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Cochrane's Mariner's Sound Indicator.

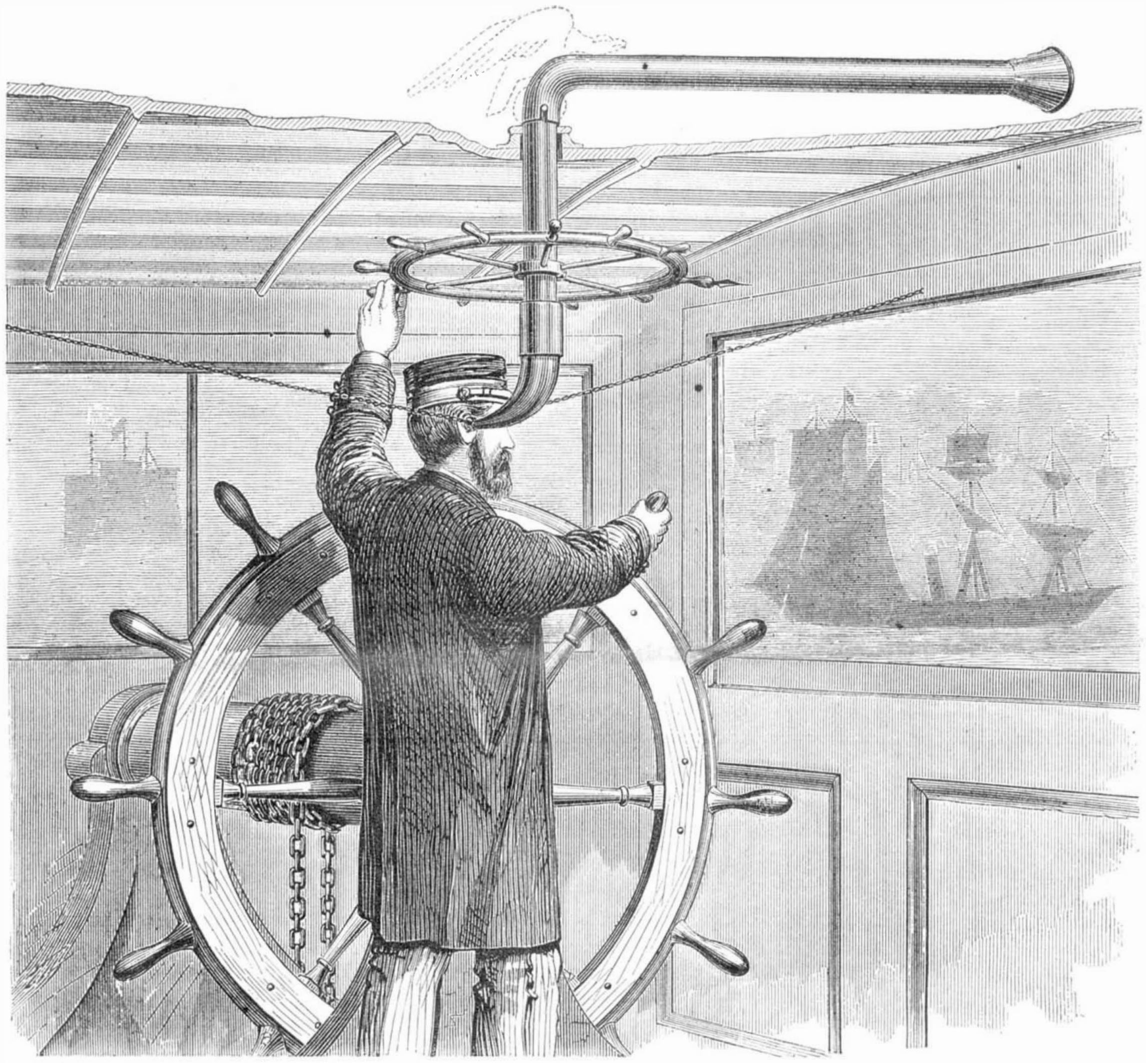
The novel device shown in our engraving, to which the inventor has given the above name, has for its object to enable a mariner to determine the direction of sound, when from any cause he is prevented from exercising the sense of sight. In the specification of his letters patent, he so forcibly sets forth the uses and advantages of the invention that we cannot do better than quote his own language:

"Great inconvenience and many accidents fatal to life and destructive to property, have resulted from the difficulty of determining the direction of sound in navigation; for instance, when, in approaching or navigating harbors or rivers, many vessels, moving in different directions, are enveloped in a thick fog, sound is resorted to as a means of signaling to prevent collisions, and also to enable ferry-boats to make out their landings. Under such circumstances every mariner is aware of the extreme difficulty and inconvenience at present experienced in determining from what locality the sound originates. It would be impossible for me (fifty years a mariner) to cite the numerous instances where difficulties of this kind have rendered the position hazardous and frightful in the extreme.

