that kind, if to be tolerated at all, might more easily be excused in such rooms as come into this part of the plan, since they will not be seen by the public, the former being for manuscripts, the others for the Trustees, than in the “grand and classic” façade, where such blunders are likely to be noted by every one as most strange and out architectural bungling. Surely Sir Robert Smirke could never have given a second thought to his own plan, or even he must have detected such very palpable “school-boy” mistakes. Or are we to suppose that detecting, he could not remove them?

Come we now to the central portico; here an advanced line of columns added to the general colonnade forms an octostyle which will, doubtless be crowned by a pediment; thus, besides some variety being imparted to the elevation, there will be some richness and a more than ordinary degree of perspective intricacy will attend the inner range of columns seen behind those in front, of which disposition of them we have as yet no example in any of our London porticos. Still it may be questioned if such arrangement of the columns is the very best suited for the occasion, because there is hardly sufficient space for so many columns in that direction within the portico, the latter being rendered thereby nearly as shallow as far as actual serviceableness is concerned, as the other colonnades. There will be no amplitude of space any where, the entire plan of the portico being
subdivided into so many lesser squares of uniform size; whereas, had the hinder part of the portico been made to recede within the building—either wholly or to the extent of the three or the five centre inter-columns—then the effect of passing through two outer rows of columns would have been more striking; there would have been sufficient space within, and also far greater variety in the general composition. As it is, we suspect that, however good it may be in itself, such display of colonniation will be upon the whole rather prejudicial than otherwise, insomuch as all the rest is likely to fall very short of the architectural pretension made in regard to columns. The omission of the four centre columns of the second range might therefore be rather an improvement than the contrary, for at any rate then some space would be gained—perhaps some monotony also avoided, while the two remaining columns would give all the greater expression of solidity to the angles where the octastyle advances before the other colonnades.

Should there be nothing else that will contrast strangely with the columnar pomp here affected, one thing there will be which cannot fail materially to impair whatever dignity is thereby aimed at. The door, it will be observed, is placed between two engaged columns at the same distance from each other as the rest, and must therefore be of exceedingly insignificant size in proportion to the scale of the order, the width of the opening not much if at all exceeding the diameter of one of the columns; low it must also be in the same degree, and will, besides, look quite squeezed in between the columns: truly a most splendid and august portal for that of a national museum! With such a door, and with windows also, the general character of the design will be anything but classical or imposing, in spite of the show made by columns. Columns, however, constitute the alpha and omega of Sir Robert Smirke's architectural ideas, and capability of design—we had nearly made a mistake and said, his powers of invention, but invention he neither has nor pretends to have. Whether he intends on this occasion to stretch a point, and give us—not any thing new, but some variation of his usual Ionic, some richer example of that style in regard to the capitals, and some less thing mean and dowdyish than his embalatures hitherto have been, we know not; yet unless such be the case, even his colonnades—letting alone all the rest—will form but a very sorry "set out."

It is possible that, having only the plan to go by, we may have misconceived some matters, and may in consequence have expressed ourselves more unfavourably than we might have done could we have inspected the model. If that would at all refute the injurious surmises now spreading abroad, the witholding it from the public is no less foolish than it is, at the best, ungracious. However, the public voice may even yet prove too strong for Sir Robert Smirke and his supporters—and his admirers, too, if he really has any now, which we very much question.

Lengthy—some may say tedious—as our remarks have been, we could very easily have extended them, because we have only animal-voracity upon it as it is, without pointing out what might have been introduced into it. Still one circumstance remains to be noticed, more especially as it does not show itself in the wood-cut plan; which is, that in addition to the main building, there will be two subordinate wings or ranges of building for the official residences; and these cannot fail greatly to interfere with the general effect—to detract from and neutralize the display made by the facade itself, unless they were to be altogether shut out from view by screen walls, adorned architecturally—perhaps, with Doric colonnades, thereby continuing such porticos along the sides or ends of the front court, and yet with some variation of character.

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A CONTOUR—GRAPHIMETER.

Sir—In the accounts published in your valuable journal of the meeting of the British Association at Cork, I observed a statement respecting the progress made in the contouring of maps by Captain Larcom. I have addressed myself to you in order to give publicity to my claims for the application of a method of contours in delineating another kind of object. It was some years ago my attention was directed to the subject, and since then I have fallen, I think, on the rationale of the correspondences between the representation of an object by contours, and the drawing of the same in the ordinary way. In all drawings, the outline being of course first made out, we next proceed to give the appearances of solidity, or roundness, or flatness, to the figure. Now this may be done in two ways very different from each other, one by means of shadow and shading laid on smoothly, and of various depths in the proper places, but another by employing lines only of a form suited to the shape of the model. We find the latter method employed in academical drawings and line engravings, where round limbs are faithfully imitated with circular sweeps of the chalk or graver, and objects bounded by plane faces, as walls, &c., are lined and parallel; and whilst other lines are generally necessary over these to shadow the parts, still they also partake of the form of the surface, and this I conceive mainly concurs in assisting the spectator to form a judgment of the shape of the object the artist intends to portray.

It is easy then to see that a good drawing may be made without shading, and consisting only of lines, properly shaped of course, and more or less close according to the varying inclination of the surface. Any one who examines a clever pencil drawing will see ample illustration of this in many parts of it. But the best proof in favour of this method is the well-known medalion printting, where the drawing is so true in nature that the surface of the figure appears to rise above the ground. Now the machine used in this beautiful art is liable to create considerable distortion, and cannot be used if a bust or solid object is made the subject of trial. In 1839, while on service at Malta, I constructed a new machine acting on a modified principle, by the use of which all distortion was avoided, and I proved its efficiency satisfactorily to myself by coping some small casts. I had long felt the want of some such instrument, for I had had repeated opportunities of collecting casts both of remarkable living individuals and other subjects; but the limited space allowed to an officer on board a man-of-war precluded any attempt to form a collection of them, and therefore a machine to copy and measure these in every dimension, back as well as front, was a great desideratum, inasmuch as it flattened, as it were, solid objects, and enabled them to be so packed that a hundred casts might be put into a portfolio. Now the machine to which I allude is contrived to give all the outlines of successive planes of parallel section, or contours as they have been aptly called; and here I beg to remark the coincidence between the contours of Captain Larcom and my section drawings, not that Captain L. may well deserve all due praise for his important applications of the principle, but that it may not be forgotten that the same had been devised and put in practice by me in 1839. I have said that the machine measures as it draws—I mean that any measurement in any direction may be readily taken from the drawing. Now this is important to those who wish to copy subjects in illustration of national or individual peculiarities of countenance or form of skull in tribes of men or species of animals. It therefore commends itself strongly to those who cultivate physiognomy or phrenology in the practical way of comparative measurement. I proposed it once to an eminent phrenologist, who stated that such an instrument was indeed very much wanted, but he thought the photogenic process would in time supply that want. From this opinion I have reason to differ, as I believe none but linear drawings will ever give the necessary basis of measurement.

The annexed engraving is a representation of the instrument. A B C is the drawer or part moveable by the hand: it is so constructed

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1 So far from showing any improvement in respect both to the entrance itself, and to commodiousness of space, the portico of the Museum threatens to be considerably inferior to that of the Post Office, and hardly better than that of the College of Physicians.
with regard to its flat foot or base, B C, that it keeps the point A always perpendicular to the plane D E of the drawing-board at the point B; thus the line A B, in every position whatever of the sliding drawer, ABC, keeps always parallel to itself; and, therefore, if a pencil is placed at B, whatever A traces at one end is drawn exactly at the other by that pencil. If A traces the contour A F, B draws the contour at B L. When it is requisite to draw another contour the drawing-board is screwed back the distance required by the adjusting screws H H, then the point A will trace another contour, A F, which of course is drawn at B L as before. In this way the whole solid, G, may be traced over. It is hardly necessary to notice that if a metal plate be substituted for the drawing paper, and a graver for the pencil, we may secure an engraving plate, whence copies may be taken.

By this apparatus profiles of the countenance, of architectural mouldings, and models of maps, may be taken without the use of the screw; and if constructed on a large scale, the lines of a boat, &c., may be taken with ease and expedition.

If it be desirable to make a drawing having the effect of a picture, the contours should be drawn close and blunt; but if a measurement drawing, they must be wider apart and sharp, so as to produce no confusion when the back parts are traced over.

Fig. 2 represents a plan of a piece of land with three hills laid down in contours from a model; each contour is a representation of the surface at certain given perpendicular distances, say one inch of the model; then, by taking the outer contour as the base or datum, each contour within will represent so many inches perpendicular above the base; it will thus be seen that the height of the three hills in the model by the annexed plan are respectively 6, 7, and 8 inches above the base.

If it is requisite to find the distance on the surface between A and B, i.e. how far they are apart in the original model. From B or A, as is most convenient, draw a perpendicular B C equal in height to all the sections between A and B, then will the line AC be the distance on the surface between AB.

Suppose it be required to make a section of a cast from P to Q, of which fig. 2 is a drawing, it will be first necessary to draw perpendiculars from the several intersections of P Q with the contours by means of parallel rulers, and then taking P' Q' for P Q at a distance from the drawing, to avoid confusion, draw parallel lines to it distant from each other the height of each section. Where the former intersect the latter, draw the outline P T R S Q, which will give the section required. In the same manner a measure may be taken from the back to the front also, because the machine can draw, if necessary, the contours at the back within the same space as those of the front, and thus a solid object is drawn back and front from one point of view, and measured in every possible direction.

I have the honour to be, Sir,
Your most obedient servant,
Salter Livesay, M.D., R.N.

GYPSONOGRAPHIC SKETCHES FROM THE PRIORY CHURCH OF ST. BARTHOLOMEW, SMITHFIELD.

With a Gypsonographic Drawing, Plate XIV.

Among the great facilities which the metropolis affords for a school of architecture, must not be omitted the many monuments of different styles which it possesses. With regard to the early periods of English architecture, many admirable specimens exist, which, although abounding in points of interest, are not adequately studied—in some cases, indeed, are not adequately known. Many of these, from their recent restoration, have, it is true, attracted public notice, but many others, of no less merit, remain in comparative obscurity or neglect. To enumerate all the metropolitan works of the middle ages would be impossible, but to remind the student that they are not contemptible, we may call to his notice Westminster Abbey and the Chapter House, Westminster Hall and St. Stephen's Chapel, St. Mary Overy's,

1 This method of Engraving (of which our present Journal contains several specimens, particularly those in this article of the Priory Church of St. Bartholomew the Great,) is a recent invention which bids fair, if it continues to progress with as rapid strides as it recently has done, to effect a very considerable revolution in the art of engraving, more especially in that department of the art termed wood engraving, or engravings printed from the surface at the type press. Our readers are doubtless aware that in the latter process a drawing is made by the artist upon a piece of box wood in pencil, and that those portions of the wood or block uncovered by the drawing are
SKETCHES FROM THE PRIORY CHURCH OF ST. PARTHOLOMEW.

Fig. 1.—View of Arches of the old Tower and Transepts.

Fig. 2.—Arch in spandrel.

Fig. 3.—Prior Rahere's Tomb.
the Temple, besides many others. Several of these present points of great interest, and we hope we shall be affording some gratification to our readers, by devoting a series of illustrated articles to the architectural antiquities of the metropolis and its vicinity. The subject we have selected for the present occasion is the church of St. Bartholomew the Great, in Smithfield. Smithfield is a place it might be thought but little attractive for the architectural

carefully removed by the wood engraver, a process extremely expensive, tedious, and often unsuccessful in producing the effect intended by the designer, all which evils appear successfully removed by this new method. The finer descriptions of wood engravings are also at present extremely limited in size owing to the impossibility of obtaining the material box wood of a larger size than six or seven inches square, but by the Gypsographic process there is no limit to size. It may by necessary to explain the term Gypsography: it derives its name from Gypsum or Plaster of Paris, which forms the etching ground used in this method. The extreme simplicity of this invention is not the only great advantage it offers to the artist, draughtsman, or engraver, and may be readily understood by the following description—

A plate of copper is thinly covered with a composition of which plaster of Paris forms the staple ingredient, and through which to the surface of the copper, the drawing or design is etched with an etching point; when the etching is completed the plate having the lines sunk in or drawn through the composition forms a matrix or mould, the plate then is cast in type metal by the stereotyping process, and a perfect cast or block is taken reproducing an exact facsimile of the artist's original design and which may be immediately transferred to the hands of the printer.

Wood engravings have hitherto been the only description of illustration capable of being conjointly used and printed with type, the great cost both of engraving and printing on steel or copper having been an unsurmountable barrier to the general use of the latter in illustrating works requiring pictorial additions, but now as the Gypsographic process combines with it all the advantages of wood engravings both in printing and effect, as well many of the peculiar advantages of steel and copper-plate engravings, we have but little doubt it will be generally and extensively used in the illustration of all descriptions of bookwork. Messrs. Miller & Co. the patentees of the process have several specimens exhibiting the art applied in a variety of ways which they will be most happy to show to any person who may favour them with a visit at their office in Racquet Court, Fleet Street.

or antiquarian student, and yet to both it is of equal interest. Originally a large fen or waste, draining, probably, into the river Fleet, or some of the thea pure streamlets of the city; it was, in the twelfth century, in a very neglected state, occupying a much larger district than now, and used as a market, the higher ground being the site of a gallows for thieves, and the scene of frequent executions. It seems to have been, at that time, the property of the crown, and, lying outside two of the city gates, it attracted the notice of the founder of more than one religious house as the convenient site of a large conventual establishment. The priory of St. Bartholomew was founded on the south, that of St. John of Jerusalem on the west, and that of the Chartreux on the north; and in their remains, and in the disposition of the modern buildings are to be found many interesting architectural relics, and very good studies of the arrangement of the ancient religious houses. Three establishments, St. Bartholomew's and Christ's, Hospitals, and the Charter-house, keep up the hospital character.

The convent of St. Bartholomew the Great was founded about 1113 by Prior Rahere, who begged the site of King Henry I, for Black Canons of the order of St. Augustine; and upon the strength of a legend that it had been hallowed by King Edward the Confessor, obtained abundant alms from the Saxon people of London. Some, indeed, have supposed that the present edifice is founded on one of Saxon origin, as to which no records exist, but it is not improbable that some Saxon chantry or oratory might have existed here. It is such a spot as the religious mendicants often chose; outside the city walls—close to a main road, and on the scene of traffic and of death, it would be a tempting settlement. Indeed, it was by no means uncommon for religious houses to be instituted on such foundations, and we may well suppose Rahere to have occupied some deserted oratory or cell. Be this as it may, the bulk of the existing structure is clearly of Norman origin, and was raised by Prior Rahere during his lifetime, under the direction of Alwine, who built St. Giles's, Cripplegate. It was abundantly

* The Cottonian MSS. Vespasian, Book IX, says in one place 1103, another 1113, and according to Dugdale it was 1112.
strengthened with privileges, some of which are enjoyed by the inhabitants of the parish to this day. It is clear that the present church is only part of a much larger structure, and we shall endeavour to give some idea of its former extent and its present remains. On entering from Smithfield, a nave and two aisles, about 90 feet long, extended to the door of the present church, opening under the great tower, on each side of which was a transept. The nave was continued into the choir, the part now used as a parish church, and which is surrounded by a series of aisles and chapels. On the right or south of the nave were the cloisters, and attached to the east wall of these, and extending from the south transept, were a hall standing over a chapel, and latterly used by the nonconformists and Wesleyans, and a refectory, also, with a crypt underneath. Behind the east end of the choir was the prior's house. The whole length of the church was about 220 feet. Of these buildings the nave, the transepts, the greater part of the cloisters, the chapel, the chapter-house, and the upper part of the tower are destroyed. The church, itself, we shall describe subsequently. We may observe, however, that the entrance to the south aisle of the nave exists, and forms an entrance gateway from Smithfield. This relic is most deservedly admired, and is composed of a pointed arch, consisting of four ribs receding one within another, and beautifully decorated with numerous zig-zag mouldings and with ruses. The south wall of this aisle is also in existence. The eastern cloister is the only one of which there are any remains, though the lower part of them is buried in the soil. A recent visitor says that it has suffered much of late years from the fall of the roof and part of the wall, and consists of five arches more or less entire on the eastern side, and one on the west, besides a portion attached to the church, which is complete, but is walled up. The workmanship is said to be very fine, the breadth about 15 feet, and the length about 95. The refectory is also described by the same writer. "It is now occupied by a tobacco manufactury, and a large portion of it still forms our apartment, roofed over with oak of the finest kind and condition. There are now two or three stories, but, after a careful examination of the general arrangement of the multitudinous timbers of the roof of the highest story, we cannot but express our opinion that the whole has been open from the first floor to the roof, and that the latter has formed one of those open coverings of which Westminster Hall is so magnificent an example, though most probably of a ruder character. All appear to show that there was but one story, one roof: and a glorious roof it must have been, measuring some forty feet high, thirty broad, and a hundred and twenty long." The crypt under this magnificent hall is of the same extent, but crossed by an arched passage. It has a double row of aisles of pointed arches, and is in an excellent state of preservation. The prior's house is now used by a frigate manufacturer, and is an ancient building in pretty good preservation. The length is about 83 feet.

The external appearance of the church requires no description, being mutilated with facings of brick and stucco. The interior is, as we have said, composed of the under part of the tower and the choir, surrounded by aisles, separated from the choir by the tower. The tower was formerly attached to the transepts now destroyed, and is formed by four arches, two of them, the one opening to the choir and the other opposite to it, circular, the transept arches being of less span and pointed, as shown in the accompanying illustration, (Plate IV, Fig. 1.) so that the four form an oblong tower. They are all in good preservation except the western round arch, which is slightly shaken, and seem of the same age, as far as can be judged from the external inspection. The pointed arches are rather rudely formed. The whole four arches have, however, the same zig-zag moulding, Fig. 4; the two circular arches spring from corbels (Figs. 5 & 6). In each of the spandrils close to the angles, there are smaller arches, nearly at right angles to each other; one of them is shown at large in Fig. 2; with a peculiar zig-zag or indented border, and a column in the angle. There are also in the spandrils small louvered-shaped panels remarkable for their singularity, the ornaments of three of them, shown in Figs. 7, 8, & 9, are something similar to the Grecian honeysuckle.

This part of the church is of the greatest interest, the mixture of the pointed and round arch seems to point to the contemporaneous use of the two styles at the period of the transition, and has been the subject of much controversy, and Mr. Britton (Chronological History of Christian Architecture in England) says "The cause is evident; for those sides of the tower being much narrower than the east and west divisions, which are formed of semicircular arches, it became necessary to carry the arches of the former to a point, in order to subdivide the ovoid plan of the intersection, and at the same time make the upper mouldings and lines range with the corresponding members of the circular arches." Whether this be the case or not, it is not easy to determine, but the two sets of arches seem almost without question to be of the same age.

The choir, which is in continuation of this tower, is in three stories; the lower part is in the Norman style, resembling some parts of Winchester cathedral. On each side are five round-headed arches, ornamented with a billet moulding, a peculiarly connected with which is that it is in some places carried over the cap of the column to the next arch. The second story consists of a triforium of five arches corresponding with the lower story. Each opening is divided into four by small columns and round-headed arches. On the south side one of the openings is occupied by a beautiful oriel window, Fig. 10, built by Prior Bolton (about 1500). Above the triforium is a clerestory of pointed windows, and the pier are pierced longitudinally so as to form a gallery all round the upper part of the choir. The roof is of timber and not very remarkable in its construction or very handsome. The east end is of modern workmanship by Mr. Blyth, who repaired the church lately, and contains in the lower part a range of round-headed arches. In repairing this part, the stone wall behind it was found to be painted in water colour of a bright red spotted with black stars. We think it a great pity the church is now painted now, instead of the lovely supply of whitewash.

Behind the altar is a chamber, supposed by Mr. Godwin to be the chancel, the interior of which well merits inspection, and which it is desirable should be thrown open to the church. The aisles are about twelve feet wide, arched in the simple Norman style, lighted with windows of various dates. Over the south aisle is a school-room, or vestry, containing a beautiful Norman arch. The vestry which is attached to the south aisle seems to have been an ancillary oratory dedicated to the Holy Virgin.

The choir and aisles contain many ancient and interesting monuments, the most remarkable of which is that of Prior Rahere, the founder, which we have selected for one of our illustrations (Fig. 5, plate 1). "We find the monument of the founder in the north-easter corner, almost immediately opposite an excellent oriel window, which is clearly pointed, in order, perhaps, that when he sat in it the home of the ashes of his illustrious predecessor might be for ever before him. This is a work in every way worthy of the man whom it enshrines. It is one of the most elegant specimens of the pointed style of architecture, consisting mainly of a very highly wrought stone-work screen, enclosing a tomb on which Rahere's effigy extends at full length. The roof of the little chamber, as we may call it, is most excellently groined. At what period the monument was erected is uncertain; but the style marks it as of a later date than that of the founder's decease. But it was most carefully restored by Bolton (about 1500), and the fact is significant of its antiquity. As the latter found, no doubt a labour of love in making these reparations, so time itself seems to have seconded his efforts, and to have shared in the hopes of its builders that a long period of prosperity should be granted to it, by conferring it very gently. Here and there the pinnacles have been somewhat diminished of their fair proportions, and that is pretty well the entire extent of the injury the work has experienced. The monument, it must be added, is richly painted as well as sculptured, and shows us the black robes of Rahere and of the monks who are kneeling at his side—the roily features of the former, and the splendid coats of arms on the front of the tomb below." There are also other monuments of interest as those of Sir Walter Mildmay, and Archbishop Walchyn, Lord High Treasurer, remarkable for his patriotic resistance to the See of Rome.

As to the dimensions of the edifice great uncertainty prevails. Mr. Godwin has given no measurement. Malcolm gives it as 136 ft. long, 69 ft. broad, and about 40 high. Osborne as 132 ft. long, 57 broad, and 47 high.

7 Malcolm's Londinum Redivivum, Vol. I.
8 Knight's London.
WINDOW FOR A LUNATIC ASYLUM.

Sir—The humane treatment recently observed towards unfortunate individuals labouring under the affliction of lunacy, rendered it necessary that extensive alterations should be made in the establishments provided for their reception, and in consequence, architects were invited to send suggestions for the improvements of St. Patrick’s Hospital, (Swift’s) in this city, and then submitted by me, were approved. The most important arrangement was the window, in which it was indispensable to obtain strength and proper ventilation, without having any appearance of confinement, and if possible produce an elegant and cheerful effect, proper provision being made for the easy repair of them when requisite. In all these I succeeded, and as many of your readers may be called upon to make similar alterations, my suggestions may be of service; if you think so, I have sent you herewith a plan, elevation and section of the window, to which you can give publicity. I may observe, that I should have preferred having the window a little wider, but did not think it prudent to disturb the old arches, the windows being numerous, thirty-one in each corridor, in a length of 300 feet.

I have the honour to be,

Your obedient servant,

Henry Hart, Architect.

86, Talbot Street, Dublin.

ON THE ADVANTAGES OF EXTENDING INLAND STEAM NAVIGATION IN INDIA.

India presents to the civil engineer and architect of this country an almost insurmountable field of action, and an immemorial source of handsome and profitable employment. Its rivers, among the largest and noblest of the world, and coursing plains redolent with all that life can require, are rendered insipid and sometimes altogether valueless from the want of steam vessels and boats suitable to their traffic. Its plains are impassable from the want of roads; its roads and nullahs are useless from the want of bridges; its mines are useless from the want of talent to conduct them; its manufactured products are lost to the home market from the want of skill and machinery; and, in fact, in every department of agriculture, manufacture, and commerce, the want of European talent and of the appliances of steam and steam engines, railroads, foundries, and clever men to conduct them, is most distressingly felt throughout India.

We have acquired by our arms another portion of this vast country, to which Great Britain, in fertility and extent, cannot be compared; and with this acquisition additional inducements are held out to talent—additional incitements to industry, on the expansive waters of the Indus, and the vast plains which derive their extraordinary fertility from the presence of that river: talent to direct the construction of suitable vessels, to open internal communication, and to introduce the European arts and machinery, in order to enhance the value of the rich and varied products of the earth. The country traversed by the Ganges and its chief tributary, the Jumna, contains upwards of 60,000,000 inhabitants; it is intersected with navigable streams, and the traffic, which is already very great, is annually increasing, as the arts and manufactures of Europe become justly appreciated by the natives. We are informed by Mr. Bell that the produce of the Interior, in 1826, amounted to 179,459 tons, valued at £8,027,995; and it is presumed that returns at least an equal amount were made in goods or specie: the annual traffic on the Ganges may therefore be rated at more than 12,500,000 sterling. A great portion of the trade is carried on by native boats dragged up the river by human beings, a tedious, expensive, and unsafe mode of conveyance, rendered still more so from the vilely-constructed boats and dogged indifference of their crews. Of steam boats, so essential to the free intercourse of Europeans, by the native, and so much desired, there are six only, which start at intervals of three weeks from Calcutta and Allahabad. These steam boats belong to the Bengal government, and are employed principally for the transport of troops and stores, their extra tonnage being disposed of by public auction in Calcutta; and on the 6th April 1841, the exorbitant price of £23 was paid by those who chose this most expensive mode of transit of their goods. This fact alone speaks volumes in favour of an extension of inland steam navigation by members of the community of this country; for the great competition of European and native merchants which leads them to pay this extraordinary price, is a convincing proof how much the extension of this mode of transit is required, and how exceedingly profitable it would prove at half the above rates, to those who chose to introduce them in numbers suitable to the demands of the market.

The number of passengers by the Company’s steamers on the Ganges has lately become of great magnitude; and by this mode the interchange with Calcutta and the great cities on the Ganges, Mooraahrabad, Patna, Gutzapoer, Benares, and Allahabad on the Jumna, is found to be, even at the present high rates, the most economical, as it is the most speedy. The natives of India, as well as the European merchants and residents in Calcutta and in the interior,
are extremely desirous to adopt these as well as other European improvements; and it appears extraordinary that, in the depressed state of the iron trade at home, capitalists have not been found to supply the requisite number of steam tugs and flat-bottomed vessels of iron fitted for navigating these rivers in all seasons of the year, as well as for manufacturing machinery, which is at times in demand. For it must be borne in mind that, although India possesses some of the richest iron mines in the world, she has neither miners to work them, nor foundries to manufacture the prepared material; it is, therefore, to England alone she must of necessity look for her supply of machinery and wrought iron.

The extent of traffic on the Indus is not so much known to us. Dr. Burns, speaking of the advantages of opening a commercial intercourse with Sind, properly says, "Although the miserable poverty of the people of Sind will raise the hope of mercantile intercourse to any extent with them, yet the natural advantages of the country for commerce need scarcely be pointed out; security to trade and property alone required to render the Indus the medium of introducing our manufactures among vast nations, which, occupying climates resembling our native, would gladly welcome the products of British industry, and offer to the speculations of our ingenuous and enterprising countrymen ample encouragement and reward." In the preface to his interesting narrative he observes, "In the end of 1835, Mears, Heddle and Wood had the gratification of exhibiting to the astonished natives of Hyderabad the first steam boat that ever entered the Indus. Vessels laden with rich wares from Bombay and Moultan, have now hailed each other on ts waters, and while bazaars of Western India are already teeming with the shawls of Cashmere, and the products of the Punjab, received by the long forbidden route, not only for private speculators, but in large investments from Maharaja Runjeet Singh himself.

There is abundance of coal in the several districts of Bengal, and in lieu of coal, on the banks of the Indus, the "jewel," a species of coal abundant, which, in the absence of coal, is found to be an excellent substitute; there is little doubt that coal will eventually be found in some of the extensive valleys of this river.

An estimate of the expense of steam boats tells us that each iron steam boat, with engines of 100 h.p., including freight from England, and expenses of putting together in Calcutta, with wood work complete, costs £2,100; an iron flat (accommodation boat) capable of carrying 100 tons of goods and 30 passengers. £3000; the total expense being £15,000; the profits may be fairly estimated at 20 per cent.

It is to be hoped that the rivers of India, like those of America, will, in a few fleeting years, abound with these most useful auxiliaries to man's happiness; and that with increased facilities of communication, corresponding improvements will take place in the cultivation and manufacture of the staple commodities of this country. Articles, such as cotton and sugar, which to us have now become essential necessaries of life, and for the supplies of which we have at present to depend upon foreigners, are little valued at home in comparison to the same kinds of produce coming from foreign countries, simply because due attention has not been paid to their culture and manufacture; and although some slight efforts have been made by the East India directors to introduce a better order of things, and some few Europeans have embarked their capital for the same laudable purpose, yet, comparatively speaking, little or nothing has been done; not can we hope for much until that the importance of foreign communication out of one part of this vast continent, to the East, has been more extended—until many of the fine old, ancient roads are reopened and new roads are formed—until aqueducts, viaducts, and bridges are built, steam boats crowd the broad, expansive rivers, mines are opened, and foundries and factories are erected; all these objects may be gradually attained by the employment of British talent, capital, and enterprise, thereby increasing our own riches and prosperity, and at the same time administering more immediately to the wants and desires of 150,000,000 of inhabitants of India, who, as fellow-subjects, have a right to demand thus much of the inhabitants of Great Britain—of that country which, for two centuries past, has used its wealth, and diminished its internal resources.

TO PREVENT DAMP PENETRATING THROUGH WALLS.

Some distinguished French chemists have lately directed their attention to the means of excluding damp from the internal surface of walls. The following is a translation of some observations on the subject by M. M. Thénard and D'Arce. The experiments made by them were begun in 1813, when M. Gros undertook to paint the cupola of the church of M. Genievois (then the Paris Academy) which was to contain 60,000,000 of boards. The walls of the cupola had been previously prepared like a primed cloth; after the stone had received a coat of strong size, a ground of white lead and drying oil had been superadded. Fearing that this priming was not sufficiently firm, M. Gros came to consult us. We did not hesitate to say it was far from safe. The moisture might in time, we observed, act on the size, and a painting executed on such a ground would consequently change. We came to the conclusion, that it would be necessary first to saturate the stone as deeply as possible with an inertuous substance, liquified by heat, and which, solidifying as it cooled, would stop up the pores of the stone. We were strengthened in this view by the authority of the ancients, who sometimes passed melted wax over the surface of the walls which they intended to paint, and we were induced to try a coating of wax and linseed oil, rendered drying by litchare. "After some experiments on stones similar to those of the cupola, we were led to prefer a composition, consisting of one part wax and three parts oil boiled with one tenth of its weight of litchare. The absorption took place readily by means of heat, and the liquid penetrated the stone to the depth of from a quarter to half an inch. The composition as it cooled acquired solidity, and in six weeks or two months became hard. Having made these experiments, we proposed to adopt the same means on the cupola, and the operation was to be conducted as follows. The surface was first to be scraped, so as to entirely remove the paint and size, and lay the wall bare, then by means of a portable furnace, the whole superfluous was to be heated, about a square yard at a time, and the composition was to be applied at a temperature of 100°, with large brushes. The first application being absorbed, a second was to be added, and so on till the stone should cease to absorb. To promote the absorption the stone was to be warmed repeatedly according to its porosity. In every case the heat ought to be as great as possible, but not so as to carbonize the oil. At length the stone being saturated to a certain depth with the composition, and the surface being smooth and dry, it was to receive a coat of white lead mixed with oil; and on this preparation the painting was to be executed. Our plan was adopted and put in execution, and thus M. Gros was enabled to produce a new masterpiece which could undergo no change, except that which light and air might occasion. Drops of water like dew, which covered the whole surface of the cupola, every morning at first alarmed the artist; the drops appeared and disappeared without the slightest had consequence, and a trial of 15 years has now dissipated all apprehension." A letter is then inserted from Baron Gros, certifying that in the course of 15 years his work had undergone no change. The memoir goes on to state that four pénitents in the same church, painted by Gérard, were prepared in a similar manner. In this case the stone was so hard that the composition could not be made to penetrate more than one eighth of an inch. The result was however quite satisfactory. The painting by Gros was first begun, as before stated, in 1813, and has been recently examined with a view to its state of preservation; it has been pronounced to be in a sound and apparently unchanged condition. For ordinary purposes resin might be substituted for wax, the ingredients then are one part of lithargized oil to two or three parts of resin. (Appendix to the second Report of the Commissioners of the Fine Arts.)

WIRE ROPES.  
Swan Wire Rope Works, Gateshead, 28th July, 1843.
Sir—In your magazine for July in giving an account of the launch of the "Great Britain" at Bristol, it is stated that she is to be rigged with wire rope made by a Mr. Andrew Smith: we beg to inform you that the wire rigging used on board of her was manufactured by us some time previous to her launch, and beg to annex a copy of a note from T. R. Guppy, Esq., the builder of the "Great Britain," which we will feel obliged by your inserting along with this in your next number.

We are, Sir, Your obedient servants, R. S. NEWALL & CO.

Great Western Steam Ship Works, Bristol, 5th September, 1843.

GENTLEMEN—In reply to your favour of the 2nd inst. I beg to inform you that the whole of the iron wire rope used on board the Great Britain is of your manufacture, and that I decided on adopting it after testing its strength against other specimens. I am, Gentlemen, Your obedient servant THOS. R. GUPPY.

Messrs. R. S. Newall & Co.
Gateshead.
The Philosophy of Coral Formations, and Their Architects

No. II.

According to the doctrine of the Pythagoreans and Platonists, there is life in all things, the living principle being omnipresent and inseparable from matter, regulating, modulating, and reconciling the various actions and parts of this mundane system. This living principle is the electric fluid of modern philosophers, being equally manifest in the living, the fossil and mineral kingdoms, giving form and properties to all; thus plants are distinguished from minerals only by their flexible nature, which enables them to multiply their parts in a certain extent without impeding the action of the living principle: the line of division of the animal, the vegetable and the mineral, is life, the link of life being one unbroken chain, commencing with the, to us, invisible point, and ending in the beautifully complicated mechanism of man: life in all being a measure of quantities and a measure of motions, continually varying; and finally dissolved. The great inherent property of organic life is to condense the elements, and to unite them in fixed and definite proportions within the body as animal and vegetable matter, which on the cessation of living action, becomes under many new combinations, fossil and mineral matter. The living and the dead are bound by the same chain of necessity for the preservation of form and quantity, and for the capacities, qualities, and powers which they severally develop, cause depending powers producing characteristics, or do they perform the like duties, but simulate more to the respiratory vessels of plants, gradually diminishing in size, and eventually when the entire form is developed, closing altogether, leaving the trunk still accessible in all its parts, until which whole portion dissolves, or it becomes entombed by increasing generations, it is certainly a mistaken notion that every cell throughout the body is the habitation of a polyp, for while we admit that animal matter pervades the whole body, we cannot admit it to be one body in entirety, increasing and propagating through the instrumentality of its suckers which perform the active duties, conducting the food into the main trunk and branches, wherein it is elaborated into lime, gelatine, oil, phosphorus, and other peculiar compounds, the body fixed and immoveable being the passive medium of action, and receiving increasing size and solidity from continual accession of abler bodies.

Eltzenberg tells us that tripoli, chalk, and other substances, when microscopically examined, display a cellular structure, the tenanted and untenanted habitations of polypiions; and that every cell is undoubtedly the habituation of a polyp living, maturing and generating, independent of those connected with it. The radiate corals are of compound animal formation, the several tentacles or suckers being one body, united at the base, and governed by the one impulse; thus it is their growth is uniform and their form defined. Each of these suckers forms during the period of its growth a series of cells or joints, which communicate with the main body, according the general increase of the whole, and enable the polyp to withstand more effectually external influences, and to prevent the separation of the several species. The corals are as previously observed, of plant-like growth, covered with cylindrical turbinate pores, the whole compound body being one, and uniformly governed by one impulse.

The polypous animal like the plant is the unconscious architect of its own existence, both in advance in the line of light and heat, and ramify into shoots and branches; it is impossible to reconcile the effects of the several species, or the unconscious agents of production and reproduction of peculiar elementary compounds, and both perform an equally important part in the economy of nature.

The very recent report of Mr. Edward Forbes on the Moluccas and Radiata of the Azorean Sea, drawn up at the request of the British Association, confirms in a most remarkable manner the laws I have laid down regulating oceanic animal and vegetable life, in disposition, quantities, and qualities illustrating the progressive development of species, habit and character, and consequently the gradual development of the fossil and mineral kingdoms. He observes, that in eight distinct regions of depth, each presents its peculiar association of species defined between 0 and 230 fathoms; the most superficial of these is marine, though, having raised the shell to the surface, the corals, being most prolific of animal and vegetable life, and most various in mineral character. The second region ranges from 2 to 10 fathoms, the third from 10 to 20, the fourth from 20 to 35, the fifth from 35 to 55, the sixth from 55 to 75, the seventh from 75 to 105, the eighth exceeding in extent all the others combined, ranging from 105 to the lowest depths explored, and presenting a uniform mineral character throughout salin and peculiar forms. Certain species were found to range through several of these zones, and two through all. It was found to be a law, that the extent of range of a species is correspondent with the extent of its geographical distribution. On the other hand, species having a very limited range in depth were found to be either peculiar Mediterranean forms, or such as are extremely rare in the Azorean, but abundant in more northern parts. The character of the testacea of the enclosed and continental seas is preserved with their analogues in the ocean, and the number of mutuses and zoophytes are comparatively small. Below the fourth region in depth the number of animals diminishes as we descend, until, in the lowest part of the eighth region the number of testacea was found to be only eight. In the upper regions the more southern forms prevail, whilst those of the lower zones presented a northern character, indicating a probable law, that in the distribution of marine animals, regions of depths are equivalent to parallels of latitude. A corresponding succession and replacement of forms by similar forms was discovered in depth. Each species attains a maximum in development of individuals, and gradually diminishes in numbers as we descend; out before its disappearance in many genera, a representative species commences, retaining a maximum after the disappearing species, and passing on to their collateral composition and disappearing. Genera are in like manner, represented and replaced by corresponding genera. This is equally true with vegetables as with animals. Green fuel were found as deep as 55 fathoms, and millepores extend its range to 105 fathoms.

Within the waters of the Pacific Ocean several hundred thousand square miles of habitable land have been formed or are now forming among the agency of gelatinous and lime-secreting polyps, aided by innumerable families of shell fish, marine plants, and locomotive animals with which the waters abound. Hills and chains of hills, mountains and mountain chains, running along the tidal lines gradually enlarge their summits as these waters decrease, and for upwards of 4000 miles not a single island occurs that is not of coral origin. The greatest part of the extensive coast of New Zealand is composed of coral reef, and forms a continuous line with others to the extent of 1000 miles, varying in breadth from 20 to 50 miles: the lower plains of the vast continent of Australia have the like origin, and throughout the whole Australian seas there is scarcely one league without a coral reef, rock, or island, raised from the lower depths by polypos animals, though close to within the reef the sea is fathomless than the whole extent of this portion of the ocean is rapidly filling up, and the main continent continually enlarges its geographical area.

In the south sea, particularly to the eastward of the Friendly Islands, from the 10th to the 15th latitude, a reef of coral surrounds the island of Onhie falling like a wall from unattainable depths. Palmerton island, the islands of Tavea, Maldehara, Tongarao; Muaro and many islands of the South Sea are of like formations. The coral reefs and islands called the Maldives form a chain of 480 geographical miles in length, running due north and south. The whole line of coast of Eastern Africa, the island of Madagascar, and other islands scattered over the
Indian Ocean, owe their origin and increase to like causes. The islands of the West Indies and vast barriers on the shores of the main land are coraline—the Persian Gulf and the whole of the Red Sea are both rapidly filling up, the latter sea being at present barely navigable by vessels of large burthen through a very narrow channel, and by far the greater portion of the main continent of Africa and of Asia, including all the great deserts and mountain chains intersecting them in various directions. Charles T. Bell supposes the great extent of the gulf of Sameularia to be due to a great cataclysm; and all writers unite with him in supposing that great encroachments have, and continually are taking place in these latitudes. The clay of the Euphrates contains an excess of sodium, and on either side are immense deserts of sand, salt, bitumen, naphtha, magnesia, soda, and calcareous matter, while the hill chains dividing them, are wholly composed of rocks and sands and calcarious-matter, the whole plate of the shores of India, the land has encroached upon the sea to a vast extent; the great Run, 7000 square miles in extent, is one sandy flat containing vast beds of salt, and the elevated tracks surrounding it demonstrate their origin. The great deserts of Africa, Zacharâh, Nubia, Lybya, Egypt, Mesopotamia, and many others, stretching from the Atlantic through Asia, are exclusively desert, the entire soil being sands and calcareous matters. Beds and lumps of their salt, chains of hills composed wholly of corals, balani, oysters, and numerous species of shell fish, interspersed with vast accumulations of petrifications, and the skeleton remains of fishes. Approaching towards Europe the like phenomena have been noticed so far back as the time of Diotosour, Filiny, and strabo: further proofs of the decrease of the waters are afforded, by the facts of the numerous isolated islands of the Mediterranean, the Caspian and the Black Sea, the Red Sea and the Mediterranean, have been broken off, and the vast salt lakes of Russia are standing and incontestable memorials of the seas retreating therefrom.

The Red Sea is most abundantly stored with coral formations, lime secreting animals, fishes, animals, algae, and sea weeds; the vast shallows embracing for miles a transparent, saltpetre water, showing the stupendous workings of nature, and the primary causes of many effects manifest in terrestrial earth. Sailing over them during the long continued calms common to this sea, when not a ripple disturbs the surface of the waters, which are bright and blue as the lake of Como, the eye is delighted with the panoramic view beneath. Gardens abounding with animal flowers of every hue, the red gorgonias, coral, green gorgonias, and sponge, purple, blue, yellow, white and brown mudtoreps and mussels of every size and variety, in clumps and groups with corallines and plants of the most delicate texture. Plains covered with green verdure tenanted by crustacea, turdles and fishes, valleys covered with a white sand, partially hidden from the view by murenes, sea eggs, sea smals, pens, star fish, and scarlet, solemn and hermit crabs—elivated plates of pearl-oyster hills of cirripede, and chains of hills of coral reef, whose towering summits sometimes resemble the roofs of palaces and temples of the richest and most elaborate workmanship, from which pendunculated cirriped and purple mussels are hanging in clusters, while beneath, wide and magnificent portals open into caves of beautiful coral, where the coral fish resplendent in azure and silver, and green and gold, rest in their innumerable multitudes of delicate food cropping the equally gaudy flower from its living bud. Above, the sun, by its light and by its living myriad of phosphorescent animal life, sharks, bonchias, dolphins, black fish, mollusks, and numerous other species.

The calcareous matter covering the valleys and troughs is analogous to the chalk deposits of the earth, consisting of the atomic particles, entire bodies, and portions of bodies of generation upon generation mixed with the digested matter continually deposited by the living. The sands vary in their nature and quantities, in localities being extremely fine, when formed by the death and decomposition of young mollusces, which are thrown up in vast abundance on some of the shores near which they are produced by the parent; and much coarser when they are produced by the decomposition of many corals and coelenterata, and when shell fish having heavy excrecrous shells. The outward reefs towards the open sea, the great coral reefs are confoundedly numerous, consisting of the reef coral and various lime-secreting species enveloped in consolidated rising formations; the reefs always form along the tidal line, and when the rising structure causes the tide to diverge right or left, then, within the disturbed space the zoophytes cease to work, and an opening is left of considerable width and depth, of much advantage to mariners, who are thereby enabled to take refuge within the reefs during stormy weather. This outer reef presents a perpendicular wall to the tidal currents, but generally has a gentle inclination towards shores with two or more parallel chains, thus from Mocho to Yambó there is a constant reef, and for upwards of 360 miles a triple chain of reefs is seen running parallel to the coast of the South side of Arabia bordering the sea. The inner reefs are variably composed, their elevated parts being generally of the like conformation of the outer wall, but the interior is sometimes filled by coral banks heaped up by storms, consisting of broken coral sands and weeds; upon these, in the long continued calms common to this sea, vast multitudes of mollusca resort, which are buried in the next periodical disturbance, thus stratum upon stratum is formed, until the bank tops the water, sometimes cutting off vast tracts from the main ocean, which, when perfectly isolated, soon become a portion of the desert. The reef is sometimes formed by the united labours of numerous species of lime-secreting animals, separately working in groups and families, or confusedly blending together and embracing each other in the general ruin, the coral polyps enveloping all the crustaceae and corallines, and the relics of the dead in their stony folds. The reefs of the Red Sea are richer and more remarkable than in the east Indies, excepting the corals of the Persian Gulf, and the rivers containing the Calcisulc, Balani, and white tube coral, and others are wholly formed of calcareous matters or sea weed, the whole united mass being one vast receptacle of the dead, and so long as covered by the waters, one general birth place of the living: the like phenomena of coral formations is common to all tropical seas.

Thus, for example, who first drew attention to this important subject, observes, that in the eastern seas, coral banks grow by a quick progression towards the surface; but the winds heaping up the coral from deeper water, chiefly accelerate their formation into shoals and islands. They become gradually shallower; and when once the sea meets with resistance, the coral is quickly thrown up by the force of the power breaking against the land; and hence it is that in the open sea, there is scarce an instance of a coral bank having so little water, that a large ship cannot pass over it, but it is also so shallow that a ship would ground on it. The coral banks were observed by him in all stages of growth, some in deep water, others with few rocks appearing above the surface, some just formed into islands, and others covered with land vegetation. Bars of sand and coral also form, cutting off large portions from the open ocean, by the wayside, the innumerable reefs rising from the earth, are subjected to a slow and frequent change. The violence of the waves, he observes, gives the direction and form to the reefs, which are long and narrow; but when not exposed to the common monsoon they assume irregular forms, according to the accident of circumstances. Such in truth is the origin of many coral banks; but this mode of formation can only apply to those barrier reefs and rock built islands which constitute the narrow galleries and shoals of the open sea, the larger and more remote reefs receive increase by continued sedimentary depositions; but many of the inner reefs of seas being beyond the action of the storms, are entirely built up by the living architects, without the aid of broken coral and sands from deeper waters: thus all navigators speak of these enormous barriers and local accumulations as presenting seaward a solid wall of limestone of unfathomable depth, such could not be the case were they built up by the sands and broken coral collected from the sea.

The analogous formations intersecting the earth in hill and mountain chains of limeose, solite and chalk, give clear ideas of the disposition and shape of these reefs now forming within tropical seas; the limestone has invariably one or more perpendicular faces, the same inclination pervading the reef, the extreme height not exceeding 4600 feet: the chalk having also occasionally one alate face, but being in many instances dome shaped; the larger formations generally running in a considerable distance in a direct line, the smaller being grouped together, being as evidenced by their organic remains formed in the shallows of warm and tranquil seas.

The Red Sea, as previously observed, is literally choked up with coral reefs, sands, and embankments, composed of broken corals, shell fish, &c.; and the present directors are also rapidly filling up with the finer decomposed particles of lime secreting animals, fuel and other organic remains; since the days of the Pharaohs, thousands of square miles have been abstracted from this sea, from the Persian Gulf, and hundreds of islands have reared their crests far above the surface of the waters. Sea ports towns once accessible to vessels of heavy burthen, are now lost in the distant desert plain, or are inapproachable for miles. Dưỡngah tells us that the ancient harbours are filled up with the debris washed into them by storms, but this is not the facts; the present site of Yambo is on a recent coral reef; from which the inhabitants say the waters are continually receding. Djedjah is impassable by our vessels for two or three miles, the solid coral limestone rock approaching in all parts of this intervening space to the very surface of the waters, and land is scarce standing for ships. The sea lying off the coast is tolerably shallow for full five miles; the coast on the Arabian side is bounded by continuous reefs of recent coral, now standing from 20 to 60 feet above high water mark, and chains of lakes are formed both by this general decrease of the waters, and also by accumulating sand banks. Beds of pearl oysters, and hills of peculiar species of lime secreting animals common to this sea, may be found many miles inland. The accumulations of coral, sand, and calcareous matters are of incredible extent and thickness, embracing many thousand square miles between the sea and the hills of Arabia and Africa. Few of the islands are or can be inhabited, being desert soil, wholly devoid of vegetation, with the exception of the amophilous mangrove, and a few stunted shrubs and coarse grasses, and such plants that love a barren arid soil: they are the same species as those of other seas, whose dung sometimes covers the surface to a considerable depth. In the same manner, in all these, these islands continue bare and desolate from generation to generation.

The phenomena of coral reefs simulate in all parts of the ocean where they are produced, but the after changes which take place on their surface depend
on the nature of the latitude under which they are disposed. As in the Red Sea, in the absence of rain, we find them for ever desolate; so in the Pacific and South seas, the islands are swelled and baked, and seas is soon acquired aptitude and power to produce vegetables, and to sustain animal life, the scaly skins and other organic compounds being washed into the waters, or into the bowels of the earth. In and throughout the whole, the coral formations originate from its causes in action, the lower depths of the ocean, For, their fuel, and naked polyps, upon this basis the calcareous polyps build, assisted in its labours by numerous species of mollusca, and furnished with material by the myriad of creatures living in and death decomposing in the medium in which they are placed. Upon the ruins of preceding existences conchifers and mollusca dispose themselves in groups and families, or are heterogeneously united with the general body, adding their ruins to that of the latter, to give birth to the whole, and to thence to death to the general body their elementary constituents, contributing to form the one great whole, or general sum of earthly matter.

Donati speaks of the bed of the Mediterranean being filled up to the depth of 800 feet with the calcareous bodies of the dead: what must then be the depth of these deposits in tropical seas where species are infinitely more numerous and diversified, and where fine-secreting polyps build from depths unfathomable, filling up a geographical range many times larger than the Mediterranean Sea.

Nor is it to the coral polyps alone that we are indebted for the formation of islands and continents of the earth. Many localities of the deep are overspread in vast patches with fuel, which as they generate, contribute to fill up these depths with waters by administering to the wants of numerous families resorting to these submarine meadows, and by contributing to the digestive process of those fishes, and also in decomposition of their parts adding thereto. Again, the fecundity of many species is most amazing great, and were it not for the eternal warfare waged against each other, and the numerous accidents to which they are subject, the whole ocean would speedily become extinct with the living of the dead: thus we are told that in the ovals of a founder of 2 oz. weight have been counted 133,407 eggs; in one of 21 oz. 1,537,400; herring weighing from 4 to 5 oz. from 21,285 to 36,960, lobsters from 14 to 36 oz. 21,609; mackerel of 20 oz. 345,967; sturgeon of 160 lb. nearly 1,500,000; cod fish are supposed to spawn annually 9,000,000, and ling 19,218,625. Lenthalbeck also tells us that a globular body of equal diameter of salt water liquor may contain 1,728,000 embryo oysters, besides animalcula, 520 times less than the spawn. The enemies of the ocean, by their means, are all exceedingly prolific, and advance rapidly to maturity, and in warm tranquil seas the several varieties of fish are strikingly abundant; while throughout the aqueous medium fishes, animalcula, medusae, and other locomotive animals abound, and in their abundance contribute to fill up the valleys of the deep, and to raise the submarine hills and mountains to the surface of that element to which their operations are confined. Other causes in action contribute to the ultimate result, the waters slowly disappear, and the virgin soil which, from its base to its summit, as composed of the relics of the dead, becomes exposed to new influences, whereby its future character is determined.

The number and variety of living species inhabiting the ocean, and by the functional relations of life contributing to increase the elements, as donned, earth, is far beyond the imagination of man, and every species, from mosas to the monster mammalia, derive their elementary constituents from the medium in which they move, abstracting matter from the atmosphere and from the waters, and maintaining form and characteristic properties through the agency of light, heat, and electricity, becoming wholly or partly in a portion of the soil, and of those peculiar compounds generally disseminated through the waters. Of the food received within the living system nothing is lost, one portion adds by secretion to the rising strength and maturity of the body, and to the propagation of kind, and thence to decay, the remainder passing out by excretion or respiration; and as the nature of the aqueous medium and the elementary influences excited therein determines the nature of the organic body, so does the nature of the body determine the nature of the organic compound generated by living action, and the sum of existence of species uniform in their parts and qualities determines the nature of the formation produced by their combined operations. The consolidated atomic quantities, or the entire animal frame may lose a portion of their elementary constituents, which volatilize and return to the pure state, the animal would remain capable of existence, and to this end, that oscillation of the carriage must necessarily be great, whenever the brasses began to wear. He explained that it was usual, in order to save the expense of new brasses, to weld an iron ring upon the journal against the collar, and showed one, which had worn such a cavity in the end of the brass, as to bury itself completely within it. It appeared also that there was much wear both on the journal and in the box, and that unless an axle possessed the means of having its braces tightened up edways, oscillation and abrasion were inevitable. A journal and its cones of the improved form, which had run over 21,000 miles on the South-Western Railway, exhibited

**PROCEEDINGS OF SCIENTIFIC SOCIETIES.**

**INSTITUTION OF CIVIL ENGINEERS.**

May 16.—The President in the Chair.

*Description of an improved form of the Journals of the Axles for Railways.*

By Captain Elias Robson Handoock.

The paper commences by enumerating the principal disadvantages of the common railway axles, noticing particularly, the great consumption of oil; the wear and tear, not only of the axles, but also of the boxes and the rolling stock, arising from the friction occasioned by the rubbing away in length of the particles of bodies contribute by its death to the formation of some one particular earth.
no visible amount of abrasion, and Captain Handcock contended that the practice confirmed his previous ideas.

Mr. Field thought the form of the axes a decided improvement. They were somewhat on the principal of those which had succeeded so well for common roads, and he believed that they must prove of considerable advantage for railways.

Mr. Fairhain approved of the construction of the journals, and had no doubt of their practical efficiency; he particularly liked the cones, as in addition to their affording the means of preventing lateral motion and diminishing the friction, their form added strength to that point near the shoulder which was it well known was so liable to injury.

Captain Handcock stated that the average consumption of oil on railways was for an engine and tender with common axes and brasses, about 6 lb. for 110 miles; of this quantity, 2 lb. were used for lubricating the axes.

General Pauley observed that his attention had been drawn to these axes, and although on account of his official position, he scrupulously avoided giving any opinion on the merits or demerits of an invention, yet he might say that the fact was in the language of a remark was in his opinion of Captain Handcock’s axes, that he certainly would give them a trial.

"On the application of Zinc by the process of Electro-deposition, for the preservation of Iron, as applied to Engineering and other purposes." By Frederick Pellatt.

The whole of the paper is directed attention to the properties of zinc as a protecting coating for iron; to describe the processes already employed for that purpose; the reasons of their failure, and the peculiar fitness of the process of electro-deposition of metal for the purpose. Iron is, it is stated, from its superior affinity for oxygen, liable to rapid decomposition, and it has been shown that the use of some cheap mode of protecting it by the ordinary methods of painting and tinning not being sufficiently lasting. By the laws of electricity, when metals are in contact, the negative metal is protected at the expense of the positive; and under all ordinary circumstances zinc being the positive metal, it becomes a protector to the negative metal—iron. Zinc, like most metals in commerce, is not to be met with pure; in the other metals, however, the impurities do not generally tend to the injury of the metals with which they are combined; and, however, is not the case with zinc and its impurities, as when a contact is made of moisture, the zinc is rapidly destroyed. Those who have made use of zinc, especially where it has been exposed to exciting fluids, such as milk, or any other fluid easily converted into acid, are well aware of the rapidity of its destruction. The impurities existing in ordinary zinc are then noticed, as well as the difficulty and costliness of the process of sublimation, in order to refine it. It is also contended that impure zinc being in itself so easily destructible, is of little value, as it cannot afford protection to any other metal which may be coated with it; and therefore the mode of plating iron with melted zinc (of commerce), must be objectionable.

The Report made to the French Academy by Monsieur Dumas, is quoted, in which he says: "the zincing of iron by steeping it in a bath of melted zinc, in order to obviate its impurities: besides the objections: being unpractical, zinc constitutes a very brittle superficial alloy, the iron losing its tenacity. The presence of foreign matters used in the process, in order to keep the zinc in fusion, increases the amount of impurity, and being less fusible than the zinc, a great loss is created in consequence of the zinc volatilizing at a high temperature. It is well known that metallic impurities and metallic salts by the electro-process, the pure metal only is deposited, so the process described in the paper, is not open to the objections against ordinary metallic coatings. The iron also being coated with zinc in a cold solution, its state is in no way changed. The expense of the process is stated not to exceed that of four coats of oil paint.

Though to men of science the properties of zinc in connexion with other metals have been well known, (and the opinions of Drs. Graham, Kane, Davy, and Dumas, are quoted on the subject,) yet practically this knowledge has not been much applied, chiefly from the difficulty of obtaining pure zinc. The electro-process, it is stated, entirely overcomes the difficulty; at the same time it affords facilities for covering iron-work of any form and size, without any coating on any of the parts; the process may be carried on in any locality. Zinc has another great advantage: although it is easily oxidized, the oxide in ordinary circumstances is insoluble, and affords a protection to the metal below. For roofing and many other purposes, of which a long list is given, it is suggested that zinced iron would be found very useful.

Remarks.—Mr. F. Pellatt exhibited a number of specimens of iron covered with zinc and copper by the process of electro-deposition, which he described. The pieces of iron were first rendered perfectly clean and free from oxide by plunging them into a bath of heated sulphuric acid and water: they were then placed in a cold solution of sulphate of zinc: the positive pole of a galvanic battery being attached to a zinc plate, and the negative pole to the piece intended to be covered with metal, the deposition commenced equally all over it, and was continued as long as was considered necessary. By this process a single brick arch could be deposited, and the amalgamation of the zinc and iron, which occurred when the iron plates were dipped into melted metal, was avoided. For zincing, he preferred an acid to an alkaline solution of the metallic salts. Some thin plates, which had been exposed for eight months, on roofs in London, did not exhibit any appearance of rust. The process could be applied on any scale, as all the apparatus that was necessary was some wooden troughs to contain the solution and the pieces of metal to be covered. He had not made accurate experiments as to the efficacy of the process, when applied to iron exposed to the action of sea-water, but he feared the result, on account of the formation of muriate of zinc.

The President said the subject was one of great importance to engineers, as if the deposited coating was found to stand the test of time, it would enable the use of iron to be extended; but the main point to which he would direct Mr. Pellatt’s attention was the defence of cast-iron from the destructive action of sea-water.

May 28.—The President in the Chair.


The author states that the ancient Egyptians used bricks for every purpose, except for the erection of temples and tombs; that they were generally crude bricks dried in the sun, and in the dry climate of Egypt they sufficed for all ordinary purposes. The only instances in which he found they had been subjected to the action of fire, were for a quay-wall, and for the foundations of a town near the Nile in a group of houses. From the drawings in the tombs, and the narrative of Holy Writ, it would appear that the captives were generally employed in manufacturing bricks, and as many are found with the name of the reigning monarch stamped upon them, it is not improbable that they constituted a government monopoly. It is a curious fact in connexion with the Biblical account of the labours of the Jews, that more bricks bear the stamp of Thothmes III. than of any other monarch; and according to Wilkinson and other learned authors, it was during his reign that the exode of the pyramid was commenced.

The bricks, which are 16 in. long, 8 in. wide, and about 5 in. thick, are made of the alluvial soil of the valley of the Nile, mixed up with chopped straw to bind the whole together. They were formed in wooden moulds, and dried in the sun. It would appear from drawings, that the earth was tempered and the straw was mixed in, by men treading the mass with their feet. With such bricks as these the Egyptians formed the walls of their towns, using the alluvial earth also as mortar. The author states that he found some remarkably well-formed arches, of 12 ft. 14 ft. span; built in a half-brick tier at Thebes, the bricks of which were marked with the name of Senesotis; consequently they must have remained unjured by time upwards of 3,180 years. They all have a cavity in the sides to retain the mortar, similar to what is practised in modern bricks.

The pyramid from whence these bricks were taken, was built, according to Herodotus, by a king named Aschylus, who lived about 2000 years before the Christian era. The body of the pyramid is composed entirely of crude brick, but it had an external casing of limestone as a protection from the weather; whether the author is correct or not, the weather has since, it appears to have settled from its place, and that it is difficult to imagine a mass more solid and compact, in spite of the great pressure the bricks had to support in a pyramid of 215 feet high.

Deposit in Pipes from a Brewery.

Mr. Davison presented a piece of copper pipe, 6 in. diameter, through which the wort had been forced during a considerable period, at Messrs. Truman, Hanbury, and Co.’s brewery. It was nearly stopped up by a deposit of a black substance, which opposed such resistance to the passage of the fluid as to induce an examination of the pipes, and the discovery of their state.

Dr. Ure said that the deposit was a good example of what Leibig called "Eremacmus"—product of slow combustion. The substance was a carbunculous matter, resulting from the slow combustion of the gluten and starch contained in the brewers’ worts.

May 30.—The President in the Chair.

Corrosion of Iron and Steel.

"On the action of Air and Water, whether fresh or salt, clear or foul, and at various temperatures, upon Cast and wrought Iron, and Steel." By Robert Mallett, M. Inst. C. E.

The author in this paper gives the completion of his researches upon this subject, on which he has been engaged for nearly five years, during the intervals of his professional engagements.

1 This paper, which forms the continuation of the communication which was read before the Institution, May 26, 1840, (Minutes of Proceedings, Journal, Vol. III., p. 45.) occupied the attention of the meetings on two evenings.
tentials of professional avocations. The experiments, originally undertaken at the request of the British Association, had reference merely to the action of air and water on iron, in various states and under several conditions; but in the present instance, the author has extended the investigation to many other connected branches of practical importance, such as the several modes, or assumed modes, of protecting iron from corrosion, in which he has proposed improved methods dependent upon known principles, which are developed at large in the later part of the paper. In the present instance, the author has extended the investigation to many other connected branches of practical importance, such as the several modes, or assumed modes, of protecting iron from corrosion, in which he has proposed improved methods dependent upon known principles, which are developed at large in the later part of the paper.

The main numerical results of these investigations are given in two volumes of Tables, which show on inspection the absolute and relative losses by corrosion, in given times, and for different states, under several conditions, on iron, wrought and cast, in various media of cast and wrought iron, and steel, made at the most important works in Great Britain. During the experiments, the metals were exposed at two several periods of 357 days, and of 732 days respectively, to the action of—

1. Clear sea water, at temp. 56° to 58° Fahrenheit.
2. Foul sea water ditto.
3. Clear sea water 110 to 120 ditto.
4. Clear river water 32 to 65 ditto.
5. Foul river water 36 to 61 ditto.
6. Freely exposed to the atmosphere, and its precipitations, at Dublin.

Tables are also given containing the amounts of corrosion of cast and wrought iron, in sea and fresh water.

1. When coated with zine, or galvanically protected by its contact.
2. When painted and varnished in various ways.
3. When immersed in corrosive media of copper and zinc, and of copper and tin, as in brass and gun metal, which are both electro-negative to iron in water.
4. Of cast iron, with the surface variously modified by the method of casting, as by chilling, &c., or with the surface or coat removed by plasing.
5. Of the specific gravities, rigidly ascertained, of all the specimens of cast and wrought iron and steel, experimented on, and determinations, for the first time made, of the changes in density, produced in them by the changes in the temperature, in density or chemical constitutions of the metal, maximum and minimum corrosion under given conditions dependent; for this purpose numerous exact analyses of the cast and wrought iron, &c., of maxima and minima corrosion, became requisite. These have been made by the author, and are given in separate tables, together with the whole results arrived at, and fitted them for practical reference. 

Another principal object held in view in the tabulation of these results, and effected by the author, was by discussion of their contents to discover upon the results, to ascertain in what degree, and the nature of the effect, the density of density in the mass or bulk of castings in iron; all which, the author has shown, affect the ratio of corrosion of a given sort of cast iron.

These tables, which the author intends to contain the chief information requisite for the engineer, to enable him in practice to allow for the loss of his structures by corrosion in any given time, and to choose the most desirable composition of metal, and every other which enters into one view the whole results arrived at, and fitted them for practical reference. The method adopted by the author, in most cases, was a modification of Reck's method of analysis. The specimens of wrought iron and steel, selected with about twice their weight of chrome of lead properly prepared, and mixed with a little chloride of potash. This is burnt in an ordinary combusible, at a temperature of which some dry powdered chromate of potash is placed, and heated after the combustion has been completed, so as to pass a current of oxygen over the ignited mass. This precaution is indispensable with the binder and denser irons, containing most of their carbon in combination. The total amount of constituent carbon is thus obtained, and weighed as carbonic acid; but this consists of graphite and of combined carbon. By a separate analysis, the graphite is obtained, on solution of a portion of the metal in chromic acid, consisting of graphite, extractive matter (from the carbon of combination) and silica, and occasionally some oxides of combined metals. The residue is filtered and washed, boiled in caustic potash, by which the silicate and extraction are taken up. The graphite remains: it is again washed with dilute muriatic acid, then with water, and weighed after drying. The difference between this and the total weight of carbon given by the combustion is equal to the carbon of combination.

For the other constituents, after a preliminary qualitative trial, about 120 grams of the cast iron were dissolved in nitric acid, evaporated to dryness with a strong heat, and ignited in a platinum crucible with lute and

that corrosibility does not depend upon the proportion of constituent carbon in cast iron, and still less upon that of the other foreign matters usually found in cast iron; in the state of aggregation of the whole mass; upon the density, and upon the volatil uniformity, or otherwise, of the surfaces exposed to corrosion. Thus the same sort of cast iron corrodes much faster, in given conditions, if cooled irregularly, and faster than it does when cooled uniformly and at a slow rate.

Hot or cold blast produces very little difference in corrosibility of cast iron, and this result chiefly from difference in density; recollecting that carbon exists in cast iron in two very different states, viz., as diffused graphite, and as the carbon of combination. The former is nowhere to be found in any appreciable quantity in the cast iron, as the carbon of combination is more abundant. But the latter is found to be present in the state of the black grey iron, and softer irons have more of the latter; that the latter kind have much less uniformity of surface, when exposed under such conditions, than the former; while the highly graphitic iron, though more uniform in large specimens, is the least durable, and is the most durable when exposed to the action of air and water. The second prolonged period of erosion gives the maximum exposure necessary, in order to determine the "law of progression of corrosion, with respect to time." The author finds that where the coat of oxide and of carbonaceous matter or plumbago formed, is constantly removed from the surface of cast iron exposed to corrosion in air and water, the progression of the latter is a decreasing one, because as the metal is removed, the inner portions become more uniform in texture, and fewer minute volatile couples are formed; but where the oxides and plumbago remain untouched, these being both electro-negative to the metal, nearly equilibrate the effect of the outer layers removing atoms; and the rate of corrosion, as shown in these experiments, remains uniform, the nearer in direct proportion to the time of reaction. This is demonstrated experimentally, and is most forcibly exhibited in corrosion by sea water. Hence in practice, cast iron immersed without any protection, will corrode less if occasionally scraped and cleaned; or dryly, in the same way.

The rate of corrosion, as dependent on the metal itself, is a minimum when the cast iron is most uniform and hard, and free from suspended graphite, and as dependent on the water in which it is immersed; is a maximum when the water is a clear river water, both being at mean temperature, and containing nearly the same volumes of combined air and carbonic acid. The kyaneized oak boxes, 2 in. in thickness, in which the specimens were immersed in Kingston Harbour, were eaten through in about two years by the limnozic terrestris. Cast iron freely exposed to the weather and rain, in and to all its atmospheric precipitation, was corroded nearly as fast as if in clear sea water, when the specimens in both cases were wholly unprotected.

The results of experiments on wrought iron and steel, show that they consist of two or more different chemical compounds, coherent and interlocked, of which one is electro-negative to the other. The electro-positive body being that which suffers first from corrosion, the electro-negative portions of the iron and steel remain bright, and hold a perfect metallic lustre until the whole of the other portions are removed, or at least, that part of them which are nearer the surface, and are wrought. This is likewise the case when wrought iron and steel are exposed to the weather, and corroded to its full limit. The outer surface of wrought iron and steel is thrown off in a thin coat of silice formed on it. Togged scrap bars, made from best Staffordshire rivet iron, was found of all the irons experimented upon, to be the most durable; next to this was Low Moor boiler plate, and it is the one preferable for iron ship building. Fool sea water, evolving sulphuric acid by the action of the contact of soft purifying mud appears to be still more destructive. Steel generally corrodes more uniformly and slowly than wrought iron. Hardened a-half times its weight of carbonate of soda. After cooling, water is poured on it, which carries off the excess of alkali and an alkaline phosphate or sulphate, if the iron contained sulphur, which should be ascertained before the commencement of the trial. The cooled liquor must now be boiled for some time to destroy the manganese-state of potash in solution, and precipitate the manganese; again filtered, nitric acid is added to it, boiled to drive off the last of the last, and the liquor is passed into heating with water, after moistening with acid in the usual way. Ammonia is now cautiously added, and if the iron contained aluminum, a basic phosphate of aluminum precipitates. The solution, again filtered, is acidified by means of nitric acid. From the phosphate the phosphoric acid cannot be estimated with certainty; it was therefore converted into phosphate of lead, and the phosphoric acid got free from the iron, &c., in separate assays; the method with benzoate, or acetate of lead, and carbonates, and the methods of the former mode. The iron itself, from its invention by Leibig, was generally estimated from the other constituents. Separate assays are also best made for sulphur or carbonyl iron; but as far as my observation goes, these are extremely rare in British cast iron.
cast steel, after "tilting," has the average minimum corrosion, and low shear steel, which is in fact a sort of steelly iron, has the maximum.

The subject of the paper is the corrosion of the purest carbonaceous substance which he has called "plumage," formed by the decomposition of cast iron in sea water, and in other conditions, and also occasionally from wrought iron and steel, and on the other organic products of such decomposition. Mr. Mallet gives some results from the decomposition of carbonic acid in solution in the water, and is therefore highly interesting to the chemist, as an instance of crystallized carbon being so formed. The rust produced by the prolonged action of air and water on wrought iron, also, is highly interesting. Mr. Mallet finds that the constituents of the iron, its formula is 2 FeO + 3 H2O, more or less mixed with spaltic iron ore = Fe O X CO2. When very old, these lose water, and become "fer elizite," or anhydrous peroxide. The author then discusses the conditions most and least favourable to corrosion in marine steam-boilers, with especial reference to the degree of saltness concentration, boiling, etc., of the sea water; and gives tables of the saline contents at various stages of concentration. Sea water, to act least on boilers, should be heated to 150° Fahrenheit, and be deprived of air before entering as feed water, and the less concentration takes place, the less will be the amount of corrosion. The tables of the amounts of corrosion of cast iron, in contact with definite alloys of copper with tin and zinc, are now extended to wrought iron. The corrosion of this is accelerated by the contact of either brass or gunmetal in sea water, but more so by the latter than by copper. He confirms his previous results that, except in atmospheric air, a coating, or contact, of zinc in a massive form, affords to cast or wrought iron only partial protection from corrosion.

In foul sea water, the zincing is converted into artificial blende = (Zn + Fe + Sn), and as the zincing process he finds capable of many useful applications for iron exposed to air, but he questions its efficacy in water, or where there is abrasion. Zink paint he states to have been found the most durable of all the paints and varnishes tried, except coal-tar on board vessels. He states that the question is not yet entirely decided, and many questions relate to the corrosion and fouling of iron ships, applying to the laws he has previously deduced. Based on the known effects of a slightly alkaline solution in preventing corrosion, he proposes lime-water to replace bilge-water, and thus to prevent internal corrosion in iron ships. He describes his prolonged experiments on the means of preventing their external corrosion and fouling, and the details of his methods of preventing both. These consist in coating the plates with an alloy of zinc with mercury, and a very minute portion of the base of either of the alkalies. The process is much more generally applicable than the former, and the principle of protection is, that the alloy produces by the first action of a menstrum, a surface of amalgamated zine which is insoluble. This coating is protected by an asphalitic varnish, to prevent the contact of the slightly soluble poisonous paint, with the which the hull is painted over to prevent fouling. Several metallic salts are fitted to act as poisons to the molluscan and testacous animals which infest ships’ bottoms; but the author’s experience leads him to prefer oxychloride of copper, which, in fact, the salt formed on common copper sheathing, and which by its poisonous qualities keeps it clean.

The author’s method has been in use for some time on vessels which have made voyages to the tropics, and its usefulness in preventing fouling, &c., has been fully proved. He discusses and explains the errors which have been made as to corrosion, and determines, as far as he could, the corrosion does take place, but that it is not so perceptible as when the ship remains at rest. He shows that magnetism has nothing whatever to do with the amount of corrosion in iron vessels, and also discusses at length, various causes which impede or slow up the progress of corrosion, such as the nature of cargo, the mode of fastening the machinery, the contact of boilers, of various timbers, and of the same when decayed, &c.; all of which are of practical importance to the iron-shipbuilder or marine engineer. Kyazized timber is rapidly destructive of iron, in contact with it; in sea water it more than doubles the rate of its corrosion. After giving a table containing the numerical values, for iron ship-building, of a number of qualities of British wrought iron, the author proceeds to discuss in detail the principal methods of protection. This paper has been written by Henry Neilson, of the Great Eastern Steamboat Company, of the Great Eastern Railway on the Mersey, and by other persons named.

Lastly, he states that as uniform corrosion cannot be ensured in the case of iron ships, and as local action is liable to produce fatal accidents at unlooked-for moments, protection from corrosion and fouling, must be considered essential to the safety of iron ships; if so protected, the author contends, they are probably the cheapest vessels of timber. He also gives instances from various authorities of the rapidity with which foulness accumulates on ships’ bottoms, even of wood, and more so if of iron, and dissents as to the possibility of removing the fouling of iron vessel bottoms by the scraping process, unless performed in the dry dock, and constantly repeated.

The conclusion commences with some observations, as to the presumed differences in the rate of corrosion, between railway bars in use and out of use. The latter is always a subject of delicacy, difficulty, and labour. His own mode of analysing cast-iron was somewhat analogous to that which had been described. He took a portion of iron, reduced by filting to a fine powder, mixed it with the same quantity of chlorate of potash, and six or eight times its weight of clean silicious sand, to dilute the mixture; this was heated in the usual way, in a combustion tube with more chlorate of potash, whereby all the carbon contained in the iron was converted into carbonic acid, which was passed through a solution of the sub-acetate of lead, instead of potash water. Carbonate of lead was thus produced, and its amount, when weighed and bringing the quantity of carbon in the iron operated upon, 134 parts of carbonate of lead, indicating 6 parts of carbon; therefore the sixth of a grain of carbon might be detected by this method. The question as to the state in which the carbon existed in the iron was more difficult of solution. Mr. Vignoles’s mode of determining this point was very delicate and accurate; the pulverized iron was mixed with moistened chloride of silver, which acted upon the metallic iron alone, leaving the carburet of iron untouched, and its amount could thus be ascertained. A great mass! When white iron which could not be filed, the chloride of silver was formed into a mass. A disc of it being placed at the bottom of a vessel with a little water over it, the piece of iron was laid upon it; a few drops of muriatic acid were then added, and in eight or ten days the iron was dissolved, leaving untouched the carbon, which existed in the form of graphite.

Mr. Williams agreed in the advantage of preventing the corrosion of iron vessels, but he feared the expense of the mode proposed by Mr. Mallet, particularly as at present, although comparatively unprotected, they were very durable. He instanced particularly the light boats on the river Shannon, as being iron vessels which had been at work between six and seven years, exhibited no signs of decay.

Mr. Rendel said that the durability of iron canal boats was well known. On the Tavistock canal, there now existed some boats which had been employed for 25 years in carrying coals, iron, and copper ores, or other goods, and yet they were not extensively corroded.