"My invention proposes to obviate measurably these difficulties, by enabling the pilot (or other person whose duty it may be) to determine, if possible, without leaving his station, from what locality the sound originates.

"I accomplish this by means of tubes—one stationary, with an opening convenient to the pilot's ear, and another forming a continuation of the first, movable to all points of the compass, by means of a wheel or lever under the mariner's immediate touch and control."

The person desiring to ascertain the point from which the sound proceeds, turns the tube, by means of a wheel or lever, until the greatest intensity of sound through the opening in the fixed tube indicates that the bell of the movable tube points in the direction of the source of the sound. Then, by observing any suitable indicator (as the king-spoke in the wheel), which, being previously adjusted, shows the direction to which the opening of the movable tube points, the pilot is enabled to steer in the manner indicated by the signal, the sense of feeling even being a guide in case all artificial light should be extinguished, and the vessel should be groping in the dark.



COCHRANE'S MARINER'S SOUND INDICATOR.

The engraving completes the story of the design of this invention. It is shown attached to the roof of the pilot-house of a vessel, and its parts and use are so well delineated by the skilled hand of an artist as to need no detailed description. The inventor has, however, claimed in his patent the general principle of the combination, and does not confine himself to the particular construction shown.

Patented, Jan. 10, 1871, by James Cochrane, whom address for further information 64 West Tenth street, New York.

Purifying Gas and Soap. Limes.

Mr. Thomas Prideaux, of Sheffield, Eng., has, according to the New York *Mercantile Journal*, invented and patented a process for purifying gas and soap limes, which, it is well known, are so exceedingly offensive in smell as to render their proper disposal, when spent, a matter of difficulty.

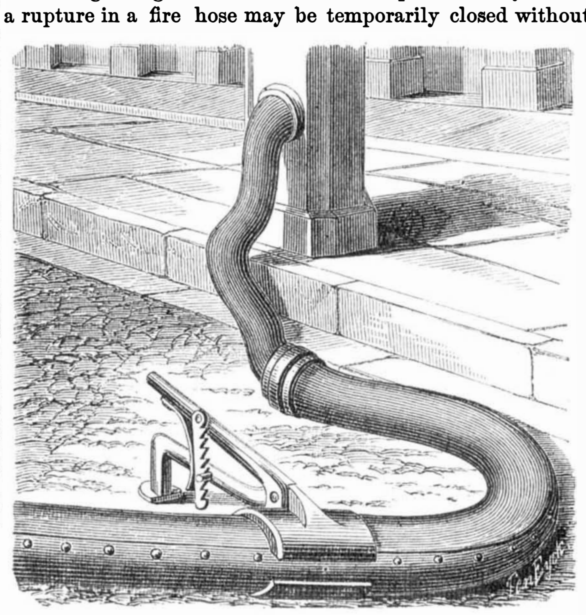
In Mr. Prideaux's process, the gas lime is thoroughly incorporated with the substances formed in the passage of the gas through the lime, and with that portion of the lime which yet remains in the caustic state. This is done by grinding the gas lime in a mortar mill, or other suitable machine, the lime either being ground dry, or, in some cases, having some water added. By this means the offensive sulphides are oxidized, and the mixture produced obtains the property of hardening in a short time, so that it can be used alone, either for plaster, concrete, or cement, or for building blocks. The specification further sets forth that iron scale and coloring matters are also used when required for decorative purposes.

By the forementioned treatment it is found that the sulphides and other offensive compounds are so much oxidized that the prepared gas lime can be used for the interior work or decoration of dwelling houses. The substance upon hardening is quite free from unpleasant smell, and is of a light-gray color. If the proportions of lime remaining in a caustic state be insufficient, a suitable quantity of quicklime is added when using the prepared gas lime for the formation of blocks, or for cement, plaster or mortar.

When this substance is calcined and pulverized, it may be kept and used as cement, by mixing with water. The cement is claimed to set hard in a very short time, and to be very strong, and suitable for all purposes to which good water cement is applicable.

DEVICE FOR CLOSING RUPTURES IN FIRE HOSE.

Our engraving shows a useful and simple device by which a rupture in a fire hose may be temporarily closed without



turning off the water. Such an instrument would often be of great use, saving time in uncoupling and coupling on new lengths of hose in cases where loss of time might result in great damage. Our artist has shown the form of the device so well that it almost tells its own story. Two pivoted clamps made in the form of tongs, one handle of which has a pivoted ratchet bar, engaging with a pin in the other handle, constitute the instrument. The extremity of the lower handle is bent downward as shown, and terminates in a foot plate which rests upon the ground when in use. The instrument is the invention of P. H. Collins, Philadelphia, Pa.

Something about Skates.

Prof. A. Dembinsky writes to the *Mechanics' Magazine* as follows:

"Fifty years of practice has enabled me to detect all those defects in skates by which the performer is inconvenienced, or prevented from executing those artistic displays of movement which require the acquisition of bodily balance, and elasticity in the various supporting parts of the skates during evolution. Among other faulty or objectionable constructions of skates, I beg leave to mention here the unproportionate hight of the steel blade, by which often the spraining of the ankle, premature fatigue, and temporary spasmodic contraction or dilatation of the sinews and muscles, are caused. The great vibration of the blade, subject to sudden changes of motion, causes a break in the balance of the body, and is sure to cause heavy falls, the more so when there exists a curvature of the blade instead of a straight, uniform shape, which allows motion in the center without being elevated in form, and which motion ought principally to be performed and supported by the part of the fixed heel provided with a screw, which fastens not merely the blade, but secures the fixing of the heel of the boot by the spike-formed head of the screw. All balancing power of the body ought to find its support on the frame, and prevent any fall backward, by which concussions of the brain are frequently caused. The hight of the blade depends entirely on the side-balancing or bending of the skater's body, and therefore must be in proportion to the side extension of the foot-plate, so that the surface of the ice cannot be touched by the wooden plate, which would cause a sudden stop of the gliding blade.

"All forms of metal skates on boots increase fatigue, and cause an unsteady footing during thawing temperature, and any fastenings for securing the toes by metallic bands provided with buckles, are not merely chilling to the compressed toes, and thus becoming inconvenient, but are from their pressure and prevention of the free circulation of the blood, the cause of frost-bitten toes, and also most painful to skaters who suffer from corns or bunions.

"I am fully convinced that any so-called improvement of skates, by the application of more metallic parts than hitherto in use, is rather an evil instead of a benefit to the skater, because it increases the weight of the skate, and thus fatigues prematurely, without increasing whatever the security against any ordinary accident.

"By experience I have found that the most suitable skates are those of the original simple form, provided with a steel blade, having a sharp incision, or groove, which reaches or extends to its ends, and without having any projecting neck or head, and fastened to the boot by a single leather strap, with two buckles, one to form a sling or noose, for the toes, passing through three holes of the wooden supporting sole, the other buckle reaching exactly that part of the boot containing the elastic jointure of the ankle. This strap must carefully be secured at the first hole of the sole or support, by means of wooden pegs, so that no shifting or dislocation of the strap at the toes can take place."

[Had the writer of the above been introduced to some of the improved American skates, we think he would have changed his views on metallic fastenings.—EDS. SCI. AM.

OSWEGO manufactures annually from 600,000 to 700,000 barrels of flour, and 10,000 pounds of starch.

A WOMAN'S VIEW OF THE PATENT OFFICE.

Elizabeth Kilham has recently visited the Patent Office, and she there saw a good deal that gratified her curiosity. In a letter to the *Evening Post*, she tells

WHERE INVENTIONS COME FROM.

"Since the organization of the Patent Office one hundred and ten thousand patents have been granted. Between five and six hundred of these were to citizens of foreign countries; the remainder to American citizens. The acting Commissioner, General Duncan, in an exceedingly able and interesting lecture delivered before the American Social Science Association last March, makes the following distribution of patents: 'To New England, about twenty per cent, Massachusetts having as her share ten per cent, and Connecticut five; to the Middle States, thirty-six per cent, New York alone receiving twenty-three per cent; to Ohio and Illinois seven per cent each; to California, two per cent.; and to the eleven States that engaged in the rebellion, but four and one half per cent.' In evidence of the impulse given to the southern mind by the removal of the institutions which produced such complete mental and physical stagnation, may be taken the fact that while, before the war, the agricultural inventions of the South were barely two per cent of the whole, they have, since the close of the war, reached seven per cent.