Mr. Field stated, that although in India iron generally corroded rapidly, the iron vessels that had been sent there, did not appear to be affected so rapidly as in England. He had been informed by Mr. Laird, that the boilers of the Garry Oregon steamer, had been preserved for nine years, and on every occasion it had been remarked, that although the bottoms of the boilers were entirely destroyed, the iron plates of the hull of the vessel immediately beneath them retained their original coat of paint, and were not at all corroded.

Mr. Jordan suggested the probability of the hull of the vessel being protected at the expense of the boilers, on account of the electric character of the metal being altered by the heat of the boiler, and the general circumstances induced.

Mr. Field said that the boilers in question had lasted as long as they would have done on board a timber-built vessel.

Mr. Williams corroborated the statement. The boilers had worn out in the regular time, and had failed first in the usual spot, which was the hottest part of the sides joining the bottom. There was not any thing remarkable in the wear of the boilers.

Dr. Ure thought that the heat of the boilers having probably been sufficient to dry up any moisture from beneath them, might have tended to preserve the hull of the vessel from corrosion in that spot. It was easy to account for a less degree of corrosion taking place in iron ships, or on rails of railways, as long as the former were constantly kept moving, and the latter were regularly travelled over. In these cases any oxidation which took place was rubbed off as it was formed; but if either were in a state of inactivity, the weight of rust permitted an accumulation of moisture beneath it, an active galvanic pile was completely formed, and oxidation went on with increased rapidity.

Mr. Vignoles remarked that the paper did not notice the iron water-tight bulkheads for vessels, which had been introduced by Mr. C. W. Williams, with practical utility was now generally admitted, and he believed they were about to be adopted in all navies.

Mr. Williams said that about nine years since, he first introduced the system of dividing the hull into five compartments, with four water-tight bulkheads, with the intention of their adding to the strength of wooden vessels; but it occurred to him that they would be otherwise useful, and although the ship builders opposed it, he persevered, and now all the vessels under his superintendence had them. Their value had been proved on many occasions, and by them, the Royal William and several other vessels had been saved. With four bulk-heads it was impossible for a vessel to sink, as the whole of the compartments were broken into, which was scarcely possible.

The President believed that the James Watt, which was built at least 16
years since, had three close timber bulk-heads, intended for the same purpose as the iron ones.

Mr. Williams replied that they would not answer the same purpose as the iron ones, and that if a vessel had only three bulk-heads, making four compartments, if one of them was broken into, the vessel would sink, but with five compartments it would be saved. With regard to the general durability of iron vessels, he stated that the iron vessel being built at the Horseley iron works more than 20 years since, which he believed was still in existence; and a small boat, built for him by Mr. Grantham, of very thin plates in the year 1824, was still at work.

The Secretary stated that the vessel alluded to by Mr. Williams, was the Aaron Manby, which was built by, and named after his father in the year 1821. It was the first iron vessel that he had ever seen; it had been very roughly used, and the engines and boilers had been more than once renewed; yet the hull had scarcely required any repairs, and it was very slightly corroded, although it had been severely tried by being used in both fresh and salt water upon the river Seine, for which service it was built. It was well known in Staffordshire that iron coal heating vessels which were used in hermetically for carrying coals, iron ore, limestone and other cargoes, and had received scarcely ordinary attention, were upwards of 40 years old, and were still serviceable. 5

Mr. Braithwaite said that he had recently heard of the sale of a wooden vessel of many years old, which was still sea-worthy, and was capable of being insured.

The President observed, that although part of two evenings had been devoted to Mr. Mallet's paper, yet that such was its value, that it could scarcely be discussed until members could pursue it at leisure, and enter into the wide field of observation which it embraced: it was a paper of unbounded merit, and the Paper and Publication Committee had been directed to mention it in their Report, in order to its general circulation, with the former valuable paper, by the same author, as soon as practicable.

Electro-Magnetic Telegraphs.

A pair of electro-magnetic signal telegraphs, constructed for the Aix-la-Chapelle railway, from the plans of Professor Wheatstone, were exhibited.

Professor Wheatstone explained, that the principle of this signal telegraph, which he considered to be the most efficient arrangement for practical purposes, was the same as his last electro-magnetic telegraph, in which a dial, or hand, was caused to advance by the alternate attractions and cessations of attraction of an electro-magnet, occasioned by corresponding alternate complete circuits and interruptions of the circuit, by means of a peculiarly constructed apparatus, placed at the opposite end of the telegraphic line. The present signal telegraph was intended for the use of the inclined plane on the railway at Aix-la-Chapelle, where only a limited number of signals were required; the entire alphabet of the complete telegraph, was therefore dispensed with, and the instrument was restricted to six elementary signals. The letters m, s, c, τ, β, α, on the face of the dials were the initials of the German words for engine, rope, train, telegraph, &c. The dial was eight inches in diameter, so that those letters might be readily seen at a distance; the hand, which was required to be very light, and to keep its form, was of blackened brass. The cross being referred to indicate the quiescent condition of the apparatus, there remained five available characters, which, combined two and two, gave 25 signals—a number ample sufficient for the purposes of the railway. It being established as an invariable rule, that each signal should consist of two characters followed by the cross; the telegraph to act in any way irregularly, the index would, at the end, point to some other character, instead of the cross. It would indicate that the preceding signals were wrong, so that if the signals received, should not correspond with those sent (which, however, could not be the case if ordinary care was taken, no mistake could possibly arise, because they carried with them the evidence of their error. The instruments were furnished with a simple means of bringing the hand immediately to the resting point, without interfering with the circuit. As it might be occasionally required to transmit a permanent signal, which should remain, until a person arrived to inspect it, the five simple characters could be employed for this purpose.

The instruments at each station consisted of a telegraph, an alarm, and a communicator; they would be arranged in such a manner to suit particular purposes, but no other alteration was requisite to effect this, than a change in the disposition of the terminal wires, and of their connexions with the communicators. The telegraphs might be so placed, that they might be connected simultaneously with all the communicators, or they might be so arranged that the instrument at one station, should only be acted upon by the communication at the other, which, in many cases, was preferable, as a great resistance was thereby taken out of the circuit. Other arrangements, useful under particular circumstances, were also practicable.

This telegraph, even when all the letters of the alphabet were employed, required only a single circuit of communications between the two stations. Professor Wheatstone's former permutating magnetic needle telegraph, though possessing a power of combination far exceeding that of any preceding telegraph, in which magnetic needles were proposed to be employed, required a number of wires proportionate to the number of signals.

By employing the earth, or an extent of water, to return the current, or complete the circuit—which might be done, by connecting the two extremities of the telegraph line by means of wires, or plates of metal, and plunging the wires into the earth or into water—circuits of the telegraphic wires might be entirely dispensed with; this plan would be adopted at Aix-la-Chapelle. That a large extent of earth, or a portion of a river, could be made to complete an electric circuit, was long since established with respect to electricity of high tension, by the extensive experiments of Mr. Watson, in 1748, and others; and the same thing was proved with regard to voltaic electricity, by the independent experiments of Erman, Jasse, and Alidini, made in 1803. Erman's experiments were performed in the river Havel, near Potsdam; Jasse's in the river Weser, near the environs of Hameln; and Alidini's researches were prosecuted on the shore near Calais. Professor Steinheil also employed the earth as a means of completing the circuit, in the electro-magnetic telegraph which he established at Münich in 1836.

A pair of Professor Wheatstone's telegraphs were established at Berlin in the year 1812; the line was carried from the temple of Jupiter at the mouth through the air upon wooden posts, and plates of metal attached to the ends of the wire were buried in the ground. In the same year he formed a communication between King's College and the shot tower on the opposite side of the river, the communicating wire was laid along the parapets of Somerset-house and Waterloo-bridge, and thence to the top of the tower, where one of the telegraphs was placed; the wire then descended, and a plate of zinc attached to its extremity was plunged into the mud of the river; a similar plate was attached to the extremity at the north side, and was thus made a part of the circuit. The water of the Thames, and the telegraphs acted as well if the circuit was entirely metallic. The peculiar construction of the present signal telegraph, enabled a magneto-electric machine to be substituted for a voltaic battery. This would of electric action not being subject to cessation or diminution, the attention necessary for keeping a voltaic battery in order, was dispensed with, and the instruments were always ready for action, without any previous preparation.

ON FRESCO PAINTING.

Abridgment of Mr. Charles H. Wilson's Report to the Commissioners of the Fine Arts. 1

Mr. Wilson in this report first describes and considers the construction of the walls on which frescoes and other mural paintings are executed, and then proceeds in order with the other portions of his subject.

Mural paintings were executed upon plaster of various kinds, laid upon walls variously constructed; several examples also occur of frescoes which were painted upon plaster laid on lathing. The comparative durability of works executed under these circumstances Mr. Wilson explains by several examples, on the Continent. They are found on three kinds of walls:—ashlar walls of Gothic edifices—brick walls of buildings of different dates—and upon coarsely built rubble walls of different kinds. To these are to be added examples of both, partly in the same building, and partly in the same parts of Italy. From the observations which have been made by Mr. Wilson, it appears that plaster will not stand well upon ashlar walls, unless the stones be small and the seams open; for if the plaster be bosomed from this kind of wall by damp or accident, it entirely falls away in large masses, showing that it does not adhere firmly to the masonry. Brick walls are the best for fresco, and the practice of the careful Germans and modern Italians is in favour of this opinion.

There are many specimens of fresco upon lath in Italy; the most ancient is that of the "Triumph of Diana," by Orgazza, in the Campo Santo of Pisa. The artist probably adopted the precaution from having entertained

1 C. H. Wilson, Esq. Director of the Government School of Design at Somerset house, was, in the course of the last year, employed by Her Majesty's Commissioners on the Fine Arts to proceed to the Continent to collect information relative to the objects of the Commission. Having been furnished with the necessary instructions he left England in August and returned in January last.
doubts as to the fitness of the walls of this edifice to receive frescoes. The ceiling frescoes in the upper Loggia of the Vatican by Giovanni da Udine are upon stucco or lath: the wooden framing to which the lath is attached is executed with a roughness that would seem almost incredible, and these works have suffered severely from the original defective carpentry and from neglect and damp. (See Figs. 1 & 2.)

The Mortar.—It is not possible to make many observations on the mortar upon which mural pictures of the period before referred to are executed, as, fortunately, there are not a great number which are in such a state of dilapidation as to permit a particular examination of them in this respect. The majority of these pictures are painted, as is well known, upon an intonaco composed of lime and sand. It is evident that there was a diversity of regard to the quantity of sand to lime to be used, and the same diversity of opinion exists amongst the modern fresconati. From such examination as it was possible to make, it appears certain that those frescoes have stood best in which it is apparent that there is a considerable proportion of sand in the lime; and I am disposed partly to attribute the bad state of the frescoes by Correggio in the Domo of Parma to his having used what is called a rich intonaco (that is, with a small proportion of sand), and the faintness of the colours is perhaps to be attributed to the same cause.

A number of mural paintings are executed upon an intonaco formed of lime and marble dust; these however are not frescoes but distemper pictures; that is, pictures which, although in many instances commencing in fresco, yet were finished in distemper. Pictures of this description are also found upon intonaces of lime and sand; and if at first the practice may have arisen from necessity, it appears to have been continued afterwards from choice, even after complete works in pure fresco had been executed.

There is nothing to be learnt apparently from old Italian plastering. In point of execution, it is surprising that such careless work could ever satisfy the artists. The Venetians have shown themselves in many instances clumsy plasterers, yet beyond all others the works of Pordenone especially exhibit the rudest workmanship, the surface being very uneven, and the junctions of the intonaco which mark the different day’s work being very carelessly executed: such is also the case in the frescoes of Titian. The Florentine practice is better, but still far from pleasing, in many of the early examples, sufficient attention to the preparation of the surface. If the wall was even, the plaster was made even; but if the wall was altogether the reverse, the plaster was allowed to be so also, and it is only in the works of later masters that we find this workmanship so attended to as to secure an even surface: the frescoes of Allori in S. Lorenzo and in the Palazzo Vecchio are models in this respect.

In the Baths of Titus examples will be found of—first lime and coarse sand, half an inch thick; then lime and pozzolana, of one inch in thickness, in which, however, there is an admixture of sand and pounded brick; the rest and upper coat is of lime and pounded marble. It will be found that this, as regards the two last coats, is the identical preparation which is so commonly used in Italy for floors under the name of Venetian pavement, except that the layers of the latter are of brick, in which, however, the fragments of marble in the superstratum are much larger. It is also quite plain, from the size of the fragments of marble in the specimens of ancient plaster, both in the Baths of Titus and at Pompeii, that the wall could not possibly be brought to a smooth surface either with the trowel or float; it must have been left to dry, and was then polished. It follows that in walls of this description the red, yellow, and other tints with which it was painted must have been subsequently applied, and had nothing of the nature of fresco, an art which, however, is apparently exemplified in ancient examples of this instance, in the Nozzo Alberdrami.

It may be generally stated, without adding other examples of this period, that where the plastering is uneven, the ruin of the fresco, or its serious injury, is the result, whilst those frescoes which have smooth and even surfaces will be found generally in good condition. The perfect specimens in point of workmanship and preservation are the frescoes of the Caracci and of their scholars. These, in the majority of instances, are quite perfect, and may be quoted as triumphant specimens of the durability of this mode of painting.

The Execution of the Picture.—We find that whilst several mechanical modes of outlining (first Report) were adopted for fresco, each artist used these means in his own peculiar way, little influenced apparently by any received rule; and as every artist commonly adheres to his own method, the execution of the outline may assist in deciding on the authorship of a work of art.

The practice of indrawing the plaster with a point or stylus is very ancient, and we find that the figures painted in Etruscan tombs were thus outlined, that the intonaco was thus used in the works of the prehistoric art. It was employed by the early masters at the revival of art in Italy precisely in the same way in outlining their works in distemper on panel; thus Giotto drew, and his followers; and we find the same practice follow in the Siene school, with a singular exception, which, is that the figure of the Madonna is essentially merely the external outline, but the outlines of folds in the drapery are drawn in in the same manner; and a notice of this practice, confined to the school of Siena, is useful, as it establishes a clear distinction between the early pictures of that school and those of the contemporary Florentine masters. It has been supposed by some that these outlines were intended as a guide to the plasterer in spreading the intonaco, but in no case do the joinings in the plaster coincide with them. If we suppose that the composition was thus sketched in to enable the artist to judge of the proper proportions and positions of the figures, what then was the use of his cartoon in this respect? it would have been more easy to place it against the wall, as is now frequently done.

Another mode of outlining, that is by pouncing, was extensively adopted; this method, as well as the last-mentioned, of course implies the preparation of a large cartoon; and there was still another mode, or rather union of the modes above alluded to viz, the outline was first pounced and then, the cartoon being removed, the forms were retracted with the stylus; this is the practice of the modern Italians, and although imposing names may be quoted in support of it, an uncertain and feeble outline is the result, and besides, in sudden turns it breaks out bits of the plaster, leaving insightly holes in the picture.

Painting.—In studying the art of fresco painting, it is necessary to consider the workmanship of the old masters for everything that is merely mechanical, we may profitably study the proceedings of the modern Germans; every process may be learnt from their practice, without visiting Italy, the graceful use of the brush excepted. Amongst the works of the present Italian fresco-painters, there is perhaps no example which it is not allowable to follow. The excellence in the works of Titian, at least in the last degree mannered and heavy, and however satisfactory may have been the progress of the French in other modes of painting, they have entirely failed in a few attempts which they have made in fresco.

Avoiding the errors into which we may conceive that our continental brethren have fallen in the actual painting of their frescoes, we must look to the works of the old masters as examples; in these we shall find painting in fresco, in as many styles, and exhibiting as much diversity of touch and brush-manipulation as may be observed. We have in oil a great many proprieties of the fresco, and in the well-nourished brush of Rembrandt seems represented in the works of the fresco-painters of old Italian times.

The fresco-paintings of the elder masters have already been alluded to; it was their practice to receive the preparatory cartoons in fresco, to make some of these totally different from the colour to be used in finishing in distemper: thus, a dark red colour was almost invariably laid in as a preparation for blue, and this practice was generally adhered to with very few exceptions. Even after the fresco was laid, the artist would take the Campo Santo, at Pisa, the plaster seems to have been painted black in the first instance. Time did not permit a satisfactory examination of these
works, but there is an example of the use of black as a preparation for blue in the Farnesina, where Daniele da Volterra in his frescoes on a ceiling in that edifice has first laid in a coat of black in fresco, and then a coat of blue in distemper. In some pictures, as for instance in those by Andrea Mantegna in the Eremitani at Padue, the blue of the skies has either partially changed or entirely faded, whilst that of the draperies is comparatively well preserved, it is thus evident that from motives of economy different blues were used in different portions of pictures. There are many other examples of this in other parts of Italy.

The Cardinal Bona Ventura, in the fresco called the Diparti of the Sacrament, by Raphael, is represented in a purplish-black robe which has been painted over red; this is an instance of the adoption of an indirect process with reference to another colour besides blue. It may be observed, that the cardinal was a Franciscan, an order which is distinguished by a brown dress; and, as it is not brown in the picture, this may perhaps be an instance of a change of colour: but one object of this mode of painting seems to have been the security of the colours against change, whilst another may have been, to attain to a harmony in the tone. In the picture just mentioned, Raphael has followed precept in painting the blues in distemper over red, and these have stood perfectly. In the School of Athens, on the contrary, he has painted in the blues in fresco, and they have perished or nearly so, as they have been in most instances in every part of Italy where blue has been thus used; both in pictures of this and of previous times. In the great works which Raphael subsequently painted in the Stanze he returned to the old practice of painting the blues above red, probably dissatisfaction with the crudeness which was the result of using them on the wet plaster. The blue that has thus generally been used seems to have been of a vegetable nature, as in many instances it has changed to a brilliant green. It may be urged, that the use of ultramarine or cobalt may obviate all necessity for such preparations, and secure the pictures against change; but whilst the former is by far too expensive a colour, the latter is crude and harsh in fresco. It seems to have been the blue which was used by the Caracci, and in their pictures, as in those of Guido, it will be found to be frequently out of harmony with the other colours; either these have in some degree faded, the blue remaining the same, or the blue has increased in intensity. Domenichino used distemper extensively in his works; but in those of Guercino will be found a triumphant solution of the difficulty; his blues are put in in fresco, and yet are in fine harmony with the other tones, they have generally a warm purple hue, and may be either small, or cobalt tempered with red, such as cobaltit of vario. This is strongly exemplified in the Zampieri Palace at Bologna, where the harmony apparent in a fresco of Guercino is an agreeable relief, after the crudity which offends in those of his masters in other rooms of the same palace; a comparison between the Aurora of Guido in the Rospigliosi at Rome (all the blues in which are not retouched) and that by Guercino in the Ludovisi, further corroborates the above observations.

As has frequently been stated in the previous report, it was the practice to retouch when the fresco was dry, more especially in the shades. In some cases it is now easy to detect this retouching: it will generally be found to be proportionately somewhat darker than the painting around; and whilst in many frescoes a remarkable polish or gloss may be observed even in situations where that effect could not be produced by rubbing, the retouched parts are invariably dim; this is exemplified in the Evangelists by Domenichino in the church of S. Andrea della Valle at Rome; these are historically known to have been retouched; and in viewing them from particular spots, their surfaces are seen to shine as if varnished, whilst some parts, which may reasonably be inferred are retouches, such as darks under the arms and in the deep folds of the drapery, are quite flat and dim.

There are portions in Raphael's pictures which present the appearance just described; in the School of Athens there are a few distemper touches even distinctly by the master's own hand, which have darkened: for instance, in one head he has had recourse to distemper to represent the external locks of hair. This seems to indicate a difficulty in fresco which at first sight appears formidable. In a picture by Gaudenzio Ferrari, at Milan, a female head with flowing locks, has in a manner represented, and the joining is made next the locks, and has a very bad effect; the difficulty is successfully overcome by the German artists without having recourse to distemper, and without placing the joining so as to injure the appearance of the picture. In this manner the joining is indicated by a sketched: the flying tresses are painted in on the background on one day, and the head is put in the next. This is indicated by the dotted line in the figure (Figs. 3 & 4). The foliage of trees is managed in the same way. It would be vain to think of cutting round the outline of foliage; the outer leaves and thin projecting branches are executed on the same day with the back-ground, and the cutting is kept quite with the line.

Transparency.—This important quality is perfectly attainable in fresco; it is found in the works of the Roman and Florentine masters; amongst the latter, more especially in those of Andrea del Sarto; in those of the Lombards it is admirably maintained; and its excess is seen in those of the Venetians. It is not easy to explain how transparency is to be attained in fresco; there is, perhaps, no quality in which our German brethren are more deficient; the brushes which they use are to an English eye small for the work, and the first tint laid on with these presents a result which perhaps could be obliterated in some instances by the use of larger brushes, and a different mode of using them. It will be easily understood how this streaky appearance is produced: having first given one wipe of the brush full of colour, the artist follows it up with another, the colour sinking in instantly, and as he cannot lay the second wipe without the first, the one overlaps the other in parts, and those parts are consequently twice as dark as the others which have got only one wipe, and so he proceeds laying a tint composed of light and dark streaks, but nevertheless transparent: this quality is lost in uniting the tint, for Apprentice, when it goes over the surface till he obtains what he seeks, a quiet flat tone, which however generally proves a heavy one. Now, in the ancient examples, this union is obtained without sacrificing transparency. In a church near Conegliano there are some curious frescoes by a Venetian painter, in which the excess of this quality is exhibited: they do not merit the name of works of art, and are very slightly executed; the colours seem laid in in one wash only, the plaster ground shining through; but these bad pictures prove that it is possible to lay in tints in a transparent and yet flat manner.

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The Cupids of the last named painter in the Convent of St. Paolo, at Parma, are covered and destroyed, is manifestly the work of another hand; the lunettes underneath have fortunately escaped this profanation.

Solid Painting.—This is a quality that is easily attainable; it will be best understood by observing, that whilst the plasterer lays on a preparatory tint—"pietra"—and with the trowel sculpts it upon the lime and colour with the brush, and he may employ it as thickly as he pleases. I observed in the works of Pordenone in Sta. Maria in Campagna, at Padua, that the lights were laid on with such a body of colour that he might stand upon it and be seated on it; in another set, the art lay on his hand, or Nahal-stick, or something else in his way, has accidentally ploughed through his work, which has not been able, or has not cared to mend.

Paul Veronese, in his frescos in the Villa Medici, has charged his lights; and his imitators in their works, both in the above villa and in that of the Obeleri at Padua, have endeavoured so much that the lights should shine up upon the wall. Such extravagancies, like the washing in of the shadows in the pictures near Caneigiano before mentioned, are poor substitutes for a careful imitation of nature.

The Buenos must be thicker than the shadows, as there is more lime in the colours of the former than in those of the latter. The great masters laid in their colours without ostentations handling; their works exhibit no tricks of manipulation; but it is surprising to observe the manner in which some artists seem to have worked their tints. Pordenone has already been alluded to, and Polidora da Caravaggio produces an effect as if his brush had been full of meaguel, as may be seen in his frescos in Rome, viz. in St. Andrea on Mozte Cavallo, and in the Farnesina.

It is necessary to mention these instances to prove the extraordinary dex- terity with which they have been attained. Fresco painting wherever the art is not to be admired when its produces such effects, and which too often distinguishes the pencil of mediocrity.

Glazing.—This process is frequently exemplified in the fresco-works of the old masters; its most successful application is seen in those of Razzi at Siena. Here the celebrated picture called the "Cristo alla Colonna," in the gallery of the Academy, is a particularly interesting example of its legitimate application in fresco, that is, of its use while the plaster is still moist; in this instance parts are made out of means of it, and much lightness and transpar- ency are attained.

Pordenone invented or adopted some process which resembles that common in oil-painting; his works have evidently been glazed after the lime had been allowed to dry; the flesh in all his figures is richly glazed—the transparent colour filling up the hollows arising from the peculiar loading already described. The light and shadow being so remarkably exhibited in his frescos, if they can be called such. Polidoro da Caravaggio seems to have adopted some analogous method, but probably these are the only masters who can be quoted who had an adopted a practice so foreign to fresco-painting. Perhaps the artist who Voltaire has praised the most, the Tho, may be admitted to be a virtu of the first rank. The adoption of such a practice evidently arises from a misapprehension of the legitimate application of fresco-painting. It will be found that the Venetian painters generally had no clear idea of the true mode of employing this art; even Titian fell into the mistake of trying to produce effects of light and shadow and colours, like those which he had been in the habit of producing in his oil-pictures. The light and brilliant colouring of Paul Veronese enabled him to paint with more success in fresco than the gene- rality of his Venetian brethren; and in his works it is evident that this mode of treatment is attempted, not only with great rapidity, but with great facility.

The principles of colour suited to the peculiar art of fresco-painting, which he was sometimes practised, and most successfully at the Villa Medici. Palma Vecchio alone of the Venetian masters seems to have truly estimated the powers of fresco; there are two saints by him in S. Liberale at Castelfranco, which have breadth and dignity. Razzi has already been alluded to as an artist whose works most promi- nently exemplify legitimate glasing in fresco; it is not apparent in the works of any other master to the same extent.

The use of fresco in Painting.—It is not difficult, in examining some frescos, to ascertain the time occupied in painting them. In some examples, the paintings by means of which this calculation can be made are distinctly visible; in others they are either so well executed, or are so concealed by the use of tempera, that it is very difficult to trace them. It is evident that the Venetian masters painted with great rapidity; large and important works, judging from the following examples, were executed in a month or six weeks.

The "Incendio del Borgo," in the Stanze, seems to have been painted in about forty days; the group of the young man carrying his father has been executed in five or six days, a quantity of work in a day. In another fresco, the "Graces," in the Cornaro Chapel, by Raphael, has been painted, at most, in five days. The Cupid and the head of the Grace, with her back to the spectator, have occupied one day; the back and part of the lower limb of the latter figure, another. In this day the Cupid's right leg may be seen rising in process of being a joining across the knee; there was certainly one across the next; both these joinings do not follow outlines, but are in parts of the figure which are in shadow. It is of course better, as has been already observed, to cut by outlines; but this is not always possible, especially in very large figures. The frescos have been executed across a large surface, or in the case of the artist to make a joining where there is no outline. The graceful composition called the Galatea, also in the Farnesina, has been entirely executed in eleven or twelve days; the head and body of the principal figure have been painted in one day. This subject will be further incidentally illus-

Duration of Frescos.—The circumstances which must be taken into consid- eration in judging of the duration of frescos have already been ad- verted to. It has been shown that where proper constructive principles have been attended to, and where the walls are of good and appropriate materials, the safety of the paintings is in a great measure secured, and it may be cer- tainly proved that fresco is a very durable mode of painting, not surpassed in this respect by any other, if indeed equalled. But independently of the most careful building, various causes may contribute to the deterioration or destruction of frescos, and as these have been very distinctly described in the First Report it is not necessary to say much on the subject further than to state a few facts. Damp is the greatest enemy of this kind of painting; it ascends through the walls from the soil, and descends from ill-constructed or dilapidated roofs. In Venice, where the houses actually stand in the water, the external plastering falls off entirely to a height of twenty feet; in Milan, Padua and others, I observed that in paintings are obliterated on walls to a height of from seven to eight feet from the ground. The destruc- tion of many fine works on roofs and on the upper part of walls is entirely to be attributed to culpable negligence, or to ignorance; this is painfully exemplified by a case in a house too still exists under the new leaded one which has been added to save the walls:

Fig. 5.

Many examples might be adduced of injury resulting to frescos from imperfect roofings, and the fact having been recognized, precautions have now been taken after irreparable injury has been done. The tiled roofs of Italy have everywhere been a constant source of injury to frescos, but in some few instances precautions of an extraordinary nature have been taken to make the roof water-tight. At the Villa Medici flat tiles have been laid at right angles to the roof-timbers, the joints being filled with lime. These tiles represent the planking under slates in this country, and the ordinary roof tiles are put over them in the usual way; this makes an imperceptible but very heavy roof. The plan has lately been adopted in the Palazzo del Giardino at Parma, the frescos there by Anièbale Caracci having suffered from damp. The Caracci have evidently been alive to the necessity of taking precautions against damp: the vault in the Farnese Palace in Rome, which is under an open loggia, is covered with flat tiles, and is roofed over so as to prevent any moisture from the upper surface of the vaults has been carefully plastered; but this has not sufficed. Some frescos by Allori, in the Palazzo Vecchio at Florence, which are on a six-inch brick wall, have lately been destroyed by plastering the back of the wall. In the Library at Siena, the paintings in the vaults were raised by some persons who mixed lime above them. All these facts prove the necessity of preventing, by every possible means, the passage of damp through the walls, and there is no difficulty whatever in effecting this.

External frescos may never be executed in this country, but their preser- vation in some parts of Italy may encourage their adoption in corridors and porticos. These paintings are found to be well preserved on external walls turned to a favourable weather quarter. Thus, as at Genoa and Treviso, although frescos are nearly obliterated by the action of the weather on some walls, it is to be observed that wherever they are protected by the projection of a roof or cornice, they are well preserved. External damp or sea air has no bad effect. The obliteration of external frescos in Venice cannot be attri- buted to this, since those at Genoa are preserved; and those in the Campo Santo at Fisa, are doubtlessly destroyed by damp from the soil and roof. As light when either damp or dry, the in the same place, has not suffered at all from the action of the atmosphere.

The paintings in the upper loggia of the Vatican have suffered severely, owing to the insufficient construction of the roof. Those beneath, from Rap- phael's designs, have been much obliterated, partly by damp (the corridor for the transmission of light being partly blind), and partly by the weather.
above having been left open till lately), and partly from their having been painted in the presence of the artist and the public; they have also suffered in some measure from violence and mischief.

Effect of Stained Glass on Paintings.—A few facts and observations connected with the employment of stained glass in rooms with paintings in them may not be unimportant, as an opinion has been expressed that windows coloured in this manner are injurious to, and perhaps harmful to, the paintings so lighted.

It rather appears, however, from many instances, that stained glass may be sometimes as employed with great advantage; and that the excess of light may be thus subdued or otherwise modified so as to produce the most pleasing effect.

In the cathedral at Munich the windows are coloured to a certain height, and although the effect is far from pleasing considered in itself, it is very useful as regards the pictures in the church, as the light is brought in from above in an advantageous manner.

At St. Mark, in Venice, there are two small frescos by Luini with a coloured circular window between. The pictures are lighted by a window on one side, and could not be seen at all but for the exclusion of white light by the coloured glass in the centre window. In St. Patrizio, at Bologna there is an arcade window with a glass picture in the arch. The pictures are well lighted from a double window, but if the window over it and of white glass it would have been impossible to see the picture, which is very dark. The sun happened to shine through the rich hues of the window above, and I observed here, as I had previously remarked at Sarouon, that the picture did not suffer in consequence.

At Assisi in the upper church, all the windows, one excepted over the door, are coloured, but in those which are painted, much of the glass is left white; the light is weak in this church, and it is thus apparent that it does not always answer to tint all the windows, even although pure light is partially shut out; for, as already stated, in windows with paintings may have a certain proportion of stained glass in it (provided pure light be not altogether excluded). It may be objected that coloured rays will be thrown on the frescos when the sun shines, but white rays are quite as objectionable: they may be received with advantage, and the sun can shine upon them, as, like other pictures, they fade sooner or later under its influence; coloured glass in such a case might be an advantage, and the inconvenience from the coloured rays would be temporary.

Fresco-secco.—Certain processes of painting allied to fresco having been referred to in the foregoing statement, it may be desirable to add a brief account of them.

The early mural pictures, although commenced in fresco, were, as before observed, usually finished in distemper, and the vehicle employed was a mixture of yolk of egg and vinegar. This mode of paint was pressed also on canvas; and it is probable that many Venetian pictures, supposed to be entirely in oil, were painted in this manner, and then glazed and finished with oil colour.

There can be no doubt of the duration of this mode of painting on walls, as there are many well-preserved examples of it by the early masters; but I am unable to quote any instance of the successful adoption of the process in modern times. Professor Overbeck informed me that he painted in this manner at Assisi, but that it was necessary to lay a ground of whiting on the wall in the first place—a process which is manifestly objectionable, and not in accordance with ancient practice.

An Italian artist informed me that it is necessary first to give the wall a coat of strong size, and then to give it a second coat mixed with the yolk of egg and vinegar.

Another mode of painting, of which there appear to be a few early examples, and of which there are many later ones, is called by the Italians fresco-secco. I was informed that a large painting by Orgagna, in the church of Sta. Maria Novella, is in fresco-secco. I examined it, but hesitate to pronounce an opinion.

The latter masters painted extensive works in this manner: the ceiling of the great hall in the Barberini Palace in Rome appears to me to be in fresco-secco; and in Rome, Florence, and Genoa, the ceilings of most of the palaces are covered with paintings executed in this manner; it is the mode of painting adopted for nearly all decorative purposes, is easy of execution, and unquestionably durable, whilst it is certainly the most economical process which can be followed.

Fresco-secco has been practised for some time in Munich: the ceilings of corridors of loggie and of staircases, are thus painted in the palace; and the plastered walls of the rooms in Munich, is satisfied with the experiments which have been there made with it.

The following is a description of the method. The plastering of the wall having been completed and line and sand only having been used for the last coat, the plaster is allowed to dry. When a wall is intended to be painted, the surface of the line is rubbed with pumice-stone, and on the evening of the day preceding that on which the painting is to be commenced the plaster is thoroughly washed with water, with which a little lime has been mixed. The wall is again wetted next morning, and then the cartoons are fastened round the wall, and the artist then begins to paint.

The colours are the same as those used in fresco-buono, and are mixed with water in the same way, lime being used for the white.

If the wall should become too dry, a syringe, having many fine holes at the end, is used to wet it. Work done in this way will bear to be washed as well as real fresco, and is as durable: for ornament it is a better method than real fresco, as in the latter art it is quite impossible to make the joinings at outlines, owing to the complicated forms of ornaments; on this account walls thus decorated in real fresco present an unsatisfactory appearance. The joinings are particularly observable in the loggia of the Vatican.

Painting in fresco-secco can be quitened and resumed at any point. The artist need not rigidly calculate his day's work, and can always keep the plaster in a good state for working on. But whilst it offers these advantages, and is particularly useful where mere ornamental painting is alone contemplated, it is in every important respect an inferior art to real fresco. Paintings executed in this mode are ever heavy and opaque, whereas fresco is light and transparent. Fresco-secco has been largely adopted by late and inferior masters, and none of the works executed in this manner are of great reputation. The early pictures which are designated by the Italians as fresco-secco are not probably executed in this manner. The method may have been adopted in repainting parts, and this may have led to the idea that entire works were thus executed.

Fresco-secco is extensively used in Italy at present, and with great success: the chiaro-secco decorations executed in this manner are excellent; but I found that at Milan, where I had an opportunity of examining some specimens, it did not bear washing like the Munich process. The method secured the same, but the result differed in this respect, and I had no opportunity of seeing the actual process of paintings executed in this manner, in any other part of Italy.

At Genoa, where the paintings in the churches and palaces have no claim to be called frescos, although generally so described, a compound process has been followed in their execution. They were all commenced, or partly commenced, in fresco, but were finished in distemper, and size has been used for mixing the colours, as they can easily be removed by washing. The object of the Genoese artists has been to supply the fancied deficiencies of fresco painting in point of colour; but, although they have succeeded in making use of vermillion, brilliant green, and bright yellow, they have not produced satisfactory works of art. The paintings are garish, and out of harmony; the colours subsequently added in distemper do not harmonize with those previously used in fresco, and the general effect is totally devoid of that transparency which is distinctive of good fresco-painting. The Genoese have brought fresco down to the level of mere size-painting; and the works which they have left are proofs of the danger of carrying the practice of retouching too far.

In the Doria Palace instances occur in which it may be observed that the entire picture was not prepared in fresco and then retouched in distemper, but that portions were painted in fresco and then, the plaster being allowed to dry, the remaining portions, not previously touched when wet, were begun and finished in distemper. Pierino del Vaqa, or perhaps Forademon, who painted in the same palace, may have introduced this practice as well as others equally objectionable.

The annexed wood-cut, Fig. 6, exhibits a contrivance for a scaffolding, &c. formerly and still in use in the practice of fresco-painting.
THE ARCHITECTURE AND ENGINEERING OF AGRICULTURE; OR, COLONIAL DIVISION OF LANDS AND ITS RESULTS.

Under the above paradoxical and high-sounding title, I propose to draw the attention of the landed gentry and farmers of this country to the results of the proceedings of the Colonial Land and Emigration Office, in their treaties with the North, South and West Australian colonies; also the colonies established in New Zealand. The Crown granted to the New Zealand Company, established in 1839, lands to the extent of 100,000 acres, at Port Nicholson, in one block, or more; of which blocks six might be 5000 acres, and the rest 30,000 acres, each block to be a continuous tract bounded by the natural landmarks of the country. The government is to define and make the survey of the external lines of every assigned block; and arbitrators nominated by the Government are to determine the price of the interior survey of each block of 1000 acres. The land is to be sold progressively, as the surveys are completed, at one uniform price of 30s. per acre.

A second colony was formed in March, 1841, under certain stipulations, viz., the site to be chosen in New Zealand, (the site is since selected and named Wellington,) and to extend to 201,000 acres, which was to be divided and sold in allotments, each allotment to consist of three sections, one of 120 acres of rural land, one of 60 acres of agricultural land, and the remaining 34 acres of town land. Priority of choice is to be decided by lot; the fixed price of each allotment to be £300, and upon which a deposit of 30s. was to be paid to the Company’s bankers; and on the payment of the full purchase money, three separate land orders to be given, which were also to be determined by lot. The Company reserving a right to purchase 100 acres of the 1000 allotments subject to the same conditions as the other purchases. An amount equal to 25 per cent of the purchase money paid by the colonist to be allowed towards cost of cabin passage, outfit, &c., in the order of their respective applications; and the other 75 per cent to be appropriated towards the Emigration Fund.

A revival of the sales of land is now in course of being established by the New Zealand Company, for planting a third colony, to be called New Edinburgh, the site to be a block of 120,550 acres. The original grant from the Crown to the Company was at the rate of 5s. per acre; and from what precedes this, it will be seen that the Company charged in New Edinburgh a uniform price of 30s. per acre, which is increased in the second and third colonies to 30s. per acre.

What I propose to denominate the architecture of agriculture, is the terms and limits employed in the dealings with the Company and the Government, and the terms employed between the Company and the emigrant purchasers. I propose to call the engineering of agriculture an add-on of the terms, which are to make the system knowable. First then as to architecture, we have the term block used, to specify an indefinite extent of country; then specific blocks, to specify a continuous tract of country, bounded by its natural land marks: these specific blocks are limited in size and number, as in the instance of the first settlement of the New Zealand Company; six were of 5000 acres and the rest 30,000 acres. The Chief Surveyor assigns the boundaries of the specific blocks as soon as they are assigned. We have now the term specific assigned blocks, and a proprietor, who now appears for the first time entitled to a block of land, say one of the six of 5000 acres, as mentioned above; so much for the architecture of agriculture.

The engineering, or means of occupation by the proprietor, is now to be considered. The external boundary of the blocks, as before stated, is first surveyed by the Government, and the Government and Company fix a scale of prices for the interior survey of each 100 acres.

When a purchaser is obtained for one of the blocks, we have a proprietor of an assigned block ready to treat with purchasers of lots of 1000 acres each, or a section, viz., a portion of a large lot; we have then a large handed proprietor ready to treat with a purchaser for a section of land. Suppose the block to obtain a name from some peculiarity of the country, as a mountain, say Mount Barker, the block then has a distinct name, and the term is changed to a district, as in this suppositional one, “The Mount Barker District;” this district will afterwards contain several surveys of 100 acres each, as was supposed a purchaser has been found for a section of land, another name is then required for the allotment, say, in this case, that it shall be called Dutton; the purchaser is then entitled to ask for a survey, which when complete, he will be ready to sell into smaller sections to be occupied by purchasing emigrants. On the arrival of emigrants, they generally employ an agent to go up to the section of land for the purpose of selecting a location, it would then be designated, in the phraseology of emigration, a section situated in New Zealand, the name of the country, in the Mount Barker district, in Dutton’s survey, section 120s., or as the case may be. Next, suppose the emigrant’s hut built, and he gives it a name: our Ballannah, Ballannah, Ballannah, begin to get rid of all sections and blocks, and in the mind’s eye, have arrived in Her Majesty’s loyal town of Ballannah, New Zealand.

But to return to see what has been actually done in carrying the above plans into effect; we first have the settlement of the New Zealand Company, then the district called Wellington in Port Nicholson; two-thirds of the lots had arrived and in March, 1840, the town contained 3000 inhabitants. The amount of several of the land in this case was for one acre of land 100 acres of rural land. A second Company was then called into existence, which has subsequently merged into the New Zealand Company; they erected a settlement called New Plymouth, where the amount of land was reduced to six acres. These purchasers took 200 acres and 50 acres of agriculture, the whole block consisting of 57,500 acres, exclusive of roads, which was divided into 2200 town sections, containing in the aggregate 550 acres, and 209 suburban or agricultural sections, constituting the remainder. Before the emerging of amalgamation the New Zealand and the rival Companies, the latter had sold 963 town sections in British, and 1548 town sections in the colonies of rural land, (a third term now introduced for the first time,) and there have been sent out by the New Zealand Company, this the second settlement, called New Plymouth, 30s. male and 204 female colonists.

The second settlement of the New Zealand Company, or third yet projected, is to be called Nelson, the site of which is not yet chosen; it is to be divided and sold in sections of 201 acres, viz., one acre of town, 30, suburban, and 150 agricultural, to be sold at the uniform price of 30s. per acre, which is at the rate of 7l. per acre for town lands, and so on.

From what has been previously said, it will be seen that one of the stipulations was, that the terms of settlement would be right of purchasing in the first instance nearly one half of the whole block settlement; and by introducing three terms into the conditions, and consequently three different orders of land. The land orders sold in this country are for the suburban and agricultural, the town land being retained as a previous monopoly, and with a non-residence of thousands of miles.

In the Jamieson’s dictionary, we may find the word superintendent of emigrants to South Australia, and to whose account 1 am indebted for many of the details of the size of blocks of land, he says, at page 142, “The owner of a land order entitles his holder to the first choice of a town allotment in the New Zealand Company’s settlement of Port Nicholson, refused to sell his priority of choice for £1000;” and that sheep farmers now proceed beyond the borders of location by paying for the pasturage, or a squating license. As a further proof of the establishment of the land monopoly in the colonies of the New Zealand Company, I may add the substance of a letter in the Times, September 26, 1843, and dated Wellington, March 9, 1843, from an officer of artillery, practising as a private surveyor; he says, “I wish something every day to go to the General Surveyor to give encouragement to bona fide settlers. The agents are confounded by the absentee to grant no other terms for forest land than a lease for seven years,” which is evidently of no use to the settler, the absentee coming in for all the settler’s improvements almost as soon as they have been done, his only object is to make the land valuable. Martin Chuzzlewit the public are deeply indebted, for the bold manner in which he shows us the system pursued in America, with regard to emigration, in his graphic description of taking possession of an allotment, he says, “At last they stopped—at Eden too—the waters of the deluge might have left it but a week before; so choked with slime and matted growth, was the hideous swamp which bore that name.”

I will now state what has been achieved in Australia. New South Wales was colonized in 1788; West Australia in 1829; South in 1834, and North in 1838, and their populations in 1839, were respec-

1 The New Zealand Company, it must be remembered, have received these grants in compensation for the claims they had derived by purchases from the government, in London, in the name of the Company for the benefit of the government, and of the native claimants.

2 Published 1842; Smith & Elder.
tively 78,000, 4,000, and 13,000; the population of North Australia is not given, but Van Diemen's Land is stated at 134,000. Australia has suffered equally with New Zealand in regard to the disastrous effect of a slow and inefficient survey, and from the injustice of the Special Survey Law prohibiting the cutting of wood and cultivation of the ground in unappropriated lands. The enormous amount of £460,000 is requisite to get a special survey. The squatting system which prevails, and the large area of land for agricultural purposes, in consequence it only remains pastoral. The squatters pay a licence of 40s. per annum per square mile, and who upon their leaving are paid for the stock yard by the proprietor.

I have perused the letters of a relative who arrived in Adelaide, South Australia, in September 1839, and from whose experience and residence in the property fact connected with the county as regards the system pursued with respect to lands, its price and suggested improvement. The cost of a Special Survey has been stated, which entitles the parties to a selection of as many acres as pounds are paid for the survey out of 23 square miles which is allowed to extend twelve miles in length, and any breadth; to make up the quauntity, by this means the land is as well gotten of good land, and the remainder is unsaleable on account of its distance from a common crossing or reserved acre with water; it also prevents cultivation as good land is kept for sheep runs, to prevent which, as also the bad land remaining for ever on the hands of government, it is recommended to divide the blocks into 640 acres or square miles, and again to divide them into 64 acres of further division into water, and three and half and mountain, and to make the price proportionally to the 20s. value, and to fix a maximum price for each description to prevent malignant bidding, at 40s. for free land, 20s. for hill, and 6s. 8d. for mountain. At present the special surveys generally bring from 50 to 90 per cent. profit after examined by the public, five years of residence, and the surveyors themselves are the proprietors of the survey itself. The boundary of the proposed survey, and five guineas is paid to an agent for the selection of each section, which is a much cheaper and better plan than exploring the land personally, and if a special survey is required, a year will elapse in waiting for the leisure of the surveyor, and of these surveys already completed the proprietors pick out portions and delay the race, and monopolize the district by reserving those containing water; and to prevent small holders of land orders coming and settling and sharing with the large resident proprietor the sheep runs, they have large districts surveyed, and then allow them to be occupied by squatters, the proprietor picking out all the best sections. To counteract this an attempt is sometimes made by an association of small capitalists joining and getting a special survey jointly, and fixing previously a sole arbitrator to fix the site of each location; but this plan did not succeed on account of the squabbles occasioned by the selection and the delay in fixing the site of each party to the joint survey although land has been obtained by this means that sold for 30s. 60s. per acre. Unsurveyed lands in Mount Barker are advertised on the banks of the River Onkaparinga and River Onkaparinga, and in the Adelaide hills. There are also several acres in the vicinity of Jamieson's Creek, and in the vicinity of the town of Totara, over which there has been a dispute and which will be surveyed. The town of Totara was named by the late Mr. Collingwood, who was one of the directors of the company. The town of Totara was laid down in the sun at 115° to 125°. In the colony of South Australia there are about 12,000, although Mr. Jamieson says 15,000 inhabitants, and in Ade-
have all been alluded to; as also the variation of land orders in extent and a description of the land, the terms on which the absentee landlords have all granted leases of wood lands, and the restrictions imposed as regards cutting wood, and the cultivation of the ground, and the enormous amount of rent charged for the best town sections, have also been stated; and I will leave it to your readers to say whether the freedom anticipated on emigration is likely to be obtained; and the statement of the governor of South Australia, as to the number of public houses, I think sufficient to prevent the man of retirement and fine feelings to seek for a home there. Instances are mentioned, from Mr. Jamieson's work, of sellers of rum and ballock drovers realizing large fortunes in almost no time, from preying on the new arrivals. This also shows that there is no association—no sympathy with new comers; and that the fight for a living will have to be continued with even greater vigour than in this country; and it must also be considered that in individual origin granted the scheme.

With respect to the price of manual labour, the emigrant is paid 9d. a week, and food, until he finds a master, and the wages given by masters is from 18s. to 21s. a week and keep; and men working by job-work will earn from 7s. to 10s. a day; and wood-splitters will be enabled to earn on an average 20s. a day, and instances are known of 50s., 60s., and 100s. per day having been made. The cost of floating seems almost the standard of wages—ten to fifteen yards being a day's work at a cost of 1s. 6d. to 2s. per yard.

I would have sent you a list of provisions for emigrants on the voyage, as also a tariff of purchases made and profèted realized by the sale on arrival, but your Journal, not being exactly the medium, I forbear to mention them.

As far as my individual opinion goes, I am so prejudiced in favour of the crowded city, and like so well to be on the full tide of civilization, that I am almost inclined to think, with a quondam friend, who said "he would rather be executed in London, than die a natural death elsewhere." I hope what I have already said will tend to give parties the means of better judging of their probable position on their arrival in the colonies.

St. Ann's, Newcastle-upon-Tyne.

O. T.

REVIEWS.

Specification of a Patent granted to P. M. Parsons, of Waterloo Bridge Road, Surrey, for "certain improvements in steam engines and boilers, and in marine machinery connected therewith," &c. G. Hebert, Cheapside.

Mr. Parsons has evidently great expectations and hopes to ascend to the pinnacle of fame by his inventions—of which consumption we have very considerable doubts. If we were to judge of his abilities by the extent and manner of his improvements, we should rise from the perusal of his pamphlet with a high sense of his merits; but unfortunately, according to the common maxim, he has saved one of his inventions, the idea of small condensers, in his paper, for the benefit of the public, and he has not seen fit to execute a model of them. We cannot, however, allow this opportunity to pass without bearing our small tribute of admiration to Mr. Hall, for the ingenious and scientific way in which he has carried out his improvements upon Cartwright's surface condensers; for although it was formed of plain plates, we contend the principle is the same, Mr. WATT's introduction, and not failed. We have yet to point to what Mr. Hall is more fortunate; but bear that it as it may, his arrangement for supplying the loss of distilled water is really beautiful, and upon which Mr. Parsons' is a sad parody and burlesque.

We have hitherto principally treated of what Mr. Parsons does not claim for the Scotch patentee, but collective, of his invention, is his condenser or surface condenser, which is what his individual merit, a few of the latter added to our stock of knowledge.

The eleven claims in the first branch put us in mind of what is called "ringing the changes," being a species of involution of surface condensers, high pressure, and double expansion engines. The third claim in the first branch is, we think, the best, the safety of the surface condenser, but so in essentials exactly identical in principle with the railway locomotive boilers; and we have reason to know such are now working under a much higher pressure of steam than the public have any conception; or is a knowledge of the value of expansion new, either in theory or practice: and Mr. Parsons will find that we have made much greater progress in the art than he appears to have any knowledge of.

There can be no doubt, that when the proper time arrives, when by some new and approved invention we can make a further advance in the use of high steam, by an increase in the amount of pressure, that a considerable saving will arise in the consumption of fuel, and a decrease in the necessary boiler room; theory has told us this for many, many years past; but in these matters, theory awaits practice, and the state of the latter may be judged of from the recent works of some of our most eminent engine makers.

But is it probable that the railway locomotive boiler, as figured by Mr. Parsons, will be introduced on shipboard? We think not, because their shape is that of least capacity compared with space occupied; and experience has detailed better forms and arrangements, quite capable of bearing as great pressures, and which enables the engine to be more conveniently carried for his own machinery. If, therefore, Mr. Parsons does not strictly adhere to his specification in this particular, he will merely follow in the footsteps of Penn, Seaward, and others too numerous to enumerate; and his invention is therefore "useful but not new."

We could have wished that some scale had been attached to the drawings in the pamphlet, so that we might have brought to bear upon Mr. Parsons' schemes the test of figures, combined with practical experience of the requirements of marine machinery: and it appears to us, we could have satisfactorily shown that he is far behind both in his theory and practice of such engineering. Dissmissing, therefore, the boiler, we pass to the engine, and we have (although not in a manner productive of much for the "Tubular Boilers," as patented by him in 1751, (see Farcy, page 384, and Gregory's Mech. Vol. II., page 385) or perhaps more distinctly, we should say Woolf's engine, inasmuch as Mr. Parsons proposes to use high pressure steam in his small cylinder, and expand it in his large one); Hornblower, on the contrary, employed low pressure steam, Mr. Parsons' complexity is beyond all endurance, valves upon valves, and steam and vacuum passages without end, the former placed in situations where they cannot be conveniently examined, the latter rendering the casting of the part of the most difficult and critical proceeding; it further occurs to us, that by the employment of two piston rods, he somewhat encroaches on Maudslay's patents of 1840 and 1811, (see our Journal of March 1840 and October 1811,) and is in this and in its method of securing the lower end of the connecting rod, an exact infringement upon the designer of the Prince Albert's engines, whose name we forget, but believe to be by birth a Swede; and between who and the Messrs. Maudsleys, we bear, a tacit understanding exists, arising from mutuality of invention, or rather adaptation or use, for we cannot dignify such things by the term "invention."

And what are Mr. Parsons' condensers but surface condensers? differing only in detail from Cartwright's of 1797, from Mr. Watt's gridiron condenser, and later still from Mr. Hall's; the latter employs pipes, Mr. Parsons corrugated iron plates; disbelieving, as we do, if these save anything, we believe, at the same time, that he, however, cannot allow this opportunity to pass without bearing our small tribute of admiration to Mr. Hall, for the ingenious and scientific way in which he has carried out his improvements upon Cartwright's surface condensers; for although it was formed of plain plates, we contend the principle is the same, Mr. WATT's introduction, and not failed. We have yet to point to what Mr. Hall is more fortunate; but bear that it as it may, his arrangement for supplying the loss of distilled water is really beautiful, and upon which Mr. Parsons' is a sad parody and burlesque.

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we have to here, two piston rods and an annular cylinder, the internal cylinder to be used a la Woolf, for high steam; besides a patent by Mr. Gillman has been already secured for using two cylinders one within the other, and adopted for the same purposes as Mr. Parsons proposes.

Without being hypercritical upon descriptive drawings to so small a scale, we shall content ourselves with remarking, that we cannot see how Mr. Parsons means to fit, adjust, and repair the small sliding valve, E F, Fig. 7, sheet A; or how to make good the wear and tear of the valves. N A M, with their triple faces to secure and make tight the cylinder cover; and lastly, how all this complication is to be manipulated and worked? These are practical points which suggest themselves to us, for the means described in p. 6 are, in our opinion, totally inapplicable.

The third branch comprises a scheme that really provokes our exclamation—we believe it to be entirely new, although Mr. Parsons does not claim its leading principle—the reciprocation of the cylinder upon a fixed piston, stating it to have been used; if so, we conceive it must have been on a very small scale.

The fourth branch consists of an arrangement of steam engine, "having for its object the better application of the power for driving screw propellers." It is on Woolf's plan, but evinces considerable ingenuity; but it is objectionable on account of the space required, which has been found the great difficulty in applying and working screw propellers.

The fifth branch, for disconnecting paddle-wheels from the engines, so that they may revolve when the ship is under sail, would be expensive in fitting, and useless in practice. Many other schemes are known of far greater superiority; among others, that of Trevithit is prominent.

The sixth and seventh branches introduce more complication where there is necessarily too much already, namely, in the locomotive engine. The eighth branch is an invention for supporting the main plunger blocks of marine engines. This is verily an "invention," for we feel assured nothing of the kind was ever seen before. This, like the third branch, assures us of what we previously had an idea—that Mr. Parsons's ingenuity far exceeds his practical knowledge.

The ninth branch, an improved packing for pistons and shiftings boxes, like the fifth, is useless, because far better means are in use, as those of Maudsley and of Robert Napper. The tenth branch, an improved cock and plug, is absurd.

The eleventh branch, for preventing casks tumbling round with the shaft, is absolutely preposterous, because it can be, and is done, by more simple arrangements.

This, then, completes our analysis of Mr. Parsons's patent. We cannot, however, conclude without protesting against this wholesale mode of breaking up a patent, and observing that he cannot reconcile, with the honour and dignity of the profession, thus bringing together other men's inventions, disguise them under a thin veil of doubtful improvement, and make the compound the subject for a patent.


Mr. Weale, having succeeded so well with some of his annual publications, particularly the papers of the corps of Royal Engineers, has now commenced two quarterly miscellanies, one devoted to engineering, and the other to architecture, as the means of preserving those branches of scientific learning of sufficient bulk to justify an independent publication are yet too small. These branches require a greater extent of illustration than we can devote to any one subject. We see that the design includes scientific memoirs, the lives of eminent professional men, republicans of American works, and translations of important communications from the French, Dutch, and other languages. It is considered that the works will each form a handsome volume at the end of the year, expensively illustrated, and at a moderate price, we are sure these new enterprises will receive that support from the two professions which they well merit.

The engineering part not inappropriately commences with a copious life of Brindley by Mr. Hughes, C.E. It gives full details as to his works, and is illustrated with a copper-plate portrait. Another very valuable branch is this, namely, one on Wm. Chapman, C.E., for whom is claimed the title of "the father of steam," a name given to him in 1757, on the Kildare County Canal in Ireland. Originally employed in the merchant navy, his attention was early directed to hydraulic engineering, which, on the advice of Watt, Boulton, and others, he determined on pursuing as his profession. He was consequently employed on a number of canals and docks, and, among others, on the London Docks. He was also the author of several valuable professional works, and of many valuable inventions and improvements in mechanical processes, particularly in rope-making, and the shipment of coals.

We have afterwards a paper on the dredging machine, with three engravings, and entering into the history of that invention, but to which, as it is likely to be the subject of controversy in this Journal, we have not space to give due notice. We here describe a machine constructed under the direction of the late Mr. Remie, in 1802, for raising mud out of Messrs. Perry's dock at Blackwall, and another used at the Hull docks in 1808. In this paper it states that "the piles (600 in number) for the coffer-dam of the Wapping entrance of the London Docks, constructed by Mr. Remie, were driven by one of Boulton & Watt's engines in 1801. Next comes an account of the engines of the Russian war steam frigate, the Polnische, constructed at New York by Messrs. R. & G. L. Schuyler. Four plates illustrate this subject, and a description is given of several peculiarities in the construction, for which we cannot say much in its favour. We will, however, let the engineers give their own reasons.

"In the United States, the most approved method of using steam is expansively, that is to say, by having a high pressure in the boiler, cutting off the steam from the cylinder after the piston has performed say one quarter of its stroke, and allowing this high steam to expand through the remaining three quarters of the stroke. To this system to the best advantage, Mr. Maudsley, late of the engine works at Blackwall, and afterwards of the engine works at Kameshakha, constucted at New York by Messrs. R. & G. L. Schuyler. Four plates illustrate this subject, and a description is given of several peculiarities in the construction, for which we cannot say much in its favour. We will, however, let the engineers give their own reasons.

"Having determined upon adhering to this method, so successful in our river steamers, it became necessary to adopt some plan by which the length of cylinder could be preserved without elevating the engine above the deck or cramping the action of the connecting rod, as is seen in some English government steamers. By reference to the drawing you will observe that by desired length of stroke can be obtained without adding to the elevation of the engines, and also that the connecting rod has great length and free action. The advantages of placing the cylinders in a horizontal position, firmly secured to the keelsons, and bolted down through the hull, are also very great. The strain of the engine is fore and aft, which tents greatly to relieve the sides, and gives an engine that takes up less space in length than any other; there is consequently room for coal-banks for feet on each side, thereby rendering the engines completely shot proof. In this plan we retain vertical air pumps, force pumps, and valves. The steam and exhaust valves are of the kind commonly used in the United States, known as double balance valves. The valves used for expansion of our own contrivance, and peculiar to this ship; they are worked by a separate eccentric and rocker shaft, which is so set as to follow the motion of the steam valve, cutting off the steam at any point of the stroke which may be desired; they can be thrown out of gear instantaneously, without stopping the engine. The triangle or half beam, which forms the connexion between the piston rod and the connecting rod and cranks of the engine, can be so arranged, by altering the fore and aft position of the crosshead, that the crank of any length which is thought most advisable, without reference to the length of stroke of the piston. In the case of the Kameshakha's engine, the cylinders are 624 in diameter, and have ten feet stroke, while the cranks are but four feet in length, and you will readily perceive that any leverage lost in shortening the crank is exactly counterbalanced by the gain upon the half beam. The steam is cut off at one third of the length of the cylinder. The number of strokes of the piston are from 26 to 34 per minute—on an average 30; thus requiring 1260 cubic feet of steam per minute, of an average pressure of 12 lbs. per square inch above the atmosphere. She has four copper boilers, (constructed for burning anthracite coal), each 10 feet long, 12 feet 6 inches wide, and 11 feet 6 inches high. In height of the flues, they are 6 feet 8 inches, and 46 feet high above deck. Each boiler has four separate furnaces; the heated current is taken from each furnace through 400 copper tubes, each 28 inches long, and one inch in diameter in the clear. From any one of these furnaces, by a peculiar construction of a revolving grate, the coals can be instantly dropped, and the tubes in that furnace can be swept out and cleaned while all the other furnaces
are in active operation. Some doubts were entertained by engineers in this country as to the possibility of keeping these small fires tight, and also as to their chocking up on a long sea voyage. Our experience is that the Kamaschota completely settles that point. Of the 150 tubes in her boilers, not one is known to have failed in any respect. After passing through these small tubes, exposing an immense quantity of fire surface, the heat is carried by ordinary cross tubes through the upper part of the boiler over the arch of the furnaces to the chimney. The consumption of anthracite coal in the Kamaschota, to furnish the supply of steam above stated, varies from 10 to 12 tons an hour and a quarter per hour. We would also remark, that the same boilers answer, though not so perfectly, for the consumption of bituminous coal. On the voyage from Southampton to Crounstadt the latter coal was used, the average consumption being 32 tons in 24 hours.

The plan of engine used in the Kamaschota, and known as Lightall's Patent, is gradually coming into general use in these waters. A new steamer for the Hudson river, now building, 325 feet long, which is expected to excel in speed all others, is to be supplied with these engines, the proprietors having already tested the plan for several years in the largest and finest boat on that river.

"The Kamaschota, planned and constructed by us for the Russian government, is a man-of-war steamer of the largest class, carrying a heavier armament than any steamer. She is a double decker; carries on the main deck eighteen light 30-pounders; and on her spar deck two guns of 10-inch bore, one forward and one aft, revolving in whole circles; and two guns of 8-inch bore, revolving in half circles. Of the 610 tons, 210 tons are in water, 275 feet 6 inches; depth, 24 feet 6 inches; tonnage, 2040 tons; draught of water with crew, ammunition, provisions, water for a cruise, and fuel for 26 days, 16 feet. The performance of the ship, in a very stormy and tempestous voyage from New York to Crounstadt, in the months of October and November, 1811, was entirely satisfactory. Her speed was from 10 to 12, and occasionally 14 1/4 knots per hour. Under sail, her engines being disconnected, she has made 187 miles in 24 hours. In the heaviest weather she was steered with perfect ease, and shipped no sea during the whole voyage." Mr. Joseph Gill has contributed some hints and improvements of the steam engine, which require to be separately considered. We see that for the next number much matter of interest is promised by Mr. Weale, and particularly papers on the light-houses of England, France, and America, the hydraulic works of Holland, and the ship-building of the United States.

The Quarterly Papers on Architecture commence with "an Essay on those Powers of the Mind which have reference to Architectural Study and Design," by Mr. George Moore, well known for his talent and abilities in architecture, as well as the fine arts generally. The Quarterly Paper on a New House by Mr. R. P. Browne, the architect of the building. It is accompanied by four plans and an isometrical view. The arrangements for classifying the inmates appear to be well carried out, and are of an excellent character, affording accommodation for nearly 1200 persons, the cost being, on an average, about £241 per head. The following is the cost of the land and buildings:

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase of land and expenses</td>
<td>£8 95</td>
</tr>
<tr>
<td>Forming a sewer to the river</td>
<td>230 feet</td>
</tr>
<tr>
<td>other works</td>
<td>1,200</td>
</tr>
<tr>
<td>Contract for house</td>
<td>£18,674</td>
</tr>
<tr>
<td>Additional works in buildings</td>
<td>0</td>
</tr>
<tr>
<td>fittings</td>
<td>3,604</td>
</tr>
<tr>
<td>Artesian well and three-barrel pump</td>
<td>20 11 11</td>
</tr>
<tr>
<td>Boilers and furnaces for washing</td>
<td>85 5</td>
</tr>
<tr>
<td>Steam cooking apparatus, eight baths,</td>
<td>720</td>
</tr>
<tr>
<td>single tubes, fore and middens</td>
<td></td>
</tr>
<tr>
<td>Additional works for enlargement of infermary department</td>
<td>1,546</td>
</tr>
<tr>
<td></td>
<td>24,850 16 11</td>
</tr>
<tr>
<td>Total</td>
<td>£27,915 19</td>
</tr>
</tbody>
</table>

The next paper is the Life of the late Mr. Morrison, architect of Dublin. We learn from the memoir that William Vitruvius Morrison was a kind of hereditary architect, his father, grandfather, and great grandfather having also exercised the profession. Sir R. Morrison, the father of William, and under whom he was brought up, is also a subject of the memoir. William Morrison, according to this paper, was the first to introduce the Tudor style into Ireland in modern days, and was the designer of a number of the finest modern seats in Ireland, principally in the style just named.

We next have four plates of stained glass windows, selected from the ancient churches of York by Messrs. Bell and Gould, architects. The plates are beautifully colored, and the effect produced by them is, as the artists say, very rich. The concluding paper on the Primitive Churches of Norway, with six drawings of doors, with carved frames and frontispiece in wood, highly ornamented, and of a peculiar arabesque character, are well deserving the study of the architect; and, as the author observes, they afford hints and ideas that might be turned to account, and, among other purposes, for ornamental metal work.


The present ecclesiastical fever will do some good if only for the interest it excites in architecture and its details. Parsons are looking about them, brushing off the whitewash, and brushing up antique fonts, pulpits, screens and pews, a zeal which we hope will also be caught by the Church Building Commissioners. The old rule was when one of the large workhouse buildings, misnamed churches, was run, to stick in a few sheep-pens or pews, and consider the job completed. Attention to details, or the necessary ornaments, was not to be expected, the same ice-fined ruled in cold propriety in the interior who had pared the outside to bare walls, simplicity, or as we should call it, nakedness, reigned supreme, and the carpenter and joiner finished a job the hands of the architect, with the happy result of a mongrel sort. We hope, however, that the reign of the Goths is checked, and that we shall see better things. The present work will do much good in this respect, for it gives some excellent examples of what may be done in all styles in that neglected attribute of a church the font. The present number contains no less than sixteen engravings all by first rate artists, and executed with that skill and accuracy by Mr. Van Voorst knows so well how to display in his illustrated publications. We hope to see this work carried to a great many numbers.

Railway Works—Abbot's Cliff, Dover.

We are indebted to Mr. Hodges, engineer of the South-Eastern Railway, for the following details. Another of those blasts by which the progress of the works have been so greatly facilitated, and having for its object the clearing out the angle of the shore to form the face of the Abbot' Cliff tunnel, was intended to have been executed on Thursday, but from some unexpected cause the circuit of one of the voltaic batteries was prematurely completed, discharging a portion of the mines, and leaving the rest un sprung. In this blast (although minor in point of power, yet, as a piece of engineering, much more difficult than any of the preceding), 3600 lbs. of gunpowder were to have been exploded. This was divided into 28 charges, varying from 28 lbs. to 900 lbs. each, and placed upon two platforms, 100 feet apart; the upper having 12, and the lower 16 charges, the whole of which were intended to have been simultaneously ignited. The arrangements had all been most carefully made by Mr. Hodges, assisted by Mr. Graves, and it is impossible to account for the partial and premature ignition which took place. So, however, it was; some of the mines first exploded, and Mr. Hodges, finding that to be the case, completed the circuit of the whole of the batteries, by which the 12 mines on the upper platform were discharged. Upon examination, it was found that the spoil caused by the prematurely exploded mines, had disarranged the whole of the wires connected with the lower mines, and, of course, prevented their being discharged until this spoil could be removed. The dislodgement effect by the upper mines is precisely what was required; and there is little doubt but that the lower mines, when discharged, will produce the desired result, although not fired with the upper. This partial check, for it scarcely can be called a failure, is the first with which Mr. Hodges has met in the course of the numerous explosions which have been carried out and executed by him during the progress of the works, and by which so many thousands of pounds and so much time have been saved the company and contractors. Since the above was written, the lower mines were discharged, and the result is precisely what was desired by the projectors. The works are progressing here with great rapidity; the outward piles of the viaduct are now being driven, and its completion will take place during the month. These piles go completely into a rocky substratum, and give great security and firmness to the work. The sea-wall is in a state of rapid completion, and, when erected, will prove a most perfect barrier to the intruders of "Davy Jones," from whose attacks, such is the natural formation of the beach, we think there is nothing to be feared. The Archcliff-fort Tunnel will be finished next week; and the preparations are now being made for laying the permanent rails in the Shakespeare Tunnel. According to appointment at the present time, a kite is to be let for the continuation of opening the line to Dover before the end of next month will be realized; at all events we feel quite satisfied that the year 1843 will witness the carriages of the South-Eastern Railway running to Dover.—Dover Telegraph.
NEW INVENTIONS AND IMPROVEMENTS.

BIELEFELD'S PATENT DRESSING GLASS STAND.

In the construction of glass stands every kind of form has been given to the frame and pillar supporting them, but it is somewhat remarkable that no attempts have been made to improve the principle of construction; in seeking graceful forms we appear to have hitherto forgotten to inquire whether the mechanical structure may not be improved—a circumstance the more remarkable, as the usual mode is adopted by every one to be very faulty. The glass in all cases hangs on two stems, and turns on two pins: after leaving the workman's hands, for a few days or weeks, the glass turns obediently to our will, and retains the desired angle; but soon a little obstinacy shows itself; the glass seems bent on resuming its vertical position: a turn is then given to the screws to keep it in its place; again another and another turn gives us a brief control over the pertinacious mirror; but it is soon found that every turn of the screw increases the evil, for, in pressing against the glass, it is mechanical pressure from which the glass suffers most. Never yet, however, has this difficulty been overcome; for, by some strange oversight, inventors have never sought a new principle of hanging. Mr. Biefeleld, however, the inventor of the article before us, which he calls the Quadrupolar Glass Stand, has at length adopted the right course with complete success.

The accompanying figures and description will explain the construction.

ARMSTRONG'S HYDRO-ELECTRIC MACHINE.

This discovery, like many others which are now changing the pursuits and opinions of men, is of very recent origin, bearing date but two or three years ago. It appears that an attache to a fixed engine at Newcastle, whilst standing in a current of steam rushing from a leaky valve in the boiler, extended his hand towards it, and perceiving a slight spark, concluded that the boiler was full of fire. Without further experiment, Mr. Armstrong tried it, and from thence proceeded with experiments, which have ended in the production of the present machine. It is said that from the fall of an apple, Newton worked out his beautiful theory of gravitation—that the disk with the eye of a lamp in a window, suggested to Galileo the laws of the pendulum—and although we would not think this the result of chance and unaccountable, would immediately consider its cause and effect, and see in what manner it might assist in the advancement of science.

Description.—It may be considered as consisting essentially of three parts: a boiler 7' 6" by 3' 6" from which the steam passes, by two tubes in the top, into the 2nd sub, a long last right angle to the generator, and turned ; a series of pipes, terminated by wooden nuts with orifices $\frac{1}{4}$ of an inch, allowing high-pressure steam, mixed with a great quantity of condensed water, to rush upon the 3rd part, the conductor, which is composed of four rows of brass pins, contained in a tine box, 7 ft long by 1' 10" wide. The boiler is insulated by standing on six strong glass legs; the funnel is suspended, and when the machine is in action raised up; the conductor is in electric communication with the earth.

Theory.—It appears from the investigations of Dr. Faraday, that no portion of the electricity is due to the steam; it acts only as the driving power to the particles of water which are condensed in the curved pipes. That, in fact, it arises from the particles of water, rubbing against the small orifice from which it rushes. Positive electricity is excited, which the conductor instantly carries to the earth; the water then, in order to return to its normal state, robs the boiler of its share of electrically negative state. Thus we see, that although derived from a new source, we have not to add to the list of thermo, magneto, chemic, and frictional electricities, as the latter is quite sufficient to account for it. It may, indeed, be compared to the common electrical machine, by considering the water to correspond to the glass, and the boiler and tubes to the rubber. The Doctor has shown, by experiments as simple as conclusive, that dry steam or air elicit no electricity, but that if either hold in suspension particles of liquids or solids, electricity is excited; that in the case of water, it must not contain a gas, but may be in the solid state. It would be an interesting experiment to ascertain if, being absorbed by a vessel, apparatus, electricity could not be collected. The circumstances appear so similar, that we feel convinced that such would be the case. We should like to hear of Mr. Addams, who has greatly improved upon Thilorier's apparatus, what he has tried it, and what he has gained as a result.

The exceeding beauty of the experiments performed by this machine is very striking. Water and other liquids have been decomposed by it; and every day, beyond the ordinary experiments with tin foil and wires in various shapes, gunpowder is exploded, and shavings ignited, and the aurora borealis is produced on the ceiling. Metallic leads and wires are exploded by discharges from the large battery, which is charged six times in one minute. Although the battery can be charged in one-fourth of the time by this machine that it could be by the colossal plate machine that they used formerly, showing, therefore, four times the intensity, it appears that the striking distance, that is, the length of flash, is not anything like so long. 1

Mr. Bachhofer, who gives an exceedingly clear lecture on the machine, drew attention to an interesting spiral movement in the electric fluid, which occasionally takes place in the aurora experiment, which cannot be accounted for, but which he thinks is due to a bit of unpremeditated metal of small cross-section, which, not having been noticed, that although the apparatus is not shifted at all, yet the discharges do not take place in the same spot, but are always shifting; it may be, because the electricity does not arrive at the same degree of tension on the spot where a discharge has just taken place.

1 On closely inspecting the paper on which the metals were exploded, which was kindly given to us by Mr. Bachhofer, the coloured streaks which are left were found, in several instances, to be composed of an infinite series of fine lines, and in consequence of the wire, the idea that at the time of the discharge they were converted into temporary electromagnets.
We think the proprietors of the Polytechnic Institution deserve all the success that are due to the spirited way in which they are bringing forward all new scientific discoveries; and may, with great confidence, recomm-}

We think the proprietors of the Polytechnic Institution deserve all the success that are due to the spirited way in which they are bringing forward all new scientific discoveries; and may, with great confidence, recommend our readers, both scientific and otherwise, to witness the splendid effects of this new machine.

PAPERED PAINTED SURFACES OF PAPER.

Henry Martin, of Norton-Terrace, Camden-town, painter, has obtained a patent for "improvements in preparing surfaces of paper."—Patent dated March 30, 1840; they consist in embossing and enamelling the surfaces of paper, and in manufacturing paper-hangers for paper, of which that of oil-paint of the desired colour, is first applied to the surface of the paper, as evenly as possible, with a common paint-brush; it is then rubbed lightly over with a brush, similar to a clothes or shoe-brush, (giving it a circular motion), to remove the hairs or starch, and the surface is then polished and given a polish of the painted surface, by passing a dry brush, called a "softener," lightly over it. If more than one coat of paint be laid on, this process is repeated.

Or, instead of the above method, the paint may be applied by conducting the paper between two rollers, together with an endless felt or other fabric, which is supplied with paint by passing under a roller, partly immersed in it; the superficial paint being removed from the felt, as it ascends, by a scraper.

The paper, thus prepared, is embossed, by passing it between engraved rollers or dies; or is converted into paper-hangings, by printing the required designs upon it, and printing also the edges and borders. If advantage be taken to give to the paper, the oil-paint must be used in a thick or round state, and thinned only with turpentine, in the same manner as if it were used for "flatting." When the turpentine evaporates, the colour becomes set; the paper is then applied upon a bed of woven cloth or other soft material, and a pallet-knife or towel, with a polished surface, is passed over the painted surface of the paper, with a slight pressure; the colour being set, yields to the pressure, and a glazed surface is produced, which may be afterwards heightened in the usual manner. Other means may be resorted to for gilding the painted surface of the paper, if preferred.

RAILWAY CHRONICLE OF THE MONTH.

The Railway proceedings of this month have been principally confined to the results of the great amalgamation movement of last month. The influence of the great Midland junction has been to produce the greatest effect on all the railway interests of England by the creation of a new power, with a new policy. The London and Birmingham, hitherto the ruling line of the south, has been the first to feel the change. It is said that the Great Midland has made a proposition requiring the London and Birmingham to let them work their own traffic to London on the same terms as the Manchester and Dudley Junction, and the Grand Junction, under the penalty of having their own line from Leicester to London. The London and Birmingham have, in consequence, taken a bold step by bringing about an amalgamation, or rather union, of the Northern and Eastern, and Eastern Counties, so as to prevent these latter lines from falling under the power of the Great Midland, and assisting them in obtaining the traffic of the north and east of England; while it is expected that the London will secure to the London and Birmingham the benefits of the Northampton and Peterborough line. It is most probable that these hopes of the London and Birmingham will not be fulfilled; but the union of the two lines has taken place, meeting of each being held at the Shoreditch Station on the 23th, when resolutions were passed, almost without opposition, approving of the plan, except that Mr. D. W. Harvey, at the Eastern Counties' meeting, made a speech two hours long. The plan guarantees 5 per cent. dividend to the Northern and Eastern, and the remaining profits to be divided in the proportion of two-thirds to the Eastern Counties, and one-third to the Northern and Eastern. The joint board to consist of twelve Eastern Counties Directors and six Northern and Eastern Directors.

The Division and Corridor Railway is progressing, two meetings having been held at Plymouth and Devonport on the 25th and 26th. In favour of it, at which Mr. Saunders, secretary and chief superintendent, and Mr. Brunel, chief engineer of the Great Western Railway, attended. Two lines have been started as branches from the Eastern Counties Railway to Harwich, and the plan for the extension to Ipswich is being prosecuted. A line has been brought forward to carry the mineral traffic in Furness for shipment to the Port of Furness: it will also form part of a West Cumberland line.

The Charnel Valley line has been revived. This railway would proceed from the Manchester and Birmingham Railway by Leeds to Derby.

Mr. Rutledge is surveying for a Brighton Railway branch from Shoreham to Worthing and Chichester.

We have mentioned above that an amalgamation is also on the top of the Union Railway and the Bolton and Preson. Many parties justly fear that the ultimate result of all amalgamation will be to throw all the lines into the hands of the Government. The French government, in defiance of the expression of public feeling on the General Railway Act, is trying to get the lines into its own hand in France. It is said they intend next session to ask the Chambers for her authority to work the Paris and Northern Railway and Montpellier and Nissmes Railway. This, if successful, would also be an example for our parties here.

With regard to foreign railways, the great event has been the opening of the junction line between Lisse and Aix-la-Chapelle. This forms a continuous communication of upwards of 200 miles from Cologne, on the Rhine, to Antwerp, Oostend, and Lille.

The Darlington Junction Railway has guaranteed the projectors of the High Level Bridge 3 per cent. on the expenditure of £100,000, as a compensation for toll on railway traffic. Messrs. John and Benjamin Green are appointed architects and engineers to the railway, which will be commenced when the workmen are employed; wood is abandoned, and either stone or wood will be the material employed. The capital is to be raised in shares of 20l. each, and the estimate of the cost of the bridge is £80,000; a revenue from traffic of 8p. per cent in addition to the guaranteed per cent is anticipated, notwithstanding which, very few shares have been taken; the prospectus was issued last September, and John Hodgson, Esq., M.P., is chairman of the committee.

Another great event of the month, has been the decision in the important case in Chancery of Ranger v. The Great Western Railway. Involving in itself and the cases depending upon it, upwards of a quarter of a million sterling, say £400,000. This litigation has long acted to the disadvantage of the Great Western Railway Company, Mr. Ranger and his advocates having been large in their demands and loud in their denunciations of fraud against the company and its engineers, particularly Mr. Brunel's. The Vice-Chancellor (Sir Lionel Shadbolt) pronounced his decision, at Lincoln's Inn on the 27th, gave judgment on every point in favour of the company, dismissing the plaintiff's bill with costs, and charging his statements to be devoid of foundation, at the same time that he vindicated the high character of Messrs. Brunel, Freer, and Babbage. As to the plea that contractors were not to be guided by the decision of the engineers as to which the work was extended, the Vice-Chancellor repudiated such a doctrine; he said it was of importance to the safety of mankind that railways should be executed under the directions of eminent scientific men. and that in the act of the Great Western Railway Company, the legislature had set an example, in declaring the opinion of the Surveyor-General of Metropolitan Roads, and of the Engineer of the London and Birmingham Railway, dealing also with rival works, as to quantities and principles, and application might be made to that Court. He treated as nonsense the attempt to reject the decision of the engineer, because he was a shareholder in the company; it was notorious that engineers and other officers of railway companies were shareholders in them; and there could be no doubt the interest of the engineer was paramount to that of the shareholder. The Vice-Chancellor, on the plaintiff's own showing, upheld the system of precedent and of full inspection and of judicial control as a system to secure the work being effectually and punctually executed, since the plaintiff himself had adopted the same system with his subcontractors, and on the same grounds. He also asserted the legality of the taking possession of the work and plant. In fine, the Vice-Chancellor dismissed the bill on nearly every ground, with costs, leaving the plaintiff to any remedy he might have at common law, and all his application to be made out upon the penalties and conditions of the contract. This result was what was anticipated by most reasonable men, though Mr. Ranger and his friends had buoyed themselves up to the last with the hopes of success. He will, however, very probably try to induce his creditors to appeal from this judgment, though it is not likely with any success. This decision is of importance, not merely on its technical grounds, but as it relieves the property of the Great Western Company from a bearing influence in the money market, secures the present management in office, which otherwise was in jeopardy, and leaves free scope for the exercise of the plans of extension entertained by the moving parties in the concern.

Midland Counties Railway.—We are informed that the platform across the Trent was not carried away by the floods, as stated in last month's Journal, but was removed at the latter end of August, in consequence of the Weir being finished.

English and Belgian Coke.—For the comfort of the Newcastle colliery owners, and as a set-off to a paragraph depreciatory of the Newcastle coal, we have to mention that serious complaints have been made by colliery proprietors with the Belgian coke, in reference to the Belgian coke which has been latterly used upon it. The Journal of Roches, states in a recent number, that on the opening of the railway, and for some time afterwards, the Belgian coal was employed with English coke, and all well. The stock, however, became exhausted, and recourse was had to Belgian coke. The trains immediately became seriously retarded, and the company has appealed to the Tribunal of Commerce, for damages against the merchants who supplied the Belgian coke—and surveyors have been appointed, in consequence, to estimate the damage.—Gateshead Observer.
THE GREAT NORTHERN STEAM SHIP.

This fine vessel, which was built by two or three spirited individuals at Londenerry, in the north of Ireland, and completed last year, arrived in the river Thames last January, she has since then, through some imperfection in her machinery, been laid up in the East India Docks, for the purpose of having her engines thoroughly examined and set to rights, to adapt them more particularly to the working of Mr. Smith's patent Archimedean screw; for this purpose, the owners placed the machinery in the hands of Messrs. Miller and Ravenhill, the well known engineers of Blackwall. We know of no one better qualified for such a task than Mr. Joseph Miller, his superior practical knowledge of all the details of the marine engine are well known to all persons throughout the world, who are in any way connected with steam navigation; this is further proved by the very great satisfaction he has given to the owners, for the very perfect manner he has completed this task, which has been an Herculean one, when it is considered that he has had to alter engines of a large magnitude which had been made, not by one engineer, but by several, and in various parts of the United Kingdom, part having been made in Ireland, and other parts by different manufacturers in England. It now affords us much pleasure to state that at a trial of the vessel down the river Thames on the 11th ult., the engines performed all that could be desired; her performance against tide was fully equal to 73 knots per hour, her speed through the water may be fairly taken at 10 knots per hour; when we consider the disproportion of the power to the tonnage of the vessel, this is a most satisfactory performance, and shows that the screw is nearly equal to the paddle wheel in rivers, and superior in the open sea, particularly when considering the aggravating weather which has satisfied her owners. Mr. Smith, the patentee, to whom all the credit is due, for his persevering industry in bringing forward this new mode of propelling, in opposition to a whole phalanx of great men.

As the engines have undergone some alterations, we will proceed to describe them, together with their dimensions, and also those of the vessel.

There are two engines, which are placed immediately abaft the vessel, with the large spur wheel athwart, between the engines, and the boilers in advance of the engines, leaving the whole of the middles and fore part of the vessel clear; and we must here suggest the necessity of placing the saloon or principal cabin in the middles, so as to avoid the unpleasant noise of the cog-wheel gearing, which is very objectionable. There cannot be the slightest objection to it; for, if stowage be required, it might be placed in the stern and fore part of the vessel as well as in the middles.

The engines are of the direct action steenple principle, with cylinders 68 inches in diameter, and 4 ft. 6 in. stroke placed in the centre of the breadth of the vessel; attached to the top of the piston rod is the cross head, forming the base of a triangle, to the apex of which is depended the connecting rod, working like a pendulum; the lower end of this rod is attached to a crank fixed on to the shaft of the large spur-wheel, a corresponding engine working a similar crank on the other side. One of the cog-wheels is placed before stated, placed between the two engines. There are two air pumps to each engine 19 inches diameter, and of the same stroke as the cylinder, worked by rods fixed at each end of the cross head forming the base of the triangle just mentioned; these two air pumps communicate by passages with a single condenser placed in front of the cylinder, with the steam and exhaust valves, which are independent from the description of the engine given above.

The diameter of cylinders .................. 66 inches.
Length of stroke .................. 5 ft. 3 in.
Diameter of paddle-wheels over the floats 21 6
Breath of paddle-floats .................. 8 6
Depth of ditto .................. 2 7

The air-pump, which is double-acting and placed between the cylinders, is 37 in. diameter, and 2 ft. 7 in. stroke.

MISCELLANEA.

NEW Dock at Ellesmere Port.—A commodious new dock, for the reception of shipping, has just been completed by the Ellesmere and Chester Canal Company at the terminus of their canal; the second order, in Mr. Popham's celebrated model for the dock of public use was celebrated on the 13th Sept. The works occupy three acres, and consist of a spacious dock, with wharfe, berths, c., capable of accommodating a large number of vessels of 300 tons burthen. In connection with the dock is an extended range of warehouses, four stories high, being 260 feet in length, and 45 feet wide; and which are connected with the dock by three wings; two stories in height, each extending in length 200 feet, and giving 40 wholesale warehouses, each which capable of giving the convenience of loading and unloading the vessels and boats using the canal and dock. The whole of the works, with the exception of the river wall, were designed by the late Mr. Robert Stephenson; Thomas Telford, Esq., R.S.S., having been carried out under the direction of Mr. Cubitt. The works, which have been in progress for the last two or three years, were conducted under the able direction of Mr. Provis, the contractor, at a cost of £40,000, and a masterwork of architecture and engineering.

The National states that the Government had commenced the construction of new land on the site of the old cells, and intended to contain a model foundry and complete arsenal, with barracks for a considerable force of infantry and cavalry. "These works," adds the National, "have been undertaken without the authority of the Chambers, and the expense of the construction is estimated at £500,000."
Mr. Steward's new Iron Beacon for the Goodwin.—Her Majesty's steamer Tortaurus, Captain Bullock, R.N., arrived on our roads last night for the purpose of taking off and planting on the Goodwin Sands an iron beacon intended by Mr. Steward and constructed upon the plan of the pondeous-footed pile, which is the great novelty in Mr. Steward's plan for the formation of a harbour of refuge. On Sunday afternoon Captain Bullock having communicated with Mr. Steward as to the best course of proceeding, the Tortaurus sailed for the Goodwin, to fix a buoy at the spot appointed by the Hon. Trinity Board for the erection of the beacon. On Monday the Tortaurus returned to our bay, having been presented by the heavy surf on the Goodwin from fixing the buoy. After a stay of a few hours the Tortaurus again steamed off for the Goodwin, and returned to Dover on Tuesday morning, accompanied by a large lugger No. 1, from the deal yard, to take off the beacon. For this purpose the Tortaurus, having upon each visit received the usual flag honours from the castle and heights, entered the harbour, and being a very fine vessel, upwards of 500 tons, she was an object of no small attraction. On Wednesday morning, arrangements were made for shipping the large iron block upon the bigger, half of the shaft, with the ponderous foot, was lowered from the Ordnance crane, when it was unfortunately found that the boat was unequal to the weight of this part of the beacon, on account of the position in which it was necessary to lower and work upon the scourer. The iron block, which was intended for a chain lighter, and the Tortaurus left the harbour on Wednesday afternoon, and proceeded to Sheerness for that purpose. She is expected to return in a few days to complete her task, and place Mr. Steward's beacon on that grave of thousands, the all-devouring Goodwin. May success attend the enterprise, and may all who are employed in the work be spared! This whole business has been conducted by Messrs. Poole and Co., of this town, and we shall give a description of it in a future number. The active co-operation of the Admiralty must be highly gratifying to Mr. Steward, as it ought also to be to the public in general. The Herald, the Times, the London, the Advertiser, all express their high opinion of the work, and all speak of the beacon as a fine piece of wet-engineering, admirably suited for the place, and perfectly safe for the use of the shipping, and the preservation of their brave crews.—Dover Telegraph.

Improvement of the River Tyne.—The Town Council of Newcastle on October 11th, decided to take the opinion of Mr. J. Walker, as to the effect of the alterations now in progress in constructing the waterway of the Tyne, so as to reduce the 9th line from a line laid down by the late Mr. Rennie, in which line Mr. Cubitt, Mr. Richardson, and Mr. Anderson, the late engineer to the corpora iron, and their present engineer, Mr. Brooks, are said to concur. The opinion of Mr. Walker is taken, as engineer to the admiralty, in consequence of a memorial from the Trinity House, shippers, and pilots, to the Council, against the proposed construction of a river at Dene's Hole; Mr. Cubitt having been previously employed in a similar line of work. The Council agreed to consult with him as to the construction at Dene's Hole; but Mr. Walker's opinion as to the whole question was decided to be taken.

Launch of an Iron Steam- vessel.—On the 5th ult. there was launched from Messrs. Poole and Co.'s yard, &c. of the hull plan to procure from vessel called Der Pfife Graf, of the following dimensions—length, 181 feet, beam, 20ft. 3in., depth of hold, 9ft., and about 300 tons burthen, to be propelled by engines equal to 140 H.P., her draught of water when launched was only 2 inches, but with all her machinery, boilers, and fuel on board, it will not exceed three feet. She is intended for the navigation of the Tyne, and will be employed as a tug-boat for taking up vessels from Rotterdam to Berne, and from Berne to Rotterdam. The vessel is one of three steamers that have been constructed by the Messrs. Fairmorn, to be used as towing vessels on the same river; and we are informed that the other two, which are of nearly similar dimensions with the present one, have completely answered the expectations of the proprietors.

Launch of the "Fire Queen."—On Tuesday, September 26th, a splendid new iron steamer, called the Fire Queen, was launched on the river Wear, at the yard of Messrs. Daventry, Grindon, and Patrick, south side of the Queen's Basin, river Wear. The vessel, which is intended to carry passengers and cargo between Calcutta and Singapore, is about 500 tons burthen, and will have engines of about 300 H.P.

English Locomotive Engines on the Continent.—In Germany (exclusive of Austria) there are running 180 locomotive engines, built in England, of which Messrs. Robert Stephenson & Co. made 81, running on 14 lines of railways; G. & J. L. Stephenson & Co. 35; George and John 10 lines of railway; Turner & Co., 11; Redditch, 10; Longbridge & Co., 5, Taylor & Co., 5; Bury & Co., 1; Bury & Co.; 4; Ashton & Co., 2; Gaskell & Co., 2; Rempe, 1; Hawthorn, 1, Total, 189.—Leipziger Journal.

North Shields.—A new gas company, to be called the Borough of Tynemouth Gas and Coke Company, is formed, with a capital of £6,000, to construct a gas works and in two hours a thousand shares were taken up, the old company refusing to give the light on the town offered by the Commissioners, viz., £6 per annum.

LIST OF NEW PATENTS.

(From Messrs. Robertson's List.)

GRANTED IN ENGLAND FROM SEPTEMBER 26 TO OCTOBER 21, 1813.

Six Months allowed for Enrolment, unless otherwise expressed.

Elisha Haydon Collier, of Goldsworthy-terrace, Rotherhithe, Surrey, civil engineer, for "improvements in the construction of furnaces and flues."—Sealed September 28.

John Asaie Fermer, of Reddough, near Dalkeith, N. B., for "a new or improved mode of drying tiles, bricks, retorts, and such like work, made from clay and other plastic substances."—Sept. 30.

John Briggs, of Leicester, coach proprietor, for "improvements in axles."—Oct. 5.

Edward Banton, of Walsall, Stafford, saddlers' ironmonger, for "improvements in saddles and horse harness."—Oct. 5.

Richard Doote, of Burslem, Stafford, earthenware manufacturer's clerk, for "improvements in machinery applied to the manufacture of ornamental mouldings, and other useful purposes." (A communication.)—Oct. 5.

James George, Captn. of Liverpool, and partner, for "improvements in healing, cleansing, preparing, and carding flax and other fibrous substances."—Oct. 5.

Benedict Alano, of Piccadilly, civil engineer, for "improvements in preparing materials, and applying them to the manufacture of ornamental mouldings, and other useful purposes." (A communication.)—Oct. 5.

James Griffin, of Withymoor works, Dudley, manufacturer, for "improvements in the manufacture of tyres of railway and other wheels, and in the manufacture of railway and other axles."—Oct. 5.

Jonathan Saunders, of Soto Hill, Birmingham, gentleman, for "improvements in the manufacture of spades, shovels, and such like tools."—Oct. 5.

John Baptist Sold, of Windshope-place, Southwark-bridge-road, Surrey, for "improvements in apparatus for measuring of person's heads, and for filling and retaining hats, caps, and bonnets according to such measures." (A communication.)—Oct. 5.

Charles Brown, of Woolwich, Kent, surgeon, for "improvements in the manufacture of dip codlins."—Oct. 5.

Lawrence Hardman, of Liverpool, merchant, for "improvements in machinery and apparatus in the manufacture of sugar."—Oct. 5.

John George Bodamer, of Manchester, engineer, for "improvements in grates, furnaces, and boilers, and also in manufacturing or working iron or other metals, and in machinery connected therewith."—Oct. 5.

Margaret Henrietta Marshall, of Manchester, for "an improved plastic composition, applicable to the fine arts, and to useful and ornamental purposes."—Oct. 5.

George Wall jun., of Manchester, gentleman, for "improvements in the methods or processes of manufacturing earthenware, china, and other similar wares, and also in the machinery or apparatus applicable to such manufactures."—Oct. 5.


Charles Brook, of Waltham mills, cotton spinner, for "improvements in machinery for spinning and twisting cotton and other fibrous substances."—Oct. 12.

Moses Poole, of Seer-street, gentleman, for "improvements in enveloping machines." (A communication.)—Oct. 12.

Stephen Goddard, of Hagger-stone-place, King's-cross, architect and civil engineer, for "improvements in the construction of pavellings and framing, applicable to all building purposes, cabinet work, and other similar uses."—Oct. 13.


Richard Tanion Nevil, of Llanganeswh, Carmarthen, Esq, for "an improved machine for operating certain metals when in certain states of combination with each other."—Oct. 18.

William Watson, Junior, of Leeds, chemist, for "improvements in retaliating houses and other buildings."—Oct. 18.

Julius Adolph Detnadel, of London, merchant, for "improvements in the construction and arrangement of furnaces or fireplaces applicable to certain useful purposes."—Oct. 18.

Thomas Morton Jones, of Birmingham, merchant, for "improvements in heating liquors and aeriform bodies."—Oct. 18.

James Gibbons, of New Radford, Nottingham, mechanic, and Thomas Roe, of the same place, merchant, for "improvements in machinery used for what is called setting or reading patterns, and stamping or punching them in jigsaw boards."—Oct. 21.


ERRATA IN LATE MONTHS JOURNAL.

Page 356, column 1, line 6, for "challenged" read "allured."—Page 366, column 2, the Princess Alice steamer, for "12 feet long," read "120 feet long." and in the fifth line from bottom, for "his" read "their."
THE NEW TERMINUS OF THE BRIGHTON, CROYDON, DOVER, AND GREENWICH RAILWAYS AT LONDON BRIDGE.

(With an Engraving, Plate XIV.)

We have at length the pleasure of presenting to our readers some particulars of the New Joint Railway Terminus at London Bridge, the extensive works of which have been in progress during the last 18 months, and are now all but completed, so far as respects the portion to be executed by the Brighton, Croydon, and Dover Companies; and our remarks are accompanied by a view of the entire façade, as it will appear when the Greenwich Company's portion of the building shall have been completed, together with a ground plan.

From the time of the passing of the Acts of Parliament for the construction of the Brighton and Dover lines of railway, it became evident to the Directors and Engineers of those undertakings, that the Croydon terminus at London Bridge would be found not only totally inadequate to the carrying on of the united traffic of these lines of railway, but that its position to the north of the Greenwich station was inadmissible, involving as it did the inconvenience and danger of crossing the Greenwich line of railway at the departure and arrival of every train; and in due time arrangements were accordingly entered into with the Greenwich Company, by which the original Croydon station was made over to them in exchange for the original Greenwich station, together with an extent of new works on the south side thereof of equal area; by this arrangement, combined with the widening out of the Greenwich viaduct from the Croydon junction to the terminus, from which point four lines of rails are now provided, the Greenwich traffic is kept entirely distinct, and to the northward of that of the Brighton, Croydon, and Dover lines; while by a happy agreement between the four different companies, assented to on the part of the Greenwich company, by the advice of their talented architect George Smith, Esq., a complete unity of design has been preserved in the entire façade, as seen from the approach from Duke Street.

The whole extent of surface now occupied by the joint station, is 130,000 square feet, or about three acres. And when it is considered that the whole of this extensive surface has of necessity been raised by massive piers and arches to an average height of about 25 feet above the general surface of the ground, some idea may be formed of the magnitude and cost of these works, in which, exclusive of the old Croydon and Greenwich terminus, above 8,000,000 of bricks have been consumed.

On entering the station the spacious and elegant iron roofs attract notice; the surface covered in by this means includes an area of 45,000 square feet, or upwards of an acre, affording ample scope for housing and cleaning the numerous carriages of the different companies, and securing from the weather the spacious arrival and departure platforms, and the space to the south appropriated to carriages waiting the arrival of trains.

These roofs are supported by three rows of cast iron fluted columns, of elegant design, connected together above their capitals by ornamented arched ribs, which carry the trusses of the roof; the rainwater is received into cast iron gutters communicating with the columns, which being cast hollow, convey away the water to the pipes and drains of the substructure. In the construction of these roofs, Mr. Rastriick has observed the same peculiarity of form in the struts as he employed at the roofs of the terminals at Brighton, but in this case, instead of being of wrought iron tubing, they are of cast iron, hollow, and fluted to harmonise with the fluting of the columns, and the masts at the end of the king and queen rods are concealed by ornamental foliated pendants. The whole area is well lighted by skylights on either side of the ridge, running nearly the whole length of the roofs, and numerous others in appropriate situations.

The arrival and departure platforms, each 21 feet in width, are lined with slabs of Bangor slate paving, in slabs, averaging 6 feet 6 inches by 4 feet each. On the arrival platform is a travelling luggage enclosure, deserving of notice, as being well adapted to its purpose, and less unsightly than such contrivances usually are.

To avoid confusion, a back entrance to the station has been provided by means of an inclined plane, commencing at the south end of Joiner's Street, by which cabs and omnibuses are allowed to enter and wait the arrival of trains, by which means the inconvenience of the confined space in front of the principal entrance is very much lessened.

The goods warehouse stands on the east side of Dean Street, communicating by a bridge with the spare carriage house on the west. The cranes for hoisting and lowering are worked on the pneumatic principle, by a small steam engine placed under the tank, which supplies the station with water.

On referring to our engraving, it will be seen that the advanced portion of the façade consists of a centre, in which are three doorways, and two wings with a doorway in each; that in the right wing is the first class passengers' entrance to the booking offices; the right hand door of the centre is the second class entrance, and the centre doorway is the way for luggage; and the remaining doorways are the first and second class entrances to the Greenwich company's offices.

Receding from the principal front on the right is the campanile rising to a height of 97 feet from the level of Tooley Street to the summit of the vane, and exhibiting an illuminated clock for regulating the times of the arrival and departure of trains.

Still further removed from the line of the principal front are the offices for the arrival and departure of parcels, (forming the extreme wings of the façade,) united by a lofty archway, which serves as an entrance for gentlemen's carriages departing by the trains. The interior of the building contains on the ground-floor the general booking office 53 feet by 21 feet, with separate entrances, passages, and waiting rooms, for first and second class passengers, so arranged, that the two classes are kept distinct, until they arrive at the platform, to affect which objects, the arrangements seem well adapted. On the one-pair floor, to which we ascend by a stone staircase in the tower, there is a large room for the public meetings of the companies, and three others for the use of the joint station committee, secretary, &c., besides the apartments of the housekeeper; a secondary staircase from this part of the building leads to the clock room, in the upper floor of the tower, and above this to the lead flat, at the level of the principal cornice, from which, between the arches of the upper part, an extensive view of the metropolis and its southern suburbs is obtained.

To carry out their object, the committee availed themselves of the professional services of J. N. Rastrick, Esq., and W. Cubitt, Esq., as their joint engineers, to the judicious counsel of whom they are mainly indebted for the amount of accommodation secured in so confined and difficult a situation.

In the architectural department, Mr. Henry Roberts has been generally consulted, the designs being prepared, and the works more immediately superintended by Mr. Thomas Turner, the resident architect and engineer; and we deem it due to the taste and talent of the latter gentleman to state that we are indebted to him for the elegant Italian composition represented in our engraving.

We remember, that in the competition for the new Infant Orphan Asylum, the second premium was awarded to Mr. Turner, and we think his present effort entitles him to be considered as one of the rising architects of the day.

OBSERVATIONS ON ARCHITECTS AND ARCHITECTURE.

By Henry Fulton, M.D.

No. 3.

The Institute of British Architects is making a collection of all the editions of the works of Vitruvius. As soon as this collection shall be formed, which ought to contain as many copies of each edition as
possible, the entire, together with all the works of Palladio and Sir William Chambers that can be procured, should be piled together and burned, and the ashes collected after the manner of the ancients and deposited in a suitable urn, and let the spirits of these mighty authors rest in peace. The Institute is in the habit of giving medals and prizes for essays; it would be well to give a medal for the best essay on the propriety of such a sacrifice at the shrine of architectural taste. Although the destruction of these works would not destroy the existing memorials of them, nor yet perhaps work out much improvement in the taste of those architects who are grown old in the love of them, yet the advantage to the rising generation would be great, and a new order of things would arise.

There is a royal road to a correct taste in Grecian architecture and every other style, (except, perhaps, the Gothic,) it is the straight and consequently the shortest road to excellence; it is comprised in this aim at chasteness, unity, and simplicity; ornament as highly as you please, finish as elaborately as you can, but still recollect that all must harmonise with chasteness of composition, unity of design, and simplicity of character: such are the features to be recognized in the rude remains of Possidonia, and such is the character of the highly finished, though ruined and despoiled edifices at Athens. This road will lead us to study the best proportion; will lead us to be more anxious with regard to the quality than to the quantity of ornament. There are few things which distinguish a civilized from an uncivilized people more than the love of displaying extravagant ornaments on their persons, particularly the softer sex; our own lovely countrywomen set off their beauty and show their sense by a few but well selected ornaments; others, not so highly gifted in person, but making up for that deficiency by good sense and taste, use no ornament which can make them remarkable; and others again, deficient both in mind and person, show the first in attracting observation to the latter, by a display of too much ornament. Does, or rather did, the gilding of the monastic cagés, which surmount the National Gallery, redeem the want of chasteness, unity, and simplicity? By the way, these cages ought to be removed to the Zoological Gardens.

In pursuing our journey by the royal road, we shall not be tempted to seek for variety for the purpose of "relieving the eye." Vitruvius gives us his theory of the proportions of columns as to that of the human figure, this is sheer nonsense; but it is not nonsense to observe that in the human form there are no breaks, no angles except those necessary for some purpose in the economy of our being. How well the Greeks understood the appropriate manner of relieving the eye, may be seen from an inspection of the Elgin marbles; the figures of the pediment, intended to be raised far above the point of vision, are in high relief, those of the metopes, which were nearer, are in a lower relief, and those of the friezes of the pronaos still lower, because intended to be seen directly from beneath; had they projected, the effect would have been anything but pleasing. The architects of the interior of St. Peter's understood the effect of due proportion well—the figures with which it is ornamented are increased in size in proportion to their elevation, and hence in optics the most perfect unity of proportion is obtained. To a want of the consideration of this may be imputed the poverty of our crowning cornices, and the necessity which is improperly created for the use of those hideous balustrades on the tops of our edifices: man dislikes monkeys, they imitate humanity so abominably—and the quadrupla themselves, as they rise above each other in the scale of intelligence, shun the society of those below them: the horse abhors the ass, because it is a caricature of himself: and if columns were animated they would reject all association with balusters; but although they cannot speak, the effect produced shows us the incongruity.

An architect should be in his line what Raphael was in painting, not the pupil of Perugino, nor the disciple of Palladio, but the scholar, whose mind should be enlightened by a ray emanating from the works of Da Vinci or the ruins of a Greek temple. And here we may observe, that as Raphael did not think it necessary to copy the works of Da Vinci, in order to arrive at the excellence which he attained, neither is it requisite to copy the works of the ancients, pro-

vided the same principles guide the modern architects which enabled the ancients to produce theirs.

Greek and Latin are called dead languages, and any author writing in them must, to write well, compose in the style of those authors who are considered to be classical; the ideas of the modern writer may be new, but the style and construction are old; so it is with the Greek, Roman, and Gothic styles of architecture. We may, indeed, invent a new order or style out of these, just as French, Italian, and Spanish were formed on the root of Latin, after it was barbarised by the Goths and Vandals; but the new style so invented will require to be refined and polished, as those languages were in the hands of men of master minds. Without, therefore, asserting that the door for change and improvement should be considered as closed to us, it is folly to require architects to give a composition in any particular style, and at the same time say that they are not to be bound down by the rules which governed those who invented the examples from which we learn it. The lovers of pure architecture have some consolation when they see many of the edifices which are every day served up to them, for they may hope that even out of absurdity itself (and we have enough of it), good may eventually arise in the shape of a new style, as I have, in former papers, endeavoured to show that the Gothic did out of the debased Diecletian.

In the last number of this Journal, page 376, a ground plan of the proposed façade for the British Museum is given; I freely confess that it promises better than anything which I feared was to be given to us; and I have no doubt the drawing of the elevation will appear strikingly magnificent; but, let Sir Robert Smirke remember and let the public understand, that the building itself must have a very different effect, for the portions of the wings being seen first and nearer to the eye than that of the recessed centre and principal one, will appear colossal in proportion. In one of two ways, and with the same number of columns, this might be obviated. First, by making the centre a colonnade (without any pediment) with steps on the three sides, and adding another column to the depth of the front of the wings; or, secondly, by arranging the columns of the centre portion after the manner of the Roman Pantheon—thus:

There are two errors of the press in my last paper, page 374 column 1, lines 41 and 65, for "porks" read "crows," and for "un-dressed" read "undraped;" the season is too cold for dress being dispensed with; better to wait until "the wind shall be tempered to the sordid lamb," before we request the Palladian architects thus to exhibit on the raking cornices of the window pediments in a dos à dos tête à tête position as designed by the great Maestro.

ON THE QUALITIES OF TIMBER AND DEALS.

On the several species of Fir Timber and Deals supplied to the English Market, and their respective qualities for the purposes of Building. Read at the Royal Institute of British Architects, Nov. 20, 1843. By George Bailey, Esq., Hon. Sec.

In the practical part of the profession of an architect, and especially in those branches which occupy by far the greater portion of the time and labour of most of us, the security of our foundations is certainly the most important object to which we have to direct our attention—the second in importance is undoubtedly the choice of our timber.
The properties of the various descriptions of wood coming under the denomination of timber—their relative strength and durability—their fitness for the various purposes of building, with regard to their stiffness in different situations and under different conditions, have all been treated scientifically and practically, in a manner highly useful to the architect, and the results have long been in our hands.

The attention of the profession has even been called, both in ancient and modern works, to the planting, growth, and felling of timber, and the varieties which local circumstances and soil may produce in the same species. That information of this kind is in the highest degree useful to the architect, and indeed indispensable to be known, is not to be doubted, and the important practical results which may be derived from inquiries strictly scientific, must be familiar to all of us, who, on a former occasion, have had the pleasure of listening to the Botanical discourses of our friend Dr. Dickson. But in the ordinary routine of our profession it is seldom, comparatively speaking, that we have to refer even to the original principles from which our practice is derived, and still less to questions connected with the organization and natural history of timber trees.

The architect, in fact, has—and any connexion with the choice or conversion of his timber beyond certain limits. His choice is restricted to such qualities of timber, of such length and scantlings as he can find in the market, and on this point less information has been placed in the hands of the architect than any other connected with this subject. It has been thought, therefore, that a few words on the qualities of timber, to be found in the market as imported from the Baltic and from America, might not be unacceptable to the meeting. We will begin with European timber in the log, then proceed to American timber, and afterwards to the subject of deals.

**Baltic Timber.**

**Memel Timber.**—The largest supply of square fir timber brought from any part of the Baltic to this country at the present time is from Memel: it is divided into three qualities—the best, termed crown, the best middling, and second, or brack Memel.

Of the first quality little comes to the London market, but a considerable quantity to the outports. It is of admirable quality and manufacture, nearly as clear of knots as the Riga timber, but not quite so close in the grain, nor so rigid, nor so durable: the more free it is from knots, the more liable it is to be shaky at the core. The knotty timber is less liable to this defect at the heart, because the knots serve as bolts through the timber to keep all the parts together. Crown Memel timber is usually somewhat more than 13 inches square, and the best of it is from 28 to 55 feet long, which is longer being usually knotty at the upper extremity. The best middling is the highest quality of Memel timber commonly imported into London. Much likewise of the second middling or brack timber comes to the London market.

The chief defect of this quality of timber is that it contains large knots which renders it unfit to be cut into small scantlings.

**Dantzic Timber.**—Whenever square fir timber of great length and size, coupled with durability is required, the Dantzic timber is to be employed. On the average, Dantzic timber is the longest and largest fir timber that comes here from any port in the Baltic. It may be procured, upon order, as much as 70 feet long and 16 inches square—a commonly runs 14 or 15 inches square. The cheaper sort of brack timber has the defect of being full of large knots; the best middling is knotty in a moderate degree, but the crown Polish-squared Dantzic timber, that which has been squared in the province where it was felled, may be considered, upon the whole, the very best timber that the north of Europe supplies, next to that of Riga, it is the most durable of fir timber.

The timber from Pillau, Konigsberg, and Stettin resembles that of Dantzic, but is rather coarser in the grain and more knotty: that of Stettin, though not very long, is sometimes of very large size, as much as 29 inches square.

**Riga Timber.**—Riga used formerly to be the port from whence almost all the fir timber in the log, from 12 to 13 inches square required in this country for building purposes was imported. As timber in the log, it is peculiarly applicable for beams, girders, and joists, being very rigid, and bending little under great weights; it is, moreover, very regularly squared, very straight, clear of knots, straight in the grain, and very durable. Owing to its rigidity and freedom from knot, it is, however, more liable than some other timber to the defect of being rent and shaken at the heart, for which reason the fir timber from other ports on the eastern coast of the Baltic is by many preferred for building purposes and less of this species of timber is consequently now imported into this country.

Formerly a considerable quantity of timber in the log was imported from Narva, St Petersburg, and Archangel, but scarcely any now comes from these ports—the St Petersburg timber is defective as being very subject to rent itself and become shaky as it dries.

**Norway Timber.**—But little timber and that of small scantling is now supplied from Norway, although at one time, large quantities were imported from Longsound, Porsgord, and Brewick, but owing to the change in the mode of taking the duty some years since, by which the small timber of Norway was made liable to the same duty as the large timber from the Baltic (an exception being made only in favour of timber used in the Cornish mines), the importation of timber from that country almost ceased:—it is now, however, again making its appearance in the London market. Some of the superior Longsound timber is of an excellent quality, and is, perhaps, the most durable of fir timber.

The timber from Gottenburgh, Stockholm and Geffle is not usually well squared, seldom exceeds 30 feet in length, indeed is generally much shorter, and has, moreover, the bad property of rending and becoming shaky if kept in the state of the log, so that unless immediately converted, it loses much of its value; very little, however, of this timber is now imported into England.

**American Timber.**

The only description of American timber known in this market in the state of the log, are the red pine and the yellow pine—for although pitch pine has been brought here, via Halifax, from the southern ports of the United States, yet that species of fir timber is scarcely known in this country as an article of consumption; it is said to be extremely brittle.

**Red Pine.**—The red pine approaches very nearly in quality to Riga timber: it is almost as stiff and is free from knots, but the irregular manufacture and tapering of the logs occasion much loss in the conversion of the timber for use in buildings; the manufacture of this timber is, however, improving, and it is consequently rising in public estimation. It is the produce of Upper Canada and the adjacent portions of the United States; it is brought down in rafts from the great lakes (on the borders of which it grows), by means of the River St. Lawrence to Quebec, where it is shipped for England. Great caution is necessary in the use of this timber; if the voyage from Quebec was as short as that from Riga it would not, perhaps, be more liable than Riga timber to take the dry rot, but owing to the length of time that it remains in the ship, or owing to the yellow pine wood, which, as deals or timber is generally in the same hold with it, a cargo of red pine seldom arrives which does not exhibit, on some part or other of the surface of the logs, indications of the presence of dry rot, and therefore, although the timber, if not so treated, might not be liable to this defect, yet treated as it has been before it arrives here, it is often inoculated, and if then placed under circumstances only slightly favourable to the growth of the fungus, it will be the means of introducing the dry rot into a building, unless a closer examination be made of the surface of each log to be used than is usually done, or some means adopted to counteract the infection.

**Yellow Pine Timber.**—The yellow pine timber in the log comes from Quebec, from St. John's, from Miramichi, and from some other ports in New Brunswick. That from Quebec is not so fit for the better purposes to which yellow pine is applied as that of St John's, nor is that of St John's so fit for those purposes as that from Miramichi. That of Miramichi is the lightest and most spongy, and the least fibrous of all. It is exceedingly mellow, to use the joiner's term, has
no tendency to warp, and preserves the form that the workman gives it. Yellow pine timber ought not to be used for rafters, joists, girders, or plates, in any building; for no purpose, in short, and in no situation, where strength and stiffness are required, and where the ends or any part of the timber come in contact with brick-work or masonry, or are liable or subjected to damp. Yellow pine timber is not rigid; it is deficient in strength; will break with a less weight than almost any other kind of timber; and, except in perfectly dry situations, or where it is thoroughly well ventilated, is extremely liable to take the dry rot.

Deals, Planks, and Battens.

The first thing to be considered, as regards deals, is the quality of the wood. Many deals are of durable quality, and fit, on that account, for rough out-of-door purposes, and coarse floors or carpentry, but they are wholly inapplicable for fine joiner's work; for when the saw has passed through and reduced them to small dimensions, they warp and twist like a piece of whalebone. Deals of this character are termed by carpenters *strong.* Such deals have likewise the bad property in general, of rendering themselves to pieces as they dry, and become shakey. Deals that, when acted upon by the saw, do not form saw-dust, but are torn into long strings or fibres, and, on that account, termed *stringy,* are in general of this strong nature. Such deals are likewise less uniform in their texture, and vary more in the alternate fibres and cellular parts than the deals which are fit for the joiner. The deal to be good should have a certain degree of softness, easily yielding to the knife or chisel. Such deals are to be distinguished by their light weight, in comparison with the strong fibrous deals, and when planed, they exhibit a silky texture. Some deals, and particularly the stringy deals, are very hygroscopic, and never lose the property (however long they have been seasoned), of expanding and contracting with change of weather. White Petersburg deals are said to have that property. The deal to be good should be straight in the grain; if cross-grained, it generally becomes shakey diagonally upon drying, and falls to pieces under the saw; or, if cross-grained in a lesser degree, it does not yield a smooth surface to the plane, but remains rough and fuzzy. The deal should, of course, be without coarse knots, and the more nearly it is perfectly clean the better. As to the manufacture of the deal, it should be square-cut; above all things, it ought not to have the centre or pitch of the tree left within it, since, where that is the case, the deal tends on drying. In yellow deals the sap, or albumen of the tree, ought to show itself only at the very edge of the tree. Deals are usually cut of three different widths, each of which has its appropriate name:—those from 11 or 12 inches wide are called *planks,*—those from 8½ to 10 inches are called *deals,*—and those from 6½ to 7 inches are called *battens.*

Yellow Deals.

Norway Deals.—The yellow deals of Christiania, in Norway, have always been considered to be of the very best description:—they are so in two senses—they are both durable and mellow; yellow meaning, soft, light, and fit for the joiner. Though soft, they are not wanting in a proper degree of stiffness. When properly seasoned, previously to being used, they remain (however minutely divided) precisely of the form that the joiner gives. This quality applies to the white, as well as to the yellow deals of Christiania—and to those above the deals of any other part of the world—and, therefore, the deals of Christiania will always be the material that the consumer will endeavour to obtain, if the price will allow him to do so.

Of late years the mode of taking the duty caused the deals to be cut in longer lengths than the timber would afford, so that inferior wood has been brought into the London market, and the high estimation and price diminished to a certain extent; it is said, however, that they are now rapidly regaining their former character.

The Yellow deals from Fredericksstadt, in Norway, are very nearly the same in quality with those of Christiania, and generally obtain nearly the same price in the market. The white deals would be as good as those of Christiania, but for one defect, which is that the bark of the tree adheres to the knots, which, therefore, have a black ring round them; when the deal comes to be cut into board, a knot of this kind is apt to fall out. It may be observed that neither the deals of Christiania nor Fredericksstadt are of as good quality as they used to be, particularly as respects the yellow deals.

There are several kinds of yellow deals not quite so good as those of Christiania in the quality of the wood, and yet coming near to them, which formerly used to be imported from Norway in very large quantities, and still are imported from some of the places of shipment referred to, but to a moderate extent only. The principal of these ports are Longsound, Porsgrund, Larvig, Krageroe and Dram.

The cloister deals from Longsound 2 inches thick, and the broad and clean deals from Krageroe 1½ inch thick and 14 feet long, were noted for their excellence. From Dram, an immense quantity, both white and yellow, were imported, usually 10 feet long and 2 inches thick. The "lowland" deals from this port are of inferior quality, but the "upland" of superior quality.

Of the deals of most of the above-mentioned ports it may be said that they are good as regards the texture of the wood, but small in size, as they are seldom more than from 8½ to 9 inches wide. Some few deals (principally white deals) used to come from Tenberg, occasionally there was a considerable supply from Fredericksstadt and Moss; the yellow deals of those ports are of bad quality, and the white deals not much better. Of the white lowland deals of Norway, in general it may be said that they resemble in quality the white spruce deals of America; they have the same tendency to warp and to rend on drying.

Deals of Sweden.—The yellow deals of Sweden nearest in quality to the best yellow deals of Norway, as regards their being at the same time durable and mellow, are those which come from Stockholm and from Gellle in the gulf of Botnia. If Stockholm or Gellle deals were quite as mellow as Christiania deals, they would be preferred to those of Christiania, on account of their full size and freedom from sap, but they are somewhat more disposed to warp, and with regard to Gellle deals to have coarse knots. There are some other ports in the gulf of Bothnia, viz., Hemso and Sundeswall, from which cargoes of yellow deals are shipped, occasionally little inferior in quality to those from Stockholm and Gellle. But it may be said of most of the deals from those ports, that in them there is in general an exaggeration of the faults perceptible in the deals of Stockholm and Gellle. A large portion of the deals from Hemso and Sundeswall are from 18 to 21 feet long and 10 inches wide. The deals of Sundeswall and Schonwick are of a still harder and coarser nature than those last described. The yellow deals of Gottenberg although very free from sap, and durable, yet have the fault of being rigid and unfit for the joiner; they are, however, well adapted for rough purposes, both in and out of doors, on account of their durability.

Deals of Northern Russia.—The yellow deals of Archangel and Onega are very similar to each other in quality, and of all deals, they approach in one respect the nearest to the yellow deals of Christiania; they are exceedingly mellow, and fit for the joiner—on the other hand they are not very durable or capable of resisting damp, for which reason they ought not to be used in the ground-floor of a house; the knots are apt to be surrounded by dead bark: they are imported of the average length of 20 feet. Archangel deals formerly were imported only of the width of 11 inches, or 7 inches; that is, in the state of plank or of hatten, but more recently they have been imported of the width of 9 inches, and from the certainty of obtaining entire cargoes of the very first quality, without any admixture of inferior goods, (an object which could seldom be accomplished with regard either to Norwegian or Swedish deals,) these Archangel deals were made to supersede the use of almost every other superior description of European yellow deals. St. Petersburg and Narva yellow deals come of the breadth of 11, 9, and 7 inches: in quality the wood is inferior to that of Onega or of Archangel; Petersburg deal is less durable and not nearly so mellow as either the Archangel or Onega deal; it is said to be nearly as liable to take the dry rot in a damp
and confined situation as the yellow pine deal of America. A few yellow deals are likewise imported from Riga.

The yellow deals from Memel and from Dantzic may next be noticed;—the former 11 inches, the latter 12 inches wide; both of these are very durable. Memel planks are well adapted for all rough purposes out of doors, for barn floors, and for the steps of stairs when clean; Dantzic planks are used by brewers and distillers for making the large vessels for holding the liquor, called backs. The very best of the Dantzic planks are likewise extremely fit for joiners work, as they are soft and mellow, and retain the shape, but this only applies to a small portion of them, and those which are soft, are not so durable. Dantzic likewise affords the long yellow plank 40 feet long, 3 inches thick, and 12 inches wide used for the decks of ships. Memel planks until of late years, were not imported in any large quantity.

There are likewise yellow deals from Finland; Nyland deals 14 feet long, resembling some of the coarser varieties of Sundsvall deals, are of late introduction. The broad yellow planks 12 inches wide and 21 feet long from Borneburg in the gulph of Bothnia, are of a quality very nearly approaching to the plank of Archangel, but far more knotty.

White Deals.

We now come to the White Deals manufactured from Spruce Fir, the yellow deals of Europe being manufactured from the Scotch Fir. All that has been said of the qualities of yellow deals applies likewise to white deals, except that the sap in white deals is not discernible from the heart, and therefore the manufacturer of white deals has so far one difficulty the less to contend with.

Norway is the only country from which white deals of the very first quality are imported in any quantity; for although the white deals from Stockholm and Gille in Sweden, like the yellow from those parts, are very good, yet the quantity is too small to render them worth particular notice. The white deals, like the yellow, shipped at Christiania are the very best in the world; well fitted for joiner's work, being above all other deals of the kind, light and mellow. The white deals of Frederickstadt also are very good, yet rather subject to a small black knot surrounded by dead bark. All the other ports in Norway which have been mentioned as yielding yellow deals, supply white deals of good quality likewise; but from the smaller ports generally, the deals are somewhat narrow, (from 5½ to 8½ inches wide,) whereas the deals of Christiania and Frederickstadt are full 9 in. wide; the narrow deals fetch a proportionately less price in the market. The white deals from Wekkere are sold by the name of Christiania deals, the least mellow and the hardest of which they resemble; they are of greater average length than the deals of Christiania, being perhaps of a mean length of 19 feet.

The Lowland white deals of Norway form the exception to the general good quality of the white deals of that country, the lowland white deals having most of the bad properties of the white spruce of America, that is a tendency to warp and to split upon drying. From Dram two qualities of white deals used to come, the upland and the lowland, the former as good in quality as the latter is bad, although it may be observed that both have of late years improved considerably. The white deals of Mosh, though showy to appearance, are of this bad quality. Those from Longsound, Schien, and Larwig, are good. A considerable quantity of white deals have of late years been shipped from Gottenburgh—with few exceptions, they are of a hardstringy nature; the saw on passing through them tears their substance into strings instead of saw-dust: the white deals of the width of 11 and 12 inches from this port are, on account of their cheapness, one of the materials used by the makers of packing cases.

Russia.—Northern Russia exports hardly any white deals, although the few that come occasionally from Archangel, mixed with accident with yellow deals, are of excellent quality—the white deals from that country that come nearest to those of Norway in quality are those of Narva—they are brought of the width of 11 and 9 inches—when properly seasoned they can be used for all purposes to which Norway white deals are applied—next in quality to those of Narva are the white deals from Riga, which are brought both 9 and 11 inches wide. White deals are imported from St. Petersburgh, both 9 inches and 11 inches wide, in considerable quantities—they are not uniform in texture, but contain hard veins, and they have the defect, (however long they may have been kept,) of expanding and contracting with change of weather, so that if used in the panel of a door, the wood alternately enters and recedes from the groove into which it fits, as the paint will show, when that kind of deal has been used for a panel.

Battens are deals 7 inches wide, and are principally used for floors. The best yellow battens are imported from Christiania; a large number of both white and yellow battens were formerly imported from Longsound in Norway, but battens of this description are now imported from Dram; they are from about 6½ to 6¾ wide. The white especially are of an excellent quality, and so are such of the yellow as are not sappy; the sappy ones preponderate in number, and on account of their cheapness are frequently used as a substitute for timber, in building the smaller description of houses. The next in quality to the battens of Christiania and Frederickstadt, are those which are imported from Archangel and Onega, though few have of late come from the latter port. Yellow Archangel battens cost usually somewhat more per Petersburg standard than the 11 inch planks. Both Archangel and Onega battens have the defect of having black bark round the knots, the wood of which is dead, whereas the knots of Christiania wood are bright, and firmly united to the substance of the tree. Yellow battens are imported also from Petersburg considerably inferior in the quality of the wood to those of Archangel and Onega.

American Deals are of three descriptions, viz., the yellow pine, the red pine, and the white spruce. A fourth, the hemlock-spruce deal is sometimes brought, but it is too bad in quality, and the quantity too small to deserve further notice.

Yellow Pine Deals.—The best of the yellow pine deals are shipped from the Port Lawrence; some are floated down the river from the mills to the port of shipment, and when taken on board are saturated with water, and covered with river silt, others are put on board, and come bright from the saw to this country. Of the bright deals, the very best quality are those from the Riviere de Loup. In a very good parcel of yellow pine deals about two-fifths will be perfectly clear of knots.

Yellow pine is of a very light and spongy texture, and the more completely it is of that texture and the opposite to what is hard, fibrous, and stringy, the better it is for all the purposes to which it is properly applicable, such as the panels and moldings of doors and shutters, and other internal fittings of houses, the framing of cabinet-work; all those purposes in short for which lightness and no great strength is required. It preserves the form which the joiner gives it without warping, and this property, coupled with the facility of obtaining it free from knots, fits it admirably for the carver, the musical instrument maker, the maker of Venetian blinds, for patterns for iron castings and similar purposes; the inferior yellow pine deals being coarser in the texture of the wood and more knotty, are mostly used for ordinary packing cases. If the yellow pine is exposed to damp in any confined situation it rapidly decays, but in the open air, for palings raised from off the ground, weather-boarding to sheds, and wherever it is completely well ventilated, it lasts a long time, although exposed to alternations of wet and dry. Its spongy texture prevents it being rent so much as deals of a more rigid substance are liable to be, by exposure to the weather. It is now much used for the decks of ships, as it resists the effects of the sun better than the European deals.

Red Pine Deals come in very small quantities, so small indeed, that they are seldom separated from the yellow pine deals with which they come mixed; the best description are such as are brought from the Riviere de Loup. The red pine deals will answer for most of the purposes to which the yellow or Scotch fir deal of Europe is applied. When used for floors in houses, these deals have the defect of turning
of a very dark colour, but this probably is owing to the resinous texture of the wood, which causes dust to adhere to its surface, and might be prevented by washing the floor with alkaline lye, or any other solvent of resin.

White Spruce Deals.—Of the American white spruce deals, none, not even the very best, are to be compared for quality to the white deals of the north of Europe. They have two faults—they are very liable to warp, and the knots in them (owing to the bark adhering to the branch while the wood grows over it), are liable to fall out and leave a hole in the board. However long they may be kept they will never lose their property of warping, and are consequently unfit for joiner's work. They are used only for the floors of the most ordinary houses. They are extremely liable, if placed in damp situations, to decay. An instance of this is mentioned by Mr. Warburton, in his evidence upon the Select Committee on the Timber Duties, 1835, as having occurred in the floor of his counting house at Lambeth, which he had caused to be made of spruce deals as the cheapest material. An unusually high tide in the Thames overflowed it. It was covered at the time with oil-cloth, and the oil-cloth being replaced upon the floor before it was thoroughly dry; in less than a week the dry rot had spread over the whole floor, and had penetrated in some parts below the surface of the deals. Of this species, as well as of every other description of American deal, and most especially of yellow pine deals, it may be observed, that they ought only to be used in situations that are perfectly dry, or if not dry, that are completely exposed to the air. Spruce deals (particularly the spruce planks 11 and 12 inches wide) that come from St. John's and St. Andrew's in New Brunswick, are chiefly used for making packing cases.

It is stated that every deal of yellow pine that has been shipped in America in a wet state, when it arrives here, is covered over by a net-work of little white fibres, which is the dry rot in its incipient state. There is no cargo (even if it has been shipped in tolerably dry condition,) in which, upon its arrival here, some deals will not be found with fungus beginning to vegetate on their surface. If they are deals that have been floated down the rivers in America, and shipped in a wet state only, they arrive quite covered with this net-work of fungus, so that force is necessary to separate one deal from another, so strongly does the fungus occasion them to adhere; they will grow together again, as it were, after quitting the ship while lying in the barges before being landed. Accordingly if a cargo has arrived in a wet condition, or late in the year, or if the rain falls on the deals before they are landed, and they are piled flat, one on the other, after the usual manner of piling deals, in six months time or even less, the whole pile of deals will become deeply affected by the dry rot, so that wherever the flat surface of one deal lies upon the flat surface of another deal the rot penetrates to the depth perhaps of one-eighth of an inch. Its progress is arrested frequently by re-piling the deals during the dry weather of the month of March, and by sweeping the surface of each deal before it is re-piled with a hard broom; but, perhaps the best way is to pile the deals in the first instance upon their edges, by which means the air circulates round them, the growth of the fungus is checked, and the necessity of re-piling them prevented.

As respects the dry rot, it may be noticed, that there are but very few cargoes of timber in the log that come from America, in which, in one part or other of every log, a beginning of the vegetation of the dry rot is not, parent. Sometimes it will show itself only by a few reddish discoloured spots on the surface of the log, which, if scratched with the nail, it will be seen that to the extent of each spot the texture of the timber to some little depth is destroyed—it will be reduced to powder: a white fibre will generally be seen growing on these spots. If the timber has been shipped in dry condition, and the voyage has been a short one, there may be some logs without a spot; but if the cargo has been shipped in a wet condition and the voyage has been a long one, then a white fibre will be seen growing over every part of the surface of every log. It should further be noticed in connexion with this subject, that there are two descriptions of European timber likewise very liable to take the dry rot, yellow Pe-

tersburg deals and yellow and white batters from Dram in Norway. Batters that have been received from Dram and allowed to be a long time in bond in this country, without being re-piled in time, (as they ought to have been,) have been as much affected by the dry rot as many American deals, though this has not happened in as short a time as has been known to be sufficient to rot American deals. That the fungus growing on the surface of American timber is the dry rot appears to be quite certain: it has all its character, as to appearance and as to effect, for whenever it spreads over the surface, the deal, if neglected, is reduced to the state of powder.

These are a few leading facts connected with the important subject of the selection of such timber as is placed within our reach, and to which for the most part our choice is limited. For a mass of information on everything connected with the subject we may refer to the documents from which these few particulars have been chiefly gathered, the Evidence given before the Parliamentary Committees on the Timber Duties.

RAILWAYS IN INDIA.

In a preceding article we have spoken of the political and mercantile advantages derivable from the further extension of steam navigation in British India; we will now follow up the subject with a few further remarks on the still more important subject of railways. India is confessedly an agricultural country; its internal sources of agricultural wealth, and its capabilities of production are literally boundless, sufficient to supply more than thrice its present population of 150 millions of inhabitants, with all the necessaries and luxuries of life; and, so far as regards its exports, to satisfy the wants of Great Britain, rendering her independent of foreigners for her supply of cotton, tobacco, sugar, and tea. Lords of the soil, the East India Company depend chiefly upon agriculture for their immense annual revenue, and consequently for the maintenance of their power: it is to this certain source the merchant looks for his wealth, the many millions for their support, and the manufacturers of this country for the means whereby they are enabled to maintain tens of thousands at home, and to supply every quarter of the globe with the fruits of their industry: nay, the very existence of the Honourable Company depends at the present moment, much more upon an immediate development of its internal resources, than upon continuing their career of conquest and acquisition of territory now so happily begun. It is not sufficient that they encourage private or public speculation, that they incur a large annual outlay in promoting agricultural objects, and use their endeavours to introduce better modes of culture and manufacture of the chief staple commodities: other, and more extensive measures must be immediately entered upon, in order to meet the wants and expectations of the age in which we live; the country must be thrown open to class colonization, to men of spirit and possessing some small capital, and its agriculture must be promoted by the means of railways in those central provinces which are deficient of navigable rivers.

Upon looking over the map of India it will be observed that many of the finest and most productive provinces are isolated, possessing neither good roads nor navigable streams; the rich products of Malwa, the southern parts of Allahabad, Cawnpore, and Hydabad, have to be conveyed to the respective markets on the backs of oxen; thus the cotins of these insulated provinces, after being collected and rudely cleansed, are transported to the banks of the Ganges in this manner, over, in some places, almost impassable roads, the journey being performed in not less than 20 or 30 days, during which time, the loosely packed bales are exposed to a burning tropical sun as well as to the dews of the night, and other mischances attending long and dangerous journeys: who then, after considering the rude manner in which this commodity is cultivated and cleansed, can wonder at its being inferior to the produce of the West? the only surprise is, that after this rude journey, and its equally rude modes of conveyance down the Ganges to Calcutta, it should be worth any thing at all.

The valley of the Ganges extending over a surface of 400,000
square miles, is so intersected with natural canals, as to render the adoption of railroads below Calcutta impossible, and many of the fertile valleys of India, from being annually inundated, will be found insuperable difficulties to their adoption in these particular parts: but the vast plains of upper India, of the Deccan, and the Peninsular, present an inexhaustible field for the skill of the engineer, the architect, and the surveyor, in forming railroads. From Calcutta to Benares, now a distance of 441 miles, a considerable time might be saved by a railroad passing through the coal district of Bardwan, Magore, and the rich province of Bahar; or a still nolder road might be formed from thence through Berhampore, Bhagulpore, Dinapore, Ghazipoor, Benares, Allahabad, Etawa, Kajghat Agra, Muttra, Delhia, to Kurnaul, a distance of 1208 miles. Again, let railroads radiate from the tributary state of Nagpoor to Benares through Jubbulpore, Rewar and Mor Gunge, meeting the railway half way from Calcutta to Benares. From Nagpoor to Hyderabad, a distance of 315 miles over a very fair road, from Benares to Lucknow, Barielly, Mouradabad and Hardwar; a branch from Agra might be formed passing through twelve considerable places of trade to Gwalior, the capital of the Maratta chief, a place of great note as a commercial and military depot. From Nagpoor to Saugor via Taro Ghat to Chandhar via Hingun Ghat. Nagpoor from its central position, its vast fertile plains adapted for the most extensive cultivation of cotton, &c., its proximity to other fertile provinces, and its position as a British military station, is invaluable as a central point of railway communication. From thence to Benares on the one side, and Hyderabad on the other, there are few natural impediments, none but what might be readily overcome by the skill of English engineers. Again, from Calcutta to Hyderabad via Masulipatam, the distance is only 225 miles by the present route, and there is little doubt, but that a railroad could be formed on this route, approaching to within a very easy distance from Calcutta: from Hyderabad to the Pooor Ghat, the road is gently undulating, passing occasionally over narrow valleys rank in vegetation, which would require to be crossed by viaducts; the chief river is the Kemna, a deep rapid stream, but having a firm soil beneath the deep vegetable earth covering its banks, capable of supporting the viaduct or bridge. From the Madras to the Hyderabad via Cuddapah, Nundiala, Pantgor and Fumgourn is a distance of 405 miles by the present route, the natural difficulties are far greater than other routes previously noticed, there being four great rivers to cross from the second barrier pass to Hyderabad. There is another route to Hyderabad via Nellore and Ongole.

Other routes from the central provinces to the presidencies, and from Calcutta to the Upper Provinces, might be pointed out as applicable to railway communication, but these have already enumerated are sufficient to show the importance of railway communication in a country so densely populated, and so extensive. It may be said that the Indian government has no power to cause railroads to be constructed in the tributary states of Hyderabad and Nagpoor; but, in answer to this we must observe, that where they must derive such benefits, no reasonable objections can be made on their parts: that common roads have already been formed under the direction and control of the Bengal, Madras, and Bombay governments; and that the expences of constructing them are so insignificant as not to be worthy notice, in fact, are not to be compared to the cost of railroads in America. The land through which they pass costs nothing, labour may be had for 3s. or 4s. per month for each labourer; the Deccan, and in fact all India abounds with several kinds of acacia and other woods almost equally iron in hardness and exceeding it in durability. The destructive attacks of the white ant on these wooden rails may be readily guarded against by the use of creosote, or mineral solutions, which will not only effectually remedy this evil, but preserve them from the effects of dry rot.

It is true that the skill of the engineer practically acquainted with the formation of railroads in this country, is wanting for these projected improvements; but many able engineers may be obtained in this country, several also in the honourable company's service have greatly distinguished themselves in forming common roads, building bridges and other works of improvement, and schools for this department of engineering might be very advantageously established in the three presidencies, being placed under the control of practical engineers sent out from this country.

The only railway ever attempted in India, was that from Saugor to Calcutta, a distance of 50 miles through a swampy country periodically overflowed by the waters: it was an unfortunate project set on foot by a few individuals, inexperienced in knowledge of that portion of the country, and its failure, which was foreseen by every person of common sense, had the ill effect of discouraging future plans of the like nature based on better principles. We can hardly expect that iron rails can be adopted until such time as foundries are established in that country for manufacturing the native material, nor is iron at all necessary so long as India contains wood equally durable. For the protection and constant repair of these railways, it would be politic to have walled villages built every seven or ten miles; the tenure of occupation of land to a certain extent being held by the inhabitants to watching and keeping them in repair. Where the land is very soft and yielding, the rails should run upon piles driven deep within the earth and resting upon the firm strata beneath.

We trust that the East India directors will take this matter into their most serious consideration; the example, set by them would soon be followed by the union of private individuals, both native and European, as well as by the capitalists of this country, who at present find much difficulty in employing their capital to advantage. A slight glance at the amount of import and exports of India, at its internal trade, and boundless resources, must convince every one that railroads so cheaply constructed, and kept in order, must eventually prove exceedingly profitable.

THE NELSON MONUMENT.

(With an Engraving, a Double Plate, XVL.)

Architect, William Railton, Esq.

We feel much pleasure in being able to present our readers with some particulars as to the construction of this column, particularly with regard to the scaffolding, which is at once ingenious, effective, and of great strength, and at the same time of great simplicity; if our readers will turn to the first volume of the Journal, page 267, they will there see the drawing of the scaffolding adopted by Sir Christopher Wren, in the erection of the Monument of London: they will observe the immense quantity of poles used, and the mode in which they are put together with some hundreds of cords, so that this fragile scaffold is greatly dependent upon the tenacity of the cords; if one were to break while raising a heavy weight the whole would be in jeopardy of falling down.

In the scaffold before us there is no hazard of this kind, all the upright posts and horizontal beams are constructed of whole timbers, varying from 11 to 15 inches square: the posts are morticed at the top into the beams, and the latter are halved on each other at the angles; the struts S, springing from the ground up to the level of the first stage are also of whole timbers, about 11 to 12 inches square; the braces or struts of each upper story are of half timbers bolted together in the centre, and abut at the top with a mortice and double shoulder onto the posts.

The total height of the scaffolding above the level of Trafalgar Square is 150 feet by 96 feet square on the ground line, and contains 150 loads of timber. As each story of scaffolding is erected, the machine called the "traveler" a moveable crane or crab engine, is placed on the horizontal beams, and travels in the direction from A to B, on rails with a clogged rack, on the side laid on the top of the beams; and it also has a transverse motion on cross beams resting on a carriage, which travels upon the rails A to B; these cross beams also have rails with a copped rail on the side, to allow the traveller to run in the direction from C to D: it is moved either way by gearing,
consisting of a cog wheel, working into the caged rail, attached to the machine by the aid of one man standing upon each stage. This travelling crane or crab, which has received some important improvements from Messrs. Grissell and Peto, is the most important machine a builder can have for erecting buildings where there is masonry; by it the stones are lifted off the truck, raised, and lowered immediately on to their beds, and adjusted with the aid of a mason and his labourer only, besides the two labourers with the machine, by which means great economy in labour is obtained. As soon as the erection is brought up to the level of the first stage, the next story of scaffolding is erected, and then the “traveller” is removed up to the top, and so on until the whole construction is finished.

This description of scaffolding was first introduced into use by Grissell and Peto in the erection of the Reform Club House in Pall Mall some three years since, and was found to possess so many advantages over the ordinary scaffolding made with poles, that it is not only used by them at the New Houses of Parliament and in all their other heavy contracts where masonry is chiefly concerned, but is coming into general use by other large builders, as at the Royal Exchange, Sun Fire Office, and the new Club House in St. James’s Street. Its stability has recently been tested beyond all doubt at the Nelson Column, both as to its resistance to wind at a great altitude, and in its strength and steadiness while hoisting heavy weights. One of the parts of the statue of Nelson weighed 12 tons, and the load, although eight hours upon the scaffolding, did not occasion the least truffling vibration to be observable.

One of the advantages of this mode of scaffolding is, that the timber is all convertible for the building at which it may be used, as the scaffolding may be dispensed with as soon as the carcase is covered in, and it is generally used up in the internal carpentry of the building; the enormous waste in scaffold cords is also avoided as well as the considerable expense of a number of masons’ labourers, who are always necessarily in attendance upon a scaffolding of the ordinary kind during its use.

Before we close this description of the scaffold, we must not forget Mr. Allen, the indefatigable foreman of the masons of Messrs. Grissell and Peto, under whose able directions the scaffolding of the Nelson Memorial was erected.

The foundation of the column consists of a bed of concrete resting upon a bed of gravel, upon the concrete is carried up brickwork of hand bricks set in cement; the column is solid and constructed of granite from Dartmoor, each course consists of seven blocks, one in the centre forming an oblong square, the others have the joints radiating from the angles and middle of the centre block, and each block is dowelled together verticallly with slate dowels. The bell of the capital is also of granite, to which are fastened the enrichments and volutes, which are of bronze, executed by Mr. Clark of Birmingham. The cippus or pedestal upon which the figure stands is likewise of granite. The figure is sculptured by Mr. Baily, the eminent sculptor; it is of Creagleteh stone from the Liver rock quarry at Granton in Scotland, belonging to the Duke of Buccleuch; it is of a dark brownish tint and very hard: it is in three parts, the lower block forming the plinth, the bottom part of the figure and the capstan at the back, which is represented with a rope coiled round it, is said to weigh 12 tons, and originally when the block was removed from the quarry it weighed 30 tons, and formed part of a block 45 tons weight in the quarry, (see Journal, Vol. V., 1842, p. 230 and p. 244). The figure is fixed to the pedestal by a dowel of York stone 1 foot 9 inches long and 10 inches square, half let into the top of the pedestal and the other half into the plinth of the figure. The other parts of the figure are connected with similar dowels. The figure, we understand, has been coated with oil and wax, which gives it its present dark appearance, but it will ultimately get lighter.

The following particulars show the time occupied in raising the lower block of the figure, it was adjusted on the ground on the 3rd of November, at 5h. 20m. a.m. — it reached the first stage at 6h. 45m., second stage 5h. 8m., third stage 9h. 25m., fourth stage 10h. 23m., top 11h. 20m., total time six hours; it was removed horizontally from the end of the scaffolding to the centre in two minutes, and completely set in its place at 11h. 45m.

The landings and the steps surrounding the base are laid upon brick arches, and the plinths at the angles are to be surmounted with lions couchant, and the panels of the pedestal to be filled in with bronze bas-reliefs representing the heroic deeds of Nelson. In our 2nd volume, p. 279, will be found an engraving of the original design.

In conclusion, we cannot speak too highly of the manner in which the works are executed. They do the greatest credit to the establishment and enterprise of Messrs. Grissell and Peto.

Annexed we have given a table showing the measurements of the details.

<table>
<thead>
<tr>
<th>Details of Column.</th>
<th>height.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure of Nelson</td>
<td>17 6</td>
</tr>
<tr>
<td>Plinth of ditto</td>
<td>1 3</td>
</tr>
<tr>
<td>Cippus, or Pedestal upon which the figure stands, 7 ft. 6 in. diameter,</td>
<td>4 1</td>
</tr>
<tr>
<td>Base of ditto, 8 ft. 8 in. diameter</td>
<td>3 5</td>
</tr>
<tr>
<td>COLUMN:</td>
<td></td>
</tr>
<tr>
<td>Abacus of capital</td>
<td>2 6</td>
</tr>
<tr>
<td>Bell of capital in 4 courses, 16 ft. across the volutes</td>
<td>10 0</td>
</tr>
<tr>
<td>Top course of column with annulus, 9 ft. diameter top of shaft</td>
<td>3 2</td>
</tr>
<tr>
<td>10 courses below 2 ft. 7 in. each</td>
<td>25 10</td>
</tr>
<tr>
<td>9 ditto</td>
<td>2 ft. 11 in.</td>
</tr>
<tr>
<td>8 ditto</td>
<td>3 ft. 4 in.</td>
</tr>
<tr>
<td>Lower course (10 ft. 6 in. diam.) including the upper torus of base</td>
<td>3 6</td>
</tr>
<tr>
<td>Scotia and lower torus of base</td>
<td>2 7</td>
</tr>
<tr>
<td>Plinth of base, 14 ft. square</td>
<td>1 10</td>
</tr>
<tr>
<td>Height of shaft, base, and capital</td>
<td>102 4</td>
</tr>
<tr>
<td>PEDESTAL:</td>
<td></td>
</tr>
<tr>
<td>Scotia above</td>
<td>3 6</td>
</tr>
<tr>
<td>Moulded cornice and dentil</td>
<td>2 3</td>
</tr>
<tr>
<td>Bed moulding and upper course</td>
<td>2 3</td>
</tr>
<tr>
<td>6 courses, 16 ft. square, 2 ft. 4 in. each</td>
<td>14 3</td>
</tr>
<tr>
<td>Lower course and part of moulding</td>
<td>2 7</td>
</tr>
<tr>
<td>Moulded base</td>
<td>2 2</td>
</tr>
<tr>
<td>Plinth under ditto, 22 ft. square</td>
<td>2 8</td>
</tr>
<tr>
<td>Height of Pedestal</td>
<td>29 8</td>
</tr>
<tr>
<td>Top step below pedestal, 27 ft. 6 ft. square</td>
<td>3 0</td>
</tr>
<tr>
<td>Lower ditto</td>
<td>33 ft.</td>
</tr>
<tr>
<td>Height of two steps</td>
<td>6 0</td>
</tr>
<tr>
<td>Solid brickwork in cement to foundation of column, 52 ft. square at base, 1 ft. 6 in. high, then gradually diminishing all round, 12 ft. 6 in. high to 33 ft. square, then 1 ft. 6 in. high; total height of brickwork</td>
<td>15 6</td>
</tr>
<tr>
<td>Concrete 80 ft. 6 in. square</td>
<td>8 0</td>
</tr>
<tr>
<td>Total height, including foundation</td>
<td>187 6</td>
</tr>
</tbody>
</table>

The foundation rests upon a firm bed of gravel 12 feet below the foot paving of Charing Cross, or 18 feet 6 inches below the level of Trafalgar Square.

Surrounding the base of the column there is to be a laminting 10 feet 6 inches wide, and 10 steps 80 feet square at the bottom, in all 7 feet high above the level of the paving in Trafalgar Square, making the total height of the column above this level 152 feet 6 inches, and including the figure 171 feet.

THE NELSON MEMORIAL & SCAFFOLDING.

Half Plan of Column & Scaffold.

Concrete
View from C to D.

Scale of Feet.

View from A to B East & West sides.
I. Why anonymous criticism should be a whit more odious or more indefensible upon architectural topics than any other, it is difficult to understand; yet so it seems to be considered by some folks—who would probably be for abolishing criticism altogether, being conscious of having very little favour to expect from it. Admitting the system of anonymousness to be ever so reprehensible—what then? It was not architectural writers that brought it up; they found it already established, and that so far from being considered disgraceful, it was one which our most eminent writers had supported by their talents. Anonymous criticism may be stupid, but then censure its stupidity, not its anonymlessness. At any rate it does not attempt to bias the reader's judgment by the prestige of a name, and so far its stupidity is honest and harmless.

After all, too, is anonymous criticism invariably so dreadful as some would have us believe? Has Barry had any cause to complain of its severity or its unfairness? or has it never done justice to the productions of others in the profession? Aye! but then, it will be said, that it is because it pays deference to names, and takes its cue from popular opinion. Does it? Egad! John Nash and Robert Smirke would tell quite a different tale; they would say that it pays no respect to names—at least not to theirs, which it has treated very unceremoniously. We must have either anonymous or milk-and-water criticism, unless we choose to resort to the only other alternative, of having none at all—the last, no doubt, a consummation devoutly to be wished for, in the opinion of those excellent people whom criticism never praises, and never instructs or warms.

II. We are congratulating ourselves upon having reached a new epoch in art, at having entered upon the Victorian era of it, when it is to blaze with a lustre yet unknown. Fudge! What if a "morning star," as Pugin calls it, be rising at Westminster, all is Cimmerian darkness at Bloomsbury, where Smirkean night- or knight-hood is suffered to reign supreme. Most certainly all the proceedings connected with the Museum buildings have, up to the present moment, been kept shrouded in impenetrable mist, mistiness, and mystery. Not even a single one of the enlightened and vigilant guardians of art, or of those who compose Fine Art Commissions, has thought fit to bestir himself on the occasion, and drag the matter formally before the public, in spite of Peel and his propheesy. It might be thought that Peel has had a sufficient dose of Smirke at Drayton Manor; or if he is really satisfied with that as a specimen of architectural genius, his opinion in matters of architecture ought to pass for nothing. Nevertheless, all seem to stand in awe of the prime minister and his pet; and, strange to say, even the great John Britton himself, who has always caught at every opportunity of thrusting himself before the public in propriis personis, has not come forward with an "Addres" to any one, individual or body, on the subject of the British Museum.