"Inventions are most numerous in agricultural implements and household conveniences. Of agricultural inventions, the greatest number is from the West; of inventions in manufactures, from New England and New York. The applications for patents form a curious index to the mind of the country. There are what may be called epidemics of invention. Whatever interest is dominant for the time being is almost unerringly indicated by the business of the Patent Office. It is like laying the finger on the pulse of the nation and counting its heart beats. During the rebellion, inventions and improvements in everything that could in any way be used in war, completely overwhelmed the examiners. During the velocipede mania four hundred and thirty-two applications were made for patents in four months' time. Never a great fire but brings out some improvement in fire-escapes or heating apparatus. Never a great burglary but is almost immediately followed by one or more inventions in locks. Scarcely a kerosene accident, but brings an improved burner. In this one article over four hundred patents have already been granted. Last spring, when so many banks were deceived by checks altered from small to large amounts, there were filed in less than a week over forty applications for patents for an invention by which such alteration could be at once detected. Each one of the forty applicants expected, no doubt, to make his fortune from so exceedingly useful and important an invention. They all embodied nearly the same idea; and an examination showed that a patent had been issued for the very same thing thirty years ago. When planchette was the rage a dozen inventions of that kind were before the examiner at one time. To all of them patents were refused on the ground that it was not a useful invention; but, on the contrary, decidedly pernicious and mischievous; many persons having thereby been rendered insane.

HOW TO GET A PATENT.

"Before granting a patent various questions besides the novelty of the invention are considered. This is, of course, the primary question, 'Is it new with the applicant?' The decision of this question involves an immense amount of labor and research; an examination of all the reports and drawings, not only of American patents but those of foreign countries, and numerous scientific works. Legal questions are also involved which must be carefully decided. The question of novelty being settled, that of utility arises. Is the invention useful; or is it trivial, inoperative, or positively injurious and hurtful? In either case a patent is refused. A notable case of refusal of a patent on account of the mischievous tendency of the invention occurred under the administration of Hon. Joseph Holt. The applicant desired a patent for 'a policeman's club, so constructed that, upon releasing a spring, a triple row of keen-edged lancets would leap from hidden recesses and mangle the hand of an adversary.' The applicant's professed object was to provide a weapon which should obviate the necessity of the carrying of firearms by policemen, and yet to furnish them with a full means of protection. The Commissioner refused the patent on the ground that while the professed object was a laudable one, 'the transforming of the implement to a weapon of offence in the hands of desperadoes, as would inevitably be done, would be a great evil.' In his decision occurs this forcible sentence: 'An invention, to be patentable, must not be useful to the few with a chance of its becoming hurtful to the many; but it must clearly appear that, in view of the interests of the whole community, the good would decidedly preponderate over the evil.'

"In almost all classes of invention the names of women appear as patentees. In articles of wearing apparel they are largely represented. Several improvements in cooking stoves bear female names. An Indiana lady has invented a fluting machine; another, within a few months, has taken out several patents for different improvements in the construction of axles; and women's names are attached to some valuable improvements in surgical apparatus, this last forming a strong argument in favor of the idea advanced by some eminent physicians that women are peculiarly fitted by nature for the study and practice of medicine.

A PLACE OF ARBITRATION.

"Leaving the 'model hall,' we descend to the lower floor, and passing the examiners' rooms; the library, with its twenty thousand volumes; the draftsmen's room, where are preserved drawings of every invention for which a patent has been sought since the organization of the office; the record room, where are the printed reports of patents granted, the issue of each week in a separate volume, we come to the sunny southeast corner, where, in a pleasant room, brightened by the most cheerful of inanimate things, a blazing wood fire, the Commissioner 'improves each shining hour.' We will go in here.