III. It is impossible for any one to say of Sir Robert Smirke, that he is a temporizing or time-serving man, since, instead of at all bending to the spirit of the present times, or complying with its humour, he stands out resolutely against it, and shows himself a staunch conservative in maintaining that system of monopoly and irresponsibility under which he has flourished. The public is to him just the same ignoramus, insignificant public as it was some thirty years ago; whether it brays forth its approbation or its censure is to him matter of utter indifference. Very likely, therefore, he smiles with contempt at those—and some there are—who would fain coax him into showing some kind of deference to public opinion. Most sublimely serene, Sir Robert pays no attention either to such cajolery or to reproach. Why should he now be called upon, for the first time, to satisfy beforehand the prying curiosity of an impertinently inquisitive public, after having erected so many public edifices without being subjected to any such ordeal or surveillance? Reasons, however, there may be, although they are not obvious to himself; and one of them is, because such matters have begun to be put upon a somewhat different and more liberal footing than formerly; nor has the confidence reposed in the public liberto thwarted schemes of improvement, for the public has generally urged them forward and encouraged them. Another reason wherefore the architect of the British Museum should be called to give some pledge that that edifice will, when completed, be both satisfactory and creditable to the country, is that no such assurance is afforded by any or all of the buildings he has hitherto executed; since, so far from serving as testimonials of superior talent, they rather amount to a positive disqualification on an occasion like the present, one of unusual importance, and all the more important because no similar one can occur. It is true other museums may be founded in different parts of the country, and some of them may be, if less extensive, nobler works of architecture; yet they will not be The British Museum; and however gratifying it may be in itself to behold such structures, it must at the same time be not a little mortifying to find that the metropolitan and national one is quite eclipsed by them in architectural style and design. There are some who might still avert the mischief, but they evidently do not care to interfere, fearful, perhaps, of giving umbrage to another Sir Robert who stands as sponsor to Smirke's museum. What are the royal and noble patrons of art about, that not one of them can spare a moment to bestow a thought on the unfortunate edifice in Bloomsbury? Is there not one of them all to come to the rescue, and to avert from that structure the sad inglorious fate of being doubly boyskied.

IV. And what says that very respectable old gentleman, Dame Sylvana Urban, on this occasion? What is the old lady's opinion as to the goings-on at the British Museum? Ah! Dame Urban is a cautious body, and she therefore does not care to risk giving umbrage to any powers that be; so that, if her opinion be worth having, we may guess, from her very discreet silence, of what kind it would be; for could she squeeze it out of her conscience to take the part of Smirke's handywork in Bloomsbury, what a cackling about it would be! However, if intolerable as a specimen of any other, the British Museum will, no doubt, prove a very respectable sample of the Milk-and-water style, yet as such superfluous, as we have quite samples enough of that already.

V. Even royal taste is sometimes grievously at fault, and what is more, is grievously found fault with. Thus was it with the Albert military hat, which the gentleman of the array protested against as a vile deformity. And if princes can err in matters of taste, à fortiori, so also may prime ministers, consequently Sir Robert Peel's recommendation of another Sir Robert who designs, according to him the very ne plus ultra of architecture, ought to stand for nothing. Sir Robert Peel may be a very good cabinet-maker, Sir Robert Smirke an excellent warehouse-builder; but let them stick to those trades, and not foist upon the country such a dowdy design as the one conceived for the British Museum out of the Post Office and the Custom House. Any Pecksniff would have produced something as good, and just as "respectable,"—for some, it seems, have expressed themselves ready to be satisfied if what ought to be rendered a magnificent national work, can be patched up into something "respectable," in other words, be made a tidying sort of a job—so much for the March of Art in England!

VI. One of the most extraordinary excuses ever put forth on any occasion, is that which has been assigned on the part of Sir Jeffrey Wyattville, for the entire omission of any plates of the interior in his "Illustrations of Windsor Castle," for the reason that part of the fabric may undergo considerable alteration in the course of time: a very strong reason, one would imagine, for such illustrations being given, not merely in present studies, but as faithful records of his own work, should it at any future period be destroyed, whether by being changed into something else, or by being burnt down. Would the illustrations he has given us, lose at all in interest or value, were a confutation to sweep away the whole of the pile? How many buildings there are, in respect to which nothing, or comparatively nothing, can now be learnt, because authentic and sufficient memorials, taken at
the time, or when they were in a perfect state, have not been perpetuated by the graver. All that we now know of James Wyatt's chef d'oeuvre, rest merely upon tradition and conjecture, perplexed rather than aided by paltry views, which leave us quite at a loss as to the superlative beauty and magnificence claimed for the structure in terms of eulogium that read like newspaper puff.

VII. Now that symbolism is come into vogue, it is odd that no one has yet protested against the monstrous paganism and heathenism of the Nelson column or any other of the kind, as being evidently derived from monuments of Phallic worship, consequently not unmeaning, but on the contrary, pregnant with a meaning that will not bear to be explained. It is true symbolism does not scandalize in such cases, because no one sees or understands it; and, for a similar reason, other symbolism may be equally unavailing.

VIII. It does seem strange, that with a frontage of not much less than 150 feet, the architect of the new Conservative Club House, should not have placed the entrance in the centre of his façade; or if circumstances absolutely compelled him to place it at one end, it should not have been within a recess. There is, indeed, something corresponding at the other extremity of the front, yet not sufficiently so as to preserve symmetry, and even were such the case, gaps of this kind at the angles of the ground floor, where the expression of strength and solidity is most of all desirable, would be a defect detracting very much from whatever other merits and good points there may be in the design. Perhaps the architect was determined that it should be impossible for any one to say that he had copied—or, indeed, looked at Barry; so resolved, voilà qui voilà, to give us a specimen of something altogether different, and therein he has certainly succeeded.

IX. A good deal of sentiment and pathos has lately been expended upon the quondam College of Physicians in Warwick Lane, and that venerable piece of rubbish yelped Old London Wall. Yet it might be better, if instead of all this Parthian retrospectiveness, these long and lingering glances backwards at antiquity—a lady called by the poets “horant antiquity”—it might be better and somewhat more to the purpose to pay greater attention to the future, to look forwards a little more than we do, and bethekin us what sort of figure we ourselves shall cut in the eyes of posterity. While people are moralising, poetising, fantasticising, on some stray remnants of old brick and mortar somewhere in the ultima Thule of the metropolis, they have no eyes at all for the poritous operations now going on in Great Russell Street. At any rate they have no voice that exalts against such doings, and their eyes they employ merely to wink at them. It might be supposed that the Museum was a mere parish job, which concerned the good folks of Bloomsbury, or the “Bloomsbury barbarians,” as Hogarth used to call them, for ever so many years, and with which no one else has any right to meddle or make. Infinitely better would it have been to have kicked out Sir Robert at once, and plastered him with a good round pension, which last would, no doubt, have convinced him that if he abandoned the field to another, he had made a masterly retreat for himself, and could enjoy, if not otium cum dignitate, his otium cum pecunia—a far better thing still. How he came to be appointed architect at all to the Museum, puzzles many; and pity it is that the appointment was not made a complete sinecure to him, some understrapper, some “Pinch” being employed, as the great man's proxy. As matters have been managed, Sir Robert will not be able to find any convenient sub or proxy, who will bear for him the disgrace he is now bringing upon himself. It is true the building is not yet done, yet it is now completely “done for.”

X. Thank heaven! though literature is now for the most part reduced to a mere manufacture, art is not yet workable by machinery, although some of those who call themselves artists are in themselves no better than machines, with about just the same intelligence of and affection for it as the implements they handle. They have one or two patterns, which, either through laziness or incapacity, they apply pretty much in the same way on all occasions, no matter under how widely different circumstances. No wonder, therefore, that at the very best no more than mere decent mediocrity and insipid, flavourless common place are the result. How should that possibly be expressed which is not felt? How should there be ought of genuine and genial feeling where every thing and every part is concocted out of second-hand and borrowed ideas, and those perhaps very ill understood? I have met with architects who might have been very clever as masons, but who have had no more notion of art or of the poetry of art than an Irish labourer, although able to talk more glibly about Vitruvius and Palladio. Well! those are just the sort of people to admire the British Museum—perhaps, to build one.

XL It is cleverly remarked by a German architectural critic, that it is generally considered quite enough to provide sufficient light in a building, no matter whether there be any effect of light or not. Artist-like study and treatment in that respect are, indeed, hardly to be looked for in ordinary houses or in mere sitting-rooms; but neither on we find anything of the kind in superior ones, except on very extraordinary occasions, and partly arising out of mere accident. One may go over a large mansion containing numerous and most sumptuously furnished apartments, without being struck with a single effect of the kind in any part of it, or any thing whatever that amounts to character and effect purely architectural. One sees what the maximum of cost and the minimum of imagination if not exactly of taste, can accomplish; and even if there be nothing calling for particular censure, there is nothing to enchant by novelty of effect, or by decided individuality of character. As for any peculiarity of arrangement, that might as well be looked for in the London stereotyped front and back drawing-room, or in a row of ready-made speculation houses. A good deal has been said lately about “architecture for the poor!” but it would be hardly less charity to think of architecture for the rich—for those who are obliged to conceal the utter architectural nakedness of their mansions by the mere trappings supplied by the upholsterer, displaying most ostentatiously the costly poverty of their taste, and the paucity of their ideas. Exceptions there are—though not in our royal palaces—and I lately beheld one in an apartment which, though not very large, and rather sober in regard to decoration than otherwise was most striking for its high degree of architectural beauty, and the very peculiar kind of it, arising both from unusualness of plan, and from the mode of lighting, and the charming effects attending the latter. So replete, indeed, was it with beauty of such kind, as to possess a variety which nothing can stale. From almost every point a new picture—a fresh combination as to perspective, is presented. It should be observed, however, that this is an entirely con amore work, planned by the proprietor himself. It may be wrong for amateurs to turn architects; one consolation is, there is very little danger of architects turning amateurs, and giving more study to an episod—i.e. plan than they now do to a whole building, though it be one as big as the British Museum—whose merits are all summed up in that little word.

SOME OBSERVATIONS ON THE ANCIENT ARCHITECTURE OF THE EGYPTIANS.

In the very earliest ages of the world, man must have directed his attention to the art of building, as habitations were indispensable, not only for comfort, but also for protection; the necessity for some defence against the parching heat of the sun, the power of the elements, the ferocious attacks of wild beasts, and the treacherous assaults of fellow man must have been early experienced, and the rational faculties with which the Deity had gifted him, must at once have been called into action to accomplish this desirable object. These buildings, on account of the roving lives which their occupants led, were constructed of very slight materials, and must naturally soon have fallen a prey to the destructive hand of time. To expect, then, after a lapse of some thousands of years, to find any remains of those primitive buildings would be most absurd; but from observing the practices of men, now in an uncivilized and primitive state, as well as the authority of the earliest records, we have very strong presumptive evidence of what must have been the first dawning of architectural science.

It is recorded by the author of the Pentateuch, that Cain built a city, and called it Enoch, after his son. This town, being a collection of huts, probably constructed in the manner of those now to be seen
among the savage Indian tribes, fell to decay, and no vestige of those buildings now remain, to mark their former existence. The progress of building must have been rapid, and the art of carpentry well under-noted. It seems, as if the architects of Egypt must, in this instance, have proceeded both with heavy freight, was for many days exposed to the toasting of the bilows, and the rage of the elements. The subsequent design of the Tower of Babel, and the extent to which the proposed work was carried into execution, must convince us, that even at that early period, architectural knowledge had greatly advanced.

Satisfactory, however, as may appear these records which mark the progress of intellectual refinement in the early ages of the world, still historical evidence alone can be of little practical utility to the modern architect; to the examples of the most ancient existing ruins, must he recur, to trace the features of the science in by-gone days; and in this investigation, three countries present their claims for the palm. The Nile, the Ganges, and the Ganges, the citizens of the three nations, being the remains of great magnificence are now to be seen, gracing their almost tenantless plains, the admiration and astonishment of the most enlightened travellers and antiquarians.

As to which of these three countries we are indebted for the first degree of perfection in the architectural science, there are very numerous and conflicting opinions, and seemingly strong evidence has been produced on each side. A strong argument in favour of the Egyptian style is the very great simplicity of design observable in all their edifices. Although the leading features of the ruins in the three countries are similar, yet it is easy to perceive, from the drawings which we have of some of them, that the simplicity of the Egyptian has been departed from in the Hindostan edifices; and that the introduction of circular outlines bespeaks a certain degree of perfection in the art of designing, unknown to the architects of Egypt; and the delicate pillars and refined ornaments of the Persian architecture prove a still further progress in that science, which must have originated in simplicity. The simplicity of style, in the absence both of tradition and historical records is evident, the validity of which cannot be contested in favour of Egypt having been the nursery of scientific architecture, and to her the kingdoms of the East are indebted for these edifices “of other days.”

In examining the progress of architecture in this country, we are altogether left to draw our conclusions from conjecture; for in vain is the most instructive part of these particulars concealed from the spectator. In the latter part of the 18th century, the monks of the mysterious land consulted about those remains of the by-gone glory and forgotten wisdom of their forefathers. No clue to the hidden mysteries of those sacred temples; no recording monument to satisfy inquiring posterity; ages have gone by, time has rolled on, many generations have been called to their final account; still these massive ruins mock the power of time, pointing out a locality, where, in centuries long since passed away, science and art had their votaries, and the torch of wisdom burned brightly in those regions, where in latter times, ignorance and gross darkness have sprung up.

Little reflection is required to convince us that those stupendous works of Egypt are not the production of men, to whom the first principles of science alone were known, or that those almost super-human structures could be the results of merely infancy in the arts. The progress of architecture must have made rapid strides, and some centuries of practice must have passed away, before such perfection could have been attained. It cannot possibly be supposed that men, whose greatest knowledge of building consisted in the erection of huts, could at once design edifices of such enormous dimensions and great solidity, calculated to withstand the ravages of time, and the erection of which must have occupied many years; or that an ignorant people could have devised the means of quarrying and dressing those large masses of stone, or placed them in their present positions, which we may suppose have required the co-operation of many hands. The very magnitude of the whole work, and the great improvements in machinery, we should consider almost impracticable. To a very mature age of architectural knowledge must those ruins be attributed.

The discovery, which it is stated Mons. Denon made at Thebes, of a stone covered over with hieroglyphs, and which, from its appearance, must have been used in forming a foundation stone to one of those now standing, has been fairly adduced, as a proof of Thebes having been, at some much earlier period, adorned with temples and other public buildings, which must have either fallen to decay, previous to the erection of the present ruins, or been taken down to build those more ornamental edifices.

In that mysterious region, where now, surrounded by the scattered ruins of pyramids, temples and cities, the savage shepherd tends his roaring flocks, once studied the author of the Pentateuch, and freely imbibed the wisdom of ancient Egypt. In that same district, where those remains of antiquity attest the departed refinement of the Egyptians, in other days Plato instructed his auditors, and Euseb wrote. Amid these ruins, the remains of three different forms of structures are to be observed, the pyramid, the temple, and the tomb or cairn.

To which of these the date of priority in construction is to be assigned, is a very difficult question to decide. Arguing from analogy, it would be reasonable to suppose that nature first pointed out to un-civilized man, the cairn, as the best form of habitation: but the superior workmanship observable in the interior of these edifices must at once dissipate this idea, and the refined and well executed sculpture on the natural rocky walls must be attributed to an advanced era in the art. The simple form of the pyramid, as not requiring great talent in designing, may be adduced as a proof of the priority of this structure; but the fact of these buildings being found only in the valley of the Nile, the city of Thebes, must, perhaps, after Thebes, cast great doubt upon the validity of this claim. The complicated form and skill required in both designing and executing the temples, presents a strong barrier to the supposition of priority of construction in these buildings. The absence of historical evidence on this point, leaves this subject altogether a matter of conjecture.

Those stupendous erections, the pyramids, which have withstood the destruction of time, for more than three thousand years, in external appearance may be said to be deficient in architectural character, and no beauty in design can be attributed to them; still, from their enormous dimensions, their colossal appearance, the massive materials employed in their construction, and the workmanship, they must attract our admiration, and be justly numbered among the wonders of art. The description which Herodotus has given of the mode of construction of the pyramid said to have been built by King Cheops, must naturally lead the reader to view with astonishment, that stupendous erection and the circumstances which attended the building of this pyramid having occupied 100,000 men for 20 years, may be well adduced, as proof of the devotedness of the ancient Egyptians, to works of art.

The building which possesses most architectural character, and may be said to be the very basis of ancient architecture, considered in a scientific point of view, is the Egyptian temple; and though on first view it appears, in comparison with the vast edifices of the Persians, to be a mean and simple structure, a closer examination will perhaps, an unfavourable opinion as to its merits, still when it is kept in reollection that those people had no models to copy, or no design to borrow from other nations, but depended altogether upon their own resources, and followed nature as their guide, we must banish all unfavourable reflections, and award the well merited laurel to the authors of the science. The characteristic features of these temples are the colossal form, the enormous size of the blocks of stone employed in the execution of the works, the tapering walls of a pyramidal form, the pillars of vast dimensions, and the arrangement and disposition of the several parts of the building.

In the columns, the change of outline seems to have been considerable. The simple form appears to be a representation of a bundle of reeds, bound together near the top, with a cord wound round them several times, having a square flat stone laid on their top: they are made to bulge out a little below the binding, in order to imitate the effect which would be naturally produced in a bundle of reeds, subjected to a pressure in a vertical direction.

In the Egyptian pillars, massive and heavy as they may appear, can be traced many of the features of those refined Grecian columns, which by all writers have been justly eulogised, and to which, too frequently, and very unjustly, the claim of originality of design has been yielded. The very striking analogy which exists between the examples of the two countries, must be very apparent, upon examination.

In the plain and simple pillars of the little temple at Luxor, resembling in form the trunk of a tree, we may behold the origin of the heavy and tapering Doric shaft. Other columns, representing a bundle of reeds, placed in a vertical position, and bound round at the top, bear a strong resemblance to, and most probably furnished the prototype of the column in the temple of Amon: many copies, while in the binding of the reeds we may easily trace the astragal and necking of the column. The square flat stone placed on the top of the pillar, and the Grecian abacus are synonymous, while the flat stone upon which the Egyptian columns rests, fully accords with the plinth of the Athenian column. The absence of the plinth and the pith of the ancient temple forms is so much pronounced, as to lead the architect of the Parthenon to observe the same omission. The swelling shaft in the temple of Karnac, suggested the similar form in the Grecian Doric. The introduction of human figures in the place of columns at the Memnonium, certainly dictated to the Greeks the
similar application in some of their edifices, which they, claiming the originality of the design, called Caryatides. The most eminent writer of art, that this design was derived by the Greeks, from the Carien slaves carrying on their shoulders heavy burdens, and hence the name; but certainly the similarity between these figures, and the more ancient ruins of Egypt, could not have been accidental. The capitals of the columns of the Temple of the Winds at Athens, bear a very strong resemblance to the modern Caryatides. The tender of the transept more northward has a widely different appearance, and is unquestionably the work of a different period. The mortar joints are considerably larger and the execution altogether ruder; nor is the design exactly the same, or the parts of the same height, so that management was required (and is evident) to bring the two portions of the building to nearly the same appearance. In this History of Winchester Cathedral, considers "this might have arisen from different workmen who were employed, even at the same time, and still more from those who were engaged on the church at different periods of its erection, for it cannot be doubted," he continues, "that an edifice of this size must have been some years in progress, so that many masons were unquestionably employed in its construction."

With the greatest respect for the opinion of our veteran topographer, and every disposition to look with caution at any assumption of remote date, I am unable to think this argument conclusive in the present instance. If this difference in the workmanship had appeared horizontally throughout the building—of the lower story presented one approach of awe to another—this opinion might be tenable; but in the case before us, the difference is perpendicular, it is thrown out the height of a particular portion, not the length of the whole; and before we can admit that the diversity of construction which is apparent, results from the different workmen who were engaged on it, the evidence of different periods, we must believe that one whole of the north transept was completed before the remainder and the tower were begun.

The statement of Rudborne, too, which is urged as proving the entire rebuilding of the church by Walkelyn, is not sufficiently conclusive to destroy an opinion founded on what we see before us. He says that he and Walkelyn had visited the site and inquired of the Abbot of Waverley, whether, if I mistake not, have been used by chroniclers in some cases where it was known that much of the previous building had been allowed to remain, although the whole had been reconstructed even from the ground. In fact, that some part of the old cathedral at Winchester was allowed to stand, seems clear, from the continuation of Rudborne's own story, for that after the completion of the new building, the Bishop's men destroyed the old monastery, except portico uno et magnu altari, or, as Milner words it, "leaving nothing standing at the end of the year except the high altar and one porch, which seems to have been the corresponding part, or eastern end of the cathedral church."

In pursuing this investigation, there is another circumstance recorded which must not be lost sight of, by which (if other discrepancies could be removed) the difference of workmanship in the transept might be explained. In the eastern end of the church, which Norwood (in his work left by Walkelyn) had become dilapidated in Bishop Lacy's time, and that prelate determined to rebuild it, beginning with a tower. In the year 1290, according to Rudborne, this tower was begun and finished. It does not seem probable that the centre tower was here referred to; it would be inconsistent with other of the annalist's own statements, and moreover the style of the architecture is clearly anterior to that date. Garbett considers it was a tower at the eastern end of the choir. The whole matter, however, is wrapped in doubt, and it would be safer to say that one portion of the transept was early Norman, the other late; but for my own part, I can hardly avoid considering that the northern extremity of it may be that which is the more ancient.

The effect of the transept, massive and grand, is very striking, and will well repay attentive study; the arrangement of the aisle at the termination north and south, is peculiar. The elegant nave, of a different period, and consequently with a very different aspect, is the work of William of Wykeham, commenced about 1393, when he was seventy years old. As it is called "the indigeneous," "Gothic, as, indeed, do many other parts of the cathedral. Recent repairs have served to prove that much of the old work was allowed to remain by Wykeham, and was cased and altered.

1 The magnitude of the cuttings and embankments which form the railways of Great Britain, looked at as a whole, is enormous, and would seem the work of ages; yet all this has been effectuated within a very few years, by single attacks.

2 Mr. Britton, to whom every student in architecture, and many beside, are deeply indebted, celebrated in July last his 72nd birthday. Time has in no way diminished his energy or acumen, or lessened that kindness of heart which has led him, the unostentatious, to offer a friendly hand to all whom he thought deserving. Honour be to him!
In sepulchral chapels Winchester cathedral is particularly rich, especially in those of the perpendicular period. The eastern portion of the building, behind the altar, is a perfect reredos of monuments, unequaled, and must be seen to be duly appreciated. Bishop Fox, Bishop Gardiner, Bishop Waynflete, and Beaufort, have chantries here; Wykeham's chantry and Eldington's are in the nave. A sculptured cowl of a rood against the east wall in the north transept. It seems formerly to have been keose in the cathedral, for it is represented on the ground leaning against a pillar, in one of the plates in Mr. Britton's history.

The most interesting of the parish churches in Winchester is St. John's. It consists of chancel, nave, and side aisles, and has a tower at the west end of the north side. This structure contains many of the features which distinguished our places of worship "while yet the church was Rome's," and concerning which all information is now sedulously sought. Where the roof-loft formerly stood separate to the chancel from the nave, is now placed the organ gallery—most improperly. The staircase by which the priest ascended to the roof loft is in a similar position in the church, but, as it is in a door way in the wall; over the aisle there was formerly a gallery or passage way to the loft, with openings through the spandrels of the main arches. There was an external entrance to this turret, which was probably used as the "priest's door" to the church.

Two projecting walls from the east end separate the chancel from the aisle; that on the south south of this small, oblong apertures, opening obliquely to enable those persons who were in the aisle to see the elevation of the host, and which have been termed hagioseopes. If my memory is right (I have no note of it) this was adapted to serve also as a piscina, an arrangement not uncommon. In the wall on the north side there is a similar oblong opening inclined the reverse way, and used in the end of the main aisle, where there is a handsome altar tomb against the north wall, with a recess above it, which may have been used as an Easter sepulchre.

If so, lights were kept burning in it during the latter part of Passion week, and the opening in question may have been made to enable the attendants readily to watch them. On the side and end of the tomb are shields, one bearing the five wounds, another the instruments of punishment, and a third the letters I.S. entwined, standing probably for Sanctus Jesus, or Jesus Salvator. Returning an instant to the chancel, there is one sedile and a piscina on the south side of it. It may be well to remark that although I have described the church in this memorandum as standing east and west, the altar points in reality to the south east.

At the church of St. Peter, Colebrook (at the same end of the city as St. John's) where the tower is at the south-east corner, there seem to be remains of enriched ridge-tiles. The font is square, supported on a central pillar with four smaller pillars at the angles, similar in plan to the very interesting specimens of Norman fonts at the cathedral. St. John's has also an interesting font.

The County Hall, formerly part of the old castle, although now encumbered by the Assize Courts, has many points of interest. Milner calls it, "the ancient church or chapel of St. Stephen;" but Mr. O. B. Carter, architect, who has examined this building lately, and has prepared plans for its restoration, considers that it was always used as a Hall. It is in three aisles divided by clustered columns and arches, and must have formed a magnificent apartment.

The Hospital of St. Cross, the "alms-house of noble poverty," which stands about a mile from the city, retains more fully its ancient appearance and customs than any similar establishment in the kingdom. The brethren with their black gown and metal cross on the left breast, the dimly-hall with the old "sick sister's" table, and other implements given by Cardinal Beaufort; the quiet cloister, the ancient church embowered by trees, and the pretty residences of the brethren around it, serve to take back the mind to a much earlier period in our history, and to induce the thought that in a rude and violent age the monastery—which St. Cross, though never so used (being simply a hospital and a refuge), closely resembles—must have offered strong attractions to all studious or timid men, who were not accustomed to encounter in the world the more boisterous spirits of the time.

Originally, besides the resident brethren, 100 miscellaneous poor were fed daily in what was called, in consequence, "Hundred-Acre's Hall," but is now a brewhouse. At the present time all who apply at the gates are given bread and ale, and twelve men, that is, till midnight, two days' allowance, have been expended; nor are the applicants for this few.

Cardinal Beaufort, of whom Shakespeare says, in the bitter picture he drew of him, "Henry the Fifth did sometime prophesy,—If once he come to be a cardinal, He'll make his cap co-equal with the crown;" expended much money on St. Cross, amongst other charitable establishments, and erected many of the present buildings.

The most curious of the numerous buildings to which King Stephen, about the year 1136, is an interesting specimen of a transition period in architectural history, when the semi-circular arch was about to give place to the pointed. It has acquired considerable notoriety from the circumstance that Dr. Milner, following a suggestion thrown out by the Rev. J. Bentham,7 has appealed to the interlaced semi-circular arches in the church for the light, as being probably the first open pointed arches in Europe. The origin of the pointed style of architecture is still as doubtful as it was before the appearance of any of the numerous dissertations to which it has given rise. Nevertheless, the inquiry cannot be deemed useless: as in the pursuit of the philosopher's stone and cleaver ete, the enthusiast alchemist may daily turn up new substances. He may advance the science of chemistry, so, in the vain pursuit of the origin of the pointed style of architecture, much valuable information has been gathered.

Whichever theory may be the most correct, it is certainly not that deduced from the intersecting arches at St. Cross. Apart from less obvious objections to any deduction founded on the present appearance of this arcade, the narrow length of the church, below it, are pointed, as, too, is the vaulting of the aisles; by which we must be led to believe either that considerable alteration was made in the choir at a later period, when the practice of the pointed style was more advanced, and which might have extended to the intersected arches in question, or that the date of its original construction is somewhat anterior than that usually assigned to it; for in some of the churches in England, the date of which is asserted to be even anterior to that of St. Cross, as, for example, Buildwas Abbey, display likewise an intermixture of pointed and circular arches. The circumstances, however, which occurred in many cases to delay ecclesiastical buildings for years after the record date of their foundation, and the danger of detecting alterations and reconstructions made at a remote period, prevent us from arriving with any certainty at a satisfactory conclusion.

At the south side of the altar at St. Cross there is a table of prohesis, or credence, on which the bread and wine were placed previous to the obfory, and the introduction of which in modern churches is strongly insisted on by the Cambridge Camden Society. There seem to be very few ancient examples remaining.

Romsey Abbey church, a few miles from Winchester, is a building of the same class as St. Cross, and displays an instructive mixture of the peculiarities and style of various successive periods. It is a cruciform building of considerable size, with a square tower at the intersection of the nave and transept, which, when built, was the tallest in the neighbourhing hills, rises above the houses clustered around it, and forms the most important part of the town. It is curious to contrast, especially in a constructive point of view, the churches built by our fathers and ourselves. Anciently every small village could boast a sound substantial church of stone, which in most cases has kept its promise of long endurance, and still serves to give stability and importance to localities which, but for this, had lost their identity long ago. At the present time little heed is given to the future; the immediate wants of the day are supplied for the most part by cheap and flimsy structures which cannot be expected to outlast the present generation.

6 Bentham says, in his History of Ely Cathedral Church, 1771, when speaking of the origin of pointed arches, "Some have imagined they might possibly have taken rise from those arcades we see in the early Norman churches. Some on walls of castles, but we have already seen them in the intersect each other, and form thereby, at their intersection, exactly a narrow and sharp-pointed arch. In the wall south of the church at St. Cross is a facing of such wide round intersected arches by way of ornament to a flat arch only so much of it as lies between the legs of the two intersecting arches, where they cross each other, is pierced through the fabric, and forms a little range of sharp-pointed windows; it is St. Cross: King Stephen's brothers, whom they were supposed to have consecrated this church, was a relation of mine, who supplied a letter of introduction to Mr. Milner.

7 The length of this church, according to the curious description given in the abboz to Brown Willis's Mitred Abbess, is 240 ft., and its width, that of the transept, 22 ft. The length of the transept is 120 ft. 4½ ft. It is cruciform, has side aisles, and a large square tower at the north angle of the intersection.

8 The height of this church, according to the curious description given in the abboz to Brown Willis's Mitred Abbess, is 240 ft., and its width, that of the transept, 22 ft. The length of the transept is 120 ft. 4½ ft. It is cruciform, has side aisles, and a large square tower at the north angle of the intersection.
Amongst the generations, himself, some memory escape interesting symbolism. According to those who maintain the necessity for symbolic design in churches, a triplet, which they consider to represent the Trinity, and be confined to the east end; to place it at the west end, they say, is a decided fault. We have here one instance, at all events, and by no means a single one, that this was not always recognised by our forefathers.

In the south wall of the nave next the transept, one of the original Norman doorways remains, and is now used as a window. It presents a series of concentric arches adorned with various sculptured enrichments, and supported by two columns on either side, with enriched capitals. In the external wall of the south transept, next the door, is a curious sculptured figure of Christ on the cross, about 5 feet high, with a hand from the clouds above pointing to it. Near it is a small recess in the wall, probably to receive a lamp or taper. The present appearance of this end of the church is entirely very picturesque, and may be advantageously studied. Some of the capitals in the aisles, at the east end, are sculptured with figures of singular appearance, and have led to three communications to the Society of Antiquaries, printed in the "Archaeologia."

The nave is supported on three square pillars panelled. In minute points of interest this church is abundant. There are several interesting monuments and monumental slabs, some of which present curious examples of crosses and crooks. Unfortunately the names of the persons whom they were intended to commemorate, have, in too many instances, disappeared:—

"So perish monuments of mortal birth, perish the name, and vanish ere they were worth." Amongst the modern works, the last effort of Flaxman, a monument to the memory of Henry Viscott Palmerston and Mary his wife, should not escape notice. It is to be observed with much regret that this interesting building is, in many parts, in a very bad state of repair; and that unless some efforts be made to maintain it before decay proceeds much further, but little of this structure will remain for succeeding generations.

In the foregoing brief remarks, the writer has had occasion to allude incidentally to symbolic architecture, and he cannot avoid availing himself of the opportunity which here offers itself to add one observation in connexion with it. He has been accused by some influential persons of being silly (in Chapter III. of his book) on this subject. (In the Civil Engineer & Architect's Journal and afterwards reprinted in some of the daily journals) urged the super-eminent importance of symbolism, and the desirability of the re-introduction of details, and arrangements fitted only for the Romish faith. Now if this were his opinion, he would feel no hesitation in respectfully maintaining it:—

"If, my Lord, for my own of blood, opinion shall be surgen to my hurt, and keep me on the side where still I am:"

but it is not so. The little paper in question contained, it is true, a resume of the opinions to that effect recently urged by some ecclesiastical writers; but the motive of the paper was rather to utter a protest against their reception than to urge their adoption, as he ventures to think must be quite evident to those who have happened to read the whole of it. To quote one sentence from the paper in question:—"We would most worthily adore the house of God, to render it, to the extent of our means, fitting for its high purpose; but at the same time we would carefully avoid all proceedings, however agreeable to our temperament, however enticing to us as an artist, which should give undue importance to bricks and stones, and man's inventions and devices, which should increase the number of ceremonial observances, which should threaten to exact the shadow in the place of the substance, and so lead to a number of things which did once result from such a course, and may result again, notwithstanding the increased amount of information possessed, and the general comparative enlightenment."

Built on the foundations of Henry de Blois who built St. Cross, in the middle of the 12th century. It is remarkable for having a small chapel with semi-circular absis, on the east side of each arm of the transept. The ailes of the choir likewise terminate in a semi-circular absis formed in the thickness of the wall, so as not to project from the main body of the choir, nor to form a doorway (doubtless originally terminated in a similar absis) and the transept, are Norman: the greater part of the nave, excepting the walls, is of Early English. The west end contains a singularly lofty triple lancet window. According to those who maintain the necessity for symbolic design in churches, a triplet, which they consider to represent the Trinity, and be confined to the east end; to place it at the west end, they say, is a decided fault. We have here one instance, at all events, and by no means a single one, that this was not always recognised by our forefathers.

British Museum.

Sir—I have heard, upon what I consider tolerably good authority, the information coming to me at only one remove from the party himself, that a Mr. B., a gentleman in the University of Oxford, is getting up a design for the British Museum, in opposition to Smirke's; and intends, in either of its buildings, to introduce a capricious fancy. I cannot possibly avoid formally noticing it in some way or other. Yet, although I do not question the truth of this as far as mere intention goes, I doubt very much indeed if anything whatever comes of it. With whatever ardour and alacrity they may be projected, enterprises of the kind are apt to break down very soon, and the memory of zeal and work excitedly from the building point to nothing. Even well-wishers to it must consider such an attempt on the part of an individual, somewhat Quixotie: the greater probability, therefore, is that nothing more will ever be heard of it.

Although I agree with many others that the design actually adopted is almost the very last which ought to be so, I certainly cannot agree with your correspondent Dr. Fulton, who recommends the Egyptian style as a very suitable one for the occasion. To me it appears eminently the reverse, for that style is not only not a national but not even an adoptive one, nor at all naturalized among us in the slightest degree. I do not say it ought never to be employed by us, for any purpose, or under any circumstances, but I certainly am of opinion that a Pompeian for a public and national structure is not even an European style, would partake of absurdity, notwithstanding that the Museum contains a great number of Egyptian antiquities. Even a Gothic façade would quite as well agree with the interior of the edifice.

According to this last remark, it may be said that Sir R. Smirke's own façade will prove a better index to the interior, and prepare strangers better for the taste there displayed, than a design which, by rendering the exterior more imposing, would be a sort of architectural imposition, and lead people to expect a corresponding degree of architectural beauty; nor is there any denying that such is in some degree the case. Still there are attractions of another kind within, and that they are reckoned all-sufficient is evident, for, with the exception of the Royal Library, no part of the interior makes any pretension to architectural effect or beauty. The staircases—where, if no where else, some display of the kind is apt to be looked for—are remarkable for nothing so much as their ugliness: they might be all very decent and tolerable in an hospital, but in a national museum they are abominable.

Some of your contrivances—as Mrs. Malaprop would call them—have expressed a hope that Smirke would, on this important occasion, give us something at last truly noble, and a perfected design worthy to rank as a work of art. Yet, however well-meaning, this is surely too severe, too serious. (In the Civil Engineer & Architect's Journal and afterwards reprinted in some of the daily journals) urged the super-eminent importance of symbolism, and the desirability of the re-introduction of details, and arrangements fitted only for the Romish faith. Now if this were his opinion, he would feel no hesitation in respectfully maintaining it:—

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* From Dr. Latham, Vol. XIV., p. 138: from Sir H. L. Englefield, following the former; and from W. Latham, Esq., Vol. XV., p. 364.

** From J. R. W. J. W. R.
THE PHILOSOPHY OF CORAL FORMATIONS, AND THEIR ARCHITECTS.

No. III.

The ocean is the mother of earth, the fruitful womb of production, the living principle embodied in forms defined, being the unceasing architect of substance. Generated from the elementary compounds of air and water, living creatures are produced, having peculiar generic character, the maintenance of which, and propagation of their species, is more uncommon incident, accident of birth. With the change of climate and association, organic bodies undergo a change, genera dividing into orders, orders into species; thus the earth multiplies in all its parts, quantities, and qualities, by the action of the living principle manifest in living forms, and in the multitudinous changes continually taking place in the fossil and mineral kingdoms. For corals belong to the sponges, from the or, to the limenal, pelagic, from the polyp to the molluscous animal, from the inviolable animalia to the whale, from the fish to the insect, the bird, and the beast, from the plant to the animal, and from the minutest spark of life to man, the great chain of life is inseparable.

In the varying strata of the earth, man may see broadly and distinctly marked, epochs of creation—and epochs of destruction—a series of ages succeeding each other—of generations succeeding generations—of climates succeeding climates—of local and general changes and catastrophes. Every region of the waters opens to the inquirer new and beautiful truths of nature, attests to the forming powers of organic bodies, and speaks of changes to which all species and all individuals are necessarily subject. The coral formation, its varying composition and character, and the sequence of events or manifestations, of which it is principally composed, is as plainly delineated in the polyclitic, and limestone ranges traversing the surface of the earth, as it is in the waters of tropical seas: the one and the other tell the same truthful tale, of myriads upon myriads of bygone existences, of fossil animalcules and animals, of species analogous to or identified with those now living within the waters, whose being and existence as fossil or mineral bodies assure us of long uninterrupted periods of repose, of sudden and violent catastrophes, and of causes necessary to effect the end proposed. In the coral of the British strata, in the lins and other formations, we find an association of species peculiar to warm tranquil seas, their aggregate masses tell of an uninterrupted succession of generations, their sudden extinction, of sudden catastrophes, produced by changes in the position of the earth's surface, and consequently cessation for a time of living action in those regions affected by the change: all distinctly define, by their composition, character, and association, the inviolate laws by which oceanic, lacustrine, and terrestrial life is governed in distribution and change.

Mr. Darwin, treating largely on this subject, observes, "from the limited depths at which reef polyplifers can flourish, taking into consideration certain other circumstances, we are compelled to conclude that both in atolls and reefs, the foundation on which the formation was primarily attached, has subsided; and that during this subsidence, downward and manifest, the reef has grown upward." The conclusion he comes to is as weak as is the evidence from whence he has derived it.

Of the largest lakes disposed within coral groups, such as the Atoll Suniva, which is 44 miles long and 34 broad, enclosing a great expanse of water from 250 to 300 feet deep. Other and more extensive views may be taken of their mode of formation. We have not yet to learn that the bed of the ocean is full of inequalities, resembling in this respect terrestrial earth: its hill and mountain chains and groups are of great extent, and vary much in their general composition and character: it has its extensive plains and deep valleys, and its lands favourable or inimical to life: the mountain heights of the earth, represent the bases of the submarine mountains, the one and the other, in the absence of the requisite degree of heat, being incapable of producing or sustaining life. For even in tropical seas, there are regions in which neither plant nor animal can exist; the filling up of the lower depths must therefore depend upon the matters continually carried into them by currents, or which are precipitated from the waters above them. The lowest region where life is produced, is analogous to the boundary of vegetable existence on the Himalayas or Cordilleras, sustaining species of the simplest organization, wholly devoid of life and purely siliceous; the next region is productive of other species, and to this succeeds a region wherein animals secreting calc and other peculiar earths are present in more or less abundance. Mr. Darwin contends, in vain, that the polyplifers do not build from greater depths than 200 feet; for although their growth is protrated, and the number of species curtailed within the lower regions, still we are assured that calyx secreting polyplifers exist in beds at or near 2000 feet deep, and it is these artificers that lay the foundations and pave the way for the other. We have not, however, to complete the structure. On the bottom of submarine mountains the polyplifers commence their work, and precluded from descending within deeper and consequently colder regions, they spread themselves upwards, right and left, as they are enabled to do from the nature of the soil on which they rest: if building on a clump of submarine hills, the valleys can only be filled up by other means, far slower than those of organic action; consequently, the structure rises as a great amphitheatre or encircling reef, having openings circled by openings; by gradual deposition, by local depositions of sand or marl. At other times numerous structures slowly arise independent of each other, or united as so many links in the great chain. The atoll formed, the openings admit the tides, which carry many substances into the lake, and by their rotary motion contribute to prevent the coral from growing within the encircling reef.

The many inequalities of the ocean bed, as well as tidal action give form to the barrier, is demonstrated by the Great Chagos, which is about 60 nautical miles in length, and 1 in width; its banks consist principally of rock covered with sand, arranged so as to form a great basin, the central part consisting of a vast plain covered with marl intermingled with shells and marine refuse, it slopes outwardly to unfeathemable depths: now a circle to this extent, 34 miles, is a众多 of islands, nor does it appear that it could have been formed otherwise than by loose carried round the surface of a vast track of table lands, elevated far above the lower plains of the deep. The phenomena of the African and Asiatic deserts give some idea of the mole of formation of atolls. We there find valleys varying in size, surrounded with amphitheatres of hills, the very counterpart of atolls now formed and forming in the Red Sea, the Indian Ocean, and the Pacific: chains of hills nearly 2000 feet in height and hundreds of miles in length, consisting almost wholly, (from the base to the summit), of calcareous matter, beds of coral, of shell fish, 8c., all united in the general mass, strata with strata. Many of these chains of hills are wholly calcareous, and consist of corals and other lime-secretive species: they are nearly uniform, rising 200 or 200 feet in height, above extensive plains of sand, gravel and marl, the amphitheatres having seldom more than 1 or 2 openings leading into the valley, which is of an almost level surface. The plains are generally low, within a few feet of the oceans; the plains; although there are often several openings ranged at different heights: the surface of the valley is in fact at all times indistinct with the soil of the plains now disposed within the Red Sea, being a greyish marl, (which Darwin very unphilosophically terms mud,) combining with vast quantities of shells and other marine exuviae, and some of the valleys have been explored to the depth of more than 150 feet, without meeting with any other material. Again, we have islands and landa formed of peculiar species of shell fish and polyplifers, clumps of tufa, upwards of 30 feet high and of great width, solid masses of rock formed almost wholly of serpahill, hills of mammillae bounding the Nile, and vast mounds of sea-weed blended with salt and calcareous matter. If, therefore, the reef, the islet, and the atoll sink as they are built up, why have all these vast tracks been elevated? and why are the many thousands islets and reefs within the Red Sea continually nearing the surface and rising above it? Many of the mountains forming the African chain are also of vast height, and wholly of calcareous formation: none of them present a growth of one continuous family throughout the whole extent, but all demonstrate the vast depth of the calcareous or solid limestone formations: between these mountains and the sea the plains have been filled up and formed, or these plains have been removed by the sea, the plains demonstrate their organic origin and end in a fringing reef, which in some places is wholly removed from the action of the sea, in others, is still laved by the waters, and contains many singular grottos of dead coral, rising from 15 to 30 feet from the beach: the beach is of fine shell sand, and gradually shelves into the waters.

If, as Mr. Darwin would lead his reader to infer, the reef gradually sinks as it is built up, there is nothing to prevent its being uniform to the depth of many thousand feet, but the revealed reefs of chalk, limestone, and coral formations of terrestrial earth tell a widely different tale, for even the most solid limestone rock is formed, not of one but, of numerous species, of numerous families, of countless individuals, and of the atomic particles of these species, and the unions of these species, and of these individuals, so that their bases have formerly been washed by the sea, the plains demonstrate their organic origin and end in a fringing reef, which in some places is wholly removed from the action of the sea, in others, is still laved by the waters, and contains many singular grottos of dead coral, rising from 15 to 30 feet from the beach: the beach is of fine shell sand, and gradually shelves into the waters.
analogous to those of terrestrial earth, that they form hill and mountain chains and clumps, and consequently valleys and extensive plains: there is no reason required why their summits do not appear above the waters, the sandbanks and the hidden rock are quite sufficient proof that they are there. The fishes of the Mediterranean tell us that coral is found, even in these latter, and at a depth of 500 feet below the surface of the water, which is a proof of the existence, propagation and increase, and is here manifest, how much deeper have we a right to expect it in tropical seas. Were the great barrier reefs and atolls uniform in their growth and material, from their bases to the surface of the waters, and was this sinking strikingly manifest in all coral reefs, then might we embrace Mr. Darwin's hypothesis; but when we find the whole earth in succession intersected by the face of the waters, and through the depth of 1000 feet, with little or no change in its position, we do not find it consistent with his hypothesis. The formation of great barriers in the course of 20 months, with a layer of coral two feet in thickness, which is required great force to remove: also, the incrustation of anchors and other substances exposed for a short time in deep waters, are further confirmation of the rapid growth of coral under favourable circumstances.

The experiment of Dr. Allen of Fortaleza, as related by Darwin, who, having 20 species of living coral of 10 lb. weight each, found that after seven months they became ineradicably fixed, and many feet in length, stretching in the direction of the parent reef, is a demonstrable proof of the rapid growth of many species of reef coral; again, the relation of Leit. Welsted, in which the height of the coral reefs was found to have increased, in the course of 20 months, with a layer of coral two feet in thickness, which is required great force to remove: also, the incrustation of anchors and other substances exposed for a short time in deep waters, are further confirmation of the rapid growth of coral under favourable circumstances.

Captain Moreby speaks of knolls, in the Malabar amphitheatre, of not reaching the hollow coral basin, resulting from accumulation of branching madrepore of one particular family, growing up like a huge pillar, with branches radiating from every side, and festooning from the summit, knoll with knoll, until they fairly entwine with each other; the general structure has been formed by the successive growth and death of individuals, or from the base of the trunk and lower branches, madrepore or millet珊瑚 of acting consolidated. It is not from the branches being broken off that the reefs receive increase, but principally, from the general struggle for existence of species with species; thus, if the red coral attain the height of three feet in 10 or 15 years, other species springing up immediately around its base, enclose within its stony folds, and they, in turn, become barred beneath rising generations: thus the multiform in the Pacific environed upon the pedes and madrepore compliancy, and the latter upon the strongly branched madrepore. Matilda atoll, described by the crew of a wrecked whaling vessel as "a reef of rocks," was, when Captain Beechey visited it 34 years afterwards, a lagoon island fourteen miles in length, and having one of its sides covered with high trees; and although, from disturbing causes, some of the islets and islands of the Red Sea do not exhibit a vast range of species of corals, the species on the western coast of the East Indies are probably more remarkable instances of addition to the main land, and to islands which they resort to for the purpose of fishing for pearl, and tortoise-shell.

As the tidal action gives the direction to the outside of the barrier, so does it very often, by being introduced therein, give form to the interior of the same. Thus, in the case of reefs and coral, the current is preserved by those islands, which, from the upwards of 1000 feet high and many yards in diameter, are detached from the barrier, and preserved from filling up by the tides, and by constant depositions, which prove fatal to the polypifers, and prevent their extending over the barrier. It is well known that almost all the large lagoons communicate with the ocean by one or more openings, and by these passages the waters bring in quantities of sand and marl, which constitute in varying proportions the bottom of these lagoons; but if the encircling reef prevent the intrusion of these matters, the lagoon is soon filled up with living coral and shell fish. The larger atolls, as they are termed, are, more properly speaking, vast amphitheatres, sometimes formed of barrier coral, at other times of sand banks, calcareous matter, and dead coral or limestone rock; the interior being very rugged and unequal, numerous islets appearing above or beneath the surface, sometimes united at their base, forming groups and chains of hills, at other times running up into the interior as detached islets, sometimes rising above the surface of the ocean, and sometimes, or from clumps of rocks, or sand, depend upon the chance of circumstances more than upon design. Many of the lagoons open down into the valleys of the deep, others are formed from the multiplied depredations of coral fish, adapted by the thick scaly coats. to glide through the coral branches with impunity, like the more delicate corals living within the encircling reefs, or rising upon the latter, and thus regarding their growths, permitting only the more hairy and quicker growing madrepores to build up their peculiar edifices until they reach the surface of the waters.

Mr. Darwin speaks of the limited depth at which reef building polypifers can flourish, at the same time he quotes Captain Beechey, who informs us that off Keeling atoll all the soundings, even the deepest, were on coral, and that the depth of the coral reef was 100 fathom, or 1000 feet. The present account is quite sufficient to prove the power to vary the laws of light and heat, which regulate their existence, composition, and character, they must exist in much greater depths than in the Mediterranean, Egean or Adriatic seas. Most of the atolls in the low Archipelago are of an elongated form; thus, Bow Island, which is 30 miles broad, is not more than 5 miles wide; numerous other islets and atolls bear the like proportions.
Admitting then, that in by far the greater number of cases an atoll consists of a simple elongated ring, we are still as far as ever from embracing the idea of these atolls being formed on the summits of volcanos, as is presumed by Mr. Lyell; that they cap submarine mountains is very evident, that vast numbers have one general base is equally evident, thus in Marshall group many atolls are united together by links of land. The Red Sea, however, is the only one united in groups or in a linear direction, the barrier reef polypiers being pre-eminently the architects of the atolls and the circular reefs, formed in entirely by the one particular family. Upon examining the early development of some of these encircling and barrier reefs, we find that the polypiers fix themselves almost indifferently to the level and to the slope, always affecting growth perpendicular to it, and that the position; this circumstance must have some tendency in its extension; thus, for instance, if it take root on the side of the sand bank, it fixes that portion of the sand to which it is attached, and in growth takes the form of the upper portion of the bank, fringing it more or less all round: advancing thus, and radiating towards the surface of the waters, and outwards it continues to advance while, the interior or apex of the sandbank experiences in many instances little or no alteration, the tide passing through it with inconsiderable difficulty, thus, the part of one hollow in the reef or in the basin is proved by the nature of the material which forms the bottom of the basin, which is ocean marl, sand, or such matters as are cast by the waters upon the reef. On the other hand many of the islets and atolls covering vast areas spring up as table land, within an equal surface which has no lagoons, and others entirely if islets of islands in the sea itself have the same appearance.

Wherever soundings were obtained off Egmont Island and the neighbouring atolls, the bottom is found to be invariably sandy, and the currents run with great force around them; this alone is sufficient to account for the precipitous appearance of these formations, for, in the live or moving sands, it is impossible for the polypiers to extend their edifice over the area thus disturbed, and consequently the formation is seen to proceed upward.

Again, there are other causes which tend to give form to the reef, thus the polypiers spread over the submarine plain, covering a large area; they build upwards and attain a considerable height, when a sudden evolution of sands or calcareous matters partially or wholly destroys them; if partially destroyed, the disturbing causes having ceased, they again spring forth in detached groups upon the parent base, forming fields of lesser extent, and continuing to increase the surface of the lands and these minute hills, in like effect; thus the building arises from vast depths by a succession of steps.

Wherever sand can accumulate upon a bed of coral, then the polypiers are necessarily subject to partial or entire destruction. That the tidal currents have much influence in forming the reefs, is manifest by its form and growth; within tranquil waters the reefs have a gentle relaxation from summit to base, the natural consequence of uninterrupted and expanding growth, and in a chain of reefs they may be often seen overarching until their upper parts meet, vast causeways or arches are formed, which, if not filled up with deposits from the waters, may continue thus, age upon age; for sooner is light and heat excluded than the polypiers cease to perform its functions. It appears evident that the law of forces is the law of growth of coral, that the polypier taking root within a quiet area, will enlarge its parts on every side; until it is at last reduced to a small pebble or an architrave; but when in its extent, or in its depth, it the extent of the architrave, over a given space of a reef, then without consideration of the depth the polypiers cease to build, so long; as the disturbance continues; it is indeed an admitted fact, that the greater part of the bottom of most large reefs is formed of sediment, varying in its nature, but having the one effect the destruction of the polypiers of the reef.

Mr. Darwin says the islets placed to leeward are liable to be occasionally swept away entirely by gales, equaling hurricanes in violence, and therefore their absence is a comparatively unimportant fact: it is true that the action of the waves does often wash away so much of new islets as appears above the surface, but beyond this the most tempestuous seas have no influence, or only a very slight one, in the formation of the atolls, as is well understood, they would still present themselves to the view as submerged reefs, but in reality the polypiers do not extend themselves in the disturbed line, or if they do, they are very small compared with those to windward. The circumstance of there being no living coral on some submerged reef, is anything but proof that those reefs were once elevated above the surface of the water, but is rather demonstrative of the destroying effect of sands when thrown by occasional disturbances upon the living barriers, for where ever these depositions lie, there the polypiers cease to build, until new gene-

rations spring from the sandy base, having no relationship in many instances to those who have gone before them; however thin the coating of sand may be, a sufficient cause exists as in the case of the Great Chagos Bank, Spencers Bank and numerous others, for the appearance of dead rock in quantities more or less.

Thus, the formation as well as accidental disturbances has much to do with the form of reefs, is manifest in the numerous openings of reefs, and in their geographical distribution; the fringing reefs encirching the Mauritius have a straight passage open in front of every river and streamlet running into the ocean, and at Great Port there is a channel like that within the barrier reef extending parallel to the shore, each end being entered by a river, the two straight channels running towards the east. The Australian barrier reef, extending nearly 1000 miles, bending to the sinuosities of the coast, would appear to have its basin on a submarine mountain range on either side; its boundary of growth from the bottom appears to be defined by sands; it has few openings sufficiently large for vessels to pass through, and from its general disposition it has the appearance of being one vast submarine mountain chain varying in its composition beneath but capped throughout with coral reefs the polypies become stunted in their breadth in consequence of tidal action and shifting sand, throughout this vast range there is no evidence of extensive dislocation such as might be expected had it been elevated by volcanic action, but its sinuosities and general character give it a striking similitude to many of the calcareous formations on the main land, all of which bear evidence of their elevation above the present sea; tidal action is as manifest the fringing reefs in Eastern Africa, and in fact all other places where those formations abound.

The coral formation appearing above the waters is violently attacked by the element which gave it birth, and before the repeated attacks of tempests it falls piece meal, and the upper portion being washed away, it once more becomes a sunken reef, and the polypiers may be once more observed busily building up the edifice; again, from the effects of currents, many islets are washed away as is recorded of the Maldives, and as we have repeatedly observed in the Red Sea: but this destruction is far from being general, for the increase of coral reefs, coral banks, and calcareous beds, in adding to the earth, is infinitely beyond the decrease occasioned by the destroying powers of flood or fire, and every island and every barrier reef standing above the waters, from its unbroken appearance, and the simplicity of its material demonstrates the vast increase the earth constantly receives principally from the coral and other similar agencies of fire.

Of the largest lakes disposed within coral groups, such as the Atoll Ndavid, which is 4 miles in length, and 3$\frac{1}{2}$ in breadth, and encloses a great expanse of water from 250 to 300 feet deep, other and more extensive views may be taken of their mode of formation such as the peculiar form of their submarine bases, the effects of the currents, and of depositions, and when above the surface, the effects of storms. It is observed as a peculiarity and exception to the general rule, that many of them have a greater number of openings on the leeward than on the windward side, thus on the near sides of Ari, and the two Nilandoo atolls which face S. Male, Phaleedoo and Mollage Atoll, there are 75 deep water channels, and only 25 on their outer sides, this difference is attributable to the action taking place while the reef was far beneath the surface of the waters, the more numerous lodgments of sands, many of which were subsequently being deposited on the extreme edge of the reef in the tidal line, which occasioned more numerous separations or openings on the less exposed side of the reef.

From whence then, are derived the vast quantities of calcareous lime requisite to supply the building of these enormous formations, constituting mountain groups and chains, and filling the ocean valleys and the valleys of all seas, with calcareous beds many hundred feet in thickness, and many thousand miles in area constituting also, so great a portion of the surface of terrestrial earth? Dr. Buckland says "It is difficult to account for the source of the enormous masses of carbonate of lime that compose nearly one eighth part of the superficial crust of the globe; but until it can be shown that these animals have the power of forming lime from the elements, we must suppose that they have been derived from the sea, either directly or through the medium of its plants;—this is a very unphilosophical way of disposing of the question, for, admitting that it cannot be proved that the lime is elaborated within the living body, we can still demonstrate that it cannot be derived from springs or through the medium of plants; the quantity of lime held in suspension by the ocean waters is very trifling, and as nothing compared to the chlorides of sodium and magnesium—and to furnish these three earths in the quantities required, as will be shown in the next chapter. As far as the limestones derived from springs, what an enormous supply would be required to fill up the bed of the Mediterranean alone, which, according to Donati, is 900 feet in thickness in calcareous matters; again, fuel are not to be found in the lowest depths; they follow animal species in the order of development, and abound principally in those regions where coral formations are wholly unknown: they do not secrete lime, although in the shallow seas they are abundant and the whole is material by polypterus.
and, on the other hand, the vast quantity of chloride of sodium, increasing warm and tranquil seas. Where the coral reefs are most abundant, naturally gives rise to another question: whether, elaborated within the living system, the soda is not converted into chlorine; it is true that chemistry sheds no light upon the subject, the earths being classed as uncombed bodies widely apart in their nature, from each other; but observation and experiment informs us that the earth undergoes many modifications, and, as instanced in metals, permanent changes: but, admitting a negative to this supposition, we have still to look for its local constituents in the living body. Mr. Lyell supposes that it is supplied by thermal springs, but if so, why are the lower regions wholly destitute of lime-secreting species? by warm they are produced, and, deprivation of the requisite degree of heat: but, in most of the species produced again, the genera and species multiply rapidly in the shallows, and the quantities of calcarious matter increase faster and more extensively than in the deeper waters; numerous species of the more delicate corals existing only where the reflecting and radiating heat is greatest: again, in the vast shallows, whose valleys are covered with sand or ocean marl, the increase of calcarious matter is still more rapid and extensive.

To those who ask the question—" Where comes cement? "—I would say—

—where comes the perhaps, equally enormous quantities of animal oils—gelatine, albumen, and other compounds, manifest in organic forms, being in quantities common to the animal and vegetable frame-work, each of which in aggregate, we have from mountains and probably every mountain-chain—come the mineral oils and bitumens of Aby, Persia, America, and England? Where, but from the chemical and mechanical operation of life; as is testified by the vast fossil formations of the earth, and by the changes that are continually taking place before our eyes. In the fossil we identify the once living body, its peculiar species, and, consequently, its peculiar habit and character; we observe that its exs is remodeled in combination only, but its general mechanical structures become complicated, and, among others, earth is converted into coal and the animal blending therewith is also converted into coal: again, the fossil is assailed as flint, in like manner as the madre, porce and millipores consolidate and become converted into stone. The analytical chemist, to whom all men are indebted for many of the most important discoveries, explanatory of the nature and properties of bodies, and of their elementary constituents, tells us that, however numerous the phenomena of natural bodies, however complicated their organic or inorganic structure, however dense or subtle their material; all of them are resolvable into the four known compounds—hydrogen, oxygen, nitrogen, and carbon and all of them are mechanical mixtures of these four Elements. Why, then, should it be made a matter of surprise, that the living principle, which is universally present and directs these numerous combinations, should be the primary cause of elaborating calcium within the living system. Animals of even the lowest organization, elaborate ammonium, which is the distinguishable characteristic of animal life; animals elaborate albumen, gelatine, and carbon; and vegetables absorb the latter, giving it form and consolidation, and transmitting it in this state to the fossil and mineral kingdom, the one and the other of the under foundation; these are mechanical mixtures in nature, the great characteristic of primary elements, or of these united with secondary qualities. Admitted that many terrestrial animals abstract the portion of time they contain from the earth, still this is manifest proof that such is the general law of nature; the complex organization of the higher orders of animals is produced by abstraction of some compounds from other bodies and by the consequence, when these mineral and chemical mixtures of other abstracted compounds within the living system: thus life, red blood, fibrin, and other familiar products are generated.

PROPOSED DOCKS ON THE CHEMISE SIDE OF THE MERRY.—The leading topic of conversation in Liverpool has been the awed project of the commissioners of Birkenhead to construct a dock on the Cheimsie side of the River. It seems that the intonation is not a new one, but has been cherished a considerable time, and the parties only waited until the corporation of Liverpool had disposed of their land there, or a portion of it, for other purposes, previous to announcing it to the world. The consent of the Admiralty has been obtained for enclosing the whole of Wallasey Pool, from the bottom of this and all other parts, and at an estimated cost of less than 200,000l. It was intended to base gates, a tidal basin of 30 acres, 12 feet of water at all times of tide, for vessels to float in, and dock space to the extent of 120 acres also an additional tunnel under the township, to connect the tunnel extending from the station of the Birkenhead and Chester Railway, at Grange-lane, to the Monk's Ferry, with the dock. The cost of the work was estimated at near 300,000l. All the pecuniary advantages derived from the dock are to be appropriated to the measure itself, and if ever, from the sale of part of the land, or otherwise, any other revenue should arise, it is to go in the reduction, thus that the dock is on the cost of the whole, until finally the dock should be open to the whole world free of charge. Plans had been prepared, sections taken, bearings made, levels obtained, notices ready, and everyting in a state of forwarndess.

WESTMINSTER-BRIDGE.—Since the carriage-way of this bridge was closed for repairs last week, the extraordinary rapidity with which the work proceeded, the masons going to their work daily in loose sand and rubble walls which loaded the east pier of the centre arch unnecessarily, and are preparing to substitute brick arches, &c., for this, as described in Mr. Walker’s letter to us, and as was done to the sunken pier on the Middlesex side. Mr. Nixon, the superintendant of the works, informs us that a very large number of men were employed on the masonry of this pier, and by the proposed lowering of the roadway, will not be less than 1,700 tons, and that since this lightening began there has not been the smallest movement in any part; whether, however, this will continue so, time only can prove. Messrs. Walker and Bureges have thought it prudent to take the opinion of two other eminent engineers, Messrs. Cubitt and Remoul: we understand their opinion also to be, that the sinking of the piers of the bridge is caused by the great load upon the clay foundation, their being no piles under this bridge, and the ground on the Surrey side being of a loose nature. Supposing this to be correct, to lessen the load appears the direct remedy. The necessary of three of the arches being laid bare gives an opportunity for taking out any sunken stones, and stopping the cracks from the upper side, and is now in progress. Many of our readers may not be aware, that when Westminster bridge was designed, the engineers thought it possible that the thickness of the pier was enlarged for carrying stone arches without adding to the foundation. Hence perhaps their general weakness. It appears from the plans, which we have seen, that there is a thickness varying from 2 feet to 7 feet, of sand and gravel between the bottom of the caissons and the clay — Times.

THE NEW AMERICAN STEAMER "PRINCETON," AND THE "GREAT WESTERN."—It appears that Brother Johnathan is in ecstacies, because he has produced a rival vessel to the Great Western, and beaten her in a trial, when the latter vessel was leaving New York at her last trip to England. The only information we can collect is from the newspapers, the first announcement appearing in the Times:—

A trial of speed between the Great Western and the American steamer of war Princeton is very minutely described in the United States papers. The result was a decided victory by the Princeton, though it is said the Great Western sailed faster than on any former occasion. The American, as might be supposed, have not lost so excellent an opportunity of displaying their talent for boasting, and speak of the victory in much the same terms as would have been used if they had conquered an important province. The Times of Captain Hodge of the Princeton, and under whose immediate direction the ship and machinery were constructed, appears in the official paper, the Madisonian. Our friends across the Atlantic have forgotten to tell us that it was a Britisher who designed her engines and the propeller, both being the invention of Captain Hodge, whose name is associated with the respectable firm of Messrs. Bruithwaite and Co. of London, and patented by him in this country: the engines are of the vibratory principle (not oscillating). The following particulars we extract from a Liverpool paper:—

The Princeton is propelled by the Ericson propeller—her tonnage is about 600, and the engines equal to the power of 220 horses: the latter is a member of the augie propeller, which works at midway, 14 feet. The rudder is hinged on a metal rudder-post, resting to a prolongation of the keel under and beyond the propeller, and, of course, beyond the hull of the vessel. Above the prop of the vessel is the rudder, which is fixed in the hull of the vessel. At the rudder comes up. The Great Western is double the tonnage of the Princeton, and her engines are equal to the power of 420 horses. She draws four feet less water than the Princeton. The Princeton has a propeller, which is evidently the work of the propeller, and the necessity of its being submerged. The propeller makes 35 revolutions in the minute: the Great Western's wheels at the utmost 15. The propeller makes these revolutions compared to the rate of rotation of the Great Western. The latter was going at the rate of 91 knots an hour, conveying apparently an idea that she was not going at her usual speed, whereas we have the testimony of B. F. Ogden, Esq., of this town (Liverpool), an authority of invaluable antiquity and ability, and who has gone on board the Great Western took the distance as 18 miles, while that taken by the Princeton was 21, the former performing the 18 miles in 1 hour, 28m., and the latter 21 miles, in 1 hour and 40 minutes. This would indicate an adverse current. This, therefore, would give the Great Western twelve miles an hour, and the Princeton fourteen, the difference being two miles an hour, instead of three quarters of a mile.
CONDUCT OF EUROPEAN NATIONS TO THEIR MEN OF SCIENCE.

Project for an European Temple of Science.

Shortly before the present Prime Minister of England assumed the reins of Government, he delivered an address at Tamworth, highly eulogistic of the various "Mechanic" and other institutions for improving the working classes, which attracted much attention at the time it was published, and on the exaltation of its author to power, it was naturally expected that the opinions of the Premier would take some practical shape. Such, however, has not yet been the case. Nevertheless, when it is considered what vast commercial and other measures have occupied the attention of Government,—what difficulties Sir Robert Peel has had to grapple with in China, in India, in Scotland, in Ireland, & in Wales,—what a variety of complicated and conflicting interests he has had to encounter, or to conciliate, it will argue no want of zeal in the cause of science and public improvement because he has not hitherto taken up the subject. Moreover, it is but seldom that governments do take up matters that are not forced upon their notice from without. Men of science must begin the work themselves, which if they do with energy and unanimity, we are persuaded they will have no unkindly listener in Sir Robert Peel.

The Premier has expressed in terms his delight with, and his desire to support, institutions for the promotion of Science. Let it be our task to point out to this great statesman and to the world, what serious advantage the benefit society might derive from its measures—what it is that would foster and furnish an impetus to the progress of valuable invention and popular improvement, beyond anything ever yet established or proposed. In a word, let us put Sir Robert Peel in the best practical way of carrying out his own professed opinions.

In 1843, Mr. Rothschild called England “The workshop of the World.” Now to the extent that England has deserved this compliment she has been mainly indebted to her coal, her iron, her capital and the productivity of her workmen, and most of all to the inventions and improvements of our men of science. Without such men as Arkwright, James Watt, Richard Trevithick, Henry Bell, Dr. Cartwright, Charles Tennant, and a few others what would her manufactures or her commerce have been? The first multiplied to an immeasurable extent the products of the cotton factories; the second formed that grandest of all modern discoveries, the improvement of the steam engine; the third (his apprentice) successfully applied the great motive power of steam to navigation. Without these three men and their inventions, without the Steam Engine, without the spinning jenny, without the steam ship, where would have been our supremacy in manufactures, in commerce, or navigation? To those three men we owe more of our national wealth, and our national renown, than to all other men and to all other circumstances that shine in the pages of our history. Yet how was one of those three men rewarded, and what inducement is there for others to “go and do likewise”?

Henry Bell was one of a select committee of the House of Commons appointed to take evidence upon steam navigation to have been the first successfully to apply steam to navigation. He had conquered vast obstacles by vast perseverance. He proposed his plan of applying steam to navigation upon a large scale to the Lords of the Admiralty. It was with great difficulty their Lordships could be induced to listen to the proposition, and when they did so, they laughed at it. With the exception of a Scotch member of the board, who from a kindred nationality took a slight interest in the success of his countryman, there was an unanimous feeling that steam could not be applied successfully to navigation. The author of the project, nothing daunted, thought otherwise and went upon his own resources. And most beneficially, what it is that made the money, the “Comet” was built and sent through the Clyde to the lochs, and the mountains of the highlands. The simple inhabitants were amazed, but not so men of science and capital. Henry Bell had not taken out a patent. He had discovered and invented, but he had no right to the funds, or the discovery and invention. What was the result? Companies were formed to put his plan in practice and carry out navigation. Those companies had capital which he had not. They competed with his boat and defeated it, simply by making their boats more elegant and convenient, and what cared the traveler for the claims of the first inventor? Henry Bell had built carriages in which others also put their money.

While the struggle was going on, Henry Bell, in his arduous for improvement, occasioned a boiler to burst, which made him a cripple for life. Nevertheless, he invented a plan for deepening the Clyde, and the magistrates of Glasgow awarded him £50 per annum for life, for the valuable improvement to the navigation of their city. Fifty pounds per annum, however, did little for a man who dedicated yearly year by year a much larger amount to the promotion of his grand plan of steam navigation. He saw it succeed, but from it derived no benefit. After 8 years he found himself occupying the humble abode of the Back Alley Baths, involved in debt, with a prison or a workhouse in prospect. Yes, he, the conqueror of the winds and the tides, the creator of the wealth of millions, the greatest benefactor to commerce that ever lived in this kingdom—he, aged, crippled, and destitute, applied to the British Government for relief, and his memorial was signed by 15 members of Parliament, provosts, and chief magistrates of maritime districts. The late Right Honorable George Canning was then the Prime Minister, but that distinguished statesman had not made a Tamworth speech in favour of science. Henry Bell danced attendance upon him for three months; he occupied apartments at No. 22, Dawning Street. Poor man, his hopes were feal but to be blasted—till a proposal was made. He was too indur for a country Pest Office, and that he could not be placed on the Scotch Pension list, seeing, no doubt, that his services were not of that “parliamentary” nature which were generally so rewarded. He went home and died of a broken heart.

Another striking case is that of Richard Trevithick—a man of transcendent talents, gorgeous conceptions, and gigantic energies. Originally a miner in Cornwall, he invented, or was the first to carry into practical operation, the high pressure engine, was exalted to the rank of a Marquis and Grandee of Spain—almost worshipped as a demigod in the Indies; his inventions animating space in the old world, controlling the current of the great Mississippi, and displaying the mountain riches of the Cordilleras in the new, he returned to his own country to find a place to seek for sympathy where there was nothing but apathy—possessed of princely property which he could not make available; his countrymen wondering and admiring, but none aiding or assisting—and returning many thousands of miles, “far away from children, wife, and sacred home,” to perish poor, unfriended, comparatively unknown.

Now had an European Temple for Science, existed, could it be believed that such men as Richard Trevithick and Henry Bell would have been permitted to pins and linger out their latter days in helpless indigence? Is it right?—is it wise?—is it politic, that the great creators of national wealth should be so treated? All the common and ordinary trades and avocations of life have their asylums and institutions—why not science? Those who till lately were deemed “vagabonds” by the law, the actors of our theatres, have, nevertheless, “funds” patronized by princes and supported by millionaires—none for science! The very chimney-sweepers are not allowed to be swept from the earth by the beams of destruction, without a society to aid and protect—none for science, Sir Robert Peel—"None for Science!"

Well, indeed, has it been said by a great poet—

"In the land of the North there are insects that prey
On the brain of the elk till its very last sign;"
Oh Genies, thy patron, more cruel than they,
First feed on thy brains and then leave thee to die!"

* See Civil Engineer, vol. 11, page 93, for a lengthened and interesting memoir of Trevithick.

(To be continued.)

BRIDGE OF NOTRE DAME, PARIS.—At the Academie des Sciences a communication was read from M. Fourneyron explaining the application of floodgates to one of the bridges of Paris. A committee of the municipal council of Paris, of which M. Arago was president, was formed some time since for discussing the practicability of closing the arches of the Pont Neuf, or the bridge of Notre Dame, with gates, by which the current of the river could be regulated at will, and which, by raising the level at a certain port, would give a fall of sufficient force to work powerful turbines for the supply of water to all parts of Paris. In 1811 M. Fourneyron submitted a plan of gates of such construction that they could be worked with ease by one man; but as it was impossible to pronounce fairly on the merits of his invention without absolute experiments, the Academy and the committee of the city of Paris resolved to suspend the expression of opinion until experiments could be tried. M. Fourneyron now announces that for more than two months past one of his gates has been in use at Genoa, and that it has proved successful.
NEE ESTUARY EMBANKMENT.

This undertaking was designed for enclosing from the sea a tract of most valuable land, about 4,000 acres, which, when enclosed, be principally the agricultural interests of the town of Nene Outfall, under whose auspices the works are being carried into effect, and in which they are assisted by the professional services of that eminent engineer, Sir John Rennie. The embankment is nearly three miles and a half in length, and for some distance averages 28 feet in height, and at some parts of the line of works there is a depth of high tide of 14 feet. The whole embankment, or in other words, the whole length, is already completed, and from this portion of the work, as a specimen, it is allowed by experienced persons that it will be one of the best examples of a sea-wall to be found in England. The land, it is estimated, will vary in value from 50l. to 500l. per acre, and as a main object of the work, will be a fine site for a model farm of one of the agricultural societies of England. The works are rapidly progressing under the superintendence of Mr. H. H. Fulton, resident engineer, and the contract, we understand, was taken in August, 1842, by Mr. H. Sharp, for 80,000l. The Nene Outfall Commission, composed as it is of some of the most public spirited men of the day, headed by Mr. Tycho Wing, as chairman, has already effected great improvement in the condition of part of the fens of Cambridgeshire and Lincolnshire, by procuring a natural drainage for the lands in lieu of the inefficient and expensive system of drainage by windmills and other mechanical means, at the same time improving the navigation of the river Nene from the sea to Wisbech, to such an extent that formerly Humber keels of 50 tons could not reach that port. Now vessels of 400 or 500 tons can, without the assistance of a pilot, owing to the straightness of the channel, get up to Wisbech without the slightest difficulty. This navigation, as an artificial tidal channel, is said to be the finest of that description in the country. It was designed and executed under the direction of the late Mr. Thomas Telford and the present Sir John Rennie, and so important has been the result of these works that the trade of the port of Wisbech has been trebled during the last ten years. In the course of last year it amounted to 149,000 tons of shipping, though the shipping trade was in a worse state in 1842, than it has been in for many years past.

CONCRETE FOR WALLS.

Sir,—I have lately observed in your Journal several communications from correspondents on the subject of Concrete for Walls. They all refer to what has been done in France, as specimens of that kind of building, without, I presume, being aware that our own country can afford many examples of buildings, the walls of which are of a very similar construction. Most of the roads in Dorsetshire are formed of chalk and flints; the earth of the roads the people collect, leave in a heap to dry, and when about to use it, they temper it with water. Their walls are formed in a wooden frame, forming about a foot in height at a time, rather thicker in proportion than would be necessary for a brick wall. I entered several farm-houses, the walls of which were entirely composed of this material, and seemed to stand as well as brick. Perhaps among your numerous correspondents there may be some found able and willing to afford you full particulars relative to the method employed, cost, &c., that is if you should consider the subject of sufficient interest for your Journal.

I am, Sir,

Yours very truly,

T. WYTH.

35, New Street.

Nov. 10, 1843.

ON STOVES.

Sir,—A letter appears in your last Journal, on warming and ventilation, signed W. G., evidently written by one understanding the subject. The pith of his long letter is contained in his four last lines, where he says:—"It is evident that an ordinary fire fulfils all the principal objects of warming and ventilation, better than any of the unnatural means which science, ingenuity, necessity, or desire of novelty, has yet given birth to." As a stove manufacturer, I have watched the various fallacious modes of warming houses without entering into the use of them, the result of my observation goes to confirm the four lines quoted. The first introduced was that of Sir John Rennie, to suit every description of rooms, for certain places, and with proper care and attention, this is the best of all the new stoves, but for use in a room inhabited by human beings, nothing can be worse. Ill health and disease attend them; these remarks are not made through prejudice, as I have had one in use 5 years, and find it superior to any other stoves, most economical in expense, and no trouble to attend; but it is put in a warehouse, with an abundant supply of fresh air. The various stoves, Vesta, Chunk, &c., or by whatever name they are palmed on the public, are all founded on the Arnott Stove, and are non ventilators, as all are modes of warming by hot air or hot water.

Sir,—I am now only requisite to obtain the support of a Doctor of something, when the French introduced that of a Chemist, so worded as to say nothing, and the more noxious the vapour, the more anxious are the public to inhale it; it was stated, in 1840, that an open fire stove, with appendages, was to be placed in the British Museum, to show future generations the mode of warming made use of by the English in the present age. Will not the years 1842 to 1843, be deposited there? They would not do much credit to the English sense of John Bull. Excuse these remarks, they are from your constant reader, and one who combines Ventilation with Warming.

Sir.—Many of the fires that took place in and about London last winter, and a few this winter, have been attributed to the defective or want of warming the walls from whatever appendages may be used; this is a stigma on the stovemakers of London, which in justice to them should be removed; the fact is simply this, the most important part of a stovemaker's business, is entrusted to persons totally unacquainted with it. A gentleman wants his hall warmed, a tradesman his shop, or a churchwarden the church; he does not say that he will be satisfied with any workman who will warm his house for him, and without any regard to the consumption of fuel, or which man best understands his business, but who will do cheapest. He therefore purchases the thing most pulled by the quacks, and sets a bricklayer to put it in its place. He is ignorant alike of the maker's intentions, and how to fix it; the next week the place is burst through the ground, it is laid to the stove, the man who will lay it to the bricklayer, so no one being the blame, it falls where it should fall, on the purchaser. I was once called into a case of the kind, where a hot air stove was fixed in a drying room, heated to a very great degree, and standing on a wood floor; the regret was not that the house was burnt down, but that it fell on the Fire Office to make good the loss; about eight years since, I was applied to for a design and estimate for warming a church in the city, I gave both, but they were returned to me as much too high; the parties purchased two things, I believe, called Scott's, (or some such name,) after using them five or six years, they paid me my price for fixing a stove in the church—sent their two things to the furnace, and now they have a third, and the one was burnt through the ground, it is laid to the stove, the man who will lay it to the bricklayer, so no one being the blame, it falls where it should fall, on the purchaser.

Yours truly,

A. SMITH.

PRIORY CHURCH OF ST. BARTHOLOMEW, SMITHFIELD.

Sir,—From the circumstance of an interesting article appearing in your last number, on the Priory Church of St. Bartholomew the Great, West Smithfield, I take the opportunity of directing further attention to that interesting structure.

The writer of the article referred to, suggests various Restorations which every architect must rejoice to see carried into effect; but it is chimerical to suppose that the expense which would have to be incurred thereby, could be defrayed by the parishioners. The funds absolutely required from time to time, for maintaining the fabric in a state of ordinary repair, are raised with considerable difficulty; and the few restorations which have been made, consisting of partially re-opening the Triforium, and Prior Bolton's window, were accomplished by means of a private subscription. To restore the choir to its former extent and in its original style, would, I consider, require an outlay of nearly two thousand pounds, to say nothing of the expense attendant on the alterations which such a restoration would necessarily involve, viz., the removal of the parochial schools, which are placed over the north aisle, and of an erection (used as a manufactury) situate over the east aisle.

Under these peculiar circumstances, it is useless to hope that any important steps towards a perfect restoration can be taken, unless a general interest in the subject be first excited; and although it would undoubtedly be a great boon co ferret on Art, were this valuable relic of Anglo Norman Architecture restored to its primitive grandeur, I fear it is by the public only, that so desirable an object can be carried into effect.

Yours obediently,

John BLYTH.

113, Aldersgate Street, City, November, 1843.
THE WEIR ACROSS THE SHANNON.

Sir—If your correspondent who furnished the article on the great Weir across the Shannon, in the October number of your Journal, would favour the public with a few more particulars of that work, I think it would be highly interesting to your readers, especially as he appears to make an assertion which in its present form I cannot admit to be true, viz., "that a bar or weir may be constructed across a river in such a manner as to give an increased discharge." At the same time I am aware that the channel of a river may be widened or deepened, so that, notwithstanding the impediment of a weir (of certain dimensions) an increased discharge may be obtained.

Supposing the Shannon at Killaloe to be in its former condition and flooded to the level of nine feet above the present level of the weir, I apprehend your correspondent does not mean to say that simply placing the impediment of a weir in a certain position would at once reduce the level of the water six feet. Under such circumstances there would not be any perpendicular fall over the weir, merely a slight rapid, the stream preserving its former direction, which being the case, the cross section must be taken in all places at right angles to the stream, to give the true sectional area of the river, which area would of course be reduced by the weir. If the weir were placed at right angles for the stream, as the river widened till the sectional area of the water passing over the weir was equal to the area of the river above, or if the weir were placed, as shown in the plan accompanying the communication, and the channel below deepened, so as to give a perpendicular fall over the weir, (in which case the area of discharge must be taken in the line of the weir,) then the advantages mentioned by your correspondent would be obtained: but if the channel is widened, or deepened so as to give a perpendicular fall over the weir, the discharge must be impeded by any obstruction opposed to the stream.

I remain, Sir, &c.,

H. C.

ON CONTOURING OF MAPS.

Sir,—In your Journal for this month I have read a description by Dr. Livesey of an instrument invented by him in 1839, for copying medals, &c. and in which he speaks of his "important application" of the principle of contouring, which he may be subsequently to his invention. I only trespass on your pages to say, that if Dr. Livesey attributes to me the application of contours to the representation of ground, he gives me a very undue merit. They have been so applied for more than half a century in military plans, where the relative command of ground is of great importance; for which purpose all officers of engineers are instructed in contouring. In France and Bavaria, and I believe in some of the States of America, they are used in the national surveys. In Ireland, Mr. Bald, the eminent civil engineer, contoured a part of his Map of Mayo. The application of accurate contouring to the representation of ground from the Ordnance survey of Ireland, commenced in 1833, under the direction of Lieut. Bennet, R.E., and the trials have proved that the system may be applied without incurring any such addition of cost as should preclude its general adoption, to which this question of expense had long been the only objection. There are many valuable papers on contouring in the Memorie du Depot de la Guerre; and a concise chapter on the subject in Williams' Practical Geodsey.

I have only to add that I had not heard of Dr. Livesey's instrument till I read the account in your Journal for the present month.

I am, Sir,

Dublin,
Your obedient servant,
November 20, 1843.
T. A. LARCOM. Capt. R. Engineers.

REMARKS ON SHIP'S FASTENINGS AND STEAM BOATS.

BY J. S. ENSY, ESQ.

The necessity of great strength in the hulls of steam boats, has long been acknowledged, in consequence of the concentrated weight of the engine and boilers. In recent instances, however, a portion of this weight has been removed by the introduction of wrought iron framing in lieu of cast iron; more especially in large direct action engines. This objection to cast iron framings increases with the size of the engine, since a framing formed of this material, is liable to break when subjected to a variety of cross strains, at the junction of different masses of cast iron, at which points unequal contraction in cooling is apt to produce weakness.

Engineers have been accustomed to guard against injury from the weakness of the ship, by placing the engine on the floors in a framing, as independent as possible of the hull of the vessel, and left the ship-builders to provide a remedy against the sagging, or sinking of the centre part of the hull.

Though much has been done to strengthen steamers, yet enough remains undone, to render it a legitimate object of inquiry, whether the limit of strength has been approached in the vessels which are more and more rapidly increasing competition of iron vessels, renders it of importance to the builders of timber ships, to consider every practicable means of improvement and reduction of cost. Conceiving the iron strap used by miners in connecting together the main rods in shafts, and rails in all framing designed by engineers, stronger than the ship-builder's knee fastening, for a frame was introduced by M. Guerre for the midship section of a steamer, in which a strap was used for the purpose of connecting the deck beams to the side; this strap passes round one or more timbers, and is then bolted to the deck beams.

A similar method was shown for strapping an internal series of timbers to the floor heads and deck beams (forming two internal sides at the position of the bankers). The arrangement of the coal boxes of large steamers on each side of the engine and boilers, would facilitate the adoption of a plan of this nature, without the loss of space exceeding one foot in the internal breadth of the vessel. The plan of four sides in this portion of the vessel, could be adopted in iron vessels with the greatest ease, in consequence of the facility with which the fastenings could be effected.

As regards the strength of the strap, it may be remarked that the straps connecting together the main rod employed in pumping water from deep shafts in the Cornish mines, have been known to bear the sudden repetition, for thirty million times, of a steam strain exceeding eight hundred thousand (six strokes an hour) without failure.

The difficulty of effecting repairs will be made an objection to the employment of the iron strap in shipbuilding. Important as such secondary objections are, yet they are too often brought forward as the prominent features, in opinions that are given against the success of proposed alterations in shipbuilding. Time would alone prove whether the less tendency to require repair, where the iron strap is used, would equalize their average cost in repairs.—Report of the Cornwall Polytechnic Institution.

REMARKS ON FLOATING LIGHT VESSELS.

BY J. S. ENSY, ESQ.

The comfort of the light keepers on board floating light vessels will be increased, I apprehend, by the same means that would tend to produce greater safety in the vessel itself. It has been proposed to employ a larger vessel constructed of iron, to enable it to ride more easily at anchor—and such would be the result, if the same breadth was allowed, from the lessened draught of water. The form in which I am disposed to consider the subject is the relative proportion of the breadth and length of the vessel. For example, a vessel of iron and the common system of timber vessels, and that of three series of planks fastening together. Taking the least possible depth at 7£ or 8 feet, the breadth should not be less than 18 or 20 feet, and at 3£ to 4 times the breadth for the length, from 60 to 80 feet long. The form of the midship department should be similar to that of a water foul or of a light Dutchman. The former, however, does not ride at anchor as the latter does in bad weather, and we should look for the conditions of safety to some modification of these forms.

The floating light vessels I have seen, resemble the Dutchman only in their heavy appearance, and seem constructed to resist as an oak, rather than to bend as a willow. It is essential, I conceive, that a vessel suited for this purpose, should possess a large proportional surface department; in other words, that a light vessel should be lightly loaded. To enable her to rise with greater facility to the sea, she might be anchored by the keel by iron straps, passing round it and one or more of the deck beams. If the double plan was used, by changing the length of the chains more or less, it could be given to the vessel raising over the level of the water, feet. Perhaps a keel deepening after it would prove advantageous in some positions, though perhaps objectionable in cross tides and seas, and sharp bows might be used under some conditions. The species of knowledge required for mooring small craft in rough water, is seldom acquired by parties accustomed to large ships in the Atlantic or other open seas, and an approptiate ship of a Dutchman, or experiments on board a trial vessel with tanks, by means of which a variable displacement could be obtained, seems to offer the best means of procuring the data required for a complete solution of the question, of the best form for a floating light vessel.—Ibid.

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ON THE MEANS OF PREVENTING THE APPEARANCE OF SALTPETRE ON WALLS.

Communication from C. H. Smith, Esq., in reply to Questions proposed to him by the Commissioners on the Fine Arts, respecting Causes and Means of Preventing appearance of Saltpetre on Surface of Walls.

The mineral substances chiefly used in building, consist of lime, sand, and different kinds of stone, neither of which contains any saline or deliquescent matter as an integral part of their composition. No trace of salt or alkali is mentioned in the analyses of various stones that were examined with reference to the preparation of the New Holland Memorial. Bullock’s clay, which consists principally of aluminia and silica, but generally containing some portion of lime, in the state of carbonate or sulphate: carbonate of magnesia; iron in the state of oxide, or combined with sulphur; and common culinary salt: these various materials, when exposed to the air, or to red heat in the kiln, probably will combine with the sulphuric acid, which it obtains partly from the iron pyrites mixed with the clay, and partly from the fuel, if coal is used. It is this sulphate of magnesia (common Epsom salt) which is occasionally found to cover the surface of newly built walls, especially on a hot day.

The presence of saline or deliquescent matter on the surface of a building, either internally or externally, may, to a certain extent, be attributed to carelessness, ignorance, or inattention of those who superintended the construction of an edifice. Salts, alkalies, or acids, according to the usual acceptance of such terms, do not necessarily form any part whatever of building materials. Nearly all animal and vegetable substances, when in a state of putrefaction or decay, produce a certain quantity of saline or alkaline matter, which absorbs moisture rapidly: therefore every precaution should be taken to prevent the admission of such substances into buildings where the walls are likely to be of serious importance. It has long been a practice among builders to “purge” all the doors in a building: for this purpose cardboards of excrcement, frequently of many kinds, are procured from a cow-shed, and mixed with a little earth, and put into all the interstices of the buildings. Another objectionable practice is common during the time that the carcasse of a building is progressing, and partially until the “finishing” is nearly completed, which is that of allowing workmen to urinate indiscriminately against the angles and recesses of the interior of a new building: so much is more frequently selected than the fire-places where the stoves are placed therein; and in an extensive building, where hundreds of workmen are employed during several years, the quantity must be quite sufficient to saturate certain parts of the structure beyond all remedy. Both these causes have a tendency to increase the presence of alkali, etc., on the surfaces of the interior of buildings as are elevated above the influence of the ground. To show that dung and urine have long been considered to yield saltpetre abundantly, a proclamation of Charles I, in 1625, ordered all persons to save the urine of their families, and as much as they could of that of their cattle, to supply saltpetre for the manufacture of gunpowder; and in 1627 the salt-petre makers were authorised to take away the ground of all dove-houses, stables, lairs, or other places where cattle were kept. There are many other sources by which salts are conveyed into, or communicated to the walls of a building: those but already mentioned appear to be the most copious, and which may be considerably decreased.

Under ordinary circumstances it is scarcely possible to get rid of the various saline or deliquescent substances that have once been admitted into the walls of a building: once fixed alkali or salt may be considered imperishable; no length of time can injure them; they may ebb and flow, or, more properly, they may crystallize on the surface of a wall, and totally or partially disappear again and again, as often as a change in temperature or of dryness or humidity takes place; these changes may be daily, or the salts may remain inactive during ages, and, from some favourable cause, a crop of crystals may be produced as flourishingly as if the wall had been recently erected. The only way to abate the evil, is to brush off the crystals, dry, whenever they appear in the most flourishing condition. If potash sponges are inserted into the walls, either from the putrefaction of animal or vegetable substances, such as have been named, or from other sources, however thick the wall may be, it will make its way to the surface, and then absorbing nitrogen from the atmosphere, which contains 70 or 80 per cent. of nitrogen (of which potash is saltpetre), the solution will be formed.

If we may imagine the possibility of salts in a crystalline state getting to the interior of a dry wall, beyond the influence either of moisture or considerable variation of temperature, in such case they would unquestionably remain crystallized as they were deposited; but such a state of things is never likely to be obtained in a building, or to act upon the surface as solutions; the water very gradually evaporates, carrying with it, from the interior of the wall, the molecules which compose salt. The solution having arrived at the surface, so as to be freely in contact with the atmosphere (which may be put into a vessel containing carbon dioxide), in 1827 the solution is sufficiently strong to crystallize, leaving only the mother-water in the wall, which is indicated by a certain dampness.

Lime, mortar, or some other sort of calcareous earth, seems to act as a verifying principle to set the molecules of salt and water in action; if no lime were present in the building, it would scarcely be much less active. An increase of temperature, or a humid atmosphere, will slowly dissolve the salts; if both these causes occur at the same time, liquefaction will be rapid, and the newly formed fluid will be absorbed into the wall as fast as the salts are dissolved. These changes will take place with every variation of atmosphere: a cold dry air, in a state of absolute rest or stagnation, is favourable to crystallization; a warm one, charged with aqueous vapour, will facilitate solutions; and a wind that causes these conditions cannot be expected to remain on the same wall, with their crystals intermingled so as to escape the discrimination of a casual observer, and that each will crystallize and liquefy at different times, according to the temperature and the quantity of moisture in the atmosphere: this should be the case, perhaps the wall may never appear perfectly free from efflorescence. As the wall is thoroughly dry, light, heat, and other causes of attraction are in activity; and, since all attraction is mutual, it may readily be understood, that as the particles of water attract those of the alkaline salt, and retain them in solution, so the particles of the alkaline salt will attract those of the water, and hold them in crystallization.

It is difficult to state with precision the relative power of different bodies to attract moisture from the atmosphere; that some power exists independently of any absolute or comparative attraction; and that the intensity of attraction may be increased in various ways: this circumstance arises solely from the solid mass of the wall requiring a much longer time to attain the same elevated temperature as the atmosphere. Bodies in contact with each other in due time arrive at one common temperature, by the hotter communicating the requisite proportion of the excess of its heat to the colder; the velocity of this communication varies in different bodies, some being quickly heated, and as quickly cooled; others undergoing these changes much more slowly. It is probable that the atoms or completely solid parts of all simple substances have exactly the same capacities for heat, and that the perfect or imperfect conducting power of substances is the proportion at which the temperature of a given quantity of vacant space contained in their interstices. Deuce bodies are generally the best conductors of heat; those which are the most porous, conduct it very imperfectly; the metals, which are substances of the greatest density, transmit it very rapidly; wood is a bad conductor; and the natural clothing of animals—fur, hair, feathers, etc., are inferior to every other material in their power of communicating heat. These remarks are applicable only to the conducting power of solid substances; liquids are all very bad conductors of heat; therefore, independently of evaporation, a cold damp wall will continue at a low temperature much longer than a cold dry one; and hence it will influence the condensation of vapours during a greater length of time than if it were dry.

Various circumstances seem to infer the probability that volatile electricity, conductors of heat, and other substances of an electric nature may receive moisture from the atmosphere to the walls of a building. All substances naturally possess electrical energies, which are inherent in them; probably there may not be two substances, or even two distinct surfaces of the same substance, that are not in different electrical relations to each other; and it is a law of electricity that bodies in opposite states attract each other. Lime, sand, bricks, and hair, materials with which walls are usually constructed and plastered, are all, when dry, bad conductors; whereas a good conductor of electricity; and whenever the atmosphere, or water, or any part of the surface, or any part of a solid substance gains acidity, the action of the salts of combustible substances, there is an immediate tendency to bring the parts in contact. In this manner, other circumstances being favourable, floating aqueous vapours may perhaps be imparted to a wall, and absorbed into it by this very attraction.

Electric influence, as connected with the preceding inquiry, is merely offered as a hint, with the view of inducing scientific men to investigate the subject. Neither the public are not in possession of any facts which have immediate reference to this important object.

C. H. SMITH.

29, Clipstone Street, June 2, 1843.

OPEN SEATS IN CHURCHES.

So great is the present demand for good models of open seats, consequent upon the strong and fast-spreading dislike and condemnation of pews, and so numerous are the applications made to us for advice and assistance in restoring to churches their more Catholic arrangement for the accommodation of worshippers, that we propose to offer a few remarks on the proper portions of this kind of seats, and the best method of fixing and disposing them.

The standards or ends of ancient open seats are generally distributable under three heads: (1) those which are sloped off with a shouldered and terminated back; (2) those which are wholly carried up to the seat; (3) those which are simply square or parallelogrammic panels. The last are usually the latest in date, though it may be observed in general that open seats of the former kind are of more permanent character, and the latter are not to be forwarded in preference to the former.

Whether any are to be found as early as the fourteenth century we do not know; but there is every reason to believe that, till the conclusion of the Edwardian period, the area of churches was quite free and unencumbered, and that if
It should ever be borne in mind that open seats are actually cheaper than pews, since this is an argument in their favour which is likely to have no little weight. The cost of a well-carved ordinary standard in oak, including the material, is about 30d. The finials may be worked separately, at about 10s. a-piece, and afterwards situated in the collar to the standards. Either may be executed to order by our wool-carver, Mr. Groom (62, Sidney Street, Cambridge), from a series of very excellent models from churches in the neighborhood, casts of which are sold by him at 2s. each. We do not however recommend the latter expedient for general adoption. A far better way is not to have all the poppy-heads carved at once, but to work the block terminations gradually after the standards have been fixed in their proper position. Detached poppy-heads should always be well executed in oak, and if they are at first fastened to deal standards, these can be afterwards removed by one, and 3-inch oak substituted in their places. A set of well-carved oak standards is a particularly appropriate gift to a church.

We will suppose now that it is resolved to clear away from the area of an old church, the wotley assemblage of pews,—painted, baze-covered, short, tall, square, oiliing, dinay deal or panelled oak, or whatever hideous variety they may present,—and to restore the ancient arrangement of uniform open sittings throughout. These, of course, will all face the east; and a central passage will be left down the Nave, and another parallel to it on each side next to the piers in the Aisle, so as to have the bases perfectly free and unencumbered. Now, what is the best method of procedure after this happy consummation has arrived? First, then, we recommend the entire flooring (which is sure to be in a bad state from the vaults and encroachment of the pews) to be taken up, and a bed of concrete a foot in thickness to be laid uniformly over the whole of the interior area. In this a pavement of encasement tiles, or at least, of squared stone slabs, must be firmly fixed. When this is done, and the mutilated bases and piers restored, some idea will be conveyed of the ancient appearance of our parish churches. Thus the ground will not easily be opened for graves, and the floor will be kept clean, dry, and wholesome; provided, of course, that proper attention be paid to the external drainage and clearance of the soil from the earth-line. Upon this pavement cills or sleepers of oak should then be laid loose, in a direction from east to west; and to these the standards should be mortised at such intervals that the boards may be, at the very least, 6 ft. 6 in. apart in the clear. If a boarded floor be insisted upon,—as it often will be,—from an ignorance of what a dry and level pavement beneath the feet really is,—stout planks may be laid over and upon the pavement from cill to cill, into which they may be made to fit by a groove, in such a manner that they can at any time be readily removed for the purpose of cleaning and thoroughly drying the floor underneath. Thus also, if the occupants of one seat consent to try the withdrawal of the boards, and find no inconvenience therefrom, others will certainly follow the example, and the plan which we have ever recommended, namely, to have a stone or tiled floor under the seats as far preferable to boarding, will be gradually achieved. We can assure our readers that we have seen many ancient churches in which no boarding has ever been placed under the open seats, and the appearance is much better, and the comfort to the worshipper certainly not less, for the absence of it.

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We add some measurements of ancient seats, taken from several counties, which will probably be serviceable to many of our readers. We would call attention to the remarkable uniformity of proportion which generally characterizes these of the same kind. Indeed it would be useless to multiply examples to a great extent to show any important difference from the above; measurements must be regarded as an exception. In conclusion, we would urge all who are about to replace open seats in their churches to follow faithfully ancient models, which are, happily, even yet sufficiently abundant in our parish churches.—Eeckslowist.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

INSTITUTION OF CIVIL ENGINEERS.

June 13.—The President in the Chair.

"Description of a Plan, adopted for carrying off an accumulation of Water from the Warehouses, Cellars, &c., near the Wet Dock at the Port of Ipswich." By George Hurwood, Assoc. Inst. C. E.

The paper states that in consequence of the formation of the wet dock at Ipswich, the water from the land-springs, which was formerly carried away by the river, accumulated to such an extent, as to cause serious inconvenience to the owners of the warehouses, cellars, &c., many of them being beneath the level of the ordinary tides. It was difficult to find a remedy for this, for most of the lines of the dock, the water, was at so low a level, that a discharge could only be effected at the lowest extreme of the tide, and a general sewer could not have been constructed at a moderate expense, because from the lowness of the level, water would have accumulated constantly in it, and any causal increase from rain or other causes, would have been impossible to prevent.

The plan designed by the author, and which has been executed, had for its object, the construction of a sewer which should drain these buildings alone, and at the ebb tide should carry off the accumulated water, being at the same time of sufficient size to contain the water, which was prevented from being discharged by the flowing tide. It was required therefore to be water-tight, and branch drains were necessary from all the points where water penetrated.

The last and partial success of the plan, every precaution was taken for preventing the influence of the tide in the general sewer, retracting the discharge or operating upon the lateral sewers. At the end of the main sewer was placed a cast-iron frame, upon which were hung three tide-flaps with brass finings, accurately fitted, and balanced by levers and counterweights. By this means the water was discharged at any height, and without any considerable head of water being required to open the flaps. Each cellar was connected with the main drain by an iron pipe, with a well-balanced valve at its end, so that the water could have an easy exit; but as soon as any accumulation within the sewer occurred, the valves closed.

The sewers were built of brick, in mortar made from blue lilas lime. The dimensions varied from 12 inches to 21 inches in diameter, and the cost of the latter size was 12s. 6d. per yard, including excavating, laying, filling, &c. The pipes were of white, and as precautions are enforced, to prevent any admission to the sewers, of other than the water which filter through the natural strata of the clack-basin, the water in the sewers is fit for domestic or manufacturing purposes.

The communication is illustrated by a drawing, showing the situation of the town and dock of Ipswich, with the extent of the lines of sewers, and the details of their construction, and that of the tide and other flaps.


After describing a model, designed to show that the proper slope for reservoir embankments, should not be less than one in two on the water-face, and remarking that waves act more severely on the pitching or paving of the inner face, in proportion to the steepness of the slope, the author proceeds to describe the mode of forming embankments. The foundation is excavated to such a depth as is found firm and capable of preventing the passage of water, then spreading alternate layers of puddled peat, or alluvial earth and gravel, and beating them together with wooden dumppers, until they are completely mixed; the slopes are covered with a puddle made with small stones or furnace-cinders mixed with clay, so as to prevent the possibility of moles or other vermin penetrating into the embankment. He demonstates the practice of forming embankments with paddle-trenches, and refers to many reservoirs made by him at Greenock, Paisley, and elsewhere, the banks of which have stood the test of time without having any paddle-trenches in them. The author particularly mentions one at Greencastle which remained firm and sound, after a rush of water passing over it at a height of ten feet, caused by the breaking down of the embankment of a reservoir situated about 150 yards above it. He recommends, instead of the paddle-trenches, that the whole of the inner part of the embankment should be made water-tight, during the formation of it, by which means it will more effectually resist either any casual injury, or any effect of the swelling of the puddle-trench. The paper is entirely of a practical nature, and is intended to illustrate the author's peculiar views founded on his long experience. It is accompanied by a diagram of the model used in his experiments.

June 20.—The President in the Chair.

A Pressure-Gauge was presented for the Museum of the Institution by Alfred King, M. Inst. C. E.

This gauge, which has been used at the Liverpool gas-works for more than ten years, for indicating small amounts of pressure, consists of a close cistern containing water, in which a cylinder having in it a hollow float, connected with it by a tube, having a pitch of several parts. The float, on the axis of which is fastened a pointer, one end of which marks the amount of pressure upon a dial divided in such a manner, that as each division is equal to a column of water of 1/4th of an inch, a difference equal to 1/32th, or even 1/64th of an inch, may be estimated.

The action is very simple, the float being elevated by the rising of the water within the cylinder, when the surface is depressed in the cistern by the pressure of the current of gas from the inlet pipe.

The description was illustrated by a diagram showing the internal construction of the gauge.

"Description of a Machine for raising and lowering Miners." By John Taylor, M. Inst. C. E.

The author states that the great depth in which the copper and tin mines, in Cornwall, and in Germany, had been worked, had drawn simultaneously in the two countries, the attention of engineers on the mode of facilitating the ascent and descent of the miners, whose strength was exhausted, and their healths seriously affected, by the fatigue of going to and returning from the scene of their labours by nearly vertical ladders, as the men could not be permitted to descend by the vertical lift. He has been directed to make a machine, somewhat similar to that designed by Mr. Michael Loam, who has been applied with success to one of the deepest mines in the Hartiz; and drawings, with a description, were published in the Report of the Polytechnic Society of 1838. Mr. Charles Fox also commenced a subscription, for the purpose of awarding a sum of money to any proprietor of mines, who would first bring into active operation, efficient machinery adapted for the purpose in question.

At length the adventurers of the Tresavean copper-mines, undertook to erect a machine from the designs, and under the superintendence of Mr. Michael Loam, at a depth of 27 fathoms, on the 5th of January, 1842; has since been extended to 264 fathoms; and it is now contemplated to carry it to the lowest part of the mines, which is 288 fathoms deep.

The machine, which is worked by a steam-engine, with a cylinder of 36 inches diameter, consists of two rods, to which are attached, at intervals of 6 feet throughout their length, platforms upon which the men stand; these rods receive an alternating motion from two cranks, which give them a stroke of 12 feet; the men, either in ascending or descending, step from one platform to the other, as the rods remain for an instant almost stationary, when the cranks are going over top and bottom centres; and as the platforms are half the length of the stroke apart, one set of men can ascend while another set is descending, without at all interfering with each other. Each crank makes three strokes per minute; and when once the platforms are filled with men, they are landed at the rate of six men per minute, either going up or down; the speed of travelling being about 72 feet per minute, or 240 fathoms in 20 minutes. By the ordinary mode of ascending by ladders it would have occupied 40 minutes to mount from the same depth, as the usual speed is about 30 feet per minute; for that time not more than 30 per cent. of time is saved, independent of the diminution of fatigue.

The rods at the Tresavean mine act vertically for the first 70 fathoms, below which they follow the direction of the vein, diverging from the perpendicular 6 inches from 6 inches in 6 inches. The action of the apparatus is stated to be perfectly successful; no accident has occurred in the use of it, and the miners are convinced of the safety as well as the ease afforded by it.

The paper is illustrated by two drawings by G. B. W. Jackson, Grad. Inst. C. E., showing the details of the machine; they are copied by permission of Sir Henry De la Beche, from the model now in the Museum of Economic Geology.

Remarks.—Mr. Taylor observed, that there was an extraordinary coincidence of time in the appearance of this invention, as the public attention,
both in Germany and in England, seemed to have been directed to the subject simultaneously, without any correspondence between the engineers of the two countries. There had been many competitors for the premiums offered in Cornwall for the best method, but the only successful plans were those mentioned in the paper; and the machine therein described was a combination of the plan proposed by Mr. Loam and that actually in use in the Harz mines.

Mr. Buddle recollected many years ago seeing a model of a somewhat similar machine, which had been made fifty years before, for the purpose of raising water. He had also seen at the time two rings of iron, upon whose sides were hooks, at given distances, which on receiving a reciprocating motion were alternately engaged on the opposite handles of the "kibble" containing the ore, which was thus raised to the surface; it was probable that the idea of raising the miners had been taken from that old machine.

Mr. Taylor replied that he did not think Mr. Loam knew of the existence of any machine of the kind, and that the first impulse given to the subject was by the premiums offered for the best method, which had directed the attention of engineers to it. An American machine somewhat similar to that described in the paper had been exhibited in London by Mr. Butler, was designed for raising ore and water, but Mr. Taylor thought it applicable to raising the miners, and directed the attention of the patentee to the subject, but the machine was not successful.

In answer to a question from the President, Mr. Buddle said that the system was not applicable to the mines at Newcastle, as the men went up and down by the rope. By the use of guides and slides, the rate of drawing the coal to the surface was generally about 18 feet per second, which was not, however, considered sufficient, and a greater velocity was contemplated.

"Description of Annular Valves used for Pumps for Water-works, &c."

By Richard Hosking.

The annular valve consists of three concentric rings, arranged pyramidal, and resting one upon the other, thereby affording a free passage for the water around the circumference; the upper ring is attached to a stalk, and the two lower ones have internal wings, which serve as guides when the rings are in motion.

The chief advantages afforded by these valves are stated to be an increase of water-way and a reduction of concussion, for as the concussion occasioned by the shutting of pump-valves is in proportion to the surface in contact, so is the annular valve seen to be the best for the purpose. The act of shutting, the greater the number of parts of which the valve is composed, the greater will be the freedom of water-way, and consequently the burther that the engine and the concussion will be proportionally diminished.

These valves were first used in two 30-inch pumps at the Waldersea Drainage, near Wisbeach, and they have since been introduced into the Royal Poiboro Consols Mine and the Vauxhall Water-works.

The description is illustrated by a drawing, showing the construction of the internal parts.

"On the construction of Valves used in Pumps for raising Water." By Samuel Collett Homersham, Assoc. Inst. C. E.

The author describes the original leather flap valves which are in common use, shows their defects, the modifications which have been introduced in them, and the reasons why a better kind of valve was necessary, particularly for large pumps applied to steam engines, quoting from Mr. Wicksteed's statement on the subject he had brought out, and also on the changes in the design of the annular valve at the East London Water-works, the whole of the engine-house was shaken. This led to the application, by Messrs. Harvey and West, of a modification of the double-beat steam valve, only making it self-acting; by this, it is stated, the concussion is so much reduced that little inconvenience is felt from it. No air is required to be admitted beneath, as is frequently the case with common valves, consequently the pump when at work lifts its full complement of water.

The author states that in this valve the diameter of the top seating is somewhat smaller than that of the lower, for the purpose of allowing a sufficient area for the pressure of the water to act against in lifting it. He remarks that the pressure required to open these valves appears to vary from 2 lb. to 5 lb. per square inch, and that it does not seem to follow any uniform rule. The seats where water valves have been adopted are usually conical, nearly equal to the full area of the clack chambers, by means of a conical valve formed of rings shutting

down upon each other; this was afterwards modified into a valve with separate seatings for the rings to fall upon, allowing a passage for the water both inside and outside the rings, thus obtaining the necessary improvement in the half of the openings in the seating, and it was found that in valves of large diameter, by increasing the number of openings, the height of lifting in opening could be further reduced; the closing was necessarily more rapid, the concussion was nearly avoided, and the saving in the consumption of steam and steam lost was considerable.

A valve on this construction was adapted to the engine at the Lambeth Water-works, and it was found on setting it to work, that a counter-balance weight of upwards of one ton, required to be moved from the pump side of the beam, to some distance on the steam side, upon the usual site, was decreased. 1. A valve on this construction was adapted to the engine at the Lambeth Water-works, and it was found on setting it to work, that a counter-balance weight of upwards of one ton, required to be moved from the pump side of the beam, to some distance on the steam side, upon the usual site, was decreased.

It is stated that in consequence of the galvanic action between the brass rings and the iron seating, rapid rusting of the rings was found and, the same effect was observed at the Chelsea Water-works, where similar valves were substituted for those of Messrs. Harvey and West.

It is stated that in consequence of the galvanic action between the brass rings and the iron seating, rapid rusting of the rings was found, and had been very prevalent. The dimensions of all these valves are given in detail, and also of several other large valves which have been made.

The question of the proper weight of valves in proportion to the height of the column is then examined at great length, and the following rule is given: The mean velocity of the water in feet per second through the valve, being ascertained, one-half is more added to this velocity and considered as the maximum velocity of the water through the valve; and the height of the head of water being found that would produce this velocity, every 1/2 inch of such height is considered equal to one ounce weight avoiding, acting upon each square inch of the area of the valve, against which the water impinges, in its passage to the pump barrel, allowance being made for the difference of the weights of the rings, and of the space occupied by the air. By this rule, it was found that a considerable weight required to be added to the valves which had been erected, and that addition rendered the concussions scarcely perceptible.

The author advocates a large area in the valve passages for the water to descend in, in order that it may be trapped, and that the valves may not be exposed in putting the fluid in motion to fill the pump barrel. He states that the proper area, depends on the diameter of the pump and the working velocity of the plunger; and that if the maximum velocity of the water up the suction pipe, is not allowed to exceed 6 feet per second, but little advantage will in ordinary cases be gained by reducing that velocity; that an increase of speed is often unavoidable, but that it causes a great expenditure of power; and he quotes Mr. Wicksteed's experiments in support of this position. He urges from this, the importance of reducing the velocity of the water entering the pump barrel; and that the diameter of the valve should not exceed 2 inches, and should be as much less as possible, as the valve in that case closes quickly before the return stroke of the engine commences. Short lifts are then examined, and it is stated that the valves will not close rapidly, unless they are weighted sufficiently to resist the maximum velocity of the water flowing through them and are carefully adjusted to it; and that if they are too heavy there is a loss of power in working the pumps.

Several modifications of these valves, adapted to various uses, are then described, and the author states that his intention is, to lay before the Institution, as an account of such valves as had been found to answer well in practice; and to direct attention to the correct principles for constructing them of proper proportions and of durable materials.

The paper is illustrated by eight detailed drawings of different constructions of valves, and by three models of some which have been in use and are found successful.

Remarks.—Mr. Simpson corroborated the account of the advantages of the valves described in the paper, he had found them practically useful and economical.

Mr. Wicksteed said that with Messrs. Harvey and West's improvements, a valve 4 feet in diameter which formerly rose between 4 inches and 5 inches, now rose 1 1/2 inches, and that the durability insured; the latter was increased by substituting wooden faces for metal ones; by this means also the corrosion, attendant upon the contact of two metals, was avoided. One of these valves had already lasted three years, and was still quite good. The original improvement consisted in making the passages at right angles to the circumference, instead of through the centre of the valve. The difficulties which had been experienced at Old Ford had not arisen from the form of the valves, but from the situation in which they were placed; he argued, therefore, that when experiments were made upon these valves in the new houses and suction pipes also, they should be expressly for the purpose of not being used in the pipes from whence the old shaped valves had been taken. He approved particularly of the form of the double-beat valves as possessing great strength, and reducing the liability to fracture.

Mr. Taylor said, that the meeting was much indebted to the author, for laying down positive rules and principles, on a subject which had hitherto
Mr. Parkes remarked, that the concession arising from the closing of the valves of low-lift pumps, was more destructive than in the high-lifts; an entirely different system was therefore pursued in pumping. The engine started at a different rate, and generally worked much faster, which altered the conditions of the pumping. At the engine of the Whiston drainage, near Wishaw, there was a pump of 6 feet diameter, with a length of stroke of 8 feet, the valves were formerly destroyed more rapidly than in any mine in Cornwall; recently, Mr. Hosking, had adapted to it a large box, in which the engine and 50 inches diameter, had been adapted, with great advantage to the engine; the pump drew more water and worked much more steadily.

Mr. Glynn agreed with Mr. Taylor, in thinking that Messrs. Harvey and West's valves, were not so well adapted for mining purposes as they were for water-works, or for situations where only clean water was passed through them. Mr. Darlingston had introduced a modification of the valve, which he thought would be very efficacious; it was being constructed by the Butterley Iron Company, and he would send a description of it to the Institution. This principle of large valves had been extended to blast engines; the size of the air-valves having been much increased, a corresponding advantage had been found in their duration, as well as in the work of the engine.

June 27.—The President in the Chair.

"On the present State of the Streets of the Metropolis, and the importance of their amendment." By Charles Cochrane, President of the Association for the Promotion of Improved Street Paving, &c.

This paper first refers to a Commission formed by the present Government, "for inquiring into and considering the most effectual means of improving the Metropolis, and of providing increased facilities of communication therein;" also to a Report of a Committee of the House of Commons, which recommends "that an institution should be formed expressly for ascertaining, by a succession of experiments, the best mode of constructing roads and keeping them in repair."

A brief history of the different kinds of carriage-ways and foot-pavements, is then given, showing that the resources of art and science have been but little consulted in their construction, which is illustrated by the system of making macadamized roads, their formation being nearly dependent upon the action of the traffic. A report is added that, few, if any, improvements have been made in the method of forming granite pavements; the system practised twenty years since being nearly the same as at present, which, is to embed the stones in the earth by means of mere manual strength, although for long years, the aid of grouting has been occasionally brought into use. That in foot-pavements the same fault is perceptible, namely, the want of a good foundation, as the masons generally seem to think, that so long as the edges of the flags are well covered with mortar, and the work when completed presents an uniform surface, the chief objects are accomplished.

It is stated that wood paving, of which 100,000 yards have been laid down in the metropolis, appears likely, from the successful trials which it has undergone, to be generally adopted, the only objection against it being, that it is slippery in wet weather; this evil is chiefly attributed to the mud which is brought from the other kinds of paving and allowed to remain on it. In all other respects, wood appears a superior material to any other hitherto employed, for making roads, both as regards its general economy and durability, as well as its facility of traction, and more especially its extreme cleanliness.

The question of cleansing streets is then entered upon, when it is shown that the ostenso streets are cleaned, the less mud is created, whilst the advantage to be derived by the use of a street-sweeping machine, can be seen, when the results of the trial in this city, are compared with those at Manchester, it is shown that the street-sweeping machine, in 3 days was more than 50 per cent. more effective than the ordinary hand-sweeping, and that the amount of earth thrown upon the streets in the latter case, was more than 400 times as much as in the former.

The losses caused by the dust and dirt in the streets are stated to be very great; Mr. Milvart, of Milvart's Hotel, estimates his actual loss at about £965 per annum, whilst shop-keepers in Oxford-street and Regent-street, state that they lose annually from £289 to £250 per annum, by the destruction of their goods by the dust, &c.

Some suggestions are given for improving, repairing, and cleansing the streets, and it is stated that there are abundant means at present available, for keeping them comparatively free from mud, if machinery was properly employed.

"On the relative merits of Granite and Wood Pavements and Macadamized Roads; derived from actual experience." By D. T. Hope (Liverpool).

In this communication the author allows to the inefficiency of many of our finest specimens of paving, arising from the desire of reducing the outlay, but which, in reality, are executed and maintained at a great expense, without securing the advantages which the material is capable of affording; or the qualifications requisite for streets—and to the cleanliness, comfort and true economy, in having the work performed in the best manner, and employing material best calculated for producing all those advantages, which may be reasonably expected in streets of the present day.

The following requisites that a good road or pavement ought, in some degree, to possess, are laid down down as a standard, by which the respective substances can be compared; and the conclusion (according to the experiments on the several modes) attached to each, for the convenience of more obviously contrasting their several qualities, viz. 

1. A solid and compact structure, capable of resisting the effects of traffic, without being cut up into ruts and inequalities from other causes than mere abrasion.
2. Not requiring to be frequently repaired.
3. As much elasticity in the material, as may be useful in aiding the power in draught.
4. A firm and smooth surface, that the power employed may not require to be ever varying.
5. Although comparatively smooth, to be free from slipperiness.
6. To afford a sure foot-hold for the horse.
7. Not liable to be seriously affected by the changes of the atmosphere, or by rains.
8. An assistance of mud and dust.
9. A freedom from noise.
10. To afford economy in transit.
11. An economy in the construction and maintenance, consistent with the preceding advantages.
12. Not subject to rapid abrasion.

It is shown that macadamizing has few, if any, advantages for public thoroughfares—rising from its rapid abrasion, the frequent application of new metal—the uncertainty of its condition, varying with every change of weather—the abundance of mud and dust—and the great expense of maintenance; and from the power employed in draught requiring to be so variable, that the cost of transit is not only increased, but the horse is often compelled to exert more power at one time or in one part of the street, than should ever be required of it. And also, that the advantages which may be claimed for macadamizing in streets, are attainable in other descriptions of paving, if proper attention be paid to their construction.
It is contended, from experience, that granite pavement can be laid down, so that the results will be superior to macadamizing, not only as regards economy of construction and maintenance, and power in draught, but also of the other qualities, with the single exception of noise, which, it is shown, need not be so great a disadvantage as to warrant its rejection; if the sets be well dressed, and properly laid, on a sufficient substratum, and if the sets are not used too broad, a sure foot-hold for the horse can at all times be had, besides contributing more to the solidity of structure, than the broad and shallow blocks so frequently employed.

By employing a stone, the work would be more efficient and durable material for paving, than stone of any description, and that it is capable of affording all the qualities required for our finest streets. In order to ascertain the best position of the fibre, for securing all the advantages which wood can afford, a minute table is given of the results of experiments, during a period of eighteen months, upon blocks with the fibre placed vertically and horizontally, and leaning at the intermediate angles; from this it appears that vertical blocks sustain less abrasion and less injury than those in any other position. A sound concrete substratum, is held to be the necessary feature, and if in a vertical position, he laid down in a dry state, with close joints, the surface and structure can be maintained, under any change of weather, in a condition to resist any amount of traffic and heavy loads. It is shown that cohesion is not a fluctuating quality, for the blocks in the pavement are, in reality, not liable to become wet and dry with atmospheric changes. In wet weather they absorb as much moisture as they can contain, which increases their volume, and from which moisture they are never after totally free, even in the dry season. The evaporation of moisture from the surface, of the open dry state in which they were originally laid down, more than sufficient for supplying perfect cohesion under any change of the atmosphere. It is also shown that wood does not produce mud and dust, and that slipperiness is therefore foreign to wood pavement; that its economy in maintenance, power of repair, and durability, are in every respect preferable to stone. A wood pavement is not liable to injury or set, as to stone, and enters, with confidence, to be considered as the most suitable material for paving, whether subjected to wet, dry, or frosty weather.

Tables are given, showing the results of the experiments in a condensed form, and from which it appears, that the power of traction being in each 100 lb. the weight drawn on the level of the road is divided as follows:—

<table>
<thead>
<tr>
<th>Description</th>
<th>Weight (in lb.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>272</td>
</tr>
<tr>
<td>Level grain</td>
<td>300</td>
</tr>
<tr>
<td>Level wood</td>
<td>345</td>
</tr>
</tbody>
</table>

"On the Ventilation of Lighthouse Lamps; the points necessary to be observed, in the preservation of those lamps, may be attained." By Professor Faraday, L.L.D., Hon. Mem. Inst. C. E., &c.

The author states that the fuel used in lighthouses for the production of light is almost universally oil, burnt in lamps of the Argand or Fresnel construction; and, from the nature and use of the buildings, it very often happens that a large quantity of oil is burnt in a short time, in a small chamber exposed to low temperature without the principal walls of the chamber being only the glass through which the light shines; and that these chambers being in very exposed situations, it is essential that the air within should not be subject to winds or partial draughts, which might interfere with the steady burning of the lamps.

When in these lamps the fuel is not perfectly ventilated, the substances produced by combustion are diffused through the air, so that in winter, or damp weather, the water condenses on the cold glass windows, which, if the light be a fixed one, greatly impairs its brilliancy and efficiency; and, if the light be a revolving one, tends to confound the bright and dark periods together. The extent to which this may go, may be conceived, when it is considered that some lighthouses burn as much as twenty, or more, pints of oil in one winter's night, in a space of 12 or 14 feet diameter, and from 8 to 10 feet high, and that each pint of oil produces more than a pint of water; or, from this fact, that the ice on the glass within, derived from this source, has been found in some instances an eighth, and even a sixth, of an inch in thickness, and required to be scraped off with knives.

The carbonic acid makes the air uncomfortable, but it is easily removed by an arrangement of chimneys or ventilating pipes, which when in a state of combustion produces about 1-96 pounds of water and 2-96 pounds of carbonic acid.

The author's plan is to ventilate the lamps themselves by flue, and then that the glass of the lantern will always be as pure as the external air, yet having closed doors and windows, a calm lantern, and a bright glass.

In lighthouses there are certain conditions, to which the ventilating arrangement must itself submit, and if these are not conformed with, the plan would be discorded, however perfect its other particular effect might be. These are, that the air should not be allowed to escape from the flue by a too free opening, or by an improperly large flue; that it should not interfere with the cleaning, trimming, and practice of the lamps and reflectors;—that it should not obstruct the light from the reflectors;—that it should not, in any sudden gust of tempest, cause a cowl, or any part of the fire, or charring of the sticks,—that it should not interfere with the cleaning, trimming, and practice of the lamps and reflectors;—that it should not obstruct the light from the reflectors;—that it should not, in any sudden gust of tempest, cause a cowl, or any part of the fire, or charring of the sticks; or, in short, that it should not obstruct the light from the reflector, or interfere with the ventilation of the lighthouse.

In lighthouses there may be one large cowl, and the inner wick of which is sometimes 2 inches in diameter, or many single Argand burners, each with its own parabolic reflector. The former is a fixed lamp; the latter are frequently in motion. The former requires the simplest ventilating system, and is thus described:—

The ventilating pipe or chimney is a copper tube, 4 inches in diameter, not, however, in one length, but divided into three or four pieces:—the lower part is about 13 inches long, is opened out into a conical form about 5 inches in diameter at the lowest part. When the chimney is put together, the upper end of the bottom piece is inserted about 3/4 an inch into the cone of the next piece above, and fixed there by three or five pins, by means of which the pieces are closely brought together; but there is still plenty of air-way, or entrance, into the chimney between the pins, by which the chimneys bear with each succeeding piece. When the ventilating chimney is fixed in its place, it is adjusted, so that the lamp-chimney enters about half an inch into the lower cone, and the top of the ventilating chimney extends a little beyond it.

With this arrangement it is found that the action of the ventilating flue, is to carry up every portion of the products of combustion into the cowl; none passes by the cone apertures, out of the flue into the air of the lantern, of the lamps; the air passing from the lamps by these apertures into the flue, and so the lantern itself is in some degree ventilated.

The important use of these cone apertures is, that when a sudden gust, or eddy of wind, strikes into the cowl of the lantern, it should not have any effect in disturbing or altering the flame. It is found that the wind may blow suddenly in at the cowl, and the effect never reaches the lamp. The upper, or the second, or the third, or even the fourth portion of the ventilating flue might be entirely closed, yet without altering the flame. The cone junctions in no way interfere with the tube in carrying up all the products of combustion, into the chimney, and they give free admission of the whole of it into the room, without ever affecting the lamp. The ventilating flue is, in fact, a tube which, as regards the lamp, can carry everything up, but conveys nothing down.

In lighthouses with many separate lamps and reflectors, the case is more difficult, more complicated; and, if necessary, the apertures may be referred to are more imperatively called for, because any departure from them was found to have greater influence in producing harm. The object has been attained thus—A system of gathering pipes has been applied to the lamps, which may be considered as having the different beginnings at the end of each and being fixed to the frame which supports the lamps, is made to converge together and to the axis of the frame by curved lines. The object is to bring the tubes together behind the reflectors, as soon as convenient, joining two or more into one, like a system of veins, so that one ventilating pipe will carry the whole of the lamp parts that a pipe 2½s of an inch in diameter is large enough for one lamp; and whereas, by junction, two or more pipes have become one, if the one pipe has a sectional area, proportionate to the number of lamps it governs, the desired effect is obtained.

The pipes 2½s of an inch in diameter, passes downwards through the aperture in the reflector over the lamp, and dips an inch into the lamp-glasses; it is able to gather and carry off all the productions of combustion, though, perhaps, still 2 inches from the top of flame, and therefore not immediately; the air which is carried with it, nor coming as a shade between it and any part of the reflector: the flame and reflector are as free in their relation to each other as they were before. Neither does this tube hide from the observer or mariner, a part of the reflector larger than about 1½ square inch of surface, and it allows of a compensation to two or three times the quantity of air, which, if left open and inefficient in the ordinary service, may be made effective reflecting surface, simply by filling it up with a loose, lofty formed, reflecting plate. At this termination of the ventilating flue an important adjustment is effected. If the tube dip about an inch into the lamp-glass, the draught is such that not only do all the products of combustion enter the tube, but air passes down between the top edge of the lamp-glass and the tube, going, finally, up the latter with the smoke. In this case, however, an evil is produced, the wick is chilled too rapidly; but if the ventilating flue descends only till level with the top of the lamp-glass, the whole of the burnt air does not usually go up it, but some passes out into the chamber, and at such times the charring of the wick is not hastened. Here, therefore, the tube, of which so much is required in the formation of a lighthouse, which is open and inefficient in the ordinary service, may be made effective reflecting surface, simply by filling it up with a loose, lofty formed, reflecting plate.
as respects the application to separate and revolving lamps, the experiment has been made under the direction of the Trinity House, on a face of six lamps, being a full-sized copy of the Tynemouth revolving light, and, so far to the satisfaction of the Deputy Master and Brethren, that the plan is to be applied immediately to two light-houses which suffer most from condensation on the glass; he believes it will be with full success.

A Lock-meter.

"A model and drawing of a Lock-meter, used in Lombardy for measuring Water for Irrigation," were presented by Benedetto Albanese, M. Inst. C. E.

The author stated that the necessity for regulating the supply of water for irrigation, had induced the adoption in Lombardy of a meter, with an aperture of given dimensions, as a standard for the emission of water to the irrigating channels—this was termed the "Boche Magistrat." This standard was called "oncia d'acqua magistrale," by which was understood, a quantity of water flowing through a given aperture, under an unvarying pressure, permitting only the passage of a certain quantity per minute. This "oncia d'acqua" has now been ascertained by Kreznin (Inspector General of Canals, Milano) to be equal to 2.12 cubic metres per minute, and is now the received authority; and the system is adopted through the Lombardian and Venetian Kingdoms, and other provinces of Italy. This quantity is supposing the flow to be through an aperture 3 once wide by 1 high, and with a head of water of 2 onces. An once is equal to 1.93 inches.

The structure consists of an aperture A, where the water is measured, nearly 8 inches high, 16 inches broad, and 6 inches long, leading to which is the channel C, 28 feet long, which has a floor inclined to the supplying stream B, at an angle of 1 in 15; this channel is covered by a horizontal close boarding or ceiling D, by which the undulatory motion of the water is checked and any air is prevented from getting into the channel, while the height of the head is restricted to 4 inches above the aperture A. At the end is a sluice-gate H, of the same width as the aperture A, to be raised by a rack I; on the gate is a block K, to prevent its being raised too high, and a bolt and lock secure it. The discharge channel F, is about 18 feet long, is inclined 1 in 108, and widens about 4 inches at each side, diverging outwards nearly 6 inches in the entire length. Care must be taken that the water in the channel at G, is always kept below the bed of the channel F. The sluice-gate being opened sufficiently to fill the covered channel up to the ceiling, the quantity of water flowing through the aperture is accurately measured. Just behind the sluice there is a small opening to see when the water has reached the proper level. The aperture A, to this metre will allow a discharge of 12.72 cubic metres, or 419 cubic feet, English measurement, per minute; beyond these proportions the aperture is not allowed to be increased, as there would be a sensible error in the quantity on account of the vena contracta.

"On the Pressure and Density of Steam, with a proposed new formula for the relation between them; applicable particularly to Engines working with high-pressure Steam expensively," by William Pole, Assoc. Inst. C. E.

The relations between the elasticity, temperature, and density of steam have long been interesting and important subjects of philosophical research. The connection of the two former, namely, pressure and temperature, with each other, has excited the greatest attention, numerous experiments having been undertaken to ascertain the values of them at all points of the scale, and many formulae proposed by English and foreign mathematicians, to express approximately the relation between them.

The pressure and temperature being known, the density, or what answers the same purpose, the relative volume, compared with the water which has produced it, may be deduced by a combination of the laws of Boyle and Gay Lussac; and may be expressed algebraically in terms of the pressure and temperature combined; whereas, by eliminating the latter, by means of

8 Upwards of twenty different formulæ of this nature are given in the Encyclopædia Britannica, 7th edition, art. "Steam," where their respective merits and correspondence with the results of experiment, are amply investigated.

9 That if the temperature remain constant, the density varies directly as the pressure.

10 That if the pressure remain constant, and the temperature chance, the volume receives a certain definite amount of augmentation, for each degree of temperature added, or vice versa. This augmentation is equal to 0.0238 of the volume at freezing point, for each degree Fahrenheit, or 0.0275 for each degree Centigrade.

The before-mentioned formulæ, expressions can be arrived at which will connect at once the volume with the pressure.

But there are several difficulties in the way of this process, the equations which may be thus obtained being too complicated for practical use; and therefore, since it is important in calculations connected with steam and the steam-engine, to find a tolerably accurate, and at the same time, simple rule which shall give the pressure and volume directly in terms of each other, the empirical method has been resorted to.

The paper enumerates three formulæ given for this purpose by M. Navier and M. de Pamplour, explaining the peculiar cases to which they are applicable, and those in which they fail; and the author then proposes a fourth expression, which is intended to meet a case not provided for by either of the others, namely, for "condensing engines working with high-pressure steam expensively," such as the Cornish, and Woolf's double cylinder engine.

The equation is—

\[ P = \frac{24250}{V - 65} \]

or reciprocally, \[ V = \frac{24250}{P} + 65 \]

P being the total pressure of the steam in lb. per square inch, and V its relative volume, compared with that of its constituent water.

These formulæ may be adopted without considerable error, throughout the range generally required in such engines, viz., from about 5 lb. to 65 lb. per square inch.

Two tables are then given showing the pressures and volumes as calcula
lated for every 5th pressure in this scale; they show a comparison of the results of the four formulae with each other, and the respective amount of deviation from truth in each.

The greatest error is—

By M. Navier's formula 
M. de Pampin's first ditto 
M. de Pampin's second ditto 
The new formula 

-0.71

The mean error is—

By M. Navier's formula 
M. de Pampin's first ditto 
M. de Pampin's second ditto 
The new formula 

0-242 per square inch.
0-47
0-55
0-602

The tables also show—

1st. That the new formula is nearer the truth than either of the others taken separately, in three-fourths of the scale.
2nd. That it is nearer than all three combined, in half the scale.
3rd. That the greatest error of the new formula, with regard to the press-

ures, is only about half as great as that of the most correct of the other three.
4th. That the mean error is only one-fortieth of either of the others, and

only equal to about one-twelfth of an ounce per square inch.
5th. That the errors in the volumes are much less numerous and important

with the new formula than with either of the others.

It is also added that the new expression is simpler in algebraical form

than all the others proposed, and is easier to calculate.

183. The tendency of the constant error is to diminish the volume of the

rain from the theoretical, as the amounts of decay increase.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

Monday, November 4.—W. Tite, Esq. V.P., F.R.S., in the Chair.

He opened the proceedings of the session by making some observations in explanation of what he had stated at the concluding meeting of the last session. He alluded to what he had said as to the effect of the growing tendency to introduce Gothic architecture. What he intended to affirm was that it was not the duty of the architect to make a servile copy from the works of the ancients, but to avail himself of them only as exemplifications of the great principles which would require adaptation for modern edifices. In allusion to this subject he pointed out the advantage of studying the re-

 mains of the domestic architecture of the time of Edward I., as useful studies in the present day. So far from disapproving of the legitimate study of Gothic architecture he congratulated the members on the numerous re-

structions of ancient monuments in that style which were daily assuming all

their ancient beauty. All he had wished to do was to caution junior mem-

bers against the exclusive study of that style and the neglect of the classic

monuments of Greece and Rome, which he considered to offer more suitable

examples for domestic edifices, and he reminded them of the excellent examples

set them in this respect by Inigo Jones and Wren.

He then proceeded to give some account of his tour into Germany during

the last summer, when he had an opportunity of viewing the Walhalla (described in our Journal for April and May last, and accompanied with a view of the exterior & interior). He stated that the building was well studied, its situation admirable, and the blending of architecture, sculpture and painting exquisite, while the colouring is not so elaborate or so glaring as to make the contrast too great. In passing through the town of Ulm in Witternhaus he visited the cathedral which he described as a very fine building, and well deserving the inspection of architects who may be travel-

ling in Germany; although it is a Lutheran church, there are several objects of great beauty. Devotees of Gothic, if they have not four arches with supports as a matter of taste, the wood carving in the choir is extremely good. There is also a fine specimen of architecture, the tabernacle for the host, which is on the north side of the choir. In Munich he considered colouring was carried too far, the effect of colouring in external decoration not being good. For example, he vol. 125. the building; Il Sant'Angelo with a pediment, the tympanum of which is painted in fresco; at the back of this pediment is a second pediment also painted, the effect of which is extremely harsh. He then referred to the prevailing style of architecture in Munich, of which he and the two principal buildings were in the Byzantine style. The Basilica now being erected is in that style and well adapted to exhibit the effect of gilding. The library is in the Florentine style, but the external colouring is not well introduced. Mr. Tite then observed that from what he saw at Munich, and from the present tendency in England colour and decoration would be carried too far and likely to run into excess, although good in interiors the quantity of gold requires light, and conse- quently is not in some cases so well suited for ceilings. The roof of the Basilica is a queen-post roof and the interior is opened to the hall, the rafters are decorated as well as the other timbers, but the poverty of the materials is rather unfortunate as they are not well suited for decoration. The mode of building adopted in Munich has not the advantage we possess of the use of iron. Upon this point Mr. Tite advised the young architect to obtain a thorough knowledge, and learn the circumstances in which this metal might be more usefully introduced. He was permitted to say something relative to the best form of beams, and as to the intro-

duction of iron generally for architectural purposes.

Professor Donaldson then read a paper describing thirteen models of churches found in Utrecht the 6th, Charity at Westminster Abbey, they were designs submitted to the Commissioners appointed in the reign of Queen Anna for building of forty churches in the metropolis, but only three out of the thirty models had been adopted, viz. the Byzantine, Strand, Greenwich Church, and St. James' Westminster; the others were disapproved of by the class, and he considered it a great loss to the architectural character of the metropo-

lises that they were never carried into effect. The models are well executed and in good preservation, and it is to be regretted that they are not opened to public inspection.

Professor Donaldson also made some observations on the application of fresco by the old Italian masters to the exterior of buildings for decoration, and exhibited an original drawing by Pottiford in illustration. He then read a letter from Mr. Crane, of Wigmore Street, giving some account of the frescos which had fallen under his notice during a recent tour in Ger-

many and the north of Italy. Mr. Crane observes that in Italy, Switzerland, and the south of Germany, the paintings in fresco are so general, that there is scarcely a town in which both in the exterior and in the interior of the houses, some are not to be met with. In Italy this kind of decoration is the most important feature; there, in every church, the architectural or window 

signs have been arranged, with the view of being afterwards aided by painting; the enrichments of the mouldings and the ornaments being given in chiaro oscura. In other cases, again, the whole surface of the wall is covered with historiated allegorical or allegorical painting. The principal object in travelling was, firstly, to learn the processes employed in fresco and intonaco painting; secondly, to form an opinion as to the effects produced; and finally, to judge how far those effects would surpass painting in oil, in appearance and durability. For the first two reasons it was, therefore, the modern specimens of the art which were most frequently inspected. At the Royal Palace at Venice, I noticed decorations lately executed in fresco; but it was at Munich that I saw the art most extensively employed. In this city it is to be met with in every modern public building. In the church of St. Peter's, for instance, the grand portico is covered with frescos illustrating the life of Christ, the tabernacle of the Last Judgment, those of Zin-

nerman and others; and at the two Royal Palaces, each room is adorned by

some artist of excellence, either in fresco or encaustic. In addition to these interiors there are examples of exterior decorations at the Hof Garden, the facade of the Post Office, and the Theatre. The process of painting in fresco, though attended with certain difficulties, is easily learnt with ordinary perseverance. The effects produced surpass painting in oil, in solidity and clearness; but owing to the limitation of colours employed, there always appeared to me a certain yellow brown grey effect, and a want of the richness of oil painting. In order to see fresco painting properly executed by the artists of the Last Judgment, I think I must be felt by all; and in the beautiful composition by Veit at Frankfort, this defect is still more apparent.

"The manual operation I found, to my surprise, to be by no means rapid, even by the practiced hands. One of the most distinguished artists I noticed painting a broad fold in the drapery of a monk, he used a small brush, and gained his effects by repeated touches. The ground of lime and sand requires to be touched with delicacy. The pictures in execution at the Basilica, take, I was informed by one of the artists, nearly a twelve month to execute. The cartoons and painted walls are prepared in the winter months, and the painting is done during the summer. In ornament too, I observed that the work was not quicker than in oil, and much slower than in distemper to which it is superior as bearing washing, but inferior in the brilliancy of colouring. As to the durability of fresco in the other examples that I noticed in Italy, I observed that in those paintings had been executed in fresco and oil, the effects were at first nearly equal, and after some years the original colouring, yet the effect was in almost all cases impaired by the decay of the plaster ground, the surface of which had crumbled through the action of the atmosphere. At Venice where works on a grand scale have been executed at one time, precautions have been taken to prevent any decay, and the advantages of each, and found, that though the paintings in oil of some masters had much darkened, yet that with others, particularly Paul Veronese, the effects were still clean and fresh, and, upon the whole, being in better preservation, surpassed the actual appearance of most of the frescos. In the works of modern execution, I have been able to allow of an opinion being formed, yet, in the exterior specimens at the post office, and the Hof Garden, signs of decay are very evident. Upon the whole, reflecting upon all I saw, considering the difficulties of execution, the durability of oil, and the greater intrinsic advantages of fresco painting over oil, I could not perceive any great advantages over oil; in this country must be further added the additional likelihood of decay, from our damp climate, and discolouration through smoke and fog; on the one side it has great advan-

tages in being seen to perfection in all lights, and therefore particularly ad-

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vantageous for paintings of architectural effects in its clearness, and the
southern of its colour; on the other side, the disadvantages I have enumer-
ated above."

After the reading of Mr. Crace's paper some observations were made by
the Vice President and other members on the effect of fresco. An anedote
was related respecting Cornelius that when the King of Bavaria was viewing
his famous fresco of the Last Judgment, he observed to Cornelius that it
appeared when the sun shone on it. Cornelius replied, "That is just
what I wanted." It was also observed that it was surprising what a golden
effect was produced by simple colours, although done in dry and unshining
materials. In Munich the bricks are well burnt notwithstanding they are
absent, the line is very good and a large quantity of it is used in proportion
to the number of houses. The bricks are lamed with opening, but plastersing
bring the bottom, after the fire of the fresco is laid on by the
plasterer, who makes the first thing in the morning and puts on just
sufficient for the artist to work upon during the same day, and which this
latter must finish before it is dry. The substance is a plaster of the Eng. and to be attacked
of the efflorescence of salt-petrains, which can be removed by repeated
washing. The frescoes by Aglio in Moorfields chapel appears to have failed on
this account.

Mr. Arthur Johnson was presented with a prize consisting of the first
volume of the Transactions of the Institute for the best sketches sent in
by the pupils during the last session.

November 2, 1843.—W. Tru, Esq. v.p. in the Chair.

A highly interesting and practical paper on Timber and Deeds was read
which is given in full in another part of the Journal.

Observations.—After the paper was read Mr. Tite observed that it was ex-
actable to the practical architect, it is quite useless for architects to
introduce into their specifications the quality of materials to be used without
they are liable to assert that the contractor is not responsible for the con-
tions of the contract. He adverted to the proper use of deals; nothing was
so injurious or vexatious as the introduction of unseasoned deals, although
they appear to be quite dry; this can only be avoided by a practical know-
ledge of the quality of timber and deals on the part of the architect. Re-
specting timber the trifling difference in the price of Baltic and pine timber
was now so trifling that it was not worth while to introduce the latter, there
is something in it which renders it liable to the dry rot.

In London there is scarcely any other deals introduced but what were
named in the paper just read, but in other parts of England and abroad
there were other materials used; at Liverpool the floor of the Custom House
consists of narrow boards cut out of Riga timber which was stacked with
great care for some years; it was laid in widths of five inches with sawn
edges quite close, and afterwards planed. In France they knew of no deals;
they used boards cut out of the best Memel timber in every variety of joiners
work. In Scotland yellow pine was used to a great extent in joiners' work
without being painted, it is very durable if not covered up. At one of the
meetings during the last session he stated that the Great Western rails were
laid on very coarse pine timbers, and that had they been put down
on timber that was in the middle of the failure of the kyanizing; he has since ascertained that that was not the
case, for the timbers which had been Kyanized were found to be perfectly
sound when taken up, and that the reason for removing them was to lay
down the portion of the rails. Inasmuch as in Switzerland, a country very much exposed to a moist climate, the growth of the timber is
so trifling that it was not worth while to introduce the latter, there
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so trifling that it was not worth while to introduce the latter, there
is something in it which renders it liable to the dry rot.

The resolution is as follows:—That the modern practice of submitting
designs in competing specifications for premiums, or for employment, in any competition for preference without specific or
properly implied promise of certain payment to each and every com-
petitor, operates injuriously upon architecture, and upon the interests
and character of the profession.

Mr. John Miller, a ship-owner at Liverpool, largely engaged in the im-
portation of timber from the colonies, stated in his evidence before the Par-
liamentary Committee in answer to some questions put to him regarding
North American yellow pine timber:—"I know that Mr. Bellhouse, who is the
agent of the late Mr. Bellhouse, has by his very ardent advocacy of
pine timber, has been looked upon as the most influential of all the timber
agents. In Scotland a great deal of valuable timber (firs) has been
introduced as to the comparative merits of the two timbers, and that he now
gives a decided preference to the timber from the Colonies. For all purposes,
be, in building large warehouses, has latterly introduced Canadian yellow pine
in preference to Canadian red, or Dantzic, or Memel. He states, I think,
that he consumes about sixty cargoes a year; and even when he can get lengths
of Canadian red timber, or Memel timber to suit the purpose, he uses in
preference Canada yellow pine, and he states his reason that, for the last
fifteen years he has been a close observer of the different qualities of timber,
and the different effects of dampness, has by his very ardent advocacy of
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preference Canada yellow pine, and he states his reason that, for the last
fifteen years he has been a close observer of the different qualities of timber,
it, but it is injurious to the public. Most persons upon whom the duty de-
volves of attending to such local matters are neither disposed nor impos-
sed upon, in a notion that, in advertising for anonymous designs, they secure the advantage of designs from men of character and matured judgment; but as few such ever respond to the call in ordinary cases, the great bulk of competition
business falls into the hands of the intriguing jobbers, and the public and the profession are always the sufferers.

"Even in the case of the houses of Parliament, which has been thought by
many to afford the fullest justification of the system of general or public com-
petition, because of its apparent successfull result, the public possibly suffered
inconvenience, and the expenses will probably have been more than doubled.

"The public ought to understand, however, that what is generally requir-
ed in a competition cannot be fully and honestly complied with by either
party. It is one thing to make a design for a building of the kind and ca-
pacity required—it is another thing to arrange such design in detail, that the
cost of the building will be about the same as estimated, it is still another thing to
specify particularly all the materials, and their various kinds, qualities, and
capacities, the operations to which the materials shall be subjected, and the
quantity and quality of the labour or workmanship that shall be bestowed
upon them respectively—and it is still a further operation to estimate from
the detailed specifications, what the whole expense of the building will be. So
that with the public it is not a matter of conjecture, but of certain and
precise knowledge, that what has been granted for the building must be.
All these things should be done, nevertheless, and by every competitor, when the cost is a condition; and, moreover, every design so elaborated should be fully investigated in all its details, or the conditions of
the competition cannot be fulfilled by the parties imposing them. Now, in
consequence, men, having entered upon a competition, are compelled to limit
the extent and appearance of their design to the means set forth in the
conditions, and to satisfy their own minds as to whether they can be carried
out within those means. The most conscientious, however, will always entertain a doubt whether it be possible to complete—cannot, because of the immense disproportion between the labour
and expense which such fulfilment would involve, and the probability that the
labour and expense so applied will not be of the slightest value. But
the practice has been, and is sometimes, the habit of using, in the public
rooms, small or large, committees, or the public in general, to look at exter-
als—at the mere outside; and they are influenced by the effect produced in or by
the pretense of the drawings or models in which the design presents itself; the
merits or demerits of the "plan," as architects understand the term—the
kinds of materials used, the orders of columns, the architectural and artistic
effect of the design, etc. Nothing, however, is done to estimate the cost in
detail—and the thousand other things that go to affect the merit of a
design and its compliance or non-compliance with the "conditions," are
neither attended to nor understood; the effect of the design as to its deco-
rative finish, is, in some cases, entirely neglected; and whether they shall
be completed or not, is left to the idea and discretion of the designer, who
may take for his guide the "appearances," and not the "truth." Fortunately
it is that the conscientious man must always be an unsuccessful public
competitor when cost is a condition. Even in the notorious case of the
Royal Exchange, which might appear to contradict this, the reputedly successful conscientious competitor was still, for any value at all, unsuccessful, or at least.

"In truth, the public or their committees ask for too much, having refer-
ence to what they really want. Let the requirement be confined to a gen-
tal outline, and to the kind and extent of the structure required—of course
the capacity—and adapted to a particular site—and to be built of certain main con-
sistent materials.—Stipulate for a particular scale, and that the designs
shall be presented in drawings—in outline, or tints—and of what particular
tint or tints alone—and, if perspective views are desired—fix the point or
points, and set the scale, and the drawing will then not be required but most
likely be willing to engage themselves upon a comparatively small fee, giving
the public thereby the advantage of Competition, as far as it can be made of
any, without involving the great expense that elaborated designs must oc-
casion. The one, two, and three hundred pound premiums, now held out to
gambling crowds, might then be divided into twenty, thirty, forty, or fifty
guinea fees, according to the circumstances of the case, and offered to such
practitioners as might be known, or whose latent "talent," committees, or
individual members of committees, might desire to draw out or encourage;
and as no more a matter to a liberal profession is without some connexion
with whom it will happen to be able to give a helping hand, by nominating
him, or procuring him to be nominated, upon one such Competition or other,
all "talent" connected with knowledge and supported by character might
be urged forward to the success of the"...

The successful competitor under such circumstances might be trusted to
carry out his design in detail, adapting it to all the circumstances of the case
much better than he could have done in a general Competition.

"In an endeavour to convince Architects, as a profession, in what their
true interest consists, it is, perhaps, better to point out to the public than
the present system of Competition represents the honourable can-
didate for reputation and employment, by rendering it impossible for him to
compete on equal terms with the unscrupulous, and that, consequently, the
public is put into the hands of the latter; and to have pointed out also
that there is a reasonable course that may be pursued by which all the ad-
vantages of Competition are to be obtained, although Architects refuse any
other to lend themselves to gambling speculations.

The public will, nevertheless, go on as they have gone on until Architects,
as a profession, shall have declined any longer to degrade and beggar them-
theselves. It is, therefore, not a question proposed to the public,—and it is
one indeed with which the public have nothing to do, beyond the interest
which the public have in raising the character of the profession of Archi-
tecture, but which they shall never recognise while they think they benefit it
by its debasement. It is a matter to be determined by the Architects themselves;
and it may, perhaps, be hoped that this exposition of the abuse the profes-
sion labour under will induce all who are not quite besotted with the
vice to consider the question in this, its true point of view; and, having so
considered it, to take a longer view of their true and genuine interests, which
have any sense of honour and virtue, or, indeed any self-respect, re-
maining, will no longer lend themselves to the present degrading system, and
it will soon cease to exist among us.

October, 1842.

Review.

Perry Cyclopaedia. Art. "Window."

The part of this excellent Cyclopaedia, which will be published on
the same day as this number of our own Journal, is, we believe,
the final part, and thus a veritity in understanding will have, of Butley,
the best of whom has found no place in any English biographical
work—at least none of the many we have referred to for it—although he has been dead these eighty years: nor can it be alleged that he was too obscure in his profession for notice, since the man who made nearly all his own monument, deserves to be recorded quite as much as the illustrious Nash—we do not mean the architect, but the "beau."

"Walhalla"—the so-called structure near Regensburg, which is here fully described, is also an article which it was not absolutely indispensable to give, and the same may be said of "Windsor Castle," yet it is a very important part of our history, and it has been done at last. We shall confine ourselves, however, for extracts, to the article "Window," although it is one that ought to be read entire.

"It is one very great advantage of the Gothic or Pointed style, that there the windows derive strong architectural expression from the apertures themselves: which, with the mullions, transoms, and tracery inserted in them, mainly form the design and decoration, while the external mouldings and enframments contribute to them only in a subordinate degree. Consequently, if others quite plain, the windows can never appear more vacant spaces. Widely different is it in those styles where the ornamental design is confined to the mere exterior or framing of the aperture: therefore, however they may be so decorated, the openings will, if of very large dimensions, always have a vacant look, and the glory of the window will still appear to be in want of adequate support.