"The stream of business is at flood tide, and we sit quietly and watch and listen. One o'clock is set for the hearing of a case of interference.' An interference is a proceeding to determine which of two or more persons has the right to an invention, each claiming to be the first inventor. The principals are not present. Their respective attorneys argue the case—outwardly calm, inwardly raging. 'Their words were smoother than butter, but war was in their hearts.' The decision is made, and they retire; one jubilant, the other in an unmistakable fit of the sulks. 'Will the General see a gentleman?' inquires the magnificence at the door. The General will; and a quiet-looking elderly man enters, evidently under great excitement; that kind of excitement so intense that it produces a calm almost like death. He lays a model on the table. 'This does not represent my case,' he says. 'I find that the model is made wrong. This,' holding out a little piece of machinery, 'should have been put in instead of that. Can I substitute it now?' 'How is your drawing?' the Commissioner asks; 'does it correspond with this model, or with what you intended?' 'It is like this.' 'Then all you can do is to withdraw this and file a new application.' 'I have spent months upon this;' his hand trembles and there is a quiver in his voice. The General's keen eye takes it all in, and very gently he says: 'I wish I could do otherwise; but in these matters the office has no jurisdiction; we have to go according to law.'"

Law of Increase in the Population of the Globe.

The law of the relative increase in the numbers of mankind, and in the supply of food and other commodities required for their support may now be found in the following propositions:

Motion gives force, and the more rapid the motion the greater is the force obtained.

With motion matter takes on itself new and higher forms, passing from the simple ones of the inorganic world, and through those more complex of the vegetable world to the highly complicated forms of animal life, and ending in man.

The more rapid the motion the greater is the tendency to changes of form, to increase of force, and to increase of the power at the command of man.

The more simple the forms in which matter exists, the less is the power of resistance to gravitation; the greater the tendency to centralization, the less the motion, and the less the force.

The more complex the form, the greater becomes the power of resistance to gravitation; the greater the tendency to decentralization, the greater the motion, and the greater the force.

With every increase of power on the one hand, there is diminished resistance on the other. The more motion produced the greater must, therefore, be the tendency to further increase of motion and of force.

The most complex and highly organized form in which matter exists is that of man; and here alone do we find the capacity for direction required for producing increase of motion and of force.

Wherever the greatest number of men exist we should therefore find the greatest tendency to the decentralization of matter, to increase of motion, to further changes of form, and to the higher development commencing in the vegetable world and ending in the increased production of men.

With every increase in the extent to which matter has assumed the form of man, there should, consequently, be an increase of his power to control and direct the forces provided for his use; with constantly accelerated motion, and constantly accelerated changes of form, a constant increase in his power to command the food and clothing needed for his support.

In the material world, motion among the atoms of matter is a consequence of physical heat. Greatest at the equator, it diminishes until, as we approach the poles, we reach the region of centralization and physical death.

In the moral world it is a consequence of social heat; and motion, as has been already shown, consists in "an exchange of relations" resulting from the existence of those differences that develop social life. It is greatest in those communities in which agriculture, manufactures, and commerce are happily combined, and in which, consequently, society has the highest organization. It diminishes as we approach the declining despotisms of the East, the regions of centralization and social death. It increases as we pass from the purely agricultural States of the South towards the regions of more diversified industry in those of the North and East, and there, accordingly, do we find decentralization, life, and force.

Centralization, slavery, and death, travel hand in hand together in both the material and the moral world.

The view here presented differs totally from that commonly received, and known as the Malthusian law of population, which may thus be given:

Population tends to increase in a geometrical ratio, while the supplies of food increase in an arithmetical one only. The former, is, therefore, perpetually outstripping the latter, and hence arises the disease of over-population, with its accompaniments, poverty, wretchedness and death; a disease requiring for its remedy, wars, pestilences and famines on the one hand, or on the other, the exercise of that "moral restraint" which shall induce men and women to refrain from matrimony, and thus avoid the dangers resulting from addition to the numbers requiring to be fed. Reduced to distinct propositions, the theory is as follows:

1. Matter tends to take upon itself higher forms, passing from the simple ones of inorganic life to those more beautiful of the vegetable and animal life, and finally terminating in man.

2. This tendency exists in a slight degree in the lower forms of life, matter tending to take on itself the forms of potatoes and turnips, herrings and oysters, in an arithmetical ratio only.

3. When, however, we reach the highest form of which matter is capable, we find the tendency to assume it existing in a geometrical ratio; as a consequence of which, while man tends to increase as 1, 2, 4, 8, 16, 32, potatoes and turnips, herrings and oysters, increase only as 1, 2, 3, 4; causing the highest form perpetually to outstrip the lower, and producing the disease of over-population.