Such is the case with the windows of St. Paul's, where the apertures are filled in only with very ordinary glazing in small panes, and consequently are so far from being pleasing, as to produce a somber, dingy appearance; whereas in Gothic windows the opening or the filling itself supplies both the grace and the richness, and is never extended over such large unbroken surface, but the size of the window be what it may, as to produce an effect of blankness.

It is another advantage peculiar to that style that it allows windows to be of any dimensions—of the smallest as well as the largest, and windows of very different sizes and proportions to be introduced into the same elevation. For further remarks on this subject the reader may refer to what has been said on Gothic Architecture, p. 324, and Oriel; since we must here confine ourselves to windows in the Italian or modern style generally."

After speaking of the various modes of treating windows according to the floor they occupy in a façade, the writer proceeds with remarks of his own, referring to various examples.

"In the basement of the Strand front of Somerset House, which, although secondary to the order, is almost of equal importance and effect in the general composition, the windows are more than usually large, and the Doric pilasters, entablatures, and pediments, and their sills resting on them, all form a sort of band set within arcades, and therefore preparation is so far made for their dressing, which are thus framed in from the rusticated surface, so that their richness does not seem at variance with the latter; the richness itself too is of a bold character. When the ground-floor is not a distinct basement, its windows require to be equally dressed, or very nearly so, with those of the principal story, with little regard to the difference as to proportion and design than what is necessary for preserving some distinction and avoiding monotonous repetition; because, though it is desirable that all the windows on a floor should be of uniform design, except that a centre window may occasionally be more decorated and rendered a more conspicuous feature than the rest, it is hardly less desirable to avoid the sameness arising from all the windows of a front being too nearly alike. Where the ground-floor is the principal one also, as is now frequently the case in villa residences, in which all the chief rooms are below, and perhaps only a small chamber or bedroom over them, the lower windows are of course the most important in design, yet, whether the principal window or the others, they ought to be in keeping with the rest of the design. This rule, or rather this law of aesthetic composition, has been admirably well attended to by Mr. Barry in the Travellers' and Reform Clubhouses, London; and, on the contrary, violated in the exterior of Goldsmith's Hall, where there are two ranges of windows included within the same order, and of which the upper windows are both in the same size and height, and yet appear of two distinct orders, because of the change of the brickwork or stucco. Accordingly, while the lower division of the front looks sober, and its deficient in boldness, the upper windows seem over-embellished with ornament.

What has been said in regard to the sequence of the different tiers of windows in an elevation, is to be understood only generally, there being many exceptions, and not a few anomalous cases. In the façade of the Palazzo Massimi at Rome, one of Peruzzi's best works, there are two tiers of mezzanine windows above those of the principal floor; in the celebrated Palazzo Farnese, on the contrary, the ground floor, which are also the uppermost are somewhat lower than the others, at least in their apertures, owing to these last being arched, and are further remarkable as having pediments, which are seldom used for windows higher up than the first-floor. In Sangello's façade of the Palazzo Sacchetti, there is a range of mezzanines above the first, and an opening up the same manner between mezzanine and square windows between the first and second floor; and it also resembles it in the importance given to the ground-floor windows. In regard to windows of the last-mentioned class, the Palazzo Buoncompagno at Rome, a work attributed to Bramante, offers an unusual example, for there the lower floor and its windows are made the next principal features after those immediately above them; in both the apertures themselves are round-headed, with impost and archivolt, but flanked by pilasters supporting an entablature, whereby the general form of the chambranle, or dressing, becomes square-headed: the chief difference between these two tiers of windows is, that those above have pediments (alternately angular and segmental), while the others have none.

That the writer in the Cyclopaedia has not the same horror of small "gables" over windows as Dr. Fulton has, is evident from the following remarks, with which we must close our extracts.

"In addition to the above, there are many other parts which enter into the composition of window-dressings, and among them a principal one is the pediment, applied by way of finish to the whole. Some critics have urged objections against pediments to windows, as it is very hard to write a descriptive paragraph which might be directed against a great deal in every style, on which its particular character and expression more or less depend. It is enough for us that the application of the pediment form to such purpose is so fully established that no idea of incongruity attains it, and that, considered with regard to its artistic effect, it contributes to variety in various ways. At the same time we cannot admit as legitimate more than two distinct varieties of it, namely, the angular, and the curved or segmental; for as soon as we begin to disturb the outline, we violate the principles of the style from which such decorative feature is derived. Broken pediments, scrolled-shaped ones, etc., are therefore to be considered as defects, and themselves, when used, as defects. One great value of the pediment as a decorative feature of windows is, that its sloping lines contrast with those of horizontal mouldings, and occasion variety of outline in the general form of windows; and that such an addition serves to distinguish and give due importance to the windows of the principal floor of a building, to which, in good composition, they are generally confined. In the Palazzo Farnese both the upper rows of windows have pediments; the first alternately angular and segmental, the other only angular ones; and there, owing to the very great space over the windows, the numerous pediments do not seem to overload the design, as would be the case if the upper ones were too small and the pediment between the superior cornice.

"We now come to another mode, quite different from any of the preceding, namely, that which consists in applying a small order either in columns or pilasters, with a regular entablature, sometimes with the usual architrave also surrounding the aperture of the window, at others not. And though some object to such mycetous composition, there are a number of examples in which it has been successfully attempted to give an air of lightness to the entire composition, and through really small, yet being distinct and independent features, instead of giving an air of littleness to the entire composition, they rather give greater dignity and importance to the windows. As to the
actual effect produced by them, that depends upon the judgment and
taste with which such decoration is applied. Windows of this kind
are certainly not suited for any except asylum composition, since
there be also a large general order to the façade, while the columns to the
windows look rather insignificant by comparison; there is too
much of repetition and monotony, and the whole decoration seems
to consist only of columns of different sizes. Still worse is the effect
when, as is the case with the Atlas Office, Cheapside, London, the
building consists of more than one order, because then, as the win-
dows must be large in proportion to those orders, the columns to the
windows cause the others to look petty, and the whole to appear both
crowded and confused—a defect most strikingly exemplified in the
structure alluded to, nor is it at all decreased by the windows to both
the upper floors being camoufaged. On the contrary, Barry's two
clubhouses in Pall-Mall are truly beautiful examples in regard to
windows thus decorated; for there they are treated in a most masterly
manner, and applied with the happiest effect, and so as to produce
the felicities union of sobriety and simplicity with a very high degree
of decoration. Instead of being mere copies, those windows are
original and admirably studied compositions, beautifully and even elabo-
rate finished, whereas in the other instance just mentioned, and
also in the front of the Clubhouse Chambers, Regent Street, though
there are columns to the windows, there is a very sorry translation to
them—neither architrave nor frieze, but merely a plain lintel in lieu
of them, without mouldings of any kind, which, besides being offen-
vively lumpish and heavy, look mean in what professes to be decora-
tion of a superior kind."

The article ought to have been more fully illustrated with cuts, and
no doubt would have been so, had the writer of it not been at all con-
trolled in that respect.


The Gardener or the Amateur will find much useful information
relative to the cultivation of the flower and kitchen garden in this al-
manac.

The Mechanics' Almanac and Engineer's Year-book for 1844. Pub-
lished by the Stationers' Company, contains a great variety of statis-
tical and scientific information, collated from various works of the
present year.


This is a novel, and at the same time, an interesting view of the
great metropolis, it not only shows the line of streets, squares, &c.,
but also the elevation of the houses, bridges, and all the public build-
ings: it is a work of great labour and deserves encouragement.

Pothographia Curiosa.—Mr. Jobbins, the lithographer, is collecting
together the various alphabets of writers of bygone days; many of
them are of a beautiful form and in colours; he intends to publish them
in parts, two of which have already appeared; it will be a work of
considerable interest, and deserving of support, particularly by the
architect.

Daniels’ Eau-couranting Telescopes are very compact, being only 3 inches
long, an inch diameter, and of great power; they are particularly convenient
to carry in the pocket on a ramble or tour.
radii, and some minor curves on approaching the Utrecht station. The soil through which the line passes is generally a thin stratum of monad of about a foot thick, under which is a kind of light turf. Sand for forming the embankments had to be got from a distance of some leagues from the dunes or sand-hills. The embankments vary from a yard to 4 yards in height, and are carried down to the natural soil of the polders or marshes. In the parts which are least solid, being a distance of 6 miles, the embankments, entirely of sand, rests on a bed of fascines 11 yards wide, and about 2 feet thick. Notwithstanding this, no firmness of the ground is indeed one principal reason why the original engineer Myntner D. H. Goudouw, adopted a gauge of 2 metres (6ft. 6in.) with rails of 25 to 30 killogrammes per metre run (about 60 lbs. per yard), supported on a continuous framing of Baltic pine, of which the longitudinals are from 7 to 12 inches square, and the cross-plants are from 6 in. to 12 in. square, with a length of 3 metres (about 3 yards). For the same reason this system has also been adopted on the Amsterdam and Rotterdam railway. However extensive this framing may be, it was necessary that the track should be in a constant position, as there are no considerable slopes, but as the canals (large and small) frequently intersect, the engineers have been obliged to form a number of bridges and aqueducts, among which are three large swing bridges of cast iron made at the Hague and two draw bridges. The others are fixed wooden bridges, with abutments in masonry (2 brck). All these works of art, as well as the Amsterdam stations, are built on piles. From Utrecht to Arnhem the road goes through a rougher country, and passes several heaths, requiring cuttings, of which five or six have a depth of from 30 to 65 ft., sometimes extending over a length of 300 yards. The total quantity of cutting is about 3,000,000 cubic yards, which has to be carried a mean distance of about two miles... In general the cuttings are in mere sand mixed with loose pebbles. The inclination of the slopes, 36 to 50 feet high, is 45 degrees, and they are covered with heath sod (*grass sod*). After standing two years it has been found that the road is now entirely covered with grass. Between Utrecht and Arnhem the road is laid out with much the same kind of curves and straight lengths as in the previous part, and among the works a large iron cast iron bridge, broad enough to carry two lines of rails, some smaller bridges, cast iron, and a number of occupation bridges, viaducts and culverts.

The act for this company was granted in 1838, and the capital was raised under the personal guarantee of 4½ per cent. by the ex King Wm. 1st, he dividing with the shareholders the surplus profits. The direction of the works was entrusted to the government engineers, who, on account of the state of the law, had great difficulty in getting possession of the land, and settling with the landowners. Their difficulties were such that towards the end of 1842, they were still at law with a great number of them, and unable to prosecute the works with effect. Indeed, it was not till Spring that all the landowners were pacified—then the works were proceeded with at a rate almost unprecedented in foreign engineering enterprises, under the guidance of the present engineer, M. Vanderkum. The estimate for the whole line, 60 miles long, £110,240, and it is not expected that the excess expenditure will be more than 3 or 4 thousand. The line is, for the most part, laid out for a single way—a double way being laid only on 6 miles between Amster- dam and Utrecht, and 6 miles between Utrecht and Arnhem. Sutlings are, of course, provided at the several stations. All the bridges, and other works of art, are of double line, which will be laid down throughout where the extent of the traffic may require it.

The working plan consists, at present, of 6 locomotives, made by Sharp and Roberts, of Manchester, and 4 made at Amsterdam. They are all six-wheeled engines, with 6 ft. 6 in. of wheel base. Thompson's new patent have also been ordered of Messrs. Van Visseng and Co., of Amsterdam. The number of passenger carriages and goods trains is now seventy, and will be next year one hundred and forty; they have been manufactured in the neighbourhood of 12 months, and are all six-wheelers. All the engineers are Dutchmen.

**NEW INVENTIONS AND IMPROVEMENTS.**

**NAPIER'S PATENT COPPER CLOTH.**

A new material under the above name has lately been brought under our notice, which, as it promises to be, ere long, in very general and extensive use, we propose giving some account of it to our readers. It consists of stont linen cloth, on one side of which has been deposited, by electricity, a thin covering of copper, or it might be described as copper plating, which on being immersed in use weighs about 4½ lb. per square yard. The thickness of the metal, however, may be varied at pleasure, according to the purpose for which it is required. This production is the result of another beautiful application of electro-metalurgy—an art which, no sooner had it issued from the hands of the man of science as a mere experiment, than it stepped with giant strides into our arts and manufactures, and is now extending and ramifying itself in all directions. at one time gilding a pin, at another coppering a ship's bottom, or in the earlier judicious experiments of the new electrical industry. The mode of manufacturing the copper cloth is as follows:—on a sheet of copper paste, very evenly, with as little paste as possible, stout linen cloth; and when thoroughly dry, attach it to the negative pole of a galvanic battery, and to the positive pole of the same the iron rod which the copper is to adhere to. The resistance of the copper to the positive pole to be dissolved. Decomposition takes place, copper is thrown down on the cloth, and, endeavouring to reach the copper plate, insinuates itself into all the pores of the cloth, forming one perfect whole. The time requisite will vary according to the thickness required, but in general five or six hours is quite sufficient to give a good coating. But a battery is by no means essential, as, by the following means, it may be dispensed with. Attach the copper, with the cloth pasted on it, in a sheet of amalgamated zinc, round which has been wrapped a stout piece of brown paper, with the ends sealed down, so as to form a kind of bag: immerse the whole into the solution, and a deposit immediately takes place, zinc being dissolved, and a nearly equal weight of copper deposited. This is a very cheap and simple method, and is well worthy the attention of the electro-typist. The sublate of zinc formed remains within the paper bag, and very little of the copper solution finds its way into it. If the copper does not spread fast enough on the cloth, it may be rendered a better conductor of electricity by rubbing it over with a little blacklead, or what is better, a new conducting material, produced by heating pieces of zinc and iron together, to a red heat, and then letting them cool slowly in water, and the copper is formed, which can be reduced to a very fine powder, and may be used either alone or with blacklead; when alone, it should be used with something adhesive; glycerine has been found to answer perfectly.

The process is not costly, as the zinc is very cheap, and a great deal over, as, by cutting the underneath copper into various shapes, devices of any kind may be struck into the cloth, which, being afterwards silvered or gilt, produces a very beautiful effect.

The numerous applications of this useful material will suggest themselves to the inventor, not only for out-door works, such as for covering roofs, verandahs, &c., on account of its lightness and water-tightness, but also for ornamental purposes within doors; and we feel sure that it has but to be well-known to be very generally adopted.

**NEW LIGHT.**

It is now four years since the first experiment on the subject of rendering continuous, and fixing at a given point, the electric fluid, and making it applicable to the general purposes of lighting was made in Paris, but the discoverer was not able to induce any person to advance even 1000f. for an apparatus on a sufficiently large scale for a public experiment. A public exhibition: was held at which it was Couderc, in the presence of the authorities, and from four to five thousand of the inhabitants of Paris, on the 20th inst. On one of the bases of the statues at the Pavilion de Lille, a glass globe of apparently twelve or thirteen inches diameter, with a moveable arm, was placed in cold and in more than one place. Before nine o'clock the electric fluid was thrown into it by a conductor. At this time all the gas lights in the place, about 100 in number, were burning. As soon as the electric light appeared, the nearest gas light had the same dull, thick, and heavy appearance as oil lamps have by the side of gas. Soon afterwards the gas lights were extinguished, and the electric light shone forth in all its brilliancy. Within 100 yards of the light it was easy to read the smallest print: it was, in fact, as light as day. The astonishment of the assembly multitudes was very great, and their delight as strong as their astonishment. The estimate made by scientific persons who were present, was that the electric light was equal to twenty of the gas lamps, and, consequently, that five of these lights would suffice to light the whole place most brilliantly. As regards the expense of production, nothing positive has transpired, but it would be considered as an achievement that that of the generation of gas, whilst the first entry for machinery and conductors would not amount to a twentieth part of that required for gas-works. There would also be another great advantage in the electric light. It gives out no bad smell: it emits none of those elements which, in the burning of gas, are so injurious to health, and explosion would be impossible. The only danger would be at the battery itself, but that would be under the control of competent persons; and, even in this respect, there would be no danger, even to unskilful persons, with an apparatus of moderate size. Internal lighting would be as practical as for gas, and could be accomplished, with the same apparatus, to light every part of the house. This experiment was with a voltaic battery of two hundred pairs, composed as follows—1st, an outer globe of glass; 2ndly, in this globe a cylinder of charcoal, open at both ends, and plunged in the nitric acid contained in the outer globe; 3rdly, in the charcoal a porous porcelain cylinder, which replaces the cloth in the common battery; 4thly, in the porcelain vase a cylinder of amalgam of zinc plunged in acidulated water. The pole was on the Pavilion de Lille; the two copper conductors from the two poles, and pointed with char-
coal, lead to an empty globe from which the air has been exhausted. The two fluids on meeting produce a soft but intense light. The experiment was considered highly successful by the authorities who were present and has been repeated on many other occasions, not only as well as in a general way as it did last night, and the cost be less than that of gas, which it must be, there will be a dreadful revolution in gas works. A company for supplying the electric light would realize a handsome profit on charging only a sixth of what the gas company charge. The electric light is to be used as a liquid oxygen; but then how much more simple is the apparatus; how much less costly the expense of production! The oxygen produces a double and most expensive apparatus, and is only applicable to a few localities; the electric light may be applied externally and internally in any place.

The above description, copied from the French Journals, has been inserted by many of the public in the present comment, like several other paragraphs of new and wonderful inventions, which, if we are to believe them, are to supersede the present arrangements; and yet, from that time forward, we never hear anything more of them, they have been proved to be either perfectly impracticable, too expensive to be even worth the trouble, or in all probability not inferior to the method which is already in use, and which every reader could arrive at once, if the whole of the evidence were given instead of only that portion which just suits the inventor or projector to give. Although we consider that the consumption of nitric and sulphuric acids and zinc, in 200 cells of a battery, would cost more than the gas requisite for the 20 lights which it is said to be equal to, we cannot state so for certain without more data. But what we find most fault with is, in the stating that to be new, which has no novelty about it, and which every tyro in gas-making has himself performed in the most wonderful work Groves's arrangement, with charcoal substituted for the platinum, an improvement which was made immediately after Grove's first announcement, and of which the younger Silliman has long ago published a very simple arrangement. The new light produced thereby the charcoal poles, is almost as old as the scientific art of gas-making itself. When it became evident that the process, which, in connexion with a cheaper battery, the whole process has been patented in this country with much better arrangements, and has not been carried out, we suspect, on account, of the increased expense over gas. As to its being said to be superior to the gas, the gas is not yet, or the gas itself, but at the proposed battery there are nitric acid fumes given off, which are not only offensive, but highly corrosive to anything it comes near, animal, vegetable, and mineral. It would be requisite to keep it in a place by itself, if used in houses, as proposed, and then comes the increased expense of arrangements, and the like. The strength of this gas may be readily detected by its reddening litmus paper. We would have been disposed to encourage any plausible scheme for improving or cheapening public lighting, we cannot, in the present instance, see much to give us hopes of its success. At all events, we wish it to be stripped of a claim which it does not possess, viz., united novelty—and to place it in the light of an experiment for public adoption, that which has been long and known and conducted both in the laboratory and at the lecture table.

Editor C. E. & A. Journal.

NEW MANUFACTURE OF LIME.

Patented by Messrs. Daniell and Hutchinson, May 4, 1813; Specification enrolled April 10, 1814.

Lime is at present usually manufactured from limestone, chalk, or other substances in which it exists in an indurated state, or state of solid combination with other bodies. The nature of Messrs. Daniell and Hutchinson's invention consists in their having discovered that there are large tracts of sand on the coasts of this kingdom, and particularly on the coasts of the county of Cornwall, which are at present either treated as valueless or made use of, like other sand, for purposes of mechanical internoitio, merely, as in the making of mortar, breaking up of tenacious soils, &c., but from which, nevertheless, lime of an excellent quality, applicable to building, agriculture, manufacturing, and other purposes, can be manufactured in large quantities. The patentees state that they have ascertained, "by numerous and careful analyses of the sand referred to, that it usually contains more than 70 per cent. of carbonate of lime." The mode of reduction which they adopt is thus described:—"The sand is collected and is laid on plow beds, which is prepared for the conversion into lime by burning. We propose to operate is of the proper quality, we put an ascertained quantity into a retort, and pour dilute nitric acid upon it; if it contain carbonate of lime, a violent effervescence ensues, and carbonic acid is rapidly evolved. The strength of the acids may be readily detected by its reddening litmus paper. We then neutralize the nitric acid by the addition of liquid ammonia, and precipitate the lime by adding the carbonate of ammonia in excess. We next weigh this precipitate, which gives us a measure of the average quantity of lime which may be extracted from larger quantities of the sand in which it occurs. When this is carried out on a large scale, we proceed as follows:—We make use of reverberator ovens, the size of which is great in proportion to the size of the quantities of the lime to be produced, the last being in size according to the quantities operated upon, but the bodies of which are generally from 20 to 30 feet in length, from 6 to 13 feet in their greatest width, but gradually contracted towards the end, where they open into the chimney, and from 14 to 20 feet in height. The sand is laid upon the bed of the furnaces to the height of the bridges, which are made a little higher than the hearth; and it is converted into the lime by burning by the direct action of the current of flame upon it. The great degree of heat to which the sand is here exposed expels the carbonic acid so quickly, that in about two hours the process of conversion is generally perfect. From this lime is then removed from the furnace through doorways made at intervals, either in the sides, end walls, or in the roof, and is now in a proper state to be employed as a manure; but to fit it for the various other purposes to which it may be applied, we first pass it through sieves to separate any extraneous substances which it may contain. When the lime is desired to be used for the manufacture of building, the patentees add the necessary equivalent of water; if into sulphate of lime, or gypsum, they add the necessary equivalent of sulphuric acid; and on through all the various combinations of which lime is susceptible—Steel, May.

MISCELLANEA.

North Shields.—The Old Gas Company. The North Shields Gas works have resolved to divide their capital stock into 1300 shares of 5l. each, and to allot them in lots of not more than 10 shares each to gas consumers and reduce the rates of burners and of gas to 7s. per 1000 ft. from January 1st, 1843. The old Company is dissolved, and the new one are to take over all the shares are taken by consumers, and 433 by non-consumers, offer to take the prices the old company have reduced them to in Oct. 1841. The new company was established in 1821, and the new company assert that up to 1831 they were receiving 12½ per cent. more than companies generally. Feeling bound to state the truth of the adage of "two of a trade will be verified, time will show.

Case of Laws Opening Out New Window Lights.—At an adjourned quarter sessions held at Guildhall, Newcastle-on-Tyne, October 30th, to decide a dispute as to compensation to be paid by the corporation for setting his house back on a line with the other buildings. His house projected before the adjoining house to the extent of 5 ft. The adjoining house was set back by the corporation thirty years ago. The counsel for the defence said:—"If Mr. had a right to windows in the side wall, why had he never had them there before. The fact was, that he could not put out windows overlooking any person's property, and if the man had windows in the side wall, the corporation, or the person whose property was overlooked, could screen them up and obstruct the light. The plaintiff had no right to ask compensation for a side frontage that did not belong to him, and that he would not be permitted to have. The Recorder in summing up said, "that there was only one point of law to which he would direct the attention of the jury, which was, the right to put out windows on the flank wall. He was of opinion the proprietor had not the right to do so and, therefore, whatever benefit they might think would arise to the property from the additional light which he left on his property, would be no compensation for the damages." It was a special jury case, and the offer of the corporation was 150l. the sum claimed was 900l. and the verdict 225l. The setting back of the property was compulsory under the powers of a town improvement act.

Newcastle-on-Tyne.—There are now three projects for a high level Bridge at Newcastle, at least notices of intended application to Parliament for a bridge, but the site of it is that sanctioned by Mr. Hudson, and Mr. Geo. Stephenson, the other two are by Mr. Grainger and the Carlisle and Brandling Junction Railway.

Chatham, Nov. 10.—The Admiralty have given directions for metal masts to be erected in this dock-yard, similar to those at Portsmouth, for the purpose of supplying the eastern yards with copper bolts and sheets of copper. It is also rumoured that the Admiralty have it in contemplation to enlarges the yard, and also to make a large wet-dock for the reception of first-class ships. The Watt steam-frigate is fast progressing, owing to the number of hands on her.

Flat Roofs.—Mr. Loat of Chatham, builder, has lately obtained a patent for what he calls an improved mode of constructing floors and roofs, which are formed by a series of hollow vessels of earthenware, that have been in use for many years in foreign archives; but instead of laying them with a curve, Mr. Loat lays them flat on boards and combines them together with cement, and when the roof or floor is completed and the cement set, the vessels are removed; the roof or floor is covered with a cement bedded in cement. The under surface, he states, can be laid with iron rails or hoops, and plastered over with lime and hair; why not dispose with the lath, would there not be sufficient key for the plastering without?

Paper Cloth.—Mr. Chapman of Arundel-street, Strand, lately obtained a patent for covering one or both sides of any fabric, such as canvas, muslin, calico, or linen, with paper suitable for writing, printing, or drawing; it is understood that the maker of the fabric with a solution of gum, glue, or other adhesive material, and passing it between rollers, by which means the cloth and paper are firmly united.
LIST OF NEW PATENTS.

(From Messrs. Robertson's List.)

GRANTED IN ENGLAND FROM OCTOBER 27 TO NOVEMBER 21, 1843.

Six Months allowed for Enrolment, unless otherwise expressed.


Alphonso Granison Hull, of Clifford-street, Bond-street, doctor of medicine, for "improvements in manufacturing or improving fermented and distilled liquors." — Sealed October 27.


Matthew Leach, of Manchester, mechanic, for "improvements in rotary steam engines, which improvements are applicable to pumps for lifting and forwarding water." — Nov. 2.

Joseph Dickinson Stagg, of Middleton, in Toadhall, Durham, manufacturer of smelting works, for "a new and improved plan for collecting, condensing and purifying the fumes of lead, copper, and other ores and metals, and the particles of such ores and metals arising, or produced from the smelting, smelting, or manufacturing thereof, and also the moisture, smoke, gas, salt and acids, soluble and absorbable in water, generated in treating and working such ores and metals." — Nov. 2.

David Evans, of Colthill-street, Eaton-square, engineer, for "improvements in sweeping and cleansing chimneys and flues, and in increasing the draft therein, and in preventing the soot from smoking." — Nov. 2.

Joshua Proctor Westhead, of Manchester, manufacturer, for "a new or improved fabric, or new and improved fabrics, and also certain modifications of the manufacture of the same, which modifications of machinery are applicable to the manufacture of woven fabrics." — Nov. 2.

Frederic Isaac Welch, of Birmingham, manufacturer, for "an improvement or improvements in the manufacture of leather." — Nov. 2.

Robert Dunsdon, of Brick-lane, Shadwell, civil engineer, and William Symington, of East Smithfield, civil engineer, for "a method of cleaning, purifying, and sweetening casks, vats and other vessels." — Nov. 2.

William Edward Newton, Chancery-lane, civil engineer, for "improvements in furnaces or fire-places." (A communication.) — Nov. 2.

Robert Eyvand Jackson, of Blackburn, cotton spinner, for "improvements in the machinery or apparatus to be used in the preparation of cotton and other fibrous substances for spinning." — Nov. 4.


William Rowan, of the firm of John Rowan and Sons, of Daugh Foundry, Antin, engineer, for "improvements in axles." — Nov. 7.

Benjamin Parsons, of York-road, Lambeth, engineer, and Edward Edwall, of the City Saw Mills, City-road, machine-sawyer, for "an improved machine for cutting leaves of wood, such as those commonly called "scale-board." — Nov. 7.

Charles Druy Hazen, of Nottingham, merchant, for "improvements in machinery for knotting stockings and other articles." (A communication.) — Nov. 9.

Arthur Dunn, of Rothsridhe, soap-boiler, for "improvements in the manu- facture of soap." — Nov. 9.

William Bush, of Union-street, Deipford, engineer, for "improvements in rendering magnetic needles less prejudicially influenced by local attractions." — Nov. 9.

Thomas Clerendon, of Great Brunswick-street, Dublin, gent., for "an im-proved method of shoeing horses." (A communication.) — Nov. 9; two months.

Samuel Archer, of Rochdale, flannel manufacturer, for "improvements in the manufacture of flannels." — Nov. 9.

Walter Hancock, of Stratford, Essex, engineer, for "improvements in the manufacture of cumbouch and cumbouch in combination with other sub-stances, and in machinery or appatus for preparing cumbouch and other materials." — Nov. 9.

George Holmes, of Stratward, engineer, for "improvements in furnaces or fire-places." — Nov. 9.

Samuel Haseltine, jun., of Bromley, Middlesex, engineer, for "improvements in machinery to be worked by air or other gases." — Nov. 9.

William Edward Newton, of Chancery-lane, engineer, for "improvements in machinery for preparing and cooking wool, hair, and other fibrous substances." (A communication.) — Nov. 10.

John Withers, of Smeethwick, Stafford, manufacturing manager, for "an improvement or improvements in the manufacture of glass." — Nov. 10.

Lake Smith, of Southwark, mechanic, for "improvements in, or applicable to, lociis for weaving various kinds of fabrics." — Nov. 10.

Edward Buxton, of Raisinghall-street, merchant, for "improvements in spinning wool, cotton, and other fibrous materials." (A communication.) — Nov. 11.

George Scott, of New City Chambers, Bishopsgate-street, London, gentleman, for "improvements in the manufacture, purification, and combustion of gas or gases." — Nov. 11.

James Smyth, of Pearehall, Suffolk, machine maker, for "improvements in the construction of drills for boring gears, shafts, and machinery." — Nov. 11.

George Grawne, of Putney, gentleman, and George Ferguson Wilson, of Belmont, Wauxhall, gentleman, for "improvements in the manufacture of candles, and in apparatus for, and processes of treading fatty and other sub-stances, for the making of manu-factures, and other goods," — Nov. 11.

Ramsay Richard Reinhage, of Howland-street, civil engineer, for "improvements in applying atmospheric air as a motive power." — Nov. 11.

Arthur Wall, of Birkenhead-street, merchant, for "improvements in the manufacture of iron." — Nov. 11.

James Rose, of Birmingham, gentleman, for "an improvement or improvements in the mode or method of manufacturing gun barrels and ordna-nce." — Nov. 11.

William Shepherd, of King's-on-oaple-Hill, joiner and builder, for "an improvement in jointed, slide-rolling, and an improved jointer for railway steam-engines, and for working the steam expansively in the cylinder," — Nov. 12.

Moses Poole, of Stockport-street, merchant, for "improvements in the manu-facture of parts of ladders and other cutting instruments." (A communication.) — Nov. 12.

Edmond Saul, of Bridge-road, Lambeth, Surrey, medical student, for "improvements in the manufacture of musk." — Nov. 12.

Thomas Hancock, of Cowell's-road, Goswell-road, waterproof cloth manufacturer, for "an improvement or improvements in the preparation or manufacture of cumbouch, in combination with other substances, which preparation or manu-facturing extends to vessels for rendering cloth, and other fabrics, waterproof, and to various other purposes for which cumbouch is employed." — Nov. 12.

John Coope liddard, of Liverpool-street, King's-cross, engineer, for "improvements in the mode of manufacturing paper machines, and other articles made of vegetable pulp." — Nov. 12.

William Palmer, of Sutton-street, Clerkravell, manufacturer, for "improvements in the manufacture of pins." — Nov. 12.

Octavius Dillingham Mordanant, of Cliffed-street, Bond-street, gentleman, for "improvements in apparatus for obtaining the profile of various forms or figures." (A communication.) — Nov. 12.

Moses Poole, of Lincoln's-inn, gentleman, for "an improved machine for forcing or propelling vessels, which can also be used as a boat." (A communication.) — Nov. 12.

Antonio Frances Jean Claudet, of High Holborn, glass merchant, for "im-provements in the process and means of obtaining the representation of objects of nature and art." (A communication.) — Nov. 12.

Thomas Diggins, of the town of Rochester, Lieutenant in the Royal Navy, for "improvements in fastenings for part of ships and other vessels which improvements are also applicable to other building purposes." — Nov. 12.
MACHINE FOR SAWING TIMBER UNDER WATER

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5 & 6.

Fig. 7.

Fig. 8.
A PILE-CUTTING MACHINE USED IN BELGIUM.

(With an Engraving, Plate XVII.)

The method of laying foundations of piers by caissons has been so well and minutely described by Labeye and Milne, in their account of the building of Westminster and Blackfriars Bridges, and by other writers on the subject, that it would be useless further to advert to the peculiarities, advantages or disadvantages of that system, than is essentially necessary to show the utility of the pile-cutting machine, represented in the accompanying engraving, which is copied from the working drawings, through the kindness of our correspondent Mr. Flanagan.

The failure of some of the piers of Westminster and other bridges built on the caisson principle, has brought it into disrepute with many English engineers, whilst in France and on the continent in general, the cause of these accidents having been ascertained and a remedy applied, caisson foundations are considered as secure and solid as the more expensive and troublesome system of founding by coffer-dams; indeed, a French engineer would consider it more difficult to construct such a coffer-dam as that at present round a pier of Westminster bridge, than to make the bridge itself on the caisson principle. The great desideratum in all hydraulic structures especially, is to have a solid and sound foundation; in England this is generally obtained in such rivers as the Thames, by piling the site of the piers, having previously surrounded it by a coffer-dam, and cutting off the piles quite level to the bed of the river, laying on them a platform of timber, and the interstices filled in with rubble stone, upon which the pier is raised. Now this can be effected by using the machine exhibited in the plate, without incurring the great expense of constructing a coffer-dam. The piles are driven out refus, or as far as possible, without injury to them, at a distance of about three feet apart; they are then cut off quite level by the pile-cutting machine, and on them the bridge is laid with the greatest facility.

Every one who has seen the bridges over the Meuse, the Ourthe, the Vesdre, on the railway between Liège and the Prussian frontier, and who is acquainted with the nature of these rivers, will acknowledge that if such structures could be raised on this principle at a very slight expense, when compared with those erected by coffer-dams, it may also with advantage be adopted in this country; and it must be recollected that the failures of works constructed on the caisson principle, have been caused either by not piling the site of the piers, as at Westminster Bridge, where the action of the stream washed the gravel from under the caisson, or by leaving the piles too long above the bed of the river and placing them too far apart, as at the bridge of Tours. It is curious that Labeye, in his description of Westminster Bridge, recommends piling under the caissons where the foundations are bad, and yet never adopted it, although he even designed a machine for cutting off the piles under water; it is probable that, had he acted according to his recommendation, the settlements which have taken place in the piers would never have occurred.

It is evident that in the system here recommended of foundations by caissons, it is necessary to have a very perfect pile-cutting machine, particularly in deep rivers. The accompanying drawing represents that which has been used in the erecting of Val Beurn Bridge, and has been used at the Bovend Bridge, now built across the Meuse at Liège; it has been found to answer its purpose very well, and may safely be recommended.

Fig. 1, a transverse section; Fig. 2, the plan; and Fig. 3, a longitudinal section; the same letters refer to the same parts in each figure. This machine consists of a horizontal moveable framing of timber A, supported on four wheels C, which move on two longitudinal beams D, parallel to each other; one of these beams is moved as each row of piles is cut off, and is fixed by iron straps to moveable transverse beams E, Fig. 7, from this horizontal platform

is suspended, by four screws F, passing through "cogged nuts" g, a vertical framing of iron, C; about half way down this framing at p, is the pivot on which the arm H, of the saw, moves; g, are guide bars to change the circular motion of the arm H, of the saw, into a rectilinear motion; g', an iron stay bolt. Round the four "cogged nuts" g, and a cog wheel placed in the centre at G, passes an endless chain e; on motion being given by the winch handle k, to the cog-wheel in the centre, by means of the endless chain passing round the "cogged nuts" g, the vertical framing is raised or lowered as it may be required. The small mill-headed screw m, Fig. 2, adjusts the tightness of the endless chain. By this ingenious method the saw is lowered equally to the necessary depth. As the platform is shifted, the bar m, is spiked to the longitudinal beams D; the screw K, turned by a winch handle, and passing through this bar, gives the forward motion to the whole machine. Fig. 4 is an enlarged view of the horizontal iron stay of the framing G, to which is attached a guide for the handle. Figs. 5 and 6 are a horizontal view and section of the central cog-wheel a, with the adjusting screw n, for tightening the chain. Fig. 7 is a plan of the site, showing the piles and stage upon which the machine travels. Fig. 8 is a side view, and Fig. 9 a transverse view. The other details may be better seen on the drawings than explained. It may, however, be necessary to describe how the machine is worked. Having erected a framing, such as is shown in Fig. 7, round the site of the pier, and placed the transverse balks L, the longitudinal beams D, are suspended from them by iron straps, and adjusted by screws, and the whole made perfectly level, then the machine is placed close to the first pile of the row to be cut; the bar m, is then spiked to the beams D, and the saw is lowered to the proper depth, as previously described, and is worked by two men, one at each side of the handle H; the whole machine is kept constantly advancing, by means of the propelling screw K. It is thus seen that three men are required to work the machine, two at the saw and one at the propelling screw.

The machine was designed by the celebrated Belgian engineer, M. Simons. Perhaps it may be well to state that M. De Ridder intends to use the caisson system of foundations for a bridge projected to cross the Meuse at Antwerp, where it is fully as deep and wide as the Thames at London Bridge.

ON STOVES.

Sir,—I have been pleased to observe, in your late numbers, two or three letters on the above subject, since I consider it to be one of great importance and interest both to the profession and the public, and one hitherto but little understood by either. It appears to me, however, that there is yet scope for an unprejudiced writer to render acting service to the cause of practical science, by an accurate and lucid comparison of all the stoves which are daily competing for our preference in such endless and perplexing variety. For I imagine there are few of us who will join your three correspondents in their very summary condemnation of all the new stoves of the last 10 years. It would be strange, indeed, if so much talent and ingenuity as has been directed to the subject during that period had been wholly fruitless and abortive, and if we really were now in a worse condition than before. But we cannot fall into such an error. We have too lively a recollection of our old "hot air stoves," with their enormous and expensive fires, overheating the chimney and scarcely thawing the air at a yard's resistance, choking us with volumes of burnt air, and requiring almost incessant attention, not to be abundantly thankful for our present efficient, economical, and controllable stoves with their steady heat and automaton regularity. We can all of us now afford to warm our staircases, our halls, our offices, our places of worship; we can be supplied with stoves for rooms of all sizes, from a vestible to a Chinese museum, and, in fact, nobody now need be cold in doors.

But still, Sir, we want more information, we require to know the merits and demerits of each individual stove. It will not do to consult

No. 76.—Vol. VI.—January, 1841.
the inventors themselves, sanguine men—we have tried that already to our cost. Dr. Arnott, though not as he would have us believe, the first in the field, was the first to get the public ear—taking his advice too readily, we had several explosions, many accidents, and much vexation. Next came Mr. Joyney, and savage as he was, but in very little time his stove, too, had to be set aside—Chunk, Vestas, Olmstead, Solar, and a score more, have been successively tried, and in many instances have caused bitter disappointment. And in connexion with all these, have undoubtedly been many accidental fires, some of a very serious character. In all these cases, possibly, a little more perseverance or a little more information, would have taught us that the fault was not in the stove but in its unsuitable application.

Will you then, Sir, endeavour to induce some clear-sighted practical man to give us such a handbook as shall prevent the repetition of such mistakes, and at the same time bring into notice such stoves as are best suited for each situation. Not only shall we, the public, be benefited thereby, it would prove, I doubt not, a valuable boon to architects, and to the stokers themselves.

I am, Sir,

Your obedient servant,

J. B.


ON THE EFFLUX OF GASEOUS FLUIDS UNDER PRESSURE.


Read before the Institution of Civil Engineers.

The theoretical determination of the velocity with which gaseous fluids are discharged through tubes and apertures under pressure, has often been submitted to mathematical investigation; and the subject being of importance in various branches of practical science, it is to be regretted that considerable differences exist in the results of the several formulae which have been proposed for its elucidation. Dr. Papin, 1 in 1680, first showed that the efflux of all fluids follows a general law; and that the velocity is inversely as the square roots of the specific gravities. Dr. Gregory 2 has likewise given various formulae for calculating the velocities of air in motion, under different circumstances; and Mr. Davies Gilbert, 3 Mr. Sylvester, 4 Mr. Tredgold, 5 and many other writers of equal authority, have also investigated the subject.

The hydrodynamical law of jetting fluids has, by all writers, been applied in the calculations for the determination of this question. This law, it is well known, is the same as that of the accelerating velocity of falling bodies; and is proportional to the square root of the height of the superincumbent column of homogeneous fluid. But although the various writers all agree in this fundamental principle, they differ materially in the mode of applying it, and in the several corrections introduced in their theorems; and the results they have arrived at are of a very contradictory character.

Dr. Gregory's formula for calculating the velocity with which air of the natural density will rush into a place containing rarer air, is based upon the velocity with which air flows into a vacuum. This is equal to the velocity a heavy body would acquire by falling freely from a height equal to that which a homogeneous atmosphere would have, whose weight is equal to 30 inches of mercury. The height of this homogeneous atmosphere is 27,151 feet; and the velocity which a body would acquire by falling from this height (and consequently the velocity with which air will flow into a vacuum) is \(\sqrt{27151} \times \frac{64}{5} \times \frac{1339}{2} = 1339\) feet per second. The density of the rarefied air, divided by the density of the natural atmosphere, and this number subtracted from unity, represents the force which produces motion; and the square root of this number multiplied by 1339 feet (the velocity with which air rushes into a vacuum) is the velocity with which the atmosphere will rush into any place containing rarer air.

The method employed by Mr. Davies Gilbert is also based upon the velocity with which air rushes into a vacuum, when pressed by a homogeneous atmosphere, equal to the weight of the natural atmo-

of the colder column will be equal to \(\sqrt{(295 \times 64)} = 115.5\) ft. per second.

The efflux of air under any given pressure can also be calculated by the same means. For the pressure being known, it is only necessary to calculate the height of a column of air which would be equal in weight to this pressure. Thus if the pressure be equal to 1 in. of mercury, water is 827 times the weight of air, and mercury 13-5 times the weight of water; therefore, 827 \(\times\) 13-5 = 11164 in. or 930-8 ft.; and according to the preceding formula \(\sqrt{(930-8 \times 64)} = 241\) ft. per second for the velocity of efflux under this pressure of 1 in. of mercury.

In all these cases the velocity thus ascertained is independent of any loss by friction. A certain deduction must be made for this loss, which will vary greatly according to the nature and size of the tube or shaft through which the air passes as well as with the velocity of the air, and its temperature. If the air passing through straight tubes of any kind, will be directly as the length of the tube and the square of the velocity; and inversely as the diameter. This question, however, becomes very complicated under these circumstances, and particularly so when there are angular turns in the tubes through which the air passes. The present state of our knowledge on this subject does not allow of any very accurate determination of the amount which ought to be deducted for friction from the initial velocity obtained by calculation; and it is only by empirical means we can arrive at an estimate of its amount. We shall proceed now to ascertain how far these theoretical calculations agree with the results obtained by experiments.

In some experiments made at Dowlais by Sir John Guttenberg, we have added to his extensive iron works at Dowlais, some experiments have been made on the quantity of blast injected into the furnaces. In these experiments, the machinery employed being new and of the best construction, no loss occurred by the escape of air through imperfections of the apparatus, was perhaps as small as possible. The engine for blowing the furnaces was made, at the time of the experiments, 15 double strokes per minute. The diameter of the blowing cylinder was 100 inches, and the effective length of the stroke 7 ft. 6 in. From these dimensions, therefore, it appears that 14726 cubic feet of air were taken into the blowing cylinder per minute; and the tubes through which it was discharged from the receiver were six of 4 in. diameter, and six of 11 in. diameter; the area of all these tubes was therefore 5547 of a square foot; and the pressure of the blast measured by a mercurial gauge was equal to \(\frac{1}{4}\) inches of mercury. Calculating by the formula already given, we shall have \(\sqrt{(827 \times 13-5 \times 4\times \frac{5}{12} \times 64)} = 592\) ft., which is the velocity per second; and this number multiplied by 60, and then by the area of the tubes, will give 5592-9 ft. per minute or 57 cubic feet of air discharged per minute. From this amount some deduction must be made for friction. The velocity of the discharged air is 5514 miles per hour; and with this immense velocity, and through such small pipes the friction is no doubt considerable. By deducting 15 per cent from the calculated amount of 17203 cubic feet, we shall have 1481 cubic feet, which agrees with a fraction (namely 45 ft.) with the quantity obtained by measurement.

In other experiments made at the same place, the following were the results. The quantity of air which entered the blowing cylinder was the same as before, namely, 14726 cubic feet; the total area of the tubes which discharged the blast was 5502 of a square foot, and the pressure of the blast was equal to 4 in. of mercury. The calculation therefore, will be \(\sqrt{(827 \times 13-5 \times 4 \times 12 \times 64)} = 489-5\) ft. per second; and therefore 489-5 \times 5 \times 60 = 5502 = 16159 cubic feet discharged per minute. The velocity of the blast in this case was 335 miles per hour; and if we deduct for friction 9 per cent from the calculated amount, the remainder is exactly the quantity of air which is actually employed by experiment to be discharged through these tubes.

In a work published in 1834 by M. Dufrénoy, being a report to the Director-General of Mines in France, on the use of the hot blast in the manufacture of iron in England, the results are given of many similar experiments to the above; but with two exceptions the details are not sufficiently ample to found any calculations upon. The two exceptions related are the experiments of the Clyde and the Butterley iron works, when they were blown with cold air. Both these blowing machines are described as having been in use for several years; and it is therefore natural to suppose the various parts were more worn, and fitted less accurately, than in those experiments already described. The experiments were also made with less care. They show a different quantity of air to that which enters the blowing cylinders, in about the same proportion as it exceeded it in the former cases. This difference no doubt arises from the imperfect fitting of the piston of the blowing cylinder, which, by allowing a portion of air to escape, would diminish the apparent pressure on the mercurial gauge, placed at the further extremity of the apparatus, and thence the calculated rate of efflux would of course be diminished.

In the experiments at the Clyde works, the quantity of air which was discharged into the furnace when estimated by the quantity that entered the blowing cylinder, was 2827 cubic feet per minute. The pressure of the blast was equal to 6 in. of mercury, and the area of the tubes \(\times 0.851\) of a cubic foot. Calculating the discharge of air under this pressure, it amounts to 2450 cubic feet, being 13 per cent less than the measured amount, supposing no loss to occur by imperfect fitting of the apparatus.

At the Butterley works the quantity of air discharged into the furnace, estimated by the contents of the cylinder, was 2500 cubic feet per minute. The pressure of the blast was equal to 5 in. of mercury, and the area of the tubes \(\times 0.851\) of a cubic foot. The quantity by calculation appears to be 2235 cubic feet, being less by 10\% per cent than that shown by experiment. In both these last cases, however, there is but little doubt that the loss of air from the cylinder caused the pressure on the mercurial gauge to be less than it would have been had the apparatus been perfectly tight; and a very small diminuation in the observed height of the mercury would account for a much greater difference in the velocity of efflux than is here shown.

We are fully warranted in the conclusion, from these experiments, that this method of calculation is as accurate as any theoretical determination of such question can be; but from the results so obtained an allowance must always be made for friction, which will necessarily vary with the peculiar circumstances of each case.

The following table will exhibit the results of the preceding experiments at one view:

<table>
<thead>
<tr>
<th>Place of experiment, Dowlais.</th>
<th>Pressure of blast in inches of mercury</th>
<th>Area of tubes in square feet</th>
<th>Quantity of air by experiment, in cubic feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dowllais, No. 1</td>
<td>4.5</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Dowllais, No. 2</td>
<td>5.5</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Clyde, No. 3</td>
<td>5.0</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Buttery, No. 4</td>
<td>5.2</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

In order to show the results of the several modes of calculation which different mathematicians have adopted, the following table has been calculated from the data given in experiment Dowllais, No. 2, of the preceding table, and it shows how far the several modes differ from each other in their results:

<table>
<thead>
<tr>
<th>Place of experiment, Dowllais.</th>
<th>Pressure of blast in inches of mercury</th>
<th>Area of tubes in square feet</th>
<th>Quantity of air by experiment, in cubic feet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quantity of air discharged (by calculation).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Montgolfier</td>
</tr>
<tr>
<td>Gregory</td>
</tr>
<tr>
<td>Gilbert</td>
</tr>
<tr>
<td>Sylvester</td>
</tr>
<tr>
<td>Tredgold</td>
</tr>
</tbody>
</table>

Considering the amount of friction which must result from the discharge of air at the immense velocity which was obtained in this experiment, namely, 333 miles per hour, and also that some of the tubes were only \(\frac{1}{2}\) in. diameter, it will probably be considered that the highest of these calculations is nearest the truth, as it only allows of a deduction of 9 per cent being made for friction, to reduce the calculated amount to the quantity obtained by experiment. It may therefore be concluded that the method which gives this result, is the most accurate as it is also the simplest for general use.
THE PHILOSOPHY OF OCEANIC FOSSIL FORMATIONS.

CHAPTER IV.

Having in the preceding numbers given the Philosophy of Coral Formations and their Architects, we now pass, by a natural transition, to the consideration of fossil bodies as generally diffused through the superficial strata of the earth.

Fossil, in Natural History, according to learned commentators of the species in general, every thing that is dug out of the earth, whether it be native or artificial, earthy or calcareous, or other minerals, or extraneous, as the bones of animals and the like; this understanding of the term Fossil is, however, attended with very great inconvenience to the student, who thus finds the two grand divisions of the earth confusedly blended together, without any just reason being assigned for such a grouping or severing by nature; and again, it is highly objectionable as perpetrating error and misconception of natural phenomena. The simple term Fossil ought to be exclusively confined to those bodies or fragments of bodies of animals and vegetables, which, from their peculiar disposition and association, have maintained their integrity of form and quality with very slight alterations, and so much so, as to enable the naturalist to identify their species, and consequently the conditions under which they previously existed. The coral rag, sea shells, bones and teeth of fishes, trees or parts of trees, herbaceous plants and fruits, the bones, tusks, horns and other exuviae of land animals, found in lie, chalk, coal, slate, and other formations of the northern hemisphere, so long as their elements fossil, or remain unaltered, as distinguished from their primary organic formation; but the silicified and other mineralized bodies, which, although they retain their primary organic configuration, have undergone a complete change in their atomic structure or elementary constituents, ought to bear the designation of secondary fossils, up to that point in which they enter into and become absolutely one with the mineral kingdom. There are therefore compelled to adopt Mr. Parkinson's appellation of Primary Fossils, and Secondary Fossils, not for the reasons assigned by him, but in order to denote the natural or mineralized state of organic bodies. By many naturalists the term petrifications has been applied indiscriminately to all fossils: but, independently of the term petrification, there is an absurdity as applied to bodies in the act of silicifying or otherwise mineralizing, or in complete decomposition, into various species of marble, or into loams, chalk, calcareous matter, clays and earths: again, wood is silicified as wood opal, butmianized as coal, or passes by decomposition into earth. The stone of which Westminster Bridge is built, was quarried from chalky strata, and is consequently, still retaining its organic condition; it consists of calcareous matter, sea worms, shell fish, and other limestone secreting species, slightly held together by the common cement of calx; from this cause it soon undergoes disintegration when exposed to excess of moisture; the material of London Bridge is also fossil formation, but its larger shells have passed into nodules of spar, and the siliceous crystalline base fits it well for the purposes to which it is applied.

Fossils are Ancient, Modern, Recent, and Still Producing; in contradiction to modern geology, they are natural or primary earths, from whence all extraneous bodies, such as sands, stones, rocks, salts, and other minerals, derive their existence; they are divisible into oceanic, or those exclusively belonging to sea waters, lucaritine or fresh water, and terrestrial (here used to signify creatures of the dry land); and inasmuch as there are living species peculiar to the earth, and living species peculiar to the waters, there are also proximate principles and compounds produced by, and proceeding from these species, perhaps applicable to all men, both from the nature of the respective fossil beds, and from the nature of the earths produced by the decomposition of these fossils: thus, lime formations, the presence in large masses of sodium and magnesium, of sea shells and other marine exuviae, denote oceanic formations; vegetable earths, vegetable fossil beds, and fossil bodies in whatever state of change they may appear, are equally true indications of terrestrial action and of terrestrial influences; while beds of mixed qualities denote the combinations of the one with the other. These distinctions, upon which natural philosophy must eventually rest, have hitherto been lost sight of, for although organic beings have been classified according to their respective elements, no right conception has hitherto been formed of the fossil or mineral kingdom, the latter proceeding from or genera rating under local influences from the former, and consequently the fossil kingdom, in the primary sequence of events, taking precedence of the mineral kingdom.

It must be generally understood, that entire change in configuration or properties of organic bodies is far from being a necessary or invariable consequence of the cessation of life; for as is demonstrated by nature in various parts of the earth, ages, years, many revolutions of time may pass away, and still organic bodies remain constant to their original form and qualities: thus, much of the strata of Europe, formed in periods extending far beyond the primary age of the world, still remains in an unaltered state, united with the fragments and comminated particles of other species common to the age, temperature, and element in which they lived and propagated their kind. These extensive fossil formations bear mirroring testimony to the gradual development of oceanic, lucaritine, and terrestrial beds, to the laws of force and cohesion by which they were produced, and to the laws of nature which governed in their production: they also speak of the progressive development of life as advocated by many learned writers, of genera branching into orders, and of orders branching into species, as the accidents of climate, association, and conformation may determine. A great portion of oceanic soil is of necessity hidden from our view by reason of the depth of the waters, or from being covered in by terrestrial matters, and another and still larger portion escapes the immediate cognizance of the senses from the changes it has undergone in decomposition and recombination of its parts; but the vast extent of fossil beds, and their general diffusion in and throughout the superficial strata, are the best proof of their gradual formation. We must, therefore, look to the relics of these once living genera, which must, therefore, look for explanation of the causes of effects manifest in the varied phenomena of creation, destruction, and re-production. As in life and throughout the great chain of existence, the living and the dead, subervient to the great end of nature, the increase of consolidated matter, and the ultimate maturity of the earth.

The transition from life to death is natural; of the numerous compounds elaborated by living species, nothing is lost; portions thereof may return to the elements from whence they were abstracted, but the bulk that remain after the usual processes of decomposition of the earth, is not again divisible into its original harmonics: the earth is thus the term of nature, with which the attributes of beauty is built: thus the matters of which the various beds of the earth is composed, whether in comminuted particles or in fossil or mineral forms, boast of one common parentage, and become in the end subservient to the one common purpose. It is, indeed, singularly beautiful to observe the contradictions of our natural conditions, the strata, the attributes, quantities and qualities, proceeding from the one common fountain, life—still increasing in its quantities, and in its varieties as it rolls onward in the trackless paths of eternity, increasing in its qualities and powers by multiplication of quantities and powers, its end being lost sight of in the fathomless regions of space, and time.

The earth we inhabit we call man extends, consists of innumerable beds horizontally, vertically, or otherwise disposed, being sometimes of homogeneous and at other times of mixed and divisible into the living, the fossil, and the mineral kingdom. In the natural changes which take place, we observe, at the largest possible scale, the gradual or sudden transition of the one of these divisions into the other; thus the trees of a forest are swept away from their native resting place, the coral polyphores cease to perform the functions of life, and the one and the other enter into the fossil state, and according to their local disposition and arrangement, if favourable to such further development, into the mineral state.
the several combinations being governed by the laws of affinity, and the chemical and mechanical action of the living body. In the living kingdom are the elements of the alkaline earths, and according to peculiar food or peculiar temperature. These organic creatures pass into the fossil kingdom, the peculiar acid or alkaline earth is produced, but not necessarily so, for the after changes of bodies are contingent and uncertain, always depending upon their inherent qualities, and the accidental affections or combinations to which they may be exposed. Geologists form the laws of force or affinity which govern production; but men of even common understanding see the tree converted into earth, the earth into clay, the shells of animals secreted calc into simple carbonate of lime, and also preserving their organic form in chalk, pyrites, petrifactions, &c.; many of the hills of Egypt, for instance, are wholly composed of lutite, but others, formed by coral polyps, entirely consist of decomposed bodies of polyplieters; the olite formations of the British strata, exhibit various stages of animal decomposition, myriads of creatures differing in species and organic formations uniting as one definite and inseparable result.

Many of the superficial beds of the earth consist wholly of fossil organic matter, which has been aggregated and formed, or suddenly or gradually moulded into form, as rocks, stones, metallic earths and other substances. The fossil kingdom, in fact, embraces full one half of the superficial crust of the earth, its aggregate masses extend over the whole bed of the waters, forming in some localities mountains and mountain chains, entire islands and vast portions of continents; on the other hand, terrestrial earth is covered with forests, savannahs and meadows, insects, birds, and beasts, all of which contribute to increase the soil on which they tread. The numerous islands of the Pacific and Southern oceans, still increasing in their numbers and magnitude, the islands of the Red Sea and portions of the great continents of Asia and Africa, the broad bank of reeds extending up the Nile, the rice-fields of China, and the tropical Archelagae, are all composed of coral polyplieters and other line-secreting species, including the relics of myriads of creatures inhabitants of the waters, which in death deposit on the respective beds their elemental constituents, such as lime, soda, magnesia, animal oil, fatty matter, iron, and other compounds, the whole being heterogeneously disposed in this general reservoir of the living and the dead; and therefore it is, that probably composed of organic matter, these very extensive formations most truly come under the term and appertain to the fossil kingdom; the earths which form the clothing and skeleton of bodies, the proximate principles generated by or developed within the living system, or in union with each other after the death of the individuals, and the changes of changes into the mineral kingdom, the nature of species and of the changes produced by the cessation of life determining the nature of the mineral bodies or beds. These oceanic formations extend over the beds of all seas, distinct of themselves, or variously uniting with the terrestrial matters which are carried into seas by fresh water streams, or the mountains, rocks and earths by the force of the winds, waves, or tidal currents.

Again, if we look over the surface of the earth, the same phenomena may be observed in all parts of it; upon the remnants of oceanic species, beds of cysters, coral formations, and commingled material of countless tribes, the trees, shrubs, and grasses make their appearance, generally according to the nature of the soil, and peculiar to the food of an infinite variety of animals, the programmers of other forms and combinations of matter generated in the living system, and transferred unaltered or altered to the fossil or mineral kingdom. Geologists may contend that the sum of consolidated matter of this earth does neither increase nor diminish, but all the phenomena of terrestrial and oceanic beds give a decided negative to this assumption; for not only are tropical seas rapidly filling up with the remains of oceanic creatures, but also the great deserts and steppes of the earth, including all ancient, modern, and recently formed coral reefs and islands, the greatest portions of Africa, and large tracts in Asia, Australia, and South America.

In a general view, the coral formations embrace the bodies and relics of myriads of creatures, whose elementary constituents, received during life from the medium in which they are disposed, are set free from each other, or enter into new combinations, or are given for the origin of new substances, but the terrestrial earth itself, in localities, is continually increasing from like causes, the generation of vegetable mould being demonstrable to all men. The fossil formations of which I more immediately speak, embrace not only the vast extent of coral formations, but also all the great deserts and steppes of the earth, including all ancient, modern, and recently formed coral reefs and islands, the greatest portions of Africa, and large tracts in Asia, Australia, and South America.

That many mountains owe their origin to volcanic action, is an unquestionable fact, but the bulk of aggregate is produced most undoubtedly by the moving force of waters, by depositions of organic matter chemically or mechanically precipitated, and by the gradual accumulation of oceanic species dispersed in groups and families in particular regions; there are submarine chains of mountains, embracing a geographical range of many thousand square miles, disposed beneath the surface of the ocean, which once the constant and continuous increase to the living occupants of the waters, the deep laid foundations of these extensive accumulations having, most probably, never been affected by volcanic action; and there is one great practical manifest to the accurate observer of nature, that the waters are continually diminishing from the face of the whole earth, and more particularly so beneath the tropical band, where seas are shallowed by the vast increase of calcareous bodies, the living and the dead. This affords a ready solution of the many singular phenomena which are otherwise inexplicable, or are only to be explained by doing violence to nature.

The experiments of Sir Humphrey Davy led him to believe that heat, one of the effects of this species, changes the elements and combinations of the inflammable gases and oxygen; but, unacquainted with the phenomena of fossil soils he was disqualified from proving the soundness of his views. In these soils embracing recent formations, and also soils produced in earlier epochs, particularly when disposed in high and dry climates, in rainless regions, or within the tropical belt, the electric fluid is generated in vast quantities in the interior of the earth, and, more especially, in those beds, which, in their primary fossil state contain the metals in their unconbined state. The virgin soils or fossil beds abounding in a part of the superficial crust of the earth, consist of the elementary compounds of organic life, changed and perpetually changing in their unions and consequence in their properties, after they have entered the earth, which necessity, before the mineral kingdom in their primary fossil state do they not embrace what, strictly speaking, may be termed mineral bodies, but they embrace the elements of many mineral substances, and under favourable circumstances, do eventually produce them, abrating the oxygen necessary to effect these changes from the atmosphere and from the ocean, and without the aid of the combined particles or entire skeletons of myriads upon myriads of the inhabitants of the deep, no sooner rises its head above the waters, than it becomes exposed to new and powerful influences: the effect depending upon the nature of those influences is at once strikingly beautiful and important; a universal and mechanical action is produced, embracing every fossil body, hydrogen is driven off to form other unions, and oxygen, nitrogen or carbon supply its place, the marine acids now generated are set in motion, moving to and fro, uniting with alkaline bodies forming a very important class of salts,
or having metalloidal bases forming other mineral compounds, or containing with each other, continue for a very long period in their uncontinent state. In these vast chemical changes, in this conflict of the elements and elementary compounds, is it to be wondered at, that a great and intense heat is produced, and that this heat, acting upon bodies of salt, and aqueous nature, should very often increase to the heat of combustion. Once called into action, its duration must depend upon the nature of the material by which it is surrounded, combustion being produced, it will be carried on so long as the causes of action continue to exist, or beds of inflammable matter continue the supply of fuel. Again, the virgin soil, covered with the sand accumulations of animal oils, already mineralized as bitumens, or in union with the alkaline earths entering into the condition of rock, stone, and other ponderable substances. This material, attacked by the chlorides, oxygen, &c., is likewise the subject of incessant change, and sulphurous acid in particular is generated in abundance. And the earth, which was simply filled with the bed rock is enabled by its evolution from all the great volcanoes, and its continued evolution is a very decisive proof that combustion is going on in the bituminous beds and animalized rocks, the skeletons or cinders of the latter being ejected as pumice and ashes.

Removed from the immediate vicinity or far above the waters, the virgin soil presents to the view one vast chaotic mass of fossil bodies and their comminated particles, and the progress of change from this chaotic state depends entirely upon the local and general affections which govern and direct them; thus some formations undergo an almost immediate transformation, while others, protected from atmospheric and aqueous influences, remain for ages in an unchanged state. These various organic, as they are termed, are disposed in localities, and the nature and qualities of each stratum depend on the nature and qualities of the bodies of which it is composed, or by which it is surrounded. In the British strata we see this truth illustrated, a vast region extending over a space of 12,000 square miles. "The rocks in the western States, below the coal formation, have evidently," says Dr. Lock, "been deposited in the bed of a deep primitive ocean, and consist of alternations mostly in thin layers varying from one inch to twenty-four inches in thickness. Some of the beds are entirely composed of lime, the sedimentary strata are mostly in the lower portions clay and marl, and in the upper portions clay and sandstone, in the superior portions, lime, clay, and sand form an arenaceous limestone—al of them contain fossil remains. The arrangement of the rocks, beginning from the bottom, is: 1. blue limestone; 2. clay; 3. fainty limestone; 4. clay marl; 5. clay limestone; 6. black bituminous slate; 7. Wavyle sandstone, the whole depth 1865 feet. The blue limestone region is 500 feet below low water mark of the Ohio; the limestone is sometimes 500 feet in thickness. In Indiana the black bituminous slate is above 100 feet thick; there is also a vast bituminous coal formation, situated for the beds being evidences of organic remains still retaining their primary disposition of parts, and shafts, marls, and clays evidencing by their character and composition their organic origin. Near Newark," says Dr. Silliman, "the whole valley is one vast cemetery of animal and vegetable remains. A Petroleum oil well has lately been discovered while boring for salt water near Rockville, Indiana, which has produced more than 200 barrels of 200 gallons each, of 20 feet thick, a fountain of pure oil was struck. The coal beds in Ohio State extend over a space of 12,000 square miles." But the state of the known facts is, that we have not yet collected all the data which are requisite for forming a comprehensive view of the subject. Of the fossil formations of Europe and portions of Asia, much has recently been written by geologists. To which we refer for information, concerning their extent, and the important part they perform in the economy of nature in forming strata and crystalline rocks—the phenomena of the deserts to which the following chapter will be devoted, are almost exclusively oceanic.

The gradual development of life as genera, orders and species, is inferred by philosophers of the present day, from the known fact, that the lower we pursue our researches into the bowels of the earth the less we observe traces of organic bodies, and the more simple are the orders, genera, and species, both in their qualities and properties: this is not the case with the bituminous beds or other strata contained in the same beds. We will, in a sequel, demonstrate that every strata is composed of, and proceeds from organic bodies. The philosopher overlooks or otherwise is ignorant of the fact that vegetable earth produced in the decomposition of vegetable and animal bodies, retains no traces within its bulk of aggregate of those bodies, death levels all distinction confounding ten thousand organic bodies in one undistinguished ruin. Every atomic particle, every proximate principle, and compound body, all that is cognizant to the senses of man— all proceed from the elementary compounds, air and water—all enter the mineral kingdom when life has departed.
ARCHITECTURE.—THE PUBLIC AND THE PROFESSION.


III. Kienzle Entwürfe. Heft VII & VIII.

"The importance which architecture has assumed in this country within the last twenty years, and the deep interest taken by all classes in its progress, has been more remarkable and striking. Disquisitions upon those monuments of our art which rise up around us, occupy the public mind, and form a distinguished portion of the literature of the day. Particularly are the periodicals, and other periodical publications, passed in review the productions of our artists." Such are the opening remarks of Professor Donaldson in his "Preliminary Discourse" (pronounced before the University College, London, Oct. 17, 1812); and they may very appropriately be made use of, by way of introduction to the present article, if merely to show that the subject we have taken up, is held to be not without attraction for others besides professional readers. Indeed, we might say that the latter class is the least numerous one; and also, that very few belonging to the profession have at any time taken up their pen with the view of instructing the public, or recommending the study of the art as deserving to be cultivated for its own sake. Even may it be questioned if the profession, by profit or otherwise, is the only source of the subsequent popularity conferred upon their art, after the manner described by Mr. Donaldson.

At any rate some there are, who, so far from encouraging a taste for architectural study on the part of those who apply themselves to it merely as laymen, manifest a decided disapprobation of such "irregular" proceedings. Pain would they suppress all inquiry, all criticism, all opinion, except what emanates directly from themselves. And as far as themselves alone are concerned, they may be allowed to display sound policy at least, though the reverse of liberality, of generous feeling, and of zeal for the advancement of architecture as a branch of fine art. No doubt it is not to the interest of every one who follows it as his employment, that the public should have any clear understanding of the facts it can only be to his own advantage to be able to discriminate between what is merely mechanical and matter of routine, and what gives aesthetic value to an edifice, converting it from the mere manual work of a builder into the production of an artist.

Convenient as it may be in many—perhaps the majority of cases, to have to do with a public who are nearly all but quite in the dark as to what architecture, properly so termed, is or ought to be; and who are, therefore, ready to admire whatever is palmed upon them as works of art, merely because it is mechanically shaped secundum artem, but may, nevertheless, bear the same relation to art that paste does to diamonds; convenient, we say, as such state of things may be, there are, at the same time, considerable disadvantages attending it, and extending beyond it at defending the art itself. It is certainly not least of all, injurious to the art itself. While its importance in the latter character is Studied insisted upon, and endeavoured to be supported by dint of assertion, architecture is virtually thrown out of the ranks of fine art, by being represented as one too far removed from ordinary sympathy to be appreciated by, or even intelligible to, those who have not been regularly initiated into it. To a certain extent some kind of preparatory training is, undoubtedly, requisite, because its beauties being more or less conventional, without any positive type in nature, some knowledge of the signs it employs, and of the principles by which it is governed, becomes indispensable; but such knowledge is quite independent of, and runs in a different channel from that of the sciences of design and construction. Neither is the acquisition either difficult or tedious—at least would not be so, were a suitable course of study provided for those who require to learn no more than the aesthetic branch of the subject, leaving practical matters to the practical man. Works, indeed, there are which profess to be expressly framed for such purpose, but among them all we have not met with one that is really well adapted to it. Some are little better than ordinary and even slovenly compilations or abridgment; and under the pretence of being easy and popular, nearly all are defectively meagre, dry, and uninspiring. They lack that familiar but intelligent explanation which would really facilitate the progress of the non-professional student. There appears to be a fear of confounding the words of architecture—a true and proper definition of it, as it were, rather than to simplify. What is learned, must be learned doggedly and by rote, for however well the writers may be acquainted with the subject himself, they either want, or do not care to employ, the art of conveying instruction to others in such manner as to invest it with interest, and forcibly bring out its attractions.

On the part of the profession nothing has been done towards furnishing a popular course of instruction for lay students and the public; neither have they advocated the systematic examination of the works of the art, or the proximate authority of the aesthetic department of their art, and extending it beyond the pale of their own order. Only one solitary instance occurs to us of an architect's earnestly recommending the adoption of such views. With no less of sound policy than generous liberality, Mr. G. Wightwick has pointed out how desirable it is that a due appreciation with architecture should be cultivated as one of the accomplishments of education, and that, too, for females as well as men; which is so contrary to the prejudices established by custom, that on the first blush of it, it appears to carry with it some degree of chimerical extravagance, if not of actual absurdity, and may easily be turned into ridicule and wilful representation of the purpose in view. It may be suspected that the dabbling in brick and mortar would not be a very ladylike amusement, nor even a very gentlemanly pursuit; with much more to the same effect. To meet idle objections of that kind formally, would be self-centered, since they proceed from sheer ignorance, or from still more incorrigible male prepossession, and from the determination to mistake and pervert, and to set matters in a ridiculous light.

With respect to architecture as an aesthetic study, and so far capable of being pursued apart from the mechanical processes of building, the usually awkward Cat bone? is not a very formidable question. It is the pursuit itself which is the prize, the labour which is the gain, the occupation which is the reward. Else why should the sportsman risk his neck in the chase, and willingly encounter both danger and fatigue, merely noticing and admiring the natural beauty of the object? To which makes every hare cost him about as much as a horse? The value of architectural study as a mere study, consists in the mental occupation it furnishes, and in its opening a source of gratification from which we are else debarred, because without such study we can but imperfectly relish what requires to be viewed by the mind as much as by the eye. Where preparatory education is wanting, the finer buildings will be looked at either with listless indifference or ignorant, perhaps merely affected, admiration, certainly not with that lively interest and enjoyment felt by those who possess a cultivated taste. Without some study of the art, people are actually unable to see a very great deal that is to be considered in a building or a design; these being the instances, and it must be acknowledged that which they can neither distinguish, nor perceive, nor take note of.

To be convinced that such is really the case, we need merely open almost any tourist-book where architectural description or comment is attempted; for seldom do we meet with more than confused, imperfect, and blundering description, or what is intended for such, and with crude, hasty, shallow, babblehazards, which too evidently show that the writer has no real knowledge of what he professes to speak of.

It is true that, by opening our eyes, the study of the art drives us out of the "fool's paradise" of stupid wonder, where ignorance is bliss; yet if, on the one hand, it renders us more fastidious, and apt to sneer at our former notions of art, and capable of appreciating the satisfaction felt by ordinary spectators, on the other it greatly enhances our enjoyment of what is excellent, imparting to it a fineness, an intensity, and a gusto, which can else hardly be conceived, much less felt. While enjoyment, too, is thus increased in degree, it is also greatly extended as to duration; instead of being an object merely of glancing at, or inspected once for all, a fine piece of architecture is to the educated man, whether amateur or professional, a work of art which, however often it may have been viewed, is again contemplated with refreshed feelings of delight, and whose image is faithfully stored up in the memory, where it remains both for instruction and gratification. Unless it be useless to have some such noble sentiments and feelings to guide us in our investigations, the question as to the value of that of architecture among others may be considered, after what has been said, completely settled.

So far from having at all, it has rather more to recommend it than several—botany, mineralogy, and some others, which are now applied to by females, inasmuch as it exercises the critical faculties, leads to the valuable habit of detecting strong observation, and refines taste—merely to aesthetic feeling, whereas other studies, of the kind above alluded to, have comparatively little value as mere accomplishments, since they are too positive and material, too remote from general sympathies, and partake of that Darmymessen which renders them as unfit for conversation as for poetry.

Thus far we have been led to admit that there ought to be no occasion; it should long ere this have become so self-evident, as to incur for us the reproach of bringing forward state and common-place remarks. Yet, be the remarks themselves what they may, most certainly it is that the views we advocate are not those entertained by the public, no, nor even by the profession. Accordingly, instead of
being upon the same footing as the other fine arts, architecture has scarcely any public sympathy—there being few, except those who practise it—and not every one among them, who can truly appreciate the powers of architecture, and its poetical aspect. Hence, when the importance of the former happens to be urged on the public on some particular occasion, it is more with reference to display of public spirit, and regard to our dignity as a people, and our national credit, than for the sake of any particular enjoyment proposed to be derived to ourselves from the contemplation of a noble edifice, or for the mere sake of the ornament of architecture. On the contrary, it seems to be regarded as an agreeable task, to have architecture to flourish among us as a fine art, it must be recognised as such, not in words alone, but in a real feeling for it, and that feeling cultivated by study. It is rather unreasonable to expect that the public should warmly patronize what they have no real relish for, and what, indeed, their present ignorance renders them incapable of perceiving properly, and what they never could do to do. The architect is taught to regard the merest plodding mediocrity as talent—the servile mechanical copying of individual features and parts, as praiseworthy correctness, even though nothing of the spirit or character of the originals should be preserved, or if so far at all kept up, be entirely lost sight of in whatever is not immediately borrowed. Hence the minimum of talent has frequently sufficed for distinguished professional reputation, provided its possessor has been able to get into full employment, and establish himself with the public as the "fashionable architect" of the day. It is not the quality, but the quantity of his works, and their importance as large buildings, which recommend him, and impose upon general opinion. On the other hand, one who in their profession can here be termed success, most have shown themselves to be little more than men of business, and as such clever enough, but as artists, more or less deficient in nearly all that goes to constitute one; for their productions too plainly show no earnest con amore labour—no thorough artistlike study of the subject has been brought upon them, no spirit infused into them, and that what merits they may chance to possess are merely those of mechanical routine. Tolerably secure of satisfying their employers, few architects have laboured to satisfy themselves, or to aim at higher and more durable fame than that which they find comes to them upon cheaper terms. Although they might be, seldom is it that moderate opportunities are employed in works of importance, or rendered important enough, so as to give us highly-finished gems of art—such, for instance, as the monument of Lyons—where the effect attending grandeur of dimensions is out of the question. Even in Gothic architecture, where magnitude and extent are generally held to be indispensable in order to produce due character, many of the choicest and most elaborate rate specimens are to be met with either in moderate sized buildings, or the subordinate parts of larger ones—such as porches, chapels, chantries, orielis, and the like, any one of which shows more study of design, more regard to artistic feeling and principle, than is generally considered requisite for an entire fabric, let it be as extensive as it may. Whatever an architect has in hand, he should consider it of importance to his character as an architect. Whatever he renders inefficient, he is solely responsible for it, as he will always retain a sort of mental property and authorship in it, even should he never afterwards behold his own work. If, controlled by circumstances, he cannot do all he would, let him at least show that he is capable of producing things far superior; if he cannot indulge his imagination, or fully carry out his ideas, he may compensate us that he has some ideas of his own, and may put in those artist-like touches which—supposing him to be worthy of the name of artist—would cost him very little—nothing, it might be presumed, in comparison with his self-forbearance in abstaining from them. At any rate we ought not greatly to wonder at finding that, as it is not in his power to render a great work of architecture, he is frequently found very rusty and out of order when suddenly called for by some extraordinary one. We then obtain little more than some common-place and hackneyed ideas as usual, only on a larger scale, and spread over a greater surface. Harsh as this opinion may seem, it is but too strongly borne out by the three architectural competitions for which, by the Royal Exchange. On each of those occasions, all the designs sent in were exhibited, and the greater majority of them too plainly told that their authors had no pretensions whatever to come forward, unless, indeed, they calculated more upon the imbecility of others, than on their own attainments. Of the three by whose works the public was led to suppose that the worst of all, were little better than wholesale plagiarisms, unskillfully put together. It is not to be denied that the subject was a most difficult one—one requiring no ordinary grasp of mind, and fertility of ideas; neither was the Exchange by any means an easy one, considering the very awkward form of the site, and other restrictions. Nevertheless, however, it even in that case allowed itself upon that occasion. Of invention there was hardly anything but of tasteless and preposterous ideas, not a few; some, indeed, that if they did not partake of downright insanity, betrayed hopeless inefficacy. What renders that competition the more remarkable is, that a second trial was afforded the artists, after the first one, but with no greater success—at any rate with precisely the same results before, it is merely a fluted Corinthian column upon a pedestal—very poor and now somewhat stale conceit in itself, and in this case without any redeeming qualities in the design to reconcile us to it. If we learn nothing else from competitions, we learn from them that whenever they take place, the profession becomes sensible of one result, and that result is disastrous. It is true, that of all the buildings in the whole of that competition, only one is worthy of notice, namely, the all but entire ignorance of the public in regard to it, and their inability to form any judgment, although every one is, of course, at liberty to express his own opinion—even those who can scarcely read a plan or elevation. To say nothing of the unfairness so frequently imputed to committees and those appointed to decide on such matters, it is quite possible to imagine, that if all would have been done as before, that it would rather be strange was it otherwise—if men, who perhaps have never taken up the study at all, were able only to examine all the several designs, and maturely deliberate upon their respective faults and merits. This picture of things is neither a very flattering, nor particularly encouraging one, but we will venture to assert, neither is it exaggerated one. We have pointed out where the main root of the evil lies, and though we cannot look for its being very speedily corrected, there is some prospect of its being overcome. Already there are favourable symptoms and manifestations abroad, and although it yet forms no part of the usual course of education, an acquaintance with that study is beginning to make its way among the educated classes; as is proved by the various elementary publications, intended for the use of amateur students. But it also behoves the profession itself to encourage, or to show that they are disposed to encourage, this growing but not yet sufficiently confirmed taste; and to endeavour to render the study of their art more popular, and therefore more accessible. The learned men either are incapable of writing upon matters connected with their art in an intelligent and engaging manner, and putting off the solemn ex-cathedra tone they usually fall into whenever they appear in print; or else consider it beneath them to accommodate themselves to general or non-professional readers. Those who have published at all have rarely had in view the pockets—an entirely uninteresting and unnecessarily large class of purchasers—wealthy amateurs, who can afford to purchase works which are not only so costly, but so inconveniently large, that their form as well as their price operates almost as a prohibition upon them to all others. This may have arisen from the idea that no class of the public could take interest in it, or have occasion for works of that kind, except those who were likely to have occasion to build for themselves in a superior style, and who have accordingly been looked up to as patrons; which appears to us to be a mistaken notion, and withal, rather short-sighted policy. It may fairly be questioned whether the study of Gothic architecture would be a tenth part so popular as it has now become, if this relation of the cost to the price of the buildings were really so great—so great as the Cathedrals, edited by the Antiquarian Society: unimportant as the circumstance may seem in itself, there is little doubt but that the adoption of the ordinary quarto size—which is large enough for almost any purpose, provided there be plates of details, as well as general elevations and sections—a quarto price, by bringing the study within the reach of those who would else have been debarred from it, or might never have become acquainted with it. The time is gone by for that species of literary exclusiveness and ostentation, which was affected in the days of Colombier and elephant folios. Like many other branches of literature, architecture must now confide to consult the convenience and the pockets—not exactly of the "million," but of the "many," unless it not only disclaims
but can afford to dispense with popularity. That it can do so may be interpreted, but hardly of the majority of the profession, or of those who are attached to the art; else they are inconsistent in deploiting at the same time the indifference, or obstinacy, which has so frequently marred some of the noblest projects; and the ignorance which has either wantonly destroyed, or suffered to fall into entire decay, many interesting monuments of former times. However great may have been their faults, Whityte's preceptor, and Scindecham's, were at least not more than quite natural, when the "respectable" and well-informed classes have no idea of the value of, and no taste for, what in their eyes appear no better than so many masses of old walls and rubbish. As far as the profession itself is concerned, the hitherto all-but-entire ignorance on the part of the public, may occasionally have been found conducive to its ultimate decay; but it is now quite clear that the state of national reputation, as far as it is at all connected with the state of architecture among us. Were the study to be generally cultivated to the extent that we—and not only ourselves, but some belonging to the profession, desire, the public would probably soon begin to be more difficult to please; to be more exigent than heretofore; and to look for some manifestation of artist-like talent and power on the part of those who claim to be considered artists—a rank now held by many of them merely by courtesy, as a sort of hereditary title. Yet this would be so far from being matter for regret, that it is precisely what would materially contribute towards this end. It is the vogue of a second or seasonable head of the public, in taste; so as to be able not merely to fulfil all that improved taste may require of them, but even go beyond that point to which we are content at present to limit our views.

That the idea of an impulse being given to architects, by those who do not belong to their body, and who if they cannot exactly be styled rational men, are not yet as a body, the characters that are applicable to the head of the public, in taste; so as to be able not merely to fulfil all that improved taste may require of them, but even go beyond that point to which we are content at present to limit our views.

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and prejudices, than where no feelings of the kind should have been allowed to interfere with the plain duty of a chronicler; we allude to the List of Architects, which record we naturally expected to find tolerably copious towards the end of it. Instead of which, it gives but a very meagre sprinkling of names for the last 50 or 60 years, and those appear to have been bestowed upon it, many rashly, without any regard to principle or system. At all events, it must have been a most singular principle of selection, which, while it admitted many names of far inferior note, rejected those of James Wyatt, Sir Jeffrey Wyatville, Wilkins, and Rickman. Although we could not estimate too highly his talents, very high, the first of these, established for himself a high station in the world of architecture, and, of the rest, those of Sir Jeffry and Rickman for their attachment to the same style. But then how is it that the "Palladian" Calderari is passed over, Temanza, who, if he be not the father of the Italian architects, and Piermarini and Cagnola?—and, that, though there have been several of considerable note, there is not the name of a single Italian architect who has died within the last half century? Again, why has one who professes to think so very highly of modern French architecture as Mr. Gwilt does, omitted so many names belonging to that nation—above all that of Durand, whose system of interaxial divisions of a design, which to us appears a very mechanical and peddling one, he so warmly recommends, and has brought forward in his Encyclopedia? That he should have black-balled Schinkel as undeserving of being admitted into the company of his "worthies," is no more than we expected, after his labouring attempt, some years ago, to depreciate, not only the merits of that architect, but the whole school of his. Here again, then, Mr. Gwilt has suffered his prejudices, piques, and antipathies so far to get the better of him, that he has wilfully manifold that List, and deprived it of much of the value and interest it else might have had; nor would it have been less serviceable, or, at least, more serviceable, had the whole not been given, as they are in a much fuller table of the kind, though compiled perhaps for the beginning of the 18th century, printed in the "Civil Engineer and Architect's Journal." Does Mr. Gwilt really hope to extinguish the name of Schinkel by the marked omission of it, not only in that List of Architects, but in his chapter on German architecture! If so, he is like to be disappointed, for, on the contrary, his adoption is calculated to excite surprise, and to force that many of the most extensive and able works of the 19th century, of the great Schools, of the "Great Schinkel," and that since his death more has been written throughout Germany on him and his works than has been written relative to any other architect of the present or last century.

Having thus far touched upon the subject of German architecture, we may now as well turn at once to that chapter of the Encyclopedia which professes to give some historical account of it. In what degree it professes is the promissory title implies, what information it affords, and what pains have been taken to make it as serviceable as possible, it is difficult to say when we say that it amounts altogether to more than a single page and a few lines! In fact it consists of only a few slight unconnected and desultory remarks such as almost any one unacquainted with the subject could have picked up and patched together. It is not without reason therefore, we suspect, that Mr. Gwilt was unable to go to any, even the most ordinary sources of information in the language itself, for had he done so he might easily have compiled a good deal of interesting matter that would have been almost quite fresh to the English reader, and would have formed a tolerably satisfactory outline sketch.

What few names he does mention—and they are bare names—"vex et prorsus nihil," are, with one or two exceptions, comparatively obscure and of minor interest, for they belong to a period when the art cannot be said to have had a school of its own in Germany, but merely adopted the routine established in Italy and France. It is only within the present century that architecture has there produced modern works that have attracted the notice of all Europe, not only by their number, their magnitude, and their vast expense, but by the artifice, quality, and by the artistic study they display. Yet these are passed over entirely; not even the names of any such buildings or their authors are mentioned; for which most provoking, that is, provoking, not to ourselves but to those who are unable to obtain for themselves a knowledge of the local and the general, no more extraordinary apology is offered: "The circumstance of the tedious works of these architects, Mr. Gwilt, of Munich, Berlin, &c., having been executed by artists still living, we feel precluded here from allusion to them, because if we were to enter on an examination of them we must detail their defects as well as their beauties."

A sinister excuse can hardly be imagined, or one more illegal and contradictory: it would appear from what is here said that "allusion, to and "examination of" any of those works would be the same thing; at least that they could not be alluded to, or mentioned at all without some further examination of them being gone into; nevertheless this formidable difficulty has been completely got over by Mr. Gwilt's, that in that respect large even some general encyclopaedias, whose architectural articles show more industry of compilation and research, and contain a good deal of matter altogether wanting in his. Most of those in the Penny Cyclopaedia are very interesting, and there are also several articles in that work, belonging to architectural biography which there appear for the first time, we believe, in an English dress. Among others those on Ventura Rodriguez, and Quarenghi; neither
of whose names are once mentioned by Mr. Gwilt, although the one was the Spanish architect, par excellence, of the last century, so highly extolled by Ponz, and the other hardly less celebrated at the opposite extremity of Europe, where he was extensively employed at St. Petersburg. After this, the reader will not be very much surprised at our saying that the two chapters respectively appropriated to the architecture of Spain and Portugal, and that of Russia, are exceedingly meagre, and, in many instances, very unskilful, as if the author had add nothing at all to what might be picked up out of very common books; and although Mr. G. may not be acquainted with Spanish, and therefore not able to avail himself of Llaguno’s “Noticia de la Arquitectura de España,” he would have found many valuable materials for his purpose in Cook’s Spain. However well qualified upon the whole for the duty of the essay, so far as we can judge, from the extracts which he does not attempt to do justice to every one of the multifarious subjects it comprises; yet if so far demerit is removed from the writer or compiler, it still attaches to the work itself, therefore it would have been more satisfactory had assistance been obtained for those portions of the “Encyclopaedia,” where it was evidently required.

But let us return to German architecture, for we consider it deserving far greater attention than that which Mr. Gwilt has bestowed upon it, or thinks that it merits,—it is truly singular that one who may be presumed to take a generous pride and interest in the art, should evince such sullen, chilling indifference—or worse than indifference—towards the noble and splendid architectural achievements of his countrymen, the intermediate years of the last thirty years. Even if the architects themselves have not, in every instance, acquitted themselves in a manner perfectly satisfactorily, or so well as might have been expected from the opportunities afforded them, still they who provided those opportunities are entitled to our grateful admiration. Under their influence, a new era in the art has commenced, in which genius has obtained the sway, imbued with vigour of mind, and which, abandoning the drowsy routine of the last century, ventures to think for itself, and is less observant of rules than of principles. Whether he himself was altogether the great artist his countrymen had to be, or not, Schinkel’s influence not only was, but continues to be, very great; and what influence it has been, and the views now taken of the art, and its aesthetic principles. To him belongs the merit of introducing Grecian architecture, not only in greater purity as to style, but with less violence as to its native character and original elements than it had been before applied on any part of the continent. Yet, though he opened that track for himself, it must be confessed that he did not make that further progress in it, which some of his earlier works promised. Had he carried out to greater extent, and with more freedom, the system he appears to have originally laid down for himself, there is every reason to suppose that he would have degrees have formed a style consistent in itself, and at the sametime providing for all those circumstances which must be imagined for Grecian architecture, if it is to be employed by us moderns, since they cannot be immediately borrowed from it. But, if he was so fortunate as to succeed in it, we might even say invent, classic ornament and detail, is proved by the capitals designed by him for the columns in the sculpture room of the Berlin Museum; and it is therefore to be regretted that he did not treat with similar if not exactly equal freedom the entablature of the exterior walls, since he was so strictly adhered to authority in what we cannot help thinking is its object. The cornices of the Hellenic Ionic, always appears to us to be unsatisfactory, and at variance with the character of the order in all other respects; owing to its want of depth, and the comparative plainness as well as fewness of its members, it rather disagreeably contrasts with accords with the fluted columns, and their luxuriant curling and otherwise highly enriched capitals; in which the greatest degrees of embellishment is obtained and there stops; so that that which is or ought to be the whole character, the capital to the column itself,—its completing decoration, looks comparatively poor and unfinished.

An examination of all Schinkel’s buildings and designs, will be— we will not say a thankless task, certainly not so to ourselves,—but one of such length that we must here forgo it, merely referring our readers to what is said of them by Dr. Kugler in his “Karl Friedrich Schinkel: eine Charakterist der Künstlichen Wirksamkeit.”

There is also another memoir or similar “Charakterist” of him by O. F. Groppe, which is in some respects more complete, and which speaks with some spirit of his, and of the many appears, most successful labours,—the designs for a most magnificent and free standing edifice, obtained from the Empeess of Russia, at Orleans, in the Taurian Chersonesus, between Kafia and Baktescharisai. The spot selected by the Empress for this summer retreat is upon a rocky declivity, at a height of about 1500 feet above the level sea, and in a horizontal direction about 2000 feet from the sea beach. There is no task, or is to be, or has been attempted—for that point is left done by the writer, an extensive pil, seated on a terrace platform, and consisting of various pavilions, connected by colonnades. Unfortunately, such detail of description as would enable us to form some tolerably clear idea of what appears to be no less varied and complete than extensive in its plan, is not attempted; therefore from what is said we can collect little more than that there would be atria and open courts, surrounded with columns, with occasional vistas from one to the other, and embellished with more or less perfect Moscovian designs, for the number of plants growing in vases, &c.; and in the largest or central courtle there would be a lofty isolated structure, towering above all the rest, so as to form a striking feature in the general composition. In this project Schinkel, we are told, gave free scope to his fancy, and availing himself of the unusually favourable opportunity the peculiar nature of the subject afforded, he “made use of all the scattered rays of Grecian architecture, and also concentrate in one work some of his own happiest ideas.

One thing is certain, that whatever change of opinion may take place as to his merits and talents, Schinkel will henceforth be a prominent name in architectural history, although he has not been passed over, or pigeon-holed, in the “Encyclopaedia” and that he should have been so, is all the more strange, inasmuch as there would else have been an opportunity of touching upon the subject of Grecian architecture, properly so called, with reference to its applicability for modern purposes, and the attempts made to revive it in original purity, and so as to preserve its poetical character. But let us again advert to his attempts— we will not say to describe, but to enumerate all the monumental structures which have of late years been erected only in those two feet of art, Berlin and Munich, but in various other capitals and cities throughout Germany. Yet that he should not have named any, shows an excess of caution,—a consciousness that their bare names would impress upon the reader the idea of naturalism, on which Schinkel has been so pleased to remark, that “an extraordinary species of bigotry has laid hold of them” in favour of German architecture: an observation, by-the-bye, that does not come with peculiar grace from a writer who shows himself throughout his work to be bigoted and opposed to any other than an offensive degree.

There is at least one edifice to which Mr. Gwilt might have referred, if only as an instance of what German energy and perseverance can accomplish, and also to convince his readers, by so doing, that he entertains no bigoted prejudices against German architects,—we mean the Wallhalla,—a structure not likely to be passed over in silence by any other historian of the art, let him be of what country he may; for its fame will outlast the solid masonry of which it is built, if not the hill on which it stands. Although only one of the many magnificent architectural schemes, begun and accomplished by Ludwig of Bavaria, it would have sufficed for his fame, and proved how justly he is entitled to the epithet of “Kunstliebhaber.” The idea of erecting a temple to the universal genius of Germany, where should be assembled the portraits of all its most eminent statesmen, soldiers, artists, and their country, in arts or in art, as sovereigns or as legislators, as philosophers or as poets, had long been a favourite one, cherished by him for many years before he came to the throne. It was in February 1814, that a programme was first issued, and architects invited to send in designs, none of which, however, proved satisfactory; whereon nothing further was done until the beginning of 1821, when Klenze (the architect of the Glyptothek) was instructed to prepare a fresh one. Even this last was greatly modified afterwards, nor was it begun to be carried into execution until 1839, when the first stone of the substructure was laid October 15th. But if up to that time there seems to have been a good deal of procrastination—easily cast aside for by the number of other important works then in progress at Munich itself, no want of diligence and energy showed itself in carrying on the building when once commenced, for it was finished before October 1842, and solemnly inaugurated on the 19th of that month. Thus within somewhat less than twelve years has been successively completed one of the noblest works of art undertaken in modern times, and one that, considered merely as to its magnitude, exceeds many a building that has been the labour of an entire century. The edifice itself is a work of great magnitude, not so much on account of its mere size—for in that respect it is not at all remarkable, as of the extraordinary solidity of its construction and material, the astonishing care with which every part has been carried. The interior is finer than the exterior; and the appearance more or less imperfect on their exterior; some present little more than a façade, and in scarcely any is the same degree of flush—which is not to be confounded with decoration—kept up throughout. But, though it is shown only by itself, the Wallhalla would still be an astonishing work, the Doric peripteral edifice is only a part of the general external design, it being reared upon a lofty and colossal structure,
consisting of Cyclopean walls, flights of steps, terraces and platforms, and containing within a spacious souterrain of massive vaults, to which there is no direct access from the court. Most of this lower step of the bottom flight to the bases of the columns of the portico, the height of this vast and widely spreading-out basement is 338 feet, and from that level to the apex of the pediment 67, making the entire height 195 feet. The ascent is first by a single flight (64 feet wide), then by two others right and left, at right angles to it, where the steps are divided. Between this two-tiered ascent is a return in a contrary direction to the others, meet at the bottom of the last or upper flight, which leads immediately up to the portico. Thus, as shown in elevation or geometrical drawing, the building appears to be raised on a vast pyramidal mass 210 feet wide, and 136 high; but except the whole be viewed from a considerable distance, it can hardly be conceived as anything but a huge model. In order to convey an adequate idea of the gradation and variety attending this portion of the design, at least a dozen strictly architectural drawings would be required, describing both the terraces themselves, the views obtained from them at different progressive heights, looking towards the building or contrary, and one within the portico, with its prospect towards the far-off. If this would be requiring a good deal beyond the power of the pencil to accomplish, it being impossible to express the effect of looking immediately up or down—up to the portico as soon appearing above, as soon as seen at all, and down upon the terraces which have been ascended.

The interior of the Walhalla certainly does not fall short of the promise held out by its exterior, for if in the latter, the architect has aimed at no more than producing a faithful likeness of one of the most celebrated structures of antiquity, he has here shown his invention in the happiest manner, and united to the beauties of the original structure, all the most charming features of its imitation. Of interior architecture, the Greeks appear to have had very little—there were few buildings which were not open to the sky, and therefore partook more of the nature of an open court, than of the inside of a building, and the cela of their temples either had no other light within than what they received from the door, or were hyphæral, that is, open to the sky, not entirely, but in the centre, in which case the light was transmitted through the columns of an open court, with no shelter but within the colonnades along the sides. Although this matter of dispute with some, the Parthenon is generally supposed to have been hyphæral, but whether it were so or not, the interior could by no means correspond in architectural beauty, with the exterior. Of the German Parthenon, on the contrary, the interior affords the most perfect of all modern examples, it being much characterized by splendour and richness, as the exterior is by graceful severity. All that is not marble, is bronze and gilding; the pavement is of marble, inlaid in a pattern of various colours; the walls and shafts of the columns and altar, are of brownish red marble, from Salzberg; the entablatures, capitals, &c., of white marble, partly relieved by gilding and colours, while the ceiling is entirely covered with plates of bronze highly gilt. Were no other part of the interior worthy of notice, the ceiling alone would call for special examination, since there Klenze has fallen upon a most happy idea, one entirely original, yet so natural, and so perfectly in accordance with what is one of the most characteristic features in Greek architecture, the algorithm that the wonder is it should never have been adopted before,—although it was perhaps hardly practicable before the use of cast-iron for roofs. Instead of being either flat or vaulted, the ceiling is here of precisely the same form as the external roof itself, being, in fact, identical with it, in like manner as the open timber ceilings of Gothic buildings—consequently, while there is so masking of any kind, greater lightness is obtained than there otherwise would be. And as in the Gothic style the idea of a triforium is made to exhibit arches, and pendant beams, tracery, &c.; so here the pediment form is introduced internally, not merely in outline at each end, but in two intermediate pediments, whose architraves rest upon the massive piers which project from the walls, so as to divide the plan into three compartments, and to conceal beneath it, what is to be seen in front, the greater variety, to produce a succession of spaces, instead of merely a single one, and to break up what might have been rather disagreeable monotony and formality, had the busts been arranged in continued rows, from end to end. The pediments are therefore seen in perspective, one behind the other, and besides being otherwise embellished, they are, by their own particular form, surrounded by clouds and arabesques, in open work. Here, then, Klenze has most felicitously solved an important problem, and without other authority than that supplied him by his own invention, has produced what will henceforth be an authority and standard for others to follow. What has here done, may indeed be compared to Columbus’ breaking the egg; for now that it is done, it may say that the idea was obvious enough; nevertheless, obvious as it may have been, it was beyond their grasp and reach. Such being the case, architects would do well to think a little more for themselves, than the generality of them now appear to do, and to consider whether there may not be other latent ideas to be seized hold of, and brought out, applied, and developed,—which, however remote from one another, are not at all too similar, and do not belong chiefly to precedents and authorities, without seeking to venture beyond them. We do not mean to say it is at all desirable that every one should attempt what is beyond the power of most to accomplish; let those who have no ideas of their own,—of course we mean ideas of a proper character,—be contented with mere imitations, that others who are more gifted, who can penetrate into the resources of their art be deterred from exercising their originality, by the apprehension of being charged with innovation. The time was, when what is now authority and precedent, was innovation; without innovation, we should not have had the Ionic order in addition to the Doric, the Corinthian to the Composite, and the upper story of the other columns, and so forth; but not all this is innovation. Even in the interior, side windows would have proved highly objectionable, if only on account of their producing cross lights, and too many separate spots of light, thereby destroying that breadth of light and shade, which so greatly contributes to the effect of architecture. A great deal of improvement has been made since the time when the artist’s eye most approves it is that to which the preference is given for galleries and studies; nevertheless, architects in this country seem determined never to give it up, if they can possibly avoid doing so. As far as we are aware, not a single church professing to be in the classical style,—whether Greek or Roman,—is so lighted,—at least, only partially; notwithstanding that windows prove almost invariably wholesome, in what may be otherwise satisfactory in design. It would seem, that because windows are highly characteristic and ornamental features in churches in the Gothic style, they must be retained as matters of course in all churches, however ill they may accord with the style selected for them. Had the interior of the Walhalla been lighted according to this rule, the lowest windows of the building could have been made 16 feet high, or 32 feet, and the intermediate 8 feet high, or 16 intercolumnations. There are therefore 46 columns, or including others forming the piers within the entrance portico, 52 in all. Measured along the bases of the columns the plan is 88 feet by 222, which dimensions are as nearly as may be those of the Parthenon.

\* Not to encumber the description with too many details of the kind, we here note some of the peculiarities relative to the exterior of the building, which is nearly a fac-simile of the Parthenon, being not only of precisely the same order, but like that edifice an octostyle peripteral, and with the same number of columns on each of the six sides, being 11 columns on any given face, and 8 columns on each intercolumnation. There are therefore 46 columns, or including others forming the piers within the entrance portico, 52 in all. Measured along the bases of the columns the plan is 88 feet by 222, which dimensions are as nearly as may be those of the Parthenon.
... present amount to about eighty, or half the number proposed, are uniform in size, and in the Thames fashion; and in regard to them, any may here endeavour to meet an objection likely to be made. That there should be no statues, but only busts, may at first strike as rather a strange circumstance, insomuch as the latter may be thought somewhat insignificant, and merely accessory objects in comparison with the splendid building in which they are deposited. No doubt they are so, if considered individually, but certainly not, when considered collectively, for then they make a prodigious sum total, and their importance and interest become in keeping with the architecture around them. Certainly it is that one half of the same number of statues could have been properly arranged within the same space, and what is not least of all deserving consideration is that by busts being adopted, one exceedingly great difficulty has been entirely got over, we mean that of costume. In this respect, some of the earlier figures might have proved suitable enough for sculpture, but then the later ones would have contrasted very disagreeably, not to say ridiculous, with them. So represented, would Mozart and Goethe have seemed to have been of the same race, of the same period, as Goering, and Friedrich der Ruhmbar? The sculptors employed upon the former would consequently have worked at a very great disadvantage compared with those who were favoured by the costume of the other figures, which, besides being more picturesque in itself, admits of being treated more freely. However skillfully managed, Goethe's coat would have been in our eyes, merely the very prosaic outside of a great poetical intellect. In most, if not all of the modern statues there would have been too much of the tailor and frizzunt, unless they had been put into "night-gown and slippers" deshabille. The Gordian knot which has lighthearted so much perplexity, and given rise to such very opposite opinions in regard to the adoption of modern costume and sculpture, has therefore been on this occasion, if not unravelled, at least extremely cut through.

Another knotty point, however, there still remains,—at least, what has been made such by those who object to the Walhalla,—that its architectural character noble as it is in itself—is quite at variance with the name and purpose of the building. These, they say, lead us to look for a monument in a very different style of the art—not Grecian, but Roman. And as far as names and their influence go, this sounds well; but then if the objection is a natural one, it is so much so that it seems to have been adopted at once, without a second consideration being bestowed upon it, and as if it could not possibly be met by any counter-objection. It may fairly be questioned whether anything nearly equally satisfactory would have been produced in the Gothic style; for that is one in which the Germans of the present day have not been eminently successful. Besides which, not only would a Gothic structure upon the same scale, have appeared comparatively small and deficient in bulk and majesty, but would, in all probability, have borne too close a resemblance to a church, and have looked more like a building dedicated to religion, than to art. The applying any such form for a secular purpose, might therefore, have been construed into a desecration of it; whereas that of a Greek temple is not associated, in our minds, with any ideas of particular sanctity, nor does it excite other feelings of veneration than of those for art. Admitting that the Walhalla—that is, its exterior, is scarcely more than a repetition of the Parthenon, it is also the only one—that which alone of all the things in its tendency to be "after" the Parthenon, conveys an adequate impression of what the original was in its pristine state. Were the Athenian structure still perfect, it might have been a question if it was worth while to erect a duplicate of it elsewhere, and for a very different purpose. Yet such is not the case; neither is the Walhalla a mere copy of it, and no more; because while it is so far a truthful copy, in the sense of exhibiting the grandeur derived from fineness of style, this last circumstance is here treated more architecturally, the ascent up to the building being immediately combined with it, and made a very principal and striking portion of the entire composition.

We have now dwelt so long upon the subject of the Walhalla, nevertheless passing over much which we could have introduced into what we have said, that we have left ourselves no space for noticing other productions of German architecture, although some of them would furnish equal matter for remark, for description perhaps still more. Among them is the Rosenau at Munich, a vast pile, forming not only a palace, but almost a cluster of palaces, comprising as it does the PAGEANT, the KOLLES (with a facade nearly 800 feet in extent), the RICHTERGEN-CAPLE, &c. Much, very much more, also, could we say upon the subject of the Encyclopedia were we not here obliged to conclude. Which being the case, greatly as he dislikes German architecture, Mr. Gwilt has, upon this occasion, some reason to be satisfied with it, insomuch as the notice we have bestowed upon it has done due and proper attention from his own work. As it is, what we have said will at least serve to show what sort of matter and information he has thought fit to pass over, and likewise to prove that much as he may affect to despise "anonymous critics," and all who write for periodical publications, some of them are quite as much, if not more, au conrond du jour than himself, and certainly understand equally well what is now likely to be expected, both by the public and the profession, from a work styling itself "An Encyclopedia of Architecture."

**OBSERVATIONS ON ARCHITECTS AND ARCHITECTURE**

By **Henry Fulton, M.D.**

**No. 4.**

CONCILIATION HALL, DUBLIN.

Scale 10 feet to the inch.

1st Clown.—Who builds stronger than a mason, a shipwright or a carpenter?

2nd Clown.—Marry now I cannot tell.

1st Clown.—Cudgel thy brains no more about it, for your dull ass will not mend his pace with beating; and when you are asked this question next, say a grave maker, for the houses that he makes last till doomsday.

**HAMLET.**

It is not to a grave maker that the inhabitants of Dublin are indebted for the design of the Conciliation Hall (intended as the place of meeting for the Repeal Parliament), else doubtless it would have been erected with more durable materials than brick and plaster, yet from certain curvy-cues on the summit, such as frequently ornament the last portable receptacle of frail humanity, we may form a tolerably correct notion of the enterprising undertaker of the design. But far be it from me to insinuate that any calling or profession should debar a man from studying the noble science of architecture, I only implore the judgment of those committees of selection who do not cause to be produced something more worthy their country and their age. It matters not to the public by whom produced, or whether the artist has or has not half the alphabet as a sequence to his name, provided the design does credit to his taste and to the discernment of his employers.

The architect has given us a pleasing variety of the emblems of war and peace in military cocked and opera hats above the windows, the warlike being in proportion to the peaceful as three to two, and thus following the example of the facade of Antrim House in Merrion Square, erected for the late President of the late Royal Institute of the Architects of Ireland. Then we have a sham pediment, which does not mark the outline of the gable, but defines just nothing at all, as the ridge of the roof is on a level with the top moulding of the...
pedestal which rises from its apex. On each side of this sham pedestal we have a balustrade for no other purpose that I can see, unless to put balusters out of fashion, and if this be the object I sincerely wish it may be successful. It may be observed in this design, how effectually the balustrades and parapets swamp the pedestal; which will afford a good study for those who admire the expedient of converting a real pedestal into a sham one.

II. A letter under the signature of J. W. R., in the last number of this Journal, p. 416, objects to the proposal of making an Egyptian façade to the Museum, on the grounds that the style is not European. This line of argument is so like what my good old aunt Marabella would urge, that I trust I shall be excused, if mistaken, in assuming the signature J. W. R., to be that of a fair incoquinia, and reply, "Ah, ma'am, are you aware that the same geographical reason would apply against the introduction of the beloved congo on your breakfast table? It is true The Museum is a national one, that is, national property, but the geographical character of its contents have only the limit of the globe itself. What J. W. R. says of a Grecian façade is quite incomprehensible, for I cannot suppose the existence of such a thing, the style depending upon the development of parts impossible to be brought into a mere façade.

Of what is called Grecian architecture with its Palladian deformities, we have enough. The Egyptian style is free from the polluting touch of Palladio or his school. In the one case we know what to expect; in the other hope opens a door in the unexplored field of Egyptian antiquities for the expectation of something better. The Greeks are supposed to have learned the art from the Egyptians, and why may not we? if the like success shall attend our exertions, great will be our reward.

Oh, Madam, there be edifices called Grecian, which I have seen, and heard others praise, and that highly, that neither having the form of Grecian, nor the proportion of Grecian, Roman, nor Gothic, so pedimented, so rusticated, so bustled, so balustraded, so polytryply-symphylized, so distorted, so perverted, that I thought some architect's journeyman had designed them, and not designed them well, they imitated the style so abominably. But I would recommend to you, ma'am, and the Palladians, an attentive perusal of the entire charge, of part of which the foregoing is a parody, it is as applicable to architecture as to the drama—to Sir Robert Smirke as to Heenan.

III. Although the exterior of the Roman Pantheon, with the exception of the portico, is an unsightly mass, yet it affords an important lesson worthy the consideration of us moderns. Where (it may be asked) is the architect who could make anything of it in the way of ornament? Or who could design an edifice of the same form and dimensions, in the Greek or Roman styles at least, and make it at all ornate without being at the same time absurd? This, it would appear, was the feeling of its architect, and hence, with the exception of the portico, all ornament was reserved for the interior, which, for beauty, when restored in imagination to its pristine state, far surpasses the interior of any edifice in the world, unless it be some of the Gothic cathedrals, if things so dissimilar may be compared. Might it not be well in all cases where, from the required interior accommodation the exterior cannot be made in good taste, to follow the example of the Pantheon and leave it unornamented? this would tend to save the credit of the architect, the purse of the employer, and the feelings of amateur critics. The beauty of the portico forbids us to suppose that it was a lack either of taste or talent which caused the tambour to be left as we see it: perhaps it was the intention to hide it by other separate and distinct buildings, for no means of internal communication were left in the plan to favour the idea of some antiquarium, that it was intended as a hall appertaining to the baths of M. Agrippa. It need scarcely be remarked that the two excrescences, which rise like asses' ears behind the pediment of the portico, are modern.

2 See interior of the new Exchange.

A RECENT GLANCE AT THE WORKS AND THE GEOLOGY OF THE SOUTH-EASTERN RAILWAY.

The travelling on the Croydon Railway is very smooth and agreeable, an effect which, I understand, is due to the system of construction adopted for the permanent way. The rails on this line are laid upon a subsoil of red sandstone and Breccia, planed smooth and uninterrupted line under each rail. The train has, therefore, an equal and uniform support at every point, and is not subject to the jolting motion which is experienced on many other railways.

The Croydon Railway, I need scarcely say, is used in common by the trains of the South-Eastern and Brighton Railways, both of which approach the metropolis by means of this line, which, may, therefore, be considered as the trunck for the south-east of England. The country adjoining the Croydon Railway between the Forest Hill summit and Croydon is delightful. The railway is flanked by several noble woods, the property of Lord Dartmouth and Lord St. Germain, and the whole country is studded over with numerous elegant cottages and villas, most of which command an extensive prospect from the elevated position which they occupy. The Croydon Canal, which was formerly a favorite resort of the angler and a famous place for boat parties and water frolics, for which, indeed, it was more distinguished than for any commercial benefit which it ever realized, has been quite obliterated by the course of the railway. Some part of the canal has been filled up, its bridges pulled down, and its locks dismantled, while in other parts, the railway actually passed in the same line, and the ancient bed of the canal was lowered in order to suit the convenience of the user. In a few places, however, as about Sydenham and Adderley, short lengths of the old canal still remain, and the inhabitants of these bays have hewn out of the bordering cliffs, still frequented by many metropolitan anglers whose occupations do not afford them time for a sojourn at any more distant fishing station.

We left New Cross at a quarter before 10 and arrived at Croydon just a quarter past. About half a mile nearer London than the joint station of the South-Eastern and Brighton Railways, the Croydon Railway turns off to the right towards its own station north of the town. At Croydon we enter upon the Brighton Railway, which is used by the Dover Company as far as Merstham, where the South-Eastern line branches off. Shortly beyond Croydon there is an interesting section for geologists, in a deep cutting where the Brighton line may pass through the lower sands of the plastic clay formation. This sand exposes immediately upon the chalk, the junction with the latter being exposed in the cutting. After leaving this cutting, which occurs at Coombe Hill, just south of Croydon, the line enters the chalk district of the Surrey Downs. This is a gradually rising tract of country and through these heights the railway proceeds, the banks and embankments of the neighbouring tunnels, are still frequented by many metropolitan anglers whose occupations do not afford them time for a sojourn at any more distant fishing station.

Between Croydon and the Merstham tunnel there are several minor stations, of which only the Brighton trains stop, those of the South-Eastern company making no stoppage till they arrive at the other end of the tunnel.

From Croydon to Merstham, at which place is the summit of the chalk country, the Brighton Railway rises all the way at the rate of 20 feet in a mile, and very heavy cuttings through the chalk have been found, which to secure even this, which, nevertheless, the judicious application of capital to the object of strengthening the soil and rendering it more retentive of moisture, would effect great improvements even in the most unpromising chalk districts.

Between Croydon and the Merstham tunnel there are several minor stations, of which only the Brighton trains stop, those of the South-Eastern company making no stoppage till they arrive at the other end of the tunnel.
appearance, suggesting the idea of considerable danger, even from the fall of a very small mass of rock from the top of the cutting, should it happen to alight upon a passing train.

At Red Hill, which is about two miles south of the Merstham tunnel, the South-Eastern Railway diverges from the Brighton line by a short curve, which forms an arc of a circle with a radius of 600 feet.

The first cuttings on the South-Eastern line were made on the great tunnel through the green-sand formation at Bletchingley 31 miles from the junction with the Brighton line. This tunnel is 1325 yards in length, and is built in the form of an ellipse with a circular invert. The width of the tunnel in the widest part, namely, in the minor axis of the ellipse is 24 feet, and the minor axis of the ellipse is 3 feet, and the vertical height of the tunnel is 25 feet, measured from the hollow of the invert to the crown of the arch. I take these dimensions from the report of General Pagel on the opening of the railway. In the neighborhood of Bletchingley, and in the same range of sand hills as that of which Red Hill forms a part, the green-sand formation is very common.

It is worthy of notice that the first public railway constructed in the south of England, was that laid down from Wandsworth to Merstham, for the purpose of conveying the lime, freestone, and fuller's earth from Redhill, Gatton and Nattfield, to Croydon and Wandsworth, from which places these minerals were sent by barges up the Thames and through the Croydon Canal. This ancient railway was called the Surrey iron tramroad, and was the work of Mr. Jessop, a celebrated engineer, who designed it about the beginning of the present century. The minerals forming this road, together with the excellent railway, are now converted for the purpose of conveying the Croydon and Natts road. The old tramway has been bought up by the Brighton Railway company, and all the iron and stone blocks sold off. The fuller's earth pits are highly interesting to geologists, and are well worth a visit from any one who has an hour to spare at Red Hill. The peculiar earth known by this name is a variety of clay possessing highly sintered properties, which renders it of great value in the process of cleansing woven cloths from grease and other impurities. Fullers' earth contains 53 per cent of silex, a larger proportion than most other clays, and is distinguished by a remarkable property of falling to pieces and readily passing into the state of impalpable mud on the addition of water. In consequence of this it is necessary to preserve it with great care from the injurious effects of rain, and the earth containing it are commonly covered with tarpaulin for this purpose.

Some of the embankments on the Brighton Railway were partly composed of fuller's earth in a wet condition, and this material being so reduced to a fluid state ran out from its place in the embankment, which, as a matter of course, gave way, and subsided to an alarming extent. The fuller's earth is distinguished by a bright blue and yellow, the latter being esteemed the best. The pits contain great quantities of a semi-transparent massive spar, termed by mineralogists the ponderous earth or sulphate of barytes, (from Bara weight.) Besides the Bletchingley tunnel there is another short tunnel 88 yards in length, just before coming to Tunbridge, and a succession of cuttings and embankments above and below it, which are also several large viaducts over branches of the Medway in the neighborhood of Tunbridge.

The strata between Tunbridge and Tunbridge belong to the weald clay formation, but at Tunbridge several of the cuttings present sections of the Forest series, thus proving the interesting fact that these latter strata are found to exist in no other place than shown on Mr. Greenough's and other geological maps. The true weald clay is almost uniform in its appearance, consisting commonly of the blue or brown varieties, with occasionally a thin bed of imperfectly aggregated shelly limestone, whereas the Forest strata consist of numerous alternations of sand and sandstone, with beds of clay extremely various in thickness, separating the layers of rock from each other. This appearance, which is presented by the cuttings near Tunbridge cannot be mistaken for that of the weald clay, and hence ample reason appears to exist for examining into the accuracy of the geological maps of this district. The principal works between Tunbridge and Ashford are a deep cutting at Postern between the villages of Tunbridge and Headcorn, with a large and bold cutting at the head of the Medway, and the Bult feeders of the Medway, and one over the Stour, which flows by Canterbury and falls into the sea at the Reculver. These viaducts are principally built of timber, by which, of course, their cost has been considerably diminished, although, at the same time, it must be borne in mind, that they will decay much more speedily, and probably require to be repaired in the end than structures of masonry.

The stations on this line have also been designed with a strict view to economy. Those at Tunbridge and Ashford are of considerable size, the others consist of small wooden buildings stuccoed on the outside, lined on the inside with canvas, and painted or papered in a handsome manner. At each station there is a booking office on each side of the railway, and these offices are not opposite to each other, that is intended for the down trains, and the nearest being nearest to Dover, and that for the north train, being nearest to London.

The permanent way on this line is constructed in a peculiar manner. The rails weigh about 71 lb. per lineal yard, and are fixed in chairs which are supported by transverse sleepers of timber. The chief peculiarity consists in the form of the sleepers, two of which are made, one half of a circular form for diagonally through the other half, so that each sleeper is a triangle in section. These triangular sleepers are laid with the edge or vertex downwards, and the chair is bedded upon the flat upper surface. The advantages of this plan are said to comprise superior facilities for packing the sleepers so as to secure them from disturbance, at the same time that its economy is said to be greater than any other system. Difficulty has been experienced in procuring ballast for the permanent way. This was originally supplied by the sand cutting at Red Hill, but the material used was of far too fine a quality, and is blown away in great quantities during windy weather. I hear that the company is now about either partially, or entirely, to re-ballast the line with gravel from Croydon, the expense of carriage by the railway being so small that they can afford to go all this distance for a superior material.

I have already said that the railway commences by a curve when it leaves the Brighton line, and with the exception of this curve the line may be considered straight all the way to Ashford, a distance of nearly forty-five miles from its junction with the Brighton Railway. Throughout this long distance the railway is a true national line of communication for communication from Tunbridge to the Forest and even to the Forest country on the south. It is everywhere covered by abundance of fine oak timber, which flourishes in such luxuriance upon the weald clay, that William Smith the geologist, who first traced the succession of strata in this part of England, adopted the name of the oak tree clay for this formation.

Whoever has paid any attention to the physical geography of this country must have been impressed by the important connection between the Wealden district and the surrounding barrier of chalk which everywhere accompanies it. A series of cold wet clays, remarkably adhesive and retentive of moisture, comprises the subsoil of the Wealden country, a soil so mechanically constituted as to be almost incapable of cultivation. The chalk however, is capable of producing a mechanical division and separation of its adhesive particles. Just such an agent is quick lime, which being mixed with the stiff heavy clay, bursts and splits the clods into many pieces, and produces a soft mellow soil which is capable of being cultivated to great advantage. For many years it has been the practice of the farmers of the Weald to cultivate the South-Eastern Railway, and even more the Forest district, by sowing large quantities of chalk either burnt in the state of quick lime, or in the native state of chalk, to be burnt on their own land, for the purpose of mixing with the soil. It is a well-known fact that lime is even carried to some parts of the weald, a distance of 20 miles or more over such excreable roads, that the cost of carriage alone must exceed 11. per ton. Now mark the circumstance of the great extent of wealden clay through which the South-Eastern Railway passes. On one part of the line, namely, adjoining the great cutting and tunnel at Merstham, there is a million tons of chalk lying absolutely waste and useless, encumbering the land by its presence, and forming unsightly heaps of spoil by the side of the railway. Why is it not this chalk burnt in lime and conveyed by the railway into the clay districts, where it would produce such obvious improvement? Chalk may be had in equal abundance from the southern extremity of the line at the works beyond Folkestone, so that the distance of carriage to no part of the clay district on the direct line would exceed 25 miles, and the cost at the ordinary charge for carrying lime per ton to the clay districts, about 11. per ton. If these were employed in this service it would prove of incalculable advantage to the agriculturists of Kent, as it runs directly through the middle of the wealden district in its longest direction, and the carriage by wagon from the sides of the railway would not exceed four or five miles in the most unfavourable cases. I did not see a single ton of lime lying on the railway that had been burnt, and I greatly fear that hitherto the agriculturists of this district have been grossly negligent of the advantages within their reach.
THE RAILWAY'S TERMINUS, LONDON BRIDGE.

A statement having appeared in the Journal of the last month, relative to the building of the London Bridge Station of the Brighton, Croydon, Dover, and Greenwich Railways, which is calculated to mislead, in consequence of it not being exactly expressed in accordance with the facts; we therefore deem it right to state that the whole of the works of the three first-named companies have been under the joint direction of Messrs. Rattrick and Cubitt as Engineers, and Mr. H. Roberts as architect and that Mr. Turner to whom especial reference has been made in the statement of this Journal, as "Joint Engineers and Architect," is a "resident superintendent," and to prepare the drawings according to the directions received from them, which drawings were of course subject to their constant superintendence and alteration. The façade building combining the offices of the Greenwich Railway Company was designed in conjunction with Mr. G. Smith, the architect, to that of Greenhithe although the details were left more immediately under the direction of Mr. Roberts.

THE STEAM PLough.

On Saturday, Dec. 9, we had the pleasure, says the D:&ig;an's Courier, of seeing this truly remarkable machine in operation; and a more striking proof of what can be accomplished by human skill and perseverance can hardly be imagined. In the month of August last, a description of the machine was given to the proprietors of the Greenwich, Croydon and Dover Company by Mr. W. J. Curtis, civil engineer (an old correspondent of this Journal); and these have been brought to the interm to such a state, that the plough is now in full working order. Those who have paid any attention to the subject are aware that the steam engine which drives the plough is contained in a wooden house, borne on the more by two flexible endless lands or webs, and the driving motion is transmitted to the plough by a large and strong engine-house, in which the great weight of the boiler, engine, and other apparatus, is distributed over a considerable surface, and the mechanism enabled to bear a pressure which, in ordinary circumstances, would force it to sink. By the application of wheels and moveable railway bars, on a principle formerly explained, the engine house can be conveyed along at a slow rate, moving in curves; and indeed since the date alluded to, it has been removed to a point of the most nearly a quarter of a mile distance from its original situation. The prevalent belief on the subject is that the plough travels on the moss propelled by the engine in the same manner as a locomotive on a railway. This is not the case, however; the engine remains stationary (or at least comparatively so), while the plough is propelled on the principle of the endless rope, somewhat akin to that which is seen at the stations of the Liverpool and Manchester, or Edinburgh and Dalkeith railways, where trains ascend and descend the adjoining tunnels by means of a stationary engine. In a right line opposite the engine-house, and at the distance of the furrows' length, there is a wooden framework on wheels, also moving on a moveable railway. It is betwixt these apparatus that the plough, detached alike from the engine-house on the one side, and the moveable railway framework on the other, moves by the uninterrupted belt or rope of great strength, being composed of wire twisted together, passes round two drums in front of the engine, and round a pulley in the centre of the wooden framework. The plough is also connected with this rope, so that when the engine is put in operation, by which the drums revolve, the rope being coiled round one of them and off the other, impels the plough from the engine house towards the wooden framework, which acts as a point d'appui. The plough is double in every respect, so that when the wooden framework has been reached, or in other words the length of furrow completed, another furrow is formed by the plough returning to the engine house. The plough, be it distinctly understood, alone moves in forming the furrow, the engine and framework merely requiring to be shifted to the breadth of the furrow for the next operation. With the plough, however, it is only the framework with the common process, the engine moves along the headrig, while the plough goes up and down the field. In the plough itself the improvements made by Mr. Curtis are particularly conspicuous. The instrument consists simply of a share at either end moving on two small wheels, with a wooden framework below and an iron one above, which distribute the weight over a considerable surface. The framework sits within, and by means of a novel invention, directs the course of the plough at pleasure; for, by turning a wheel, he coils or uncoils part of the rope upon a small drum attached to the machine, which brings the force of the engine to bear obliquely on either side desired, and guides the apparatus in the same manner as a ship is steered. A code of signals has also been established, by means of which the steersman can communicate with the individual wheels with which the plough is furnished. The situation at the pulley framework, according as circumstances may require. One great step in this interesting experiment has now been made. The plough ploughs well and steadily, at the rate of between two and three miles an hour, turning over its huge furrow in a perfectly straight line, in a piece of moss where he could not even stand, far less draw.
To Sir John Barrow, Bart., Secretary to the Admiralty.

To my opinion of Holyhead for a packet station, and also for a harbour of refuge; for the reasons which have been taken in this letter as a basis for reference to the engineering part of the subject; but it is impossible for me to do justice to this, without extending my consideration to sea, and even across the channel, and considering how the day and night seasons, the land-marks, and the shoals, affect the passage and the entering into, and harbour. I have, therefore, examined the charts and pursued the reports on this subject, particularly that of Sir James Gordon and Captain Beechy, which, with the observations on the petition of Mr. Ormsby Gore, and others, and the replies to those observations, together with the communications from the different naval officers, including Lieutenant Sher- ringham, appear to me to have completely exhausted the usual part of the question, and must be well known to the Lords of the Admiralty, and all who have attended to the subject; so that very little need be said by me on this head. The natural advantages of Holyhead are described to its being the nearest point of land to Dublin, being situated under a protecting and very conspicuous headland, giving facilities for keeping out at sea in case of missing, or being unable to enter the harbour, the Skerries forming another good sea-mark, the entrance being free from bar, and the shelter which the bay affords to vessels from all winds, excepting between north-west and north-east.

The Holyhead Harbour.—This bay, and the shallow estuary now forming the inner Holyhead harbour, appear always to have been a shelter for coasters; and the outer portion before the entrance, the Skerries, in a small and assist nature, confirms the opinion. It was not until 1715 that a light was shown upon the Skerries, nor was the South Stack lighted until 1809. These lights being one on each side of the harbour, at the distance of eight miles from each other, together with the pier, and lighted jetty, and the light upon it, between the two outer leading lights, have much added to the natural advantages of Holyhead, and mark the direct course to, and the entrance into, the harbour in a superior manner.

The Stag Rock, which has now fifteen feet upon it at low water of spring tides, and 28 feet and upwards, which is within half a mile of the shore, are the only sunk rocks in the direct course of the entrance. There is one uninterrogated course, clear of shoals, between Holyhead and Kingstown, with the exception of the Burford Bank, which has upon the shalloest part two fathoms at low water springs and during ordinary tide, and which, with the exception, corresponds to the direct course to and from the port. There is also a safe course by the two outer leading lights, which has on the south side about 12 feet of water, and on the north side about 11 feet, and may be considered as a state of nature, scarcely anything having been done to improve it; nor does it appear that any one connected with shipping has thought it his interest to settle or build near it for furnishing supplies to the vessels which may have frequented it. There is no shop or store to be found there; nor is there a sheltering bay where vessels find shelter, except the bay, the having been one; a proof that if occasions a great number of ships have taken advantage of the harbour, these occasions have not been frequent, or the ships have remained a very short time. Yet this may not be conclusive against Porth-dyln-lleyn having important natural facilities for developing which a judicious application of science might do much. There are points in which I consider it has advantages.

Porth-dyln-lleyn Harbour.—Having given my opinion of Holyhead, with its capability of improvement, I have now to state the result of my observations and comparisons at Holyhead, Porth-dyln-lleyn, and Porth-dyln-lleyn, which may be considered as a state of nature, scarcely anything having been done to improve it; nor does it appear that any one connected with shipping has thought it his interest to settle or build near it for furnishing supplies to the vessels which may have frequented it. There is no shop or store to be found there; nor is there a sheltering bay where vessels find shelter, except the bay, the having been one; a proof that if occasions a great number of ships have taken advantage of the harbour, these occasions have not been frequent, or the ships have remained a very short time. Yet this may not be conclusive against Porth-dyln-lleyn having important natural facilities for developing which a judicious application of science might do much. There are points in which I consider it has advantages.

In its present state there is nothing to recommend Porth-dyln-lleyn as a station for packets.

For the reason that the passage is very short, and the traffic very small, too thin to justify the expenditure.

The angle of the entrance being so small as to make it dangerous.

The depth being so small as to make it dangerous.

The distance from the open sea to the shelter being so great as to make it dangerous.

The shelter being so small as to make it dangerous.

The current being so strong as to make it dangerous.

The winds being so strong as to make it dangerous.

The depth being so shallow as to make it dangerous.

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For the reason that the winds are so strong as to make it dangerous.

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For the reason that the distance from the open sea to the shelter is so great as to make it dangerous.
of giving between it and the rock a site for buildings, and other conveniences necessary for connexion with the packets. This is drawn to go southward from the west end of the harbour wall, at A on the plan, and to extend to D, a length of nearly 200 yards. The amount of the works I have described to form this packet line is estimated at £120,000, or from the apparent facility of procuring stone, might be executed for about £90,000. Thus the engineering works for the packet harbour and refuge lagoon would be £210,000, exclusive of all other buildings and accommodations which would raise the total cost above that for all the works which I have designed for Holyhead, and the Porth-dy-lun would be more contracted in quay room, and inferior in other conveniences, but would have a larger deepwater harbour.

The relative positions of Holyhead and Porth-dy-lun harbours, and the adjacent coast lighthouses, are shown on drawing No. 3. The advocates for Porth-dy-lun place in the foreground the objection that Holyhead is often in fog, and point to the excellent land mark afforded by the "rivels," and other high ground in the bay. The reply from the other side is, that there is deep water to the foot of the "head," which is often clear when the summit is in fog; that it is the land-mark which is of all others best known, which a seaman coming into the channel generally attempts to make: that the rivels in Caernarvon Bay are not to be seen in foggy and thick weather until approaching them, when, if a mistake has been made, it is difficult to correct it; and that the rivels at this point are as near an equal means to the head at the projecting point, as a land mark.

On referring to the objections to Holyhead, it may be noticed that they chiefly apply to the harbour as it is. Now, if the measures I have proposed were carried into effect, these objections, which I think they would do, and render it impossible to have a perfect packet station and line in a harbour, could all be shown in the improved state of the harbour. After, however, doing the best in my power in planning for both places, and supposing the land facilities equal, I have been unable to discover anything like sufficient grounds for preferring improved Porth-dy-lun to improved Holyhead. I will give a packet station here, should this be the case. Here, nor on the coast of either there is a much greater expenditure of capital than at any other station, excepting Liverpool, where the mean sea level is about 70 feet below the tide, and the numerous curves to reach the bridge, and the repetition of similar curves on the Anglesisea side, are objections. I think neither the Holyhead nor the Menai bridge, should be injuriously inter\n\nter cut with the district and division of the two lines. I have not to go at railway speed, not to be deprived of the facilities they have had upon the turnpike roads, which the change of fashion may make more used than they are at present, besides being some check upon tendency to monopoly and its effects. I have shewn the circuitous line, and the more direct line which could be adopted with the districts and division of the two lines. The railway bridge may cross at Swelly or Corgoe Rocks. The position and width of the latter are taken from a survey by Mr. Vignoles; they are nearest the direct line. The late Mr. Rennie and Mr. Telford both proposed fixed bridges. I ordered the Steel bridge, as the cost was, I believe, the objection. The iron-works of bridges may now be done at half the cost, and the traffic will be very much greater than was then calculated upon.

I think Mr. Stephenson's plan of terminating on the west, better than that of Mr. Gils, which takes the cast side of Holyhead harbour. Mr. Gils' plan of leaving the Chester and Crewe line before reaching the city of Chester, is much to be preferred to Mr. Stephenson's, which passes to the west of the city, and turns back through it by curves and works of considerable difficulty. These, if not objectionable to the citizens, are of an expensive nature. The distance and division of the two lines is the distinction of the principal towns, excepting Liverpool, is one mile shorter by Mr. Gils' than by Mr. Stephenson's plan here; and of all places, Liverpool is, from having the direct sea communication to Dublin, least interested in the question. By Mr. Gils' line there is one mile less of railway to make here. The accompanying drawings (No. 5, 6, 7, 8, and 9) are made with the short tunnels through the points of Penman Back and Penman Mawr, will, in my opinion, be preferable, in respect of despatch and safety, to embanking outside the perpendicular cliffs, which are heavily struck by the seas. The gradients for both lines are unobjectionable. A very detailed and clear account of each line is given in Sir F. Smith's and Professor Barlow's report, which contains also a proof of the sufficiency, as a question of statistics, of the chains of the Menai Bridge to carry the railway trains. Mr. Stephenson's line, through Angleses, is not so straight as Mr. Gils', but the difference in the lines of these two stations is not so great as to produce any material difference; a medium course may be the best. Near the Menai and approaching Holyhead, Mr. Stephenson appears to keep unnecessarily near the road for the safety of travelers upon it.

With further details. If the Government be a party to any contract, the line as well as the terms will, no doubt, be settled with due reference to the public in the conveyance of passengers as well as mails. If the harbour works be done in a good manner at the public expense, the harbours and packet lines at Holyhead and Anglesea, will have been expended in improving and enlarging the harbour will be beneficial to the public; and if the traffic upon it; and if the railway is to be made by a Joint-stock Company, there will, I apprehend, be no difficulty at present in obtaining offers from parties who would be ready, with the aid of a fair compensation for carrying the mails, to undertake the work upon a plan approved by the Government.

1 I have not supposed any stone to be taken from the Porth-dy-lan Point, which it would be injudicious to do.

2 If there is any inaccuracy in my statement of Mr. Stephenson's line, it must be ascribed in part to my not receiving from him an explanation of his line, beyond what the documents which he had previously seen in afford me.
To have parties who are influential upon the present lines, so that the public convenience may be secured for the whole length, might be an advantage. The line from London to Euston is unfinished, I have not inquired into the working of the Great Western Railway, but I have into that of the London and Birmingham, and I have received every facility and attention in doing so from Mr. Glyn, the chairman, Mr. Creswick, the superintendent, and Mr. Purdon, the engineer, in every respect, which, I think, if the consideration of the whole line is to be made, might be a point which, if I have suggested, might be made. A few which I named, and will now state, were received in this spirit. Ten minutes are allowed for the first mile from Euston-square, on account of the stationary engine work; this is at the rate of six miles per hour; it may be done and often is done in less time, but the difference is lost at the first stoppage, as the train must wait its time there. Now it is agreed that the locomotive engine might go to the terminus and start at once. This would save five to seven minutes. In two hours after starting there is a stoppage of ten minutes at Wolverton, where refreshments are supplied and invitingly served; less than half the time would do for changing the cars. There is no similar stoppage between Liverpool and Birmingham, although Birmingham is nearly equidistant from London and Liverpool. The arrangements near Birmingham are still more numerous and more tedious. Here the up and down trains are taken off the direct course to the Birmingham station, to a point which obliges the carriage to be turned round upon turn-piles; half an hour is usually allowed for this and for refreshments. These operations being finished, the train returns along a curve upon the Grand Junction Railway to the valley of the Tame. In addition to the stoppage, we have had 2½ miles of unnecessary travelling to the Tame, and our train is 2½ miles to the two sides which are travelled 43 miles. I see no reason, except “the good of the houses,” why the mail, or a traveller to Liverpool or Dublin, should be kept ten minutes at Wolverton, and then be carried two miles out of his way in two hours. The Birmingham mail line-drawn, as it is, and that the line had only to be made through more of the other extreme, and insufficient; it is worse than having no stoppage, exceeding five minutes, between London and Holyhead. Even Birmingham, for the sake of completing which the Birmingham detour was made at the time, will, I think, agree, that its convenience would be answered by having the Birmingham mail carriage to detache from the train. The accompanying plan (No. 6) illustrates my remarks on the Birmingham detour. In justice to the Railway Companies themselves, and to such of their passengers as are desirous of “getting on,” the cut ought to be made now. The Companies can afford it; I have had it surveyed. The execution would not be expensive, considering its importance. There are no buildings in the way. By the above plan, and the alterations lower down to which I have referred, the worst curves between London and Holyhead will be avoided, and the distance reduced nearly five miles.

Speed.—Than an average speed. The London and Birmingham Company began very prudently at 18 miles per hour; the work was new to them; they rose to 20, then 22½; the last return of their mail trains was 26½. With the exception of their power being occasionally too small for their loads to ensue punishment, the trains had been really driven so far as I have observed or heard, and has progressed steadily; their concern has paid well, and they appear disposed to attend to what the public convenience requires of them. The present Great Western speed is 29. These include stoppages. There is, in my opinion, nothing in the difference of gage of the two railways to prevent the Birmingham and Grand Junction being as quick as the Great Western, if they would apply sufficient power. That the Directors think so, is evident, from their allowing a speed of 40 miles per hour to be run when the inclination is in favour. The Northern and Eastern return 36 miles as their average speed. My observations upon this railway, and part of the Brighton, and also the South Eastern, make the speed vary from 30 to 40, and occasionally 42. The Great Western is often 45; on special occasions, it is still more.

The following calculations of time and speed are meant to refer to the mail and fast lines only. The results show that after the extensive improvements to which I have referred are made, the journey between London and Dublin may generally be made in about 14 hours, and that the answers to letters posted in the evening may be received by the morning delivery, after one day’s interval. By the received measurements of the present railways, and by the Ordnance map from Chester to Holyhead, the distance between London and Holyhead, allowing for the straightening at Birmingham and other places, will be 267 miles, which, at 36 miles per hour, is 7½ hours. 20 miles.

Add for one stoppage of 15’, two of 10’, two of 5’, and five of 4’ 5

Makes between London and Holyhead stations 8 30

25 to 30 miles, including stoppage. 8 30

Allow for crossing to Kippen and reaching the Dublin Post Office 5 30

Is from Euston station to Post Office, Dublin 14

Allow time in Dublin 14

Journey back to Euston-square 14

Making the journey from Euston-square to Dublin, and back to Euston-square. 33 hours.

According to this, if the train leave the Euston station at 8 30 p.m., the time of departure. The mail would be leaving the Post Office at 10 30, and would be due at 3 30 in the afternoon, and arrive at Euston-square at 5 30 next morning, being the present time for arrival there. Some modification may be required in the detail, but a very small allowance upon the present speed is required to justify the conclusion as being practicable. Whether the Great Western can produce anything still superior, remains to be shown when I have the materials for making the calculations; but to have taken the Birmingham and Grand Junction lines, without including the improvements of which they are capable, would have been unfair, as I think the Birmingham and Grand Junction companies will see to be their interest to make these improvements, because, without them, the above results for the times of the mails between London and Dublin could not have been brought out.

I named having inspected the country between Bangor and Portly-dyn-lleyn, which has been surveyed by Mr. Vignoles and Mr. Purdon for a railway. A higher level near Penryhn Castle must be kept to accommodate this line; but, after getting through the hill above Bangor, which, according to my opinion, the Holyhead as well as the Portly-dyn-lleyn line should encounter, there is no difficult feature for a great length. The line keeps within a short distance of the turnpike road which skirts the Menai Straits, and on the 13 miles east of the town. The country is favourable, very much more so indeed than its vicinity to mountains would have led me to expect. The only difficulty of a formidable nature is the Rivel mountain, which the engineers manage to keep clear of, and I fear the country is so narrow that only two short tunnels, together one mile in length, are required. There is also a deep and difficult cutting west of the Rivel, two-thirds of a mile long, through rock. The greatest inclination is 1 in 400. The length from Bangor to Portly-dyn-lleyn is four miles greater than to Holyhead, but of the two, I consider that to Portly-dyn-lleyn the easier; and if an inland line to Holyhead, whether through Worcester or Shrewsbury, can be shown, which shall be as good as by far the greater portion of the Bangor to Portly-dyn-lleyn line, it will be superior to the coast line, which has some heavy rock in part and which, in some places upon the coast, will be much exposed to storms.

3 There is no Post-office arrangement requiring so great a delay.

4 The line that was projected from Stone to Rugby would save 7 miles, by making 60 miles of railroad.

5 All Greenwich time. Dublin time is 25’ 22” later. Much confusion and disappointment would be prevented by the clocks in the United kingdom being all adjusted to Greenwich time. The true time for astronomical purposes might also be shown upon the dial.

Gilding and Silvering by Immersion.

The following new methods of gilding and silvering by immersion have been adopted on the Continent. Their easy execution puts them within the reach of persons who have hitherto been strangers to this kind of operation.

To Gild Silver.——Silver is readily prepared by means of a small quantity of gold added to a solution of sulpho-cyanide of potassium till the precipitate formed at first is dissolved. It is necessary that this liquid should preserve a slightly acid reaction, and if it has lost it by too great an addition of sulpho-cyanide, it must be rendered so by adding a few drops of hydro-chloric acid. In order to gild, the silver is plunged into this liquid nearly boiling and tolerably concentrated, in which state it is kept by pouring, from time to time, some hot water to replace that which has evaporated. In this manner, inconveniences which would result from too great concentration of the acid, is avoided, whose pressure is, nevertheless, useful to oppose the formation of an antiformal precipitate which takes place by elevation of temperature, when alkali predominates.

To Gild and Silver on Copper, Brass, and Bronze.——The solution of the cyanide of gold or silver has been already pointed out for silvering and gilding by the influence of electricity, but I believe has been rendered much less expensive, by adding either to the chloride of gold, or the nitrate of silver, neutral, the cyanide of potassium in excess, so as to obtain the soluble double cyanide.

Silver cannot be gilt by this method, but as it has already been stated, the solution made of gold and potassium cyanide was the most simple and the most efficacious. The solution of the cyanide of copper in the cyanide of potassium, will not copper silver, even in contact with zinc; however, it will copper this latter metal in a very solid and perfect manner.

It must, however, be stated, that these processes, though so very convenient, because they always succeed and require but a few minutes for their preparation, demand, unfortunately, but a very thin coating of the precipitated metal. This is an inconvenience common to all methods of coating by simple immersion.
On Ventilation of Ships.


(Abridged from a paper read before the Royal Scottish Society of Arts, April 10th, 1843, and reprinted in their Transactions. Illustrated by Diagrams and Models.)

The commencement of the paper is occupied with a history of the various contrivances and means proposed for ventilating ships from the year 1741 to the present time.

The failure, however, of so many ingenious schemes, extending over so many years, for improving successfully the ventilation of ships, has tended very strongly to impress me with the idea, that any method to be extensively useful, must be truly essential to the original construction of ships. And with this view I would suggest the introduction into timber and iron-built ships, of a thorough and efficient system of spontaneous or self-acting ventilation, affording at all times an ample supply of fresh air in every part of a ship, by means of a judicious arrangement of air-flues in the former, and pipes in the latter. In a large class of vessels owe afraid, by adaptation of the openings or interstices between the timbers (presently in use for airing the framework) where the plan of close timbers has not yet been adopted, a free circulation of air might be effected at all times in lower-decks and cabins. As regards the airing of the framework itself, its importance has long been a point of much interest for the preservation of the parts below the surface, though much difference of opinion among practical men is entertained on this point, one class advocating a free circulation of air about the timbers, and another the exclusion of air. In a communication to the Royal Society of London in 1820, by Sir Robert Seppings, F.R.S., when giving suggestions for a new principle of construction of ships for the mercantile navy, he alludes to the ventilators of Dr. Hales, and the utility of general ventilation, but attaches importance to the exclusion of atmospheric air for the preservation of the framework, though he was not inattentive to the value of admitting air to the interior of ships. Another view is taken of this subject in the able treatise on shipbuilding in the Encyclopaedia Britannica, where the suggestion is made that the preservation of the timbers might be assisted not only by the openings between the timbers themselves, for the purpose of circulating air about them; and it is stated that, in the year 1827, the author had proposed this plan to the Admiralty. This opinion strengthens the view I entertain of the practicability of combining in a very simple way the general ventilation of the ship, with due attention to the ventilation of the framework.

The defect at present in airing the frame, where the interstices of timbers are made use of, arises from the difficulty of obtaining a current or circulation, from the inlet for the air being placed between decks, and no outlet being provided. But were it so contrived as to allow at all times a free current of atmospheric air by points of ingress and egress, the effect would be very different. It seems often overlooked, but there is no point more important to be attended to in spontaneous ventilation, than that where openings are provided for the escape of impure air, others must also be provided for the supply of fresh air, and vice versa. It must not be forgotten that air, like other fluids, can only fill a given space, or, as one of the earliest writers remarks, "that unless openings are properly adapted to suffer air to pass freely through, the external air proves a stopper to the internal, and only mixes with the next in contact." The same law which regulates the effect of currents in natural caverns, and which has been successfully applied to the ventilation of mines, will apply with equal force here. We know that the air in a well remains stagnant and pent up; but as has been remarked, if two wells or shafts are sunk at a given distance from each other, and a horizontal passage cut from the bottom of one to the bottom of the other, so soon as the communication is made, there will be a tendency in the air to descend one shaft and ascend the other, whenever the temperature of the external air varied from that below. Applying the principle to the general ventilation of ships, there is nothing to prevent the converting of the open spaces between the timbers or ribs, into fresh or foul air flues or conduits. One series would be adapted to convey down pure air—not to be taken from below, but from above the upper deck—to points of discharge all over the breadth of the gun and orlop decks, cabin-floors, or wherever requisite, and another series of openings entirely separated from the first, to commence at the beams or ceilings of these respective places, and pass upward above decks as high as convenient, for the escape of the foul or vitiated air. The points of interest, of course, for the air between decks may be in the form of a horizontal slit covered with perforated sheet copper or zinc, to break the force of the current. The arrangement of the latter is left to the discretion of the Engineer in charge, for the better purposes of ventilation and outlet for the air above deck, must have their effect increased, by having the orifices so arranged, that, while protected from the weather, the former would open to the latter, from the wind.

A portion of the interstices of the timbers similarly arranged, communicating directly with the open air, could be made to circulate fresh air for the timbers of the ship; but the apertures for the ventilation requisite for crews and officers must be, without doubt, as far below as possible, to prevent the corrupt gases from the bilge entering the latter. Inconveniences may be experienced practically in having the air openings, as described, from the difficulty of constructing those on the upper-deck so as to keep out the water; but were the principle adopted and carried into practice, the still and ingenuity of ship-builders would soon overcome any such slight objection. Ventilation cannot be attained unless fresh air is admitted from above. When air is made to enter the openings between the timbers below the hatches, as is now done, it must be useless when the latter are put on, as must be obvious to the most cursory observer. Admit, however, the external air, as proposed, and whether hatches were secured down, or side-ports closed, in whatever state of weather, there would be pure air conveyed to the inmates below; and although in some cases this mode of ventilation might be imperfect, yet it possesses the advantage of being always in operation, requiring neither attention nor labour, nor incurring expense. To make it more complete in winter, the external air openings would require to be provided with means for regulation.

Were it necessary to attain a greater certainty of perfect ventilation, at all times and in all climates, recent experiments may then be had for increasing the circulation of air by placing the hatches in an oblong form; and instead of allowing the foul air to escape upwards from the tubes or pipes, the air might be collected from these into one horizontal trunk, and conveyed to the galley.

In iron-built ships, and in all vessels where there are no interstices between the timbers or ribs, or where these cannot be made use of, iron, copper, lead, or zinc pipes may be substituted instead. Nor would the space these occupy form any obstruction or ground of objection, as the air-pipes could be made flat or square, keeping the line of the inner wall of the ship. By some such simple arrangements as these, I can hardly doubt very considerable improvements would be effected generally in the ventilation of ships, and the obstacles to the permanent use of any machine, however perfect, in sailing vessels, must make the view I here take of it more important. It may, however, only be brought about by ship-owners and others giving encouragement to the combination or incorporation of ventilating arrangements with the construction of ships, such as have in a similar way been successfully done in domestic and public buildings. (See observations by me on this subject, Arch. Mag., July 1637.)

I do not wish, however, to be understood as inferring that even any such mode of spontaneous ventilation as could be incorporated with the framework of ships would prove at all times sufficient for the ventilation of an overcrowded vessel. The immense deterioration of atmospheric air, by 600 to 800 persons crowded into a small space, where the cubical contents bear no proportion to the cubic feet of air required for each person (10 cubic feet being considered as requisite per minute to afford a wholesome atmosphere), would require much arrangement next to hopeless without mechanical agency. So long as vessels are overcrowded, hardly any plan can be devised which can afford an adequate supply of fresh air to lower-decks during night; all that can be done, without artificial means, is to prevent positive injury to health, by affording a constant and uniform supply of fresh air below decks at all times, which surely is deserving of the most serious consideration.

In very crowded ships, such as troop-ships and others, whether any arrangements, such as alluded to, are provided or not, the wind-fan, as improved, could be advantageously made use of. Two or more of these machines, worked by hand, could speedily renovate the air of a lower deck, by means of flexible pipes communicating with different parts of the vessel; in emigrant ships, the passengers would, doubtless, very gladly waste these machines for the sake of fresh air in warm latitudes.

Another ventilator could likewise be advantageously applied in many cases in sailing ships, namely, an exhausting pump, with a hose or pipe, on the principle of pumping out the foul air, or a condensing or force-pump to throw in atmospheric air, worked like the pump of a ship or fire-engine. One of the earliest recommendations of a pump for ventilating purposes was made by Dr. David in his experimental Phil., that in the year 1727, he brought before the Royal Society. He showed how dumps of foul air may be drawn out of every sort of mine by an engine.
which he contrived. "The engine consists of a triple crank with three pumps, which both suck and force the air by means of regular alternations, and are alternately applied to drive air into, or draw it out from any place assigned, through square wooden trunks which, being made of slit deal, and ten inches wide inside, are easily portable, and joined to one another without trouble." Dr. D. illustrates his description with notices of several experiments. At every stroke, eleven cubic feet of air was driven in, or as many sucked out; if the axis of the cranks turn sixty times in a minute, one man in that time might, for instance, circulate 3600 cubic feet of air. In a mechanical man, a man brough a gallon, about 287 cubic inches, of air per minute, and a candle, six in the pound, will burn nearly as long in the same quantity. This agrees with modern calculations, at the lowest estimate—500 cubic inches are contaminated by a man per minute, although Tredgold and others take the quantity at 800 cubic inches, and a single candle alone at 500 cubic inches. These facts go to show the need of ventilation, and the necessity of giving a ventilation apparatus. The chief aids to ventilation on board ships' lower decks (Philosophical Transactions, Vol. 47), it is stated, that a candle burned 67 grains in thirty minutes where there had been no ventilation for twenty-four hours; after six hours' ventilation, it burned 93 grains in the same time. Combustion could barely be maintained in the former atmosphere.

If the utility and convenience of Dr. Desbrier's hand-pumps realized the description given of them, they might still be usefully employed in the ventilation of the lower parts of ships. Many other mechanical contrivances might be noticed. For instance, the double air-force-pump, worked by two or four men, on the principle now in use for drawing-wells, which is worked by a lever, upon a standard, on the plan of Dr. Hales' ventilator. Trewalia's ventilator (page 338) was probably on this principle. It may also be noticed here that the success which attends forcing down air, into mines, by mechanical and chemical means, and that the air forced or caused to enter in the well of a ship, might in a great measure be discharged by letting down to and pumping out fresh water from the well. As the use, however, of mechanical ventilators has been generally, and still may be, even when they are restored to, of temporary duration in sailing vessels, no doubt, chiefly from the want of a motive power, my object in directing attention to a thorough system of spontaneous ventilation has been to show that in my opinion it is most likely, if properly achieved, to be permanently useful.