Were this asserted of anything else than man, it would be deemed in the highest degree absurd; and it would be asked, why a general law should here be set aside? Everywhere else, increase in number is in the inverse ratio of development. Thousands of billions of coral insects are needed to build up islands for men and animals that count by thousands or by millions. Of the *clio borealis*, thousands furnish but one mouthful for the mighty whale. The progeny of a single pair of carp would in three years amount to thousands of billions; that of a pair of rabbits would in twenty years count by millions; whereas that of a pair of elephants would not number dozens. When, however, we reach the highest form, we hear of a new law, in virtue of which man increases in a geometrical ratio, while increase of the commodities required for his use is limited to the arithmetical one.

Endowed with faculties that can be developed solely by association with his kind, made in the image of his Creator, and gifted with the power to distinguish right from wrong, man is thus required to choose between starvation on the one hand, or, on the other, abstinence from that association which tends, in accordance with the divine command, to promote increase of numbers. Such is the generally received doctrine of modern political economy, and, strange as it appears, no proposition has ever yet exercised more influence on the fortunes of the human race. That it should so have done has partly resulted from the fact that it has been propped up by another, in virtue of which man is supposed to have commenced the work of cultivation on the rich soils which would give large returns to his labors, and to have been compelled, with the growth of population, to resort to poorer ones, with constant decline in the reward of his toil—a theory that, if true, would establish the correctness of the Malthusian law of population.—*Carey's Social Science.*

Curiosities of Scientific Literature.

Among the curiosities of scientific literature, a little work, published a few years since, must find a place. It is entitled "Principles and Rudiments of Botany, delivered according to an Iulian system of arrangement and Iulian method of classification; by C. R. W. Watkins, Gent., late Captain in the Bombay Army." These "principles and rudiments" are here, according to the preface, delivered in language "better adapted for the intellectual amusement and instruction of young persons of both sexes" than that employed in previous works; and "Botanical science" is "rendered more agreeable to students in modern times." The following extract will give a faint idea of the mode in which these promises are fulfilled, and also of the contents of the volume: "The pink (*Dianthus*) has four or five idola, ten to twenty ikona, and twenty to forty petala. The flowers are few, and di, tri, quinque ligate, and they terminate separately and irregularly. The Sweet William (*Dirythme*) has two idola, ten ikona, and five petala. The flowers are numerous and chorovinkulate, and the mode of gemmation comprises several synterminal and equimarginal chorrythma, or conturrythma. They cannot, therefore, be of the same genus; because the numerical indices, and typical characters of each gemmos, or hermaphral gemm bud of the two kinds of plants, are not symbolical; but differ, as well as the mode of gemmation, more widely than the specific, and physical circumstances of their constitutional, or peculiar veget-organical structure."

Weights for Use in Experiments.

It is a source of constant annoyance to chemists and scientific investigators generally, that the minor weights in use are so small and so easily affected by atmospheric influence, that in a short time they cease to be trustworthy. The great requirement is a substance of less specific gravity than the copper, brass, or platinum, usually employed, and not liable to tarnish by exposure to the air—for which the proper name is decay. Dr. Phipson, of England, relates that he has used a set of weights made of aluminum, well known as the metal of the least specific gravity, for the last ten years, by MM. Collet Frères, of Paris. The doctor always touches the weights with pliers made of soft brass, and exposes them as little as possible to the air of the laboratory. He reports that they are almost as brilliant in color as when new, and although they have been used twice or thrice a day for the whole ten years, they are still perfectly accurate. Brass or copper will yield to the atmosphere an appreciable fraction of its gravity; and the small weights made of either metal are very troublesome to handle, and are likely to lead to errors. The aluminum is better for the purpose than even German silver and its kindred alloys, which are remarkable for their resistance to tarnish. Makers of scales for scientific purposes or druggists' use, will do well to note these facts.

Canadian millers are largely importing wheat from Chicago and Milwaukee.

THE INCRUSTATION OF BOILERS.

[Condensed from Engineering.]

It is somewhat curious that while the complaints of inconvenience resulting from the incrustation of boilers are so numerous, the attempts to avoid those inconveniences by providing boilers with pure water should be so few. Boiler owners are ready enough to patronize patent fluids, compositions, and a variety of nostrums having for their object the prevention of incrustation, but we rarely find efficient appliances in use for purifying the water before it enters the boiler, and thus rendering such doctoring as we have just referred to unnecessary. It must not be supposed, from what we have just said, that we object *in toto* to the employment of chemical means for preventing incrustation; on the other hand, we believe that such means may be employed with great advantage in a vast number of cases, but we consider, first, that chemical "anti-incrustators" should not be applied indiscriminately and without a knowledge of the impurities which it is desired to remove; and, second, that as far as possible the purification of the feed water should be effected before it enters the boiler, and not in the boiler itself.

Many of our manufacturing towns are, as is well known, very badly off for water available for use in boilers, and pre-eminent amongst these towns is Oldham. Oldham stands on elevated ground, and is supplied with water conveyed a considerable distance from boggy ground at a higher level, and the supply is, moreover, so limited that the foul water from drains has to be used for boilers and for condensing purposes. Under these circumstances it has, of course, been necessary to provide means for purifying the water. In the first place, to make the water fit for use for condensing purposes, it is made to pass in succession through three settling reservoirs, the second reservoir receiving the overflow from the first, and so on. The injection water is taken from the last reservoir and the waste water from the hot well flows back into the second. The boilers are fed from the hot well, the feed being filtered on its way to the boilers. In one establishment the filters consist of a number of vertical cast-iron vessels strong enough to stand an internal pressure of 25 lbs. per square inch more than the boiler pressure; these vessels being each provided, at about the middle of its hight, with a perforated plate or grating, on which a layer of calcined bones, about 3 ft. in thickness, is placed. The water is forced by the feed pump up through these bones, and is led off from the top of the filter to the boiler. The water in the hot well is so filthy that the bones become choked with dirt in about half a day's working; and each filter is therefore cleansed twice a day—namely, during the dinner hour and at night—by blowing steam downwards through it. By this simple means the bones are thoroughly cleansed and the filters made ready for work again. The results obtained by the use of the plans we have described have been of a very satisfactory kind, and the whole arrangement is so simple as to commend itself at once to those suffering from the use of very dirty water.

In the case of non-condensing engines an arrangement of feed-heater in addition to the filters is employed, so as to obtain a supply of hot clean water. For this purpose the water is conveyed from the last settling reservoir into a covered tank, 6 ft. deep by 6 ft. 3 in. wide, having the water level regulated by a ball-cock, so that it is maintained 9 in. below the cover. At one end there is fixed on the cover a vertical cylindrical feed-water heater, 12 ft. high by 2 ft. 6 in. in diameter, this heater being traversed by tubes, whilst at the opposite end of the cover stands a vertical pipe, 20 in. in diameter, 30 ft. high, and open at the top. By means of a circulating pump the water is lifted from the cistern and made to fall in a shower down the pipe just mentioned, meeting in its course the exhaust steam from the engines, which is made to pass down through the tubes of the feed heater, then over the surface of the water in the tank, finally rising up through the vertical pipe, to be met by the falling shower. By this arrangement the water in the tank is heated to about 170°, at which temperature it is taken off by the feed pump and forced, first through a bone filter, and then through the feed-water heater to the boiler, which it enters at a temperature of about 210°. By the employment of this arrangement, an important saving has been effected in fuel and labor, and the boiler, which formerly had to be cleaned out every week or fortnight, now has to be cleaned at holiday times only.

In many cases trouble is experienced from the presence of an excessive quantity of bicarbonate of lime in the water used for feeding boilers, and in such cases Clark's process for purifying the water might frequently be resorted to with advantage. It is very usual to speak of the presence of large quantities of carbonate of lime in water, but this is an error, the carbonate of lime being almost insoluble, a fact on which Dr. Clark's process is founded. This process consists, as many of our readers are no doubt aware, in treating the water containing the bicarbonate of lime which it is desired to remove, with lime water, or a kind of milk of lime, the effect being that the lime thus added deprives the bicarbonate of a portion of its carbonic acid, thus converting it—and being itself also converted—into carbonate of lime, which, being almost insoluble, is deposited. The greater part of the lime will be deposited in the mixing tank; the water drawn off may be subsequently filtered by passing it slowly upwards through another tank partially filled with small pieces of coke. The coke is contained in a loose cylindrical casing within the tank, so that it can be conveniently renewed when clogged with lime. This apparatus has been at work over two years, and it has been found to be very effectual in keeping the boiler clear of all hard scale.

Although, however, the adoption of such methods of purification as those above described will be found exceedingly beneficial in a vast number of cases, yet we believe that ultimately it will be acknowledged that the only true remedy for bad water is the adoption of surface condensers. In applying surface