In steam-ships, however, there can exist no objection to the expelling ofnoxious air mechanically, or the application of a perfect system of mechanical or artificial ventilation, nor can there be any reason why they should not be properly ventilated. Yet I question much if anywhere an efficient system has been introduced. I have, indeed, observed of late years an attempt to introduce this system into ventilation has been to show that in my opinion it is most likely, if properly achieved, to be permanently useful. In the common arrangement of steam-ships conveying passengers, the sleeping rooms are often so crowded from the saloon or main cabin; hence the necessity of that eating, drinking, and sleeping go on in the same apartment. The atmosphere from such causes soon becomes noxious, which is generally further increased by what Mr. Dickens, in his American Notes, so strongly condemns, the red-hot sulphuric stove, the inconveniences of which is increased by passengers crowding round it. No wonder the air in such cabins and saloons is sickening and unpleasant for respiration. During the day, if the weather be fine and baches open, matters may go on pretty well; but in bad weather, or during the night, the case is very different. If proper air conduits or pipes were provided to bring down a ample supply of fresh air from above, distributed at the decks or floors of every cabin and sleeping berth; and from the ceilings of the respective cabins, or vacant spaces between the beams, branch-pipes conveyed the vitiated air to one large trunk, which might be conducted up through the funnel of the ship. By this arrange- ncy, the engine-bulkers, or pass through a steam chest, or encircle the steam- pipe—a constant renewal of the entire air between decks would go on. The current might be checked and regulated by valves, working in a very simple manner, before entering the chimney. In winter, the comfort of the passengers might be materially increased were the air warmed before being discharged into the cabins—cold offensive currents would thus be avoided. It is singular that the change take place at the height of feet; and by his esti- nent, the engine-bulkers, or pass through a steam chest, or encircle the steam- pipe—a constant renewal of the entire air between decks would go on. The current might be checked and regulated by valves, working in a very simple manner, before entering the chimney. In winter, the comfort of the passengers might be materially increased were the air warmed before being dis- charged into the cabins—cold offensive currents would thus be avoided. It is singular that the change take place at the height of feet; and by his esti-
It is important for national men to know the great value of fire-heat as a purifier of the air of lower decks and close places, in the estimation of many of the most experienced navigators and naval commanders: Cook and Nelson may be named. How inconceivably the importance of sanitary regulations was impressed in the minds of the men of all nations, of Captain Cook, who, during three years, out of 118 persons on board, lost four, and of these only one by sickness. We have likewise several similar examples in the arctic and antarctic voyages. See Expeditions of 1821, 1824, and later ones, where the advantages of warmth combined with ventilation, are clearly shown.

A very simple contrivance might be found useful for purifying lower decks when occupied; a grate, formed like a circular basket, hung in gimbals, which, like a pendulum, has its point of rest in the perpendicular.

The value of lime and vinegar washings and fumigations in destroying the bad effects of impure air, did not escape the older philosophers. The knowledge of these facts was of vast utility in the days of Howard. Professor Daniel, and other chemists, have, in these times, recommended the use of chlorine gas and chloride of lime to prevent and remove fumes from the ship.

The utility of ventilation in general has been gradually discovered, and combination with ventilating arrangements in ships the value of such antidotes — especially where sickness prevails—should not be overlooked.

If we turn to the graphic pages of Smollett, we may at once perceive, by contrasting his description of a man-of-war with the inspection of one now a-days, what great improvements have been made. But still, much is yet to be done in ship-ventilation generally throughout the world. The air, being inviolate by our vessels, does not vary as one, leading us to consider it pure, while it may be stagnant and corrupt; hence the necessity of impressing the admission of fresh air at all times, as we do light; and the absurd idea cannot be too soon exploded, of people enclozing themselves in an air-tight box or cabin.

With improved means of ventilation of ships and steamers, the energies of all on board will be promoted. By inhaling pure air during the night as well as day, in cold or warm climates, increased longevity will be attained, and at all events, the general comfort improved; and as Britain has outranked most nations in the application of steam-power to useful purposes, why should she not take the lead in cultivating those arts which the physiologist has proved to be essential to the advancement of the physical condition of mankind?

9 An excellent paper on this subject, written nearly a century back, will be found in the Gent. Magazine, on the method of Preserving the Health of Seamen in long cruises and voyages, where ventilation and fumigation are strongly enforced. Vol. xvi, 1778-9.

10 Naval Journal of 1754, p. 349.

11 Dr. Stephen Hales made many experiments recorded in his Statical Essays, London, 1731, vol. i, with a view to clear the air from noxious vapours. He found nothing so efficacious as a solution of potash. He says, page 267, "Sal Tarter should be the best prescription against noxious vapours, as being a strong mister of sulphuric acid and watery vapour, as is also sea-salt." A solution of caustic alkali will take up fixed air as fast as it is produced.

The rapid absorption of ammonia by water, and the avidity of fresh lime for carbonic acid, point out the utility of water in sea effects. The effects of such measures, either by the use of frequent fresh water-washings, or expediting, in shallow vessels, frequently stirred, solutions of fresh lime. In tallow, the sulphate of lime or gyspum is in great demand for the absorption of ammonia, or removing the smell of the soil-pipes.

**DECORATION.—HOUSE-PAINTING.**

[We wish to direct the especial attention of Architects to the following paper extracted from the Athenæum: it is a subject that we have often intended to bring into hand, but it is here treated with so much judgment that we safely leave it with our talented contemporary and trust that the papers will be speedily followed up by others as hinted in the conclusion of this article.]

The British School of Painting is already distinguished as a school of colour, and we islanders are said to delight in full toned and positive colouring; a proposition we are not disposed to controvert, though it is rather puzzling to find satisfactory evidence of it at the present time. We do not see our public buildings, our churches, our places of assembly for lay purposes, our private houses, our furniture, garnished and adorned with the fascinations of colours. Truth surely would compel us to admit, in spite of growing opinions which might be quoted to the contrary, that we have little else but frigid white-washings and sombre neutral tints. In the public buildings, there is little knowledge and application of colour in the more mechanical productions of art. Yet in some of Nature’s domains we have the most bountiful in specimens of colour and its endless varieties, than in our country. During the revolution of a year, we are treated with blue shades resembling those of Italy—not frequently, perhaps, yet we do have them—and red fiery shades, not inferior in depth and intensity to those of Lyons, and between these extremes, arising from the modification of light, we may collect every variety of cold colouring on the one hand, and warm on the other. The colouring of our vegetation too, is, of infinite diversity; and where is the clime that shows such delicate variations in the colouring of common flowers and trees? Yet we have to fear the effect of these very hues at the present time, we cannot be said to be following in our own works, the beautiful gifts and suggestions of Nature. Time was when we seemed in our practice more sensible of the influences of colour. The last and greatest Chapter of Sir William Chambers is on the colours of St. Paul’s; whilst the new Protestant Chapter actually refused to receive paintings as a gift. Such remnant of Middle Age furnishing as are preserved to us, indicate a much more extensive employment of bright colouring, than the furniture of our own time. Perhaps no very early specimens of the use of colour in the interior decoration of the little dwellings can be discovered, yet as we know well, that the outsides of houses were hung on high days with brilliant tinted tapestries, we are surely justified in inferring, that the insides of houses had other tints than neutral ones. Even so near our times and of much greater wealth, there were few instances of bright colouring.

It might be proved, that before the Reformation, English people delighted in strong and bright colours, and perhaps the temporary suppression of the taste (a suppression but temporary, though its duration has been so long) might be shown to have been owing to that event: we will not, however, discuss the point here. From some cause, it is certain, that we have ceased, for a long period, to use colours as much as we formerly did, and we may welcome that general revival in the employment of them which is assuredly taking place, and which first began to show itself markedly in pictures. It is, of course, our practice to avoid the extremes, either of extreme white or extreme black colouring, and to introduce the various shades and tints of the beautiful tints of the spectrum. The Sharon flowers, the exquisite flowers of Helotes, the delicate flowers of the mosses, all the flowers of the wild and of the cultivated, are so wondrously varied, that nothing is more fit for the ornamental purposes of our art, than the flowers of the wild and of the cultivated, as also the playing of the light and shade of the flower. And here we may add that in the employment of the delicate shades and tints of the flowers of the wild and of the cultivated, as also the playing of the light and shade of the flower. And here we may add that in the employment of the delicate shades and tints of the flowers of the wild and of the cultivated, as also the playing of the light and shade of the flower. And here we may add that in the employment of the delicate shades and tints of the flowers of the wild and of the cultivated, as also the playing of the light and shade of the flower. And here we may add that in the employment of the delicate shades and tints of the flowers of the wild and of the cultivated, as also the playing of the light and shade of the flower. And here we may add that in the employment of the delicate shades and tints of the flowers of the wild and of the cultivated, as also the playing of the light and shade of the flower.

"With us, the practice is chiefly confined to that of a mere handiwork, where little refinement is sought for, beyond the simple usage of the painter's shop, the mixing up of colours and their smooth application to the wall. But in Italy, the same subject is given to so much individual care, to such a work of art, as to be little inferior to what is requisite for the higher branches of the art; and, in fact, the practice of both is not unfrequently combined. They are more conversant with the science, as well as the practice, of colouring, with the rules of harmony and with the composition of ornamental painting in all its branches: so that their works might be transferred to canvas, and admired for their excellence. In fact, the great frescoes of the first masters, which have been the admiration of ages, were but part of the general embellishment of the churches and palaces of Italy. And the most celebrated names in the list of ancient and modern masters have left among us less of what we call the arabesque, in which all the exuberance and playfulness of fancy is displayed, as well as the most enchanting harmony of brilliant colours. It is in this essential point of harmony, that our practice is particularly defective; we rarely see, in the simple painting of our apartments, any combination of colours that is not in some part offensive against even the common rules of art; if there are any rules observed, save those of mere caprice or chance—although there are certain combinations pointed out by the laws of optics, which can as little be made to harmonize as two discordant notes in music. In these combinations, we are often sufficiently aware of, without having the skill requisite to assign the reason any more than the painter who chose them. This accounts for the prevalent use of neutral colours in our ornamental painting, which is less liable to offend by whatever harshness of colour we may observe the safer and better the greater combination of the shades of the same indefinite colour. But no sooner do our painters attempt any combination of decided colours than they fail. The ornamental painting in Italy, is almost entirely in decided colours of the most brilliant hue, and yet always inconspicuously placed in the combinations, because the rules of harmony are known and attended to. Neither is this proficiency confined to the decoration of palaces, or the more elaborate and expensive works; we have seen in dwellings of a much humbler cast, and indeed in general practice, the most graceful design, of ornaments in the combination of the shades of every possible tint of bold and vivid colouring, and melting into each other with all the skill and harmony of a piece of brilliant music."

For our parts, we are disposed to believe harmonious colouring, consistently employed in the decoration of all buildings—inhabited buildings especially, where we spend a great part of our lives—not to be either slight or unimportant in its influence on the moral tone of the inhabitants. As we may read to some extent the character of individuals in their dress, so we believe we may read it in their choice of their dwellings. A dull-minded, tasteless people we may be pronounced to have been during the eighteenth century. A room of bright and cheerful appearance surely tends to dispel gloomy and melancholy associations, whilst a dark and dismal cell provokes them. Glitter and tawdries disturb thoughtfulness, whilst the subdued colouring tends to suggest it."

"Experience," says Goethe, "teaches us that particular colours excite particular states of feeling." It is related of a witty Frenchman, "Il pretendait que son tou de conversation avec Madame etait change depuis qu'elle eut change—en ermite le moulde de son cabinet qui etait bleu."

The great majority of domestic apartments at the present time, even in houses of the first class, have scarcely any marked features of decoration
THE CIVIL ENGINEER AND ARCHITECT'S JOURNAL

1844.]

about them which indicate taste or knowledge. They present a monotonous
sameness and deficiency of any principles of taste, the varieties of character
which occur, from time to time, being regulated only by the caprices of
Sometimes every room you enter is of one colour. In one of the
fashion.
most splendid of modern houses in the metropolis we mean in Sutherland
House we have been especially struck with the monotony of white and
profuse gilding, in the forms of the Louis Quinze period. Sometimes the rage
is for warm shades of colouring, at others for cold, though the preponderating
" People
taste seems to take refuge in dull, characterless, neutral colouring.
of refinement" to quote Goethe again) "have a disinclination to colours.
This may be owing partly to weakness of sight, partly to the uncertainly of
During one season
taste, which readily takes refuge in absolute negation."
salmon colour, as it is called, reigns supreme then sage colour succeeds
salmon drab follows sage or slate ; and then all varieties of crimson put out
the drabs. Each is employed in its turn, without the slightest reference to
any of the questions which should determine its appropriateness or otherOne year you will find
It is the same with ornamental patterns.
wise.
every drawing-room papered with patterns of flowers, another year scrolls
One year small patterns are correct in the following
will be all the rage.
and whilst each fashion reigned, each was exlarge only can be tolerated
Crimson walls in south aspects, leaden coloured ones in
clusively used.
north aspects. Small patterns applied to rooms large and small, and large
A like absence of any recognized prinpatterns to rooms small and large.
When crimson walls were
ciples is seen in the carpets and hangings.
oftenest seen, then was the call for drab and light-coloured carpets. More
by luck, than anything else, it is now the fashion to have the carpets darker
We may often enter a room which, preserving
in colour than the walls.
something of each shifting fashion of the few past years, exhibits a violaWalls of a hot and
tion of every principle of harmonious decoration.
blue ceilings fuller of
positive colour in a room with a southern aspect
colour than the drab carpets, with curtains and hangings of scarlet
and
perchance a huge sofa covered with black horse-hair. Not a single thing
appropriate or consistent, but the whole a medley of unsuitableness.
Having watched this subject with interest for years, we have arrived at
some conclusions which, we think, it may possibly be useful to submit to
our readers, and we shall endeavour to do so, in such a shape, that they
may be turned, perhaps, to some practical account. It appears to us, that
certain principles of decoration may be laid down, which, if recognized
and applied, would make our dwellings much more cheerful and comfortable ; which might make them comparatively beautiful, not only without
any additional cost, but would make the keep of them more economical, by
rendering them, to a great degree, independent of the caprices of fashion.
It is the absence of correct principles which causes decoration and furnitiresome
palling to the eye, and subject to
ture to be out of fashion
whereas, what is really beautiful, being based on everconstant change,
We think the greater part of
lasting principles, is subject to no change.
the painting of a house might he a work to last for a life, with benefit
even to journeyman painters, and infinite satisfaction to the house inhabitant.
A truly melancholy suspension of comfort is the work of painting
a house. Your whole little world so turned upside down, that it hardly rights
What a comfort it would be to
itself before the work has to be done again.
undergo the penance only once in a life, instead of every seven years.
though a very common and popular one
It seems to us quite a mistake
Nothing
to imagine that Beauty is necessarily costly in its production.
could be cheaper in material or manufacture, than the earthenware pots
of the ancient Etruscans, yet they have perfect and everlasting beauty in
The preference of one colour to another, within a very wide
their forms.
range of colours, is not at all a thing of greater or lesser cost.
So far from
beauty being costly, it would more often happen that in a given number of
existing specimens of decoration, the greater beauty and harmony would he
obtained at a smaller cost of labour and material, than what are expended
Take, at random, a dozen patterns of
to produce ugliness and confusion.
paper hangings of various colours and devices, and in the majority of them,
we believe it could he shown, that their cost of production might be materially lessened, whilst their beauty should be greatly enhanced.
Before we proceed further in the discussion of any practical rules for colouring interiors of houses, we must find room to quote, from Mr. Hay's
work on Decorative Painting, some of his statements of the principal defects
which he has observed in internal decorations. A conviction that our practice is not what it ought to be, and a humble recognition that there may
exist rules for our guidance, though we may not he cognizant of them, are
the first steps in amendment.
The popularity of Mr. Hay's excellent work
renders any further commendation on our part superfluous, and its arrival at
a fourth edition affords a good sign of increasing attention to the subject.
We wish it had been somewhat more specific and practical in its details for
general use. It is essentially a work of principles.
Mr. Hay considers the
first and most obvious defect to be when there is no particular tone or key
fixed on for the colouring of an apartment ; " that is, when one part of the
furniture is chosen without any reference to the rest, and the painting done
without any reference to the furniture. This generally produces an incongruous mixture." The reader will understand what is meant by " tone or

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for as

the furniture of a room may he considered in regard to colouring in the same
light as the principal figures in a picture, the general tone must depend upon
the colours of which it is composed for instance if the prevailing colour be
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We

most rooms, are furnished by the carpet, the covering of the sofa, chairs,
The co&c., the draperies of the curtains, and the covering of the tables.
lours of all these are too frequently chosen without any reference one to the
other.
If the colour of the furniture be light blue, then it would be bad
taste to colour the walls crimson, or select a carpet with any amber colour
There is a very apt illustration of this
or much warm brown colour in it.
in a drawing-room in the Reform Club, which we have noticed for another
purpose below.
So with the objects vice versa. The blue furniture might
fitly he surrounded with any colour in which its own colour predominated,
full toned or light in degree according to the
or even with a lemon colour
Mr. Hay's advice is perfectly sound
tone of the key fi. e. the blue) colour.
and, as a case often occurs, where the decoration has to be
in this case
in

—

;

it is wise to lay down the proper prinBut it must not hence be inferred that furof treatment.
be
chosen
at random, and then the decorative coniture of any colour may
louring of the apartment suited to it. In cases where both the furniture and
newly
provided,
where the whole department of decodecoration are to be
ration is to begin ab initio, then the choice of colours for all objects should
In such cases (of
mutually
applicable to all.
principles
be determined upon
which we shall have to speak hereafter), the tone of the general colouring
principles
than
any one deto
much
broader
should be fixed with reference

adapted to furniture already existing,
ciple for its

mode

pendent merely on the accidental colouring of the furniture.
" A second and more common fault," proceeds Mr. Hay, " is the predominance of some bright and intense colour either upon the walls or floor.
It is evident that the predominance of a bright and overpowering colour
upon so large a space as the floor or wall of a room, must injure the effect
Very often indeed do we meet with illustrations of
of the finest furniture."
this fault.
Look over half the paper-hangings in London, and it is most
Nothing
more common than to find a paper with a cool
palpable in them.
leaden-coloured ground or surface covered over with staring bright yellow
prevalent
in carpets, which are everywhere to be
defect
less
scrolls.
It is a
no
seen strewn with flower-patterns, Louis Quatorze scrolls, and affected imita" A third error is introducing
intense
brightness.
tions of forms manifested in
deep and pale colours, which may have been well enough chosen in regard to
of
strength
or tint have not been atwhose
particular
degrees
their hues, but
tended to. Thus the intensity of one or more may so affect those which they
relieve,
to
give
them
a faded and unfinished
balance
and
as
were intended to
appearance.
This may proceed from applying the fundamental laws without
always
necessary to subdue
for
although
it
is
any regard to the minutia; ;
and neutralize such colours as are introduced in large quantities, yet when
they are reduced by dilution alone the effect cannot be good. This error is
In such
also very common in the colouring of carpets and paper-hangings.
productions the degree of intensity of the individual colours is seldom taken
into account.
A pale tint of blue is often introduced as an equivalent to
one of the
the richest orange colour, and sometimes a small portion of lilac
lightest tints of purple
as a balancing colour to a quantity of the most inaltogether.
order
colours
inverting
the
natural
of
tense yellow.
This is
Every one may understand by this, that if it is desired to contrast effectively
one colour with another say a crimson with green if one is deep toned or
dark, so should be the other."
Having thus briefly stated what appear to be the most obvious defects of
the present modes of coloured decoration in our domestic residences, we
shall submit some hints for the consideration of any of our readers who may
contemplate employing the House Painter and Decorator. We must however premise, that in treating a subject like the present, the absence of poTo ilsitive and practical illustration places us under much disadvantage.
lustrate fully the force of our observations, this paper should be read hand
in hand with specimens of colours.
The house-painter, states Mr. Hay,

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—

" must take into consideration not only the style of architecture, the situation, whether in town or country, but the very rays by which each apartment
is lighted, whether they proceed directly from the sun or are merely reflected
from the northern sky." Without undervaluing the importance of attending
to the architecture and situation, it appears to us that Mr. Hay places that
namely that which
consideration which has tbe greatest weight last in order
depends on the aspect of the room to be coloured. To us it appears, after
bearing in mind the nature and characteristics of the climate, that the first
question to be asked before commencing any work of internal decoration is,

—

What

is

the

Aspect
of the room to be decorated ?
In considering Climate, Nature herself seems
In countries where light
to offer us abundant analogies for our guidance.
is least abundant, there the objects of nature have tbe least dark colouring.
Near the North Pole, where the darkness of night is almost perpetual, nature
In the regions of the
clothes the ground and animals in snowy whiteness.
strongest, the deepest colours, approaching to
In countries advanced in art, where the light is
employment made of deep-toned
The ancients, in brightly lighted countries, as at Pompeii, were

Tropics, where the light

is

black, are most frequent.

abundant and powerful, we

"

by what follows.
The " tone or key is generally fixed by the choice of the furniture

key

461

blue, grey, cool green, or lilac, the general tone must be cool; but if, on the
other hand, it is red, orange, brown, yellow, or a warm tint of green, the
tone must be warm."
may give an example of the principles here insisted on.
The important masses of colour, independent of those on walls

colouring.

find the greatest

accustomed to paint large surfaces of their interior habitations positive
blacks.
In those cases where we find such examples, the rooms were entirely open above to the heavens, and the supply of light was altogether un-


interrupted. In a climate like that of any part of Great Britain, we should never dream of covering large surfaces with black or even with very dark blue, or purple, and scarcely with very deep crimson, unless under peculiar circumstances. During three-fifths of the year, the light in our country is subject to constant obfuscation. We therefore say, as a general rule, let the colour of the room be red or red and white. We have seen red walls and red and white paper-hangings benefit many positive strong colours, or even of black itself, which may be employed most successfully in details, but we contend that the first general impression of rooms in England should be light rather than dark. As our climate also requires rather to cold than warm throughout the year, the general rule shall be to keep the room light. Light, white, light grey, and light blue, are the principal colours used. Every reader, I assume, knows a blue from a red, red from green, yellow from purple, and the most obvious and common distinctions of colouring. Without entering into any theory on the subject, we say that blue, red, and yellow are primitive colours—that is, that they are self-created colours, because every other colour is a combination of these three. Green, orange, and purple are secondary colours, and result from the admixture of the three primitive colours. The tertiary mixtures, such as olive, brown, slate, are formed by the union of the secondary colours themselves, or the colours which make them, in the same proportions. The two colours which represent the extremes of heat and cold are red and blue. Yellow stands midway between them, and by itself is neither positively warm nor cold, though it rather more inclines to warmth than coldness, as we see illustrated in the green colours. As greens contain blue, they are cold looking, as we see in some of the greens, in flowers, in house plants, when they pass to warmth—as they contain blue, to coldness. It is true, we may have the effects of both warmth and coldness, and strong effects too, without using any positive colour at all; but this requires a peculiar treatment. We purpose to give the effect of blue, and the reader should see how the traits may realize. We are writing rather for those who are ignorant of refinements, and our object is to deal with the most general principles rather than with any exception of them. Our first canon, therefore, for all general purposes in interior decoration in this country is, that the general colouring be of light and light; leaders and cool neutral tints, and be put or eschewed, if our aim be to banish gloom and chilliness from our houses, and to have cheerfulness and warmth instead. We are far less liable to error by leaning to warm rather than to cold colouring.

The supply of light, the size of the room, and its purpose, appear to be the chief circumstance which ought to regulate the strength or depth of the colours to be used. Where the light is strong, unobscured, and plentiful, the tone of the colouring may be full; on the other hand, where the supply of light is limited and sparsely distributed, the light must be strong enough to overcome any dark recesses. Even in the ancientest and the strongest and darkest colours—even, as we have already observed—were used on large surfaces, when the apartment received a direct and full light from above. Under a strong and abundant light, full-toned colours are agreeable. The brightening in full light, just as the light is feeble, and the supply of it limited, they become dull and gloomy. Full-toned colours lessen the apparent size of the room: light colouring enlarges it. A little attention to the proportion between the space to be coloured, and the depth of the colouring, becomes, therefore, of great importance. If you wish to make your room appear as large as possible, then exclude dark colouring, not only on the large surfaces, but even in the patterns of the paper-hangings, and in the mouldings and ornamental parts. The nature of the use to which the room is applied should also influence the decision as to the tone of colouring. If the room is used mostly by artificial light, the same considerations are to be observed, the light, materially modifies the appearance of most colours—much or little, according as the light is direct or only kept in the room. If, on the other hand, it is a room for occupation during daylight, then the tone of colouring may be deep. Of the peculiar treatment which should be applied to colours when employed in the several sorts of light, we shall speak hereafter. At present we have been dealing only with general principles, which cannot be recapitulated too often. First select the colours—warm or cold—active or passive, on the plus or minus side, as we some writers call them respectively—according to the general effects which they have been shown to produce, and the taste of the colour ought to be no less subjected to regulation by certain principles.

The particular choice of colours seems to be the next branch of the subject to be examined, and on this point we would particularly refer the reader to Mr. Hay's work; but lest that work should not be at hand, we shall extract from it the most important principles. Mr. Eustake's edition of Goethe's Theory of Colours, we also find many remarks on the peculiarities, influences, and associations of the principal colours, and as these remarks seem to us calculated to be of some use in directing the selection of colours, we shall abridge from Goethe's work those portions which appear applicable to the subject under consideration, omitting the more questionable and fanciful theories with which they are sometimes intermingled.

In respect of White, Mr. Hay says, that "in Systeme Nomenclature of Colours there are no fewer than eight different tints of white enumerated, and although the term reddish white, &c. are rather anomalous, yet there seems to be no other way of designating the lightest tints of colours. For instance, when the lightest tint of any colour is placed beside the most intense red, or the most intense yellow with pure white, the colour appears as if tinged with transparent white. Therefore, if we make use of the terms, the name must be altered to a light tint of the colour with which it is tinged. A principle here is suggested, which is important in the management of every sort of colour. The white should be made to appear as light, dark, positive or negative, by contrast. Mr. Hay suggests, that if white be used, the colours brought into contact with it should be light and cool, among which grey and green are the most suitable. Very light yellow, of the same warmness as the yellow of yellow ocher, can be used. Where white is much used, the colour of the furniture should be relatively light, and bamboo and satin wood are the best in respect of appropriate colour. Some years ago it used to be the fashion to use white and black in direct contrast. Panels painted white, with the headings and mouldings picked out in black—most disagreeable in effect, and a practice that must be entirely avoided. If pure white is used, it suits best with a south aspect; but if a white is wanted in a north aspect, then it should be so far warmed in tone as to be at least a cream colour. White is often used as a tint in hangings, with violent in hues in carpets and hangings; in such cases the effect is confused and cruel.

Yellow, says Goethe, is the colour nearest light. In its highest purity it always carries with it the nature of brightness, and has a serene, gay, softy-excitating character. In this state, applied to dress, hangings, carpeting, &c. gives an aspect of great warmth and brightness. ••• "Gold, ••••• in general, has a radiant aspect. The effect of polish is superadded, gives us a new and high idea of this colour; in like manner, a strong yellow, as it appears on satin, has a magnificent and noble effect. We find from experience, again, that yellow excites a warm and agreeable impression. Heat and light, in a certain degree, is the same as brightness. Where white is much used, the colour of the furniture should be relatively light, and bamboo and satin wood are the best in respect of appropriate colour. Some years ago it used to be the fashion to use white and black in direct contrast. Panels painted white, with the headings and mouldings picked out in black—most disagreeable in effect, and a practice that must be entirely avoided. If pure white is used, it suits best with a south aspect; but if a white is wanted in a north aspect, then it should be so far warmed in tone as to be at least a cream colour. White is often used as a tint in hangings, with violent in hues in carpets and hangings; in such cases the effect is confused and cruel.

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In looking at a landscape, we find three distinct gradations of colour. The greatest light comes from above, the next gradation of light lies in the part between the sky and the ground, and the darkest part is on the ground. The exceptions to this statement, arising from partial obscuration of the direct light by the atmosphere, and from the reflection of the sky-light on the ground, are in most cases not of much importance, and if they happen to be laid down, and which we think is applicable to the artificial use of colour in interior decoration. In accordance with it, we say, let the ceiling be as light as the wall, the walls darker than the ceiling; the floor darker than the walls. The reverse is too often found in practice. In the Reform Club, the muting of the angles surrounding the great hall, and those of the upper library, are painted to imitate bronze, and in the quadrangles especially they are much heavier in colour and appearance, than the walls by which they are supported. In the Reform Club, the reverse is the case. It is pretty clear, then, that the principles of the Reform Club, and the upper library, are painted to imitate bronze, and in the quadrangles especially they are much heavier in colour and appearance, than the walls by which they are supported.

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Leaving out the account of the additional beauty which tasteful colouring on the ceiling confers on a room, we would recommend the practice as economical. The cost of changing the tones sometimes more than doubles in these costly-making times, more than beauty itself. In the course of every three or four years, the ceiling of a London house requires re-colouring. There is little doubt that the determined lines of the positive colouring in an ornamental design, and also the positive placing, of the whole makes the things more noticeable in the ceiling, caused by the dirt and smoke, and thus reduce the necessity of re-colouring. In addition to the experiment already mentioned, we had a simpler one prepared in two shades of deep straw-colour, for the centre of a room, the cost of which experiment was only five shillings. In the case of windows really seen as a whole, it is only necessary to mention that we had the assistance of Mr. Clarke, a paper-stainer, of 60, High Holborn, who seemed well disposed to carry them much farther, if any public taste could be generated for them. In the preparation of decorations for ceilings, and walls, we can enter again into the same considerations; the figures may be whispered against all and every sort of imitation of raised surfaces. Let there be no sham cornices or rosettes for centres—no sham festoons, draperies, or tassels. Whatever is done, should be limited to the expression of agreeable forms in colour, and much more effect may be produced under this limitation than is generally obtained by the plaster mouldings and ornaments themselves which are commonly attached to ceilings. The choice of the colours and peculiar treatment of them in ceilings must, of course, be regulated by the circumstances of the room, and the character of the decorations used in it.

The particular treatment of colours which should be applied to rooms of various purposes, seems to follow next in order for consideration. We are much disposed to agree with Mr. Hay, when he insists that the decorations of a room should be subordinate in importance to the furniture, which he appears to regard in the same relative importance to a room as a piece of scenery towards a picture. Mr. Hay says:—"In toning and harmonising the colours in a picture, the artist has the assistance of light and shadow, and can make his shades accord with the tone in such a manner as to improve the general harmony; but as the colours of the house-painter and manufacturer are all liable to be placed in a full light, they must be toned in themselves, to prevent that unnatural crudeness so annoying to the eye. How, then, can we account for the prevalence of those gaudy paper-hangings, which impinge the least visible extreme rays in all their brightness, in the ponderance of bright yellow and red attracts the eye, and injures the effect of everything which is placed upon them? And if, according to the rules which regulate the higher branches of art, simplicity of arrangement prevents confusion where a variety of colours are introduced, the colours in the great decorating systems, is not in general effect, and has been procured from a general negligence of the rules of harmony. I do not mean by this that bright and vivid colours are always offensive. I have already said, that they add richness and grandeur when used in their proper places and in proper quantities; but they should be never used over the floor or walls of an apartment unless very peculiar circumstances. It may here be observed, that in all pictures representing interiors, when a group of figures is introduced, there may occasionally appear a piece of rich drapery, or a piece of furniture, painted in equally vivid and bright colours with the figures, and which may have been placed there for general effect, and lastly, but who ever saw, in a work of merit, the colours on the walls of the apartment or carpet on the floor making a monopy of attraction, and causing those upon the figures and furniture to fall into insignificance? But we have no more space at present, and the suggestions touching the appropriate colouring of particular rooms must be reserved to a future opportunity.

RAILWAY CHRONICLE OF THE MONTH.

The events of the month principally concern the movements in respect to new lines, a spirit of activity manifesting itself in connexion with them strongly indicative of improvement. Not only is the number of lines proposed far greater than for years past, but they are of greater importance, and supported in a much more powerful manner, being principally branches fos- tered by the Government. There is not a question of course, of a want of definite information as to what will really be done, so that it is dangerous to speculate as to results.

The monetary operations of the month afford a strong proof of the improved condition of the railways; not only have the transactions in shares been much more numerous and at better prices, but loans have been effected by the large companies at a much lower rate of interest.

The Edinburgh and Glasgow Railway Company have borrowed £100,000 from the Bank of Scotland for ten years at 5½ per cent., and the Manchester and Preston Railway £55,000 for five years at 5½ per cent., and a mortgage sum of £20,000 to be indemnified in detail, a word of caution being proper to repayment on twenty-one days' notice. Altogether the state of affairs promises well for employment next year in the engineering profession and in the pursuits dependent on its exertions and connected with it.

The York and North Midland directors have been authorised to purchase the Leeds and Selby line, and to construct a branch to Whitby and Scarborough.

Captain Moorison, the Chairman of the Birmingham and Glo'ster Railway, has at last resigned in disgust. He is succeeded by Mr. Samuel Bowly, the Deputy Chairman.

The Manchester and Leeds Railway Company have agreed to amalgamate with the Hull and Selby Railway Company. This arrangement has been the defeat of the Bristol and Exeter Directors at a special meeting for the purpose of giving support to the Devon and Cornwall lines, when a cabal of 36 Exeter shareholders holding 300 shares, managed, by superior numbers, on the show of hands to reject the proposal. Their motives, however, are not known.

The Epsom traffic is the subject of competition between the Croydon Railway Company on the one hand, and the South Western Railway on the other. The South-Western branch would be the shorter, less costly, and accommodate west end passengers, but the distance from the terminus of the Croydon branch is not greater, it would be worked as cheaply and would accommodate a great extent of local traffic, while it comes close to the city popula-

The NEW ROYAL EXCHANGE.

Mr. Titre, the architect of the New Royal Exchange, sent in, on the 20th ult., a further report of the progress of the works, to the Joint Grand Com-

missoners. The state of the work is extremely satisfactory. The external works, the grasshopper vault, repaired and reglazed, was deposited in its place on the 7th ult.: that the tower was completed to the cleaning down of the stonework, a process which will be effected as the scaffolding is removed. At the west façade the columns and architraves of the great Vene-

nish, etc., were all in their proper places, and the whole was found in a most satisfactory state. The new arches and archways (first and second arches) have been removed, and the London Assurance portion of the building, on the one-floor pair, the whole of the fire-proof arches have been turned, and the joints and partitions in the western end are in their places. In other parts the plaster are laid. On the two-floor pair the joints have been laid all through. The roof has been nearly completed, both plasterers' work being almost wholly finished. In the Royal Exchange ground-floor the fire-proof arches have been turned throughout, and the joints and partitions have been nearly all deposited in their places. In the two-floor pair the joints have been all laid and the quartering is in a forward state. The lead-work to the roof of the portico has been within a third completed, and this department will require very little more labour generally. In the unappropriated room on the one-

pair floor the fire-proof arches have been completed as well as the joints and partitions. In the two-floor pair similar progress has been made. In Lloyd's and the Athenæum, the arches have been turned. The reading-room and other rooms on each side of the tower remain in the same condition in which they were represented to be at the time the last report was made. In the roof the plumber's and slate's work is throughout ex-

ceeedingly forward, and last little remains to complete that portion of the work.

With regard to the sculpture, Mr. Titre expresses his satisfaction to be able to report that every figure has been transferred from the model to the stone, and that a month's labour will complete the work, so that it will be ready for hoisting within that period. When the sculpture shall have reached its appropriate position, the finishing touches will be given to it by the sculptor. Judging from its present advanced state, the architect entertain no hesitation in assuring the committee, that if necessary, it could all be in its place and completely finished within two months from the date. The doors and panels, and the plastering in general, are all finished, and will be placed as soon as the scaffolding has been sufficiently removed to enable the men to place them with safety. The machinery of the clock is very nearly completed, and the only thing remaining unsettled is the arrangement with respect to the actual time. The clock itself will be completed by Mr. Tite, with congratulating the committee, at the close of the third year of the work, on the generally favourable state of the seasons throughout the whole period. The mildness of last winter, and the unusually fine spring which followed, were greatly in favour of building operations, and though the weather was very wet, yet, since its arrival, up to the present time scarcely a day has been lost by interruption from the weather. He could see nothing at present, unless some unusually severe weather should occur after Christmas, to prevent the realization of his hopes that the contract would be completed in the time originally agreed upon.
in the report of the proceedings of the Institution of Civil Engineers, in last month's Journal, p. 432. Mr. Wickstede had been misunderstood in his remarks on the Construction of Valves. We have since made inquiries and believe the following statement will be found to contain a correct report of Mr. Wickstede's observations:

Mr. Wickstede observed, that with two valves made according to Harvey and West's patent, and fixed in the same manner as the upper valve, 4 feet in diameter, the lower valve rose 4 or 5 inches, while the upper valve from 10 to 15 inches only. The concurrence in these valves was much less than in the ordinary valves;—that although the wooden faces in the seat of the upper valve, where the lower valve was so little, had lasted for three years, they would not stand in the lower valve, where the lift was greater;—for which latter he considered metal far superior to wood, and he considered metal better for the upper one also;—he had not found any corrosion attendant upon the contact of the two metals. The reason that the lower valve was not in operation, at Ford, had not answered so well as the upper valve was owing to the difference in form of the valve boxes; the lower valve box was of an irregular shape on the plan, while the valve was circular; in addition to which, the exit pipe branched from the box at a level with the seat of the valve, and this is of even greater importance. The passage through the valve was irregular, a greater quantity passing on one side than on the other, which caused the valve to cast and to wear out the guides;—but on the contrary, in the upper valve, the exit pipe was above the top of the valve, and of a circular form, allowing the water to pass more equally on every side of the valve, and hence the guides were not worn as in the lower valve; and in the cases of about 40 valves which had been introduced by his recommendation into pumps made by Boulton and Watt, and other firms at various dates, the boxes being circular and the delivery pipes below, they had worked well for an upper valve. Mr. Wickstede had in a commercial point of view it is important to remark that in none of those instances was it necessary to alter the boxes, or pipes connected therewith, he therefore recommended that in all new constructions where these valves were required, the form of the box and the position of the delivery pipe should be carefully attended to. He considered that the form of the double-heat valves, being cylindrical, possessed greater strength, and made the liability to fracture less than in the ring valves, as originally designed by Mr. Horsemans, and he considered that the model on the table, which as nearly as possible balanced the form of the Harvey & West valve, was a decided improvement; at the same time, it made it evident that the actual difference between these valves and Messrs. Harvey & West's was the application of two valves, one placed above the other, instead of one, the advantages of which he could not perceive. He at the same time, gave Mr. Horsemans the credit for this improvement.

Mr. Chevalier thought that if the talent had been applied to the proper proportioning of Harvey and West's valves to the locality or circumstances in which they were required, he would have effected the good object he had in view at less cost, as there could be no doubt that, if not properly proportioned, the valves could not work so well.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

December 4.—W. Titt, Esq., V.P., in the Chair.

A letter was read from C. R. Cockrell, Esq., R.A., giving some account of the Foundations of the Church of St. Bartholomew, near the Bank of England, removed in 1841, under his direction. The letter was accompanied by a plan, and two elevations of the north and east walls, and an explanation of the plan, showing the indications of exact period and fabric, and the principles of such things as were very great interest, as showing the rule, but efficient manner of building adopted by our forefathers, as also the masterly judgment and skill with which Sir C. Wren, availed himself of these foundations, in his new structure, after the fire of London. In the east wall, the piers, as well as those under the pillars of the nave, were formed by digging a pit, into which a mass of well made concrete, consisting of chalk, fragments of tile, stone, pebbles, and lime, were cast, the surrounding ground being left undisturbed: this concrete penetrated about one foot into a good stratum of sand gravel. In the west wall were excavations opened, which the cast and earth in order to continue the course of the wall without the expense of so much foundation, the natural soil was left undisturbed, and formed a rude centering from pier to pier, on which the voussoirs of the arches, in chalk, were at once placed. From the springing of the wall, the piers, as well as those under the pillars of the nave, was of a superior kind, the centre however being filled with concrete. The side walls of the church were of a better manner, with upright faces. The north wall rising with the natural bed of gravel, was found, by the experience, composed of pebbles, or shingle, and loam instead of mortar. Such was the simple manner of building adopted in the old church, the date of which may have been the 12th or 13th century. But the judgment, skill, and economy of Sir C. Wren, in the employment of this rude substructure, and erecting upon it a finely proportioned church of the Tuscan order, cannot be sufficiently admired. His argument here, was doubtless the same he employed at St. Paul's. "If," said he, "these foundations have carried the ancient superstructure without failing, I will take care, by lessening the weight of the new, that they shall suffice for my purpose, and I will economise all the expense which new foundations would occasion;” and the sound
Mr. T. W. Papworth exhibited a volume containing a collection of decorations or a chapel in the Cathedral at Lisbon, made at Rome in 1755. It appears, from these drawings, that the architect sent his general designs to Rome, where they were executed by the most eminent decorative artists. The name of Pompeo Battoni, who was to supply some painting of the higher class, occurs among the number. There are designs for the pavements, railings, hangings, and every description of decoration and furnishing. The artistic knowledge displayed in these drawings throughout the variety of operations necessary to carry out a work of this kind, and the unity of purpose with which it is brought together and applied, is what is principally deficient in our modern system of architecture.

December 18, 1843.—W. Tite, Esq., V. P., in the Chair.

The following communication was read from Mr. Benj. Ferrey, Fellow, on Mr. Silvester's "Process for repelling moisture from external walls."

It will be in the recollection of many members of the Institute, that Mr. Silvester, at a meeting during the last session, directed attention to the discovery of a process by which bricks might be made impervious to moisture, and exhibited some experiments, placing bricks of a very porous description which had been subjected to the process, into water, allowing them to be immersed for some time, and showing, when taken out of the water, that they had imbued no moisture. These experiments, at the time, were considered satisfactory, and thecheapness and ease attending the application to the bricks recommended it to the notice of the public.

It happened during last summer, that I was called upon, in a distant part of Dorsetshire, to suggest some means by which the wet might be prevented from penetrating the external walls of a house-school that had recently been built in a very substantial manner, with bricks of the best quality, but where, owing to the elevated and exposed position of the building, it was found that neither increased thickness of walling, nor internal battening would answer, to make the house habitable, and nothing but an external coating of cement, was by the proprietor of the building, thought capable of remedying so serious an evil.

It occurred to me that this was a good opportunity of testing the merits of Mr. Silvester's recommendation, and, it being a favourable period of the year for external colouring, I ordered the operation to be commenced, availing myself of the services of a clerk of the works, whom I had in the neighbourhood, to see that the liquids were carefully and properly applied.

I should mention that the walls of the school-house were built of kiln-burned bricks from a village called Broadway, well known as supplying the best bricks in Dorsetshire; in situations protected from the severe effects of south-west storms, these bricks are found to be proof against the ordinary effects of weather, but in many hilly parts of Dorsetshire, nothing but the most compact and indurated material will resist the violence of the tempests, and I have remarked how many ancient brick buildings, with stone dressings, have, in various parts of this country, been disfigured by coatings of cement, or blue lias. This practice has evidently been resorted to, as the general cure wherever the wet penetrated the walls, and it would have been adopted in the present case but for my interposition.

As it is probable that many Gentlemen may be present when this letter is read, who were not at the Institute when Mr. Silvester described the materials of his solutions, I will state how they were composed by us, in accordance with Mr. Silvester's directions.

The ingredients were mixed in the following proportions:—1 lb. of mottled soap to 1 gallon of water. This composition, when in a boiling state, was laid over the surface of the brickwork steadily and carefully, with a large flat brush, so as not to form a froth, or litter on the surface.

This wash was permitted to remain 24 hours to become dry and hard. Another mixture was then made in these proportions:—1 lb. of alum to 4 gallons of water, which, after standing 12 hours, in order that the alum should be completely dissolved, was then applied in like manner, with a flat brush over the coating of soap. I need scarcely mention, that we availed ourselves of the wet and dry weather during July, for these operations, and I have now to speak of the result up to the present time, as to the success of the process. Within a month after the trial, there happened one of those tremendous south-west gales, accompanied by heavy, driving rain, such as had been the rule of the weather during the spring, and we were much surprised at the extreme dryness of the walls, and the freedom from moisture, even to the sound of the rain striking against them. At this time, it is the custom to examine the external dressings of our houses, and to speak of them as being proof against the effects of weather, for building purposes, secured from weather; but the same pieces, if placed side by side on the south west side of a building, would be very differently affected, and one might speedily exhibit a rotten tendency, when the other would stand sound.

If stone or brick contain within itself substances which, by chemical agency, could destroy their structure, it might seem a hopeless matter to devise a preparation for the surface that could stop such natural disruption, or if it were ascertained that either of these materials existed moisture, from saline particles forming part of their substance, whereby the action of

when covered with lichens; the rain splashes against the walls as against glass, and runs down the face in a similar manner.

Mr. Silvester has communicated the satisfactory result, I was glad to hear from him of other useful purposes to which this simple process has been applied; at the same time I learnt that about ten years since he advised this method to be applied to the north front of a stone-building near London, where it has been properly carried out, and the damp and mildew has been very offensive. His suggestion was attended to, and with complete success.

It certainly appears to be a simple, cheap, and useful discovery, performing its purpose without discolouring the material on which it is laid, and being therefore unobjectionable on this account. Although from the nature of the solution this might have been anticipated to be equally effective on stone, for precisely in the same degree that the structure of the stone admits moisture through its imperfect formation, it will receive that solution; so that the pores or vesicles on the face of the stone become impregnated with the substance, and the latter will adhere to the stone of lime, sand, or oolithic formation. The value of a process which may give an indurated surface to many kinds of stone that before were unfit for building purposes, by reason of rapid disintegration under the effects of wet and frost, will be duly appreciated by the architect, and though it may be hazardous to use at once materials of doubtful quality, relying upon this remedy, yet it is a subject quite worthy of our best attention, and I think it right to mention what has been told me in reference to this most important object.

From the perfect success which attended experiments in other parts of the country similar to what I have described, the County-Surveyor of Kent made a bold trial of the process.

A block of the Gatton or Reigate stone, when taken from the quarry in its green state, and laid in a state of proper operation, after having been hardened and dry by the exposure to the atmosphere, it was well covered all over, both within and without, by the wash of soap and alum; this being properly done, it was at once filled with water, and used for the ordinary purposes of a leaden cistern; this was done about three years since, when the stone was laying in the slightest degree from the day it was first used, although exposed through the winters, without any protection whatever.

Perhaps no substance could put the process to a severer proof, than Gatton stone, which is so well known of all reports of the Commissioners, as composed of five siliceous grains, with a calcareous-silicious cement, containing green silicate of iron, and plates of mica. It is a stone that will not stand the weather, and though it has in former times been much used, all the exposed portions of such edifices, are destroyed. I need scarcely say, that it was near to the Gatton quarries, and that its clearance was the recommendation in the eyes of my employer.

Any composition for the preservation of stone, having a lastling effect, must be most valuable. It is true that nothing but time can prove whether the effect is permanent; this difficulty attends all schemes. It is an argument employed to depredate the use of those processes by which timber is protected from decay, and it is an objection which, if permitted to operate too strongly, may go far to discourage scientific men from directing their energies to the most important object.

It would indeed be a great point gained, if the architect, by the use of a simple chemical solution, superficially applied, to protect the external faces from the effects of weather (for it is obvious that decay occurs chiefly upon the exposed surfaces,) could employ stone, extensively, to be met with in different parts of the country, but which, at present, lie dare not use, from the established fact of its early tendency to decay,—thus, the Tottenhoe, Reigate, the Clunch, the Maln Rock, and other formations, though suited for internal work, are utterly unfit to be used out of doors. It would not be difficult to enumerate a great many more kinds of stone prohibited at present. I have alluded particularly to this, because it is a favourite notion of Mr. Silvester's, that these stones may be brought into use with a certainty of their durability if they are subjected to the process which so effectually cures bricks.
frost might in that manner lead to pulverization, there might be difficulty in countering such effects—it is however a well ascertained fact, that no such existence ever. I cannot do better than refer you to some very able remarks by Mr. C. H. Bath, in answer to questions put to him by the Commissioners of the Fine Arts, in reference to the causes of damp upon the internal surfaces of walls, where it is clearly not produced by the penetration of rain; that gentleman attributes these defects to accidental circumstances, such as are mentioned by him in his reply to the Commissioners.—

SOCIETY OF ARTS, LONDON.

Nov.-18.—The commencement of the session for reading papers was occupied by a paper on the various means for preserving life in case of shipwreck; there were many ingenious devices and models exhibited. The paper was ably read by Mr. Bath, the indefatigable Secretary of the Society.

Nov.—15.—A communication by Mr. Pellat, on Coating Iron with Zinc and Copper, was read; it was similar to the paper read at the Institution of Civil Engineers and reported by us in the November Journal. Mr. Pellat stated that the cost of coating iron with zinc was about 3d. per superficial foot, and with copper 8d.

Nov.—22.—The Secretary read a paper accompanied by models and diagrams written by Mr. Charles Wylie Williams’s argand furnace and conductor pins for boilers.

Nov.—29.—Benj. Rotch, Esq. V. P. in the chair. A paper by Mr. Dyer, on Patent Metallic Blue Green, was read by the Secretary. It stated that the cement was composed of blue base line, mixed with the metallic sand. This sand is produced by grinding copper slag by means of powerful machinery, and by Mr. Whishaw, the indefatigable Secretary of the Society.

Dec.—6.—A paper was to have been read by B. Rotch, Esq. on a new turn table for railways, and a new weighing machine, but, owing to the sudden indisposition of that gentleman, the subjects were postponed to a future evening. The information only reached Mr. Whishaw a very short time before the hour of meeting, but, not to allow the visitors to be disappointed, with his usual tact, had a large assortment of the various locks, models of which have been, for many years past, sent to the society, placed on the tables, and the principles of which were ably explained by Mr. Thomas, Solly and Varley. The interesting subject was to be continued, but as Mr. Whishaw, the indefatigable Secretary of the Society, and various other early patents, were described, and the wooden model of a lock was exhibited, the original of which was brought from Egypt, and supposed to have been in use 2000 years ago—yet, strange to say, it exhibits, in some respects, the same intrinsic advantages, similarity to more than one of the modern patents.—Mr. Varley exhibited a specimen of wheat straw, taken from a specimen which had been purchased by him, from which he had gleaned nearly as much wheat as would pay for the whole trans of straw. This he said, he was convinced was frequently the case, and he attributed it to the imperfect method of threshing, as generally adopted, although so many excellent machines exist. The evening closed with the society’s usual routine business.

Dec.—13.—B. B. Cabell, Esq. V. P., in the chair.—The Secretary read a paper on Mr. Johnstone’s plan of forming asphalt breakwater. The plan is as follows: a series of distinct and separate caissons—each representing an external form one half of the pier of a bridge, with its cut-water presented to the sea—is to be formed in four to six fathoms water, according to localities. Each caisson to consist of cast-iron plates of large size, and one inch in thickness (prepared with coal-tar, so as to resist corrosion), bolted together, and filled with concrete or other suitable material. The lower part of each caisson, to the height of thirty-two feet, having a foundation platform of wood, to be completed on shore, and when prepared to be launched, and towed out to its position, and then lowered; the whole to be secured to the bed of the sea by means of casstion piles, driven through tubes of the same material.—As the upper part of the caisson is put together, it is intended to be filled up with the solid materials, and to be coped with clamped masonry. The weight of each caisson, complete, would be 4,000 tons; and the cost of a breakwater on this principle, extending to nearly a mile in length, is estimated at 227,800.

The Secretary next read a paper by Mr. Claudet, "On the Daguerreotype Art," including a complete history of its origin and progress; one of Mr. Claudet’s assistants showing, by means of artificial light, the whole process of producing a picture. The most important part of this communication related to an improvement lately applied; it is a process of engraving on a metallic plate. Mr. Frevon is the discoverer of this new mode of engraving. Professor Grove has tried the process, which consists in dissolving, by the electrotypes process, those parts of the picture which consist of pure silver. Thus the plate is etched in, and transformed into an engraved plate for printing; the action, however, of the saline battery sometimes extends to those parts which should remain untouched.

Dec.—20.—W. H. Hughes, Esq. V. P. in the chair. The Secretary explained the Automaton Calculator invented by Dr. Roth, of Paris, by which any number, either simple or compound sums, may be rapidly and accurately added together, provided the whole amount does not exceed 999,999, or 999,999. 19. 11d. The instrument consists of an oblong mahogany box, 12 1/2 inches long, 22 inches wide, and 1 inch thick, having a metal plate at the top, in which are 9 semi-annular perforations, beneath which are fixed the requisite trains of wheels. Round the perforations are engraved the index figures, opposite to which, in the perforations, are the teeth of corresponding moulds. Under these moulds, there are 6 numbered with figures which a number of wheels set down appear as if written on paper or a slate. To set down any required figure, a pointer is inserted in the notch corresponding with that figure on the index, and by pressing the pointer against the left-hand tooth of the proper mould, it has the effect of extending the semi-annular perforation, and the figure is at once exhibited in the circular hole beneath. When the operation of adding up any amount within the range already mentioned is finished, it is requisite that 0 should be shown in each of the semi-annular holes, before another operation can be performed; this is done by putting a slide at the left end of the instrument, which fixes the numbers 999,999. 19. 11d., and by adding 1d. the nines 0s are obtained at once.

Mr. G. A. Hughes, who has been blind for seven years, exhibited his system of Stenography.—The system consists of two dots, the one smooth and the other rough, which, with the aid of a guide line, are so arranged that all the letters of the alphabet, as also the numerals, are readily represented, merely by impressing the paper, either with the smooth end or rough end of the embossing instrument, in squares, regulated by what Mr. Hughes calls the formula, consisting of a brass frame, furnished with vertical and horizontal bars.

Mr. Taylor exhibited two Fire Escapes; and Mr. Hegge explained his improved Monochord, in which measurement has been applied to sound, and the actual relation of one tone to another is shown on a scale of two feet.

REVIEWS.

The Companion to the Almanac, 1841.

The Companion is always a welcome visitor, affording, as it does, a retrospective view of what has been done in the past year. It contains an able paper "On Arithmetical Computation," by Mr. De Morgan; the progress of railways in England, an epitome of the railways in America; a chapter on pavements of towns, in which an able notice is taken of most of the wood pavements, and other modes of paving; an abstract of all the principal Acts of Parliament passed last Session, and its usual report on "Public Improvements," which, I think, is of its critical acumen, is especially entitled to the notice of architects; it has the appropriate remarks on the Fabrication of the British Museum, which has already occupied our pages; also, notices of the buildings, in Lothbury—the Doric Screen of the Marquis of Westminster’s, Grosvenor Street; engravings of the Taylor and Randolph Institution, at Oxford, by Mr. Cockrell, with an engraving; the Proprietary College at Cheltenham; Lincoln’s Inn Hall and library, in the style of Hampton Court Palace, by Mr. Hardwick; and the Joint Railway Terminal, in the Gothic style of that portion which has been erected,—a view of the whole appeared in last month’s Journal, and the Corn Exchange at Glasgow. Besides what we have already enumerated,—the "Companion" contains a great mass of valuable statistical information.

The first series of these interesting sketches of ancient and modern monuments, is now complete, comprising an extensive range of studies. The number of plates is forty, and containing a great number of details, they afford a good synopsis of the graphic history of architecture. The Hindoo, the Egyptian, and the Persian, are well illustrated. So are the Pelasgic and Celtic styles, but as these latter are really subjects of archaeological than professional interest, we could well have compounded for a more restricted treatment, as compared with Greek art. The only monument of Greece at present, is the Temple of Segesta; the deficiency, we hope, will be made, as promised, in the subsequent series. Indeed we see that the Parthenon has been already published. The Roman and early Italian styles afford several illustrations, as does the Byzantine. The Arabian style has its representative in the Mosque of Iba Tulun, at Cairo; neither have the medieval monuments been neglected.

The text has been confined to the hands of Messrs. Gailhabaud, Albert Lenoir, Raoul Roehette, Jomard, Langlois, Leon Vauclayer, Dr. Franz Rugler, and others, names which are guaranteed for the artistic and antiquarian treatment of the subject.

In the subsequent series we are promised an extended treatment of the various styles, but we think it hardly necessary to go to the extent, with regard to modern works, of reproducing St. Paul's Cathedral, the Docks, and other edifices, &c., well known, and so often described. Still, such services must be made to the public, and when we consider that it is only by a very large sale, that a work so cheap as the present can be made to remunerate, we must not complain, if the professions do not have it all their own way. Undoubtedly the present work forms one of the cheapest and most available works of reference yet afforded to the student and the profession.


In these buildings, a praiseworthy enterprise has been made to renovate in the ordinary labours cottages and village schools, that character which is so perfectly and alone in harmony with our English country, an humble endeavour to re-distribute a few sparks of that spirit of the bygone, which has lain asleep so long, and in the delightful anticipation, that the time for the erection of castalm incongruous heathen soulless buildings, has had its day, and that now is the redawning of better and nobler desires, of delight to spread far and wide, buildings suited to the recluse and the wording, of which few, though very excellent specimens, remain in ruins.

Each cottage is provided with a lobby, living room, open stairs, kitchen pantry, with two bed-rooms and closets to each, above; the whole, throughout, is in good keeping: the three single lights to the living room, are fixed in deep arched recesses, with pointed arches sufficiently spacious to accommodate a person reading, in the end recess of each habitation, the ancient custom of chaining the Scriptures, will be conformed to.

The schools are sufficiently spacious to accommodate the whole of the children of the village, and are well ventilated, being 21 feet high. The roof has all its timbers framed, boarded, and exposed, springing from stone corbels, on which are cut the initials of the several benefactors, the floors are also of stone; the windows, ground glass; opposite, are recesses for books. The end window contains the armorial bearings of the family at whose expense this portion has been erected, in the gables thereof, and the gloom of the timber, is formed an antique cross of stained glass; the school is also provided with lobby, cloak room, and masters house complete, over the centre of the latter, is the inscription, Ex. E., 1842, in the scroll work over the stone fireplace, is another, embodying the object of the donors.

These buildings are to be opened in July next, for public use, and are erected in the village of Burton, near Sirivenham, Berks, in the parish of the Archdeacon Berens, at the expense of Henry Tucker, the cottages are the sole property of Henry Tucker, Esq., the total expense of the whole, exclusive of the gift of the rough stonework, only cost 750£.

Mr. Weale recently visited Holland for the purpose of obtaining the original and only set of drawings of the extraordinary collection of painted glass in Gouda, in Holland, which he has succeeded in purchasing and bringing to England.

PARSON'S PATENT.

Sir—In No. 74 of your Journal (November, 1843) you furnish extracts from the specification of a patent granted to F. M. Parson, of Waterloo Bridge Road, Surrey, for "certain improvements in steam engines and boilers, and in motive machinery connected therewith," &c.

At the bottom of the second column, page 396, you say, "The third claim in this branch is, we believe, perfectly new, whether useful or not, remains to be proved; we allude to the double-acting air pump with separate water and steam engines, the bottom of which is at bottom to remove the condensed water, that at the top to pump away the air and uncondensed vapour accumulating in the condensers," &c.

The date of Mr. Parson's patent being 5th December, 1842, I beg leave to refer you to a patent granted to John George Bodmer, of Manchester, dated 10th June, 1841, and entitled for "certain improvements in machinery for propelling vessels in water, part of which improvements apply also to steam engines to be employed on land." There, with reference to Sheet III. of drawings, Figs. 2 & 7, you will find described a double-acting air pump, the object of which is to remove the condensed water at the bottom, and to pump away the air and uncondensed vapour at the top.

Whether or not such an air pump would tend to produce a more perfect vacuum, I do not at present pretend to determine; but of great importance I think it would materially influence the speed at which an engine may be worked.

At all events there has been one of Mr. Bodmer's double piston steam engines (of 60 horse power) whose air pump is constructed upon the principle of the question, the crank-shaft makes from 70 to 80 revolutions per minute, the steam being used at 30 lb. pressure in the boiler and expanded; and I doubt whether a common air pump would bear such a speed.

I am, Sir,
Manchester,
Your obedient servant,
Dec. 7, 1843.
R. B.

OBITUARY.

JOHN CLAUDIUS LOUDON.

After several months of impaired health, and latterly a rapid decline arising from a pulmonary disorder, this gentleman died at his house, Portland Terrace, Bayswater, on the 9th of December, leaving a name that is a very conspicuous one in the nomenclature of the year 1833, and which will thence be transferred to the more remote record of biography. Many and varied are his claims to honoursable mention by the last, since, high as he stood in his more immediate profession as a landscape gardener, and as a botanist and horticulturist, he extended his studies to other pursuits, and with more than ordinary diligence and success; nor must it be supposed, from this diversity of attainments, that his knowledge in some of them was slight and superficial. Such a man was almost always regarded by his architectural studies, and it is with reference to them that he is more especially entitled here to notice from ourselves.

To him we are indebted for the very first periodical expressly devoted to our art, viz. the "Architectural Magazine," which was commenced by him in 1834, and carried on till the end of 1836, when he discontinued it, although very reluctantly, and not so much from want of encouragement, as being then established in character, as because it occupied time which he could ill spare from other engagements, among which was the editorship of the Gardener's Magazine; and to conduct two periodical works, both of them monthly one, simultaneously, is a task almost too great for the most indefatigable. Previously to the appearance of the Architectural Magazine, there was no one known and fixed point of reference to which professional men or others could resort, whether for the purpose of seeking or communicating information.

We do not say that till then architecture had been entirely excluded from the periodical literature of the day; on the contrary, papers of the kind; some of them, of considerable merit and interest, had appeared in literary journals; but only occasionally, and scattered through a range of different publications. Then, for the first time, did Architecture, commercially speaking, enter the ranks of journalism, certainly in this country, nor as far as we are aware, did at that time exist any thing of the kind in other countries, although several foreign architectural journals have since arisen.

We may here observe that it was in consequence of being struck by an article of the kind, that Mr. Loudon sought out and made acquaintance with its author—one who, by this time, must be tolerably familiar to our readers by the pseudonym of Candidus.
Of good gen in itself, as indicating the spread of architectural study and the increasing interest taken in it, Mr. Loudon's "Magazine" gave such study a favourable impulse, and that in the proper direction. Liberal and enlightened in his views, and perceiving the real interests both of the art and its professors, better than many of the latter seemed to do themselves, he sought for those who approved and sympathised with his principles, and through his periodical had done much to promote a general intelligent appreciation of the former as an aesthetic or fine art. The more, we have heard him say, the public can be brought to understand, and to have a real taste for architecture, the better able they are to reason upon its productions, to enter into their particular merits, and to discriminate between beauties and defects, all the better will it be for architecture itself, and for those who practise it and earn for it the respect that is due to it, last but a class. People would then be disinclined of their implicit respect for mere names, they would be better able to recognise talent, and better disposed to encourage it. A taste for architecture should be cultivated by all persons of liberal education, for the sake of the interest and enjoyment it affords; and the wider such taste spreads itself and becomes that of the many instead of being limited to the very few, all the better must it prove for the art, for public patronage and influence towards it arises mainly from ignorance of it on the part of the public; and the shallow criticism and one-sided views of it which now pass current with the mass, will no longer impose upon their judgment.

Subsequent experience has confirmed the correctness of these views, if not in the fullest extent, as far as could be expected within so short a period. And to them we may add, that one very great advantage, which the main and professed one, attending a journal of such nature, is that attention is kept alive to the subjects treated of by it; our ideas are not allowed to remain stagnant; opportunity is afforded for discussion, and for testing the soundness of opinions that have been indubitably adopted as matter of course, and allowed to pass current as incontrovertible merely because they have not been controverted, but uniformly looked at from the same one-sided point of view. The medium of the periodical, through the medium of a periodical, valuable matter is frequently elicited from those who, but for the facility of communicating it so afford, would have never thought of communicating it at all; in fact, could hardly have brought it before the public in any other shape, it being too little in mere bulk for the substance of a separate volume, while in the shape of a pamphlet it would appear only to pass unnoticed. It may, indeed, occasionally happen that the suggestion is not implied in, or presented to us, in a "canned" manner, all ready, but then it is very rarely, and only under particular circumstances; those which admit articles of the kind at all, are not open to mere casual correspondents; nor, some of them are so utterly inexhaustible, and their editors so thoroughly impracticable, that for any one who is not actually of their own corps and cuterie to offer any thing in such quarters, is to incur the most insolent treatment.

But we are now digressing too widely, at what hour we have been saying shows the essential service which Mr. Loudon rendered architectural study by starting his "Magazine," more especially as he conducted it on liberal principles, allowing all opinions to have a fair hearing, aware that the soundest are likeliest to prevail in the end, and are rather confirmed than weakened by having first to encounter established prejudices and fallacies.

In the way of personal memory, little can be expected as very recently after his decease beyond a few facts and dates; for the authenticity of which we can vouch; yet even that little will make evident that such adequate materials for the purpose be in existence, the earlier part of Mr. Loudon's life would form an interesting and instructive narrative.

John Claudius Loudon was born in Lanarkshire, April 8th, 1783, but very soon afterwards the family removed into the neighbourhood of Edinburgh, where his father carried on a respectable farm. The son, however, chose for himself a different pursuit, one, indeed, not wholly out of the same direction, but more congenial to an imaginative mind,—that, namely, of Landscape-gardening, in which nature is contemplated with somewhat more poetical eyes than those of an agriculturist. He was accordingly brought up with a view to that branch of science; and first contrived it on his own account in 1813, when he came to England furnished with letters of introduction to several of the first landed-proprietors in the country. Yet although he con-

David Hamilton, Architect.

"Our obituary," says the Glasgow Citizen, "contains the name of Mr. Hamilton, the eminent architect. About two years ago he had so active a paralytic stroke, from which he never thoroughly recovered; and for some time past he had been in a declining state of health. His death took place at two o'clock on the morning of Tuesday, September 8th, after a long and deep regret of his numerous friends. He was in the 76th year of his age, being born in Glasgow, 11th May, 1768. Mr. Hamilton's professional abilities were of the first order; and in private life he was distinguished for the singular amiability of his character, the unaffected modesty of his disposition, the vivacity of his conversation, enlivened as it was by a great deal of time with those of taste, of heart, disinterestedness, and nice sense of honour. With the national sense of "manumand worship," he was in no way tainted. Had he cared more for money he must have died rich. His professional charges were considerably below what his distinguished merits entitled him to claim, and his purse was always open to assist the needy and unfortunate. It is doubtful whether he has left an enemy behind him, or whether indeed he even had one. Of his political friends few men had more attached friends or were more warm in their friendship. By his professional brethren he was much esteemed; and jealousy or unworthy rivalry had, it is believed, no place in their intercourse. He has
passel from the scene of his earthly labours; but he has bequeathed to all who knew him the memory of a good example—he survives in the affections of his friends—and the numerous splendid works he has left behind, may be regarded as so many monuments commorative of his genius.

The number of elegant or splendid structures designed by Mr. Hamilton particularly in the west of Scotland, is very great. Independently of Hamilton Palace, the princey seat of the Duke of Hamilton, which, throughout of itself, as a great residence, he produced the splendid Royal Exchange of Glasgow; the Western Club-house; the British Linnen, the Glasgow and Ship, and other magnificent banks; Toward Castle, the seat of the late Kirkman Finlay, Esq.; Dunlop House, Ayrshire, the seat of Sir John Dunlop, Bart.; the elegant structure of Lennox Castle, the residence of John Kincaid, Esq. of Kincaid, so much admired by all professional men; and numerous other buildings, remarkable for their taste and effect. Mr. Hamilton was also a competitor for the New Houses of Parliament; and although his design was not adopted, it was so highly esteemed by the Government that it was rewarded with a price of 500l. In this competition he was the only Scotch architect who was successful, although several of them sent in two or three different sets of plans, while he submitted only one. In July, 1844, Mr. Hamilton was entertained at a public dinner in this city, when he was presented with an elegant service of plate, together with a considerable sum of money enclosed in a gold box, a distinguishing proof of the estimation in which he was held by his fellow-citizens. Mr. Hamilton is succeeded in business by his son, who possesses, we believe, much of his father's fine architectural taste and talents.

NEW CHURCH, BROADWAY, WESTMINSTER.

This church, designed by Mr. Peckey, was consecrated on 15th December, by the Bishop of London. This edifice is the first of the recent Gothic churches erected in the Metropolis, which is built with stone. The exterior is beset with Kentish rag, with Bath stone quoins, windows and dressings, and the whole of the arches and of the moulded and carved work within and outside is also of Bath stone. Another point in the unhackneyed adaptations of cast iron columns to the style of architecture, which is that of the latter part of the 13th century. The early tracery of the east and west windows is of a highly ornamental character. The chancel is raised by six steps above the body of the church, and forms an apse, the ceiling and walls of which are richly decorated in colours. There is also some very fine stained glass, and the font is one of the most magnificent specimens of its kind that has been lately executed. The general effect of the building, both externally and internally, is strikingly ecclesiastical, and exhibits the skill of the architect in adapting the materials to produce the greatest effect without too large an expenditure in labour. As the neighbourhood in which this church is situated will shortly undergo a very beneficial alteration, in pursuance of the contemplated improvements in the property of the Dean and Chapter of Westminster, it has been designed with a spire, which will place it among the most important of modern ecclesiastical edifices. The proposed height is 200 feet, but it has as yet advanced little beyond a fourth of that elevation for want of funds. It is to be hoped that those who are disposed to encourage ecclesiastical architecture, will not suffer the work to languish from this cause.

LIST OF NEW PATENTS.

(From Messrs. Robertson's List.)

GRANTED IN ENGLAND FROM NOVEMBER 24 TO DECEMBER 28, 1843.

Six Months allowed for Enrolment, unless otherwise expressed.

James Connell, of Dublin, gent., for improvements in the manufacture of candles and candlewicks.—Sealed November 24.

John Garrett, of Ipswich, Suffolk, agricultural implement maker, for improvements in machinery, for drilling thrashing, and cutting agricultural produce.—Nov. 25.

John Frith, of Sheffield, architect, for improvements in the manufacture of canvas.—Nov. 25.

William Irving, of Regent-street, Lambeth, engineer, for improved machinery and apparatus for cutting and careering substances to be applied for laundering and other purposes.—Nov. 25.

Edward Tann the elder, Edward Tann the younger, and John Tann, of Milnrow, Lancashire, Hockney-road, iron-safe manufacturers, for improvements in locks and latches, and in iron rooms, doors, safe, chests, and other receptacles.—Nov. 25.

Alexander Vivian, of Greennap, Cornwall, gent., for an improved apparatus for dressing art.—Nov. 25.

Joseph Rock, jun., of Birmingham, factor, for improvements in locks and latches.—Nov. 25.

George Edmund Dominithorpe, of Bradford, York, top manufacturer, for improvements in coaking wool and other fibrous substances.—Nov. 25.

William John Hay, of Portsmouth, operative chemist, for improvements in processes for the refining of pigments for colouring purposes.—Nov. 25.

Thomas Drayton, of Brighton, gent., for improvements in coating glass with silver for looking glasses, and other uses.—Nov. 25.

John Richard Lund, of Manchester, chemist, for improvements in the determination of composition of colours.——Nov. 25.

James Cooper, of St. John-street, Clerke, provision merchant, for vessels of peculiar construction, and apparatus for the purpose of preserving various vessels of precious metals, and other articles.—Nov. 25.

John Hicks, of Bolton's-Moors, Linneater, engineer, for improvements in steam-engines, and in apparatus to be connected therewith, for driving machinery, particularly those in which improvements are applicable to forging, lifting, and measuring purposes.—Dec. 5.

Joseph Robinson, of Old Kerry, solicitor, for improvements in the construction and mode of working engines by the agency of air or gas for obtaining or producing motive power. (A communication.)—Dec. 5.

William Warneope, of Welbeck-street, surgeon, for improvements in the form, or construction of hooks and eyes for fastening dresses, and for other uses.—Dec. 5.

William Newton, of Chancery-lane, engineer, for improvements in extracting certain metals from ores and other compounds of those metals, some part, or parts of which improvements are also applicable to obtaining metals, produced, or other products from such ores or compounds. (A communication.)—Dec. 5.

Lawrence J. Sker Potts, of Greenwhich, doctor of medical, or improvements in the construction of pieces, embellishments, and other similar structures.—Dec. 5.

John Reed Hill, of Chancery-lane, civil engineer, for improvements in a pressure vessel, machines for manufacturing, for letter-press printing, and for other purposes.——Dec. 5.

William Brockedon, of Devonshire-street, Queen square, gent., for improvements in the manufacture of pills and medicated hogzoges, and in preparing or treating black lead.—Dec. 5.

John Lamb, of Manchester, spindle and dy m-smaker, for improvements in machinery used for preparing and spinning cotton, wool, flax, silk, and similar fibrous materials.—Dec. 8.

John Bishop, Poljohn, and James Wardrope, jeweller, for improvements in paving roads, streets, and other places.—Dec. 8.

Christopher Nickel, of York-road, Lambeth, gent., for improvements in apparatus for facilitating the cutting, or shaping of materials for making glasses and other articles.—Dec. 8.

William Beddall, of Lombard-street, for improvements in tertiary engines. (A communication.)—Dec. 8.

William Braddock, of St. Swithin's-lane, merchant, for improvements in the deposition of metals upon various felts and other fabrics.—Dec. 8.

Alice and Southwood Snell, of Birmingham, wine merchant, for an improved and much more efficiently retained in their situations, where differing liquids are used: also in the manufacture of articles, and the application of the same to that part of the vessel to which his improvements contribute, so as to secure the cork; also an apparatus for extracting such corks when required to be released.—Dec. 8.

Henry Wingo, and William Henry Wingo, of the town of Penzance, Cornwall, builders, for improvements in apparatus for plating or setting, drilling or dibbling corn, grass, seed, pulse, and other produce, parts of which improvements are applicable to the construction of wheels and corners.—Dec. 8.

John Sylvester, of Greenwich, Russell-street, engineer, for improvements in applying heat to brine, or other matters contained in vats.—Dec. 13.

Henry Pars, of Blackiriss-road, gent., for improvements in manufacturing metal combined with other matters, for the covering of floors and other surfaces.—Dec. 13.

Robert Kirly, of Cambridge-terrace, Hyle Park, Esq., for improvements in materials for, and in the modes of applying coverings to coffins for the dead.—Dec. 13.

William Young, of Queen-street, Cheapside, lamp-maker, for improvements in the manufacture of lamps and lamp-holders.—Samuel Parly, of Rial and Knightsbridge, retired major, for improvements in the construction of wheels for carriages.—Dec. 18.

Benjamin Cook, jun., of Birmingham, merchant, for improvements in coating or covering the surface of metals of various forms, and of applying the same to a variety of useful purposes.—Dec. 18.

Francis L'Estrange, of Dawson-street Dublin, surgeon, for improvements in seasonal trusses, to prevent the descent of hernia through the internal as well as the external ring.—Dec. 21.

Pierre Frederick Ingold, of Dean-street, Schol, watchmaker, for improvements in the manufacture for making wheels and watches, and other time keepers, as well as parts of instruments for mathematical, optical, astronomical, nautical and musical purposes.—Dec. 21.

Thomas Murray Gladstone, of New Swan Garden Iron Works, Wolverhampton, for improvements in the use of cast steel or other iron or other metals.—Dec. 28.


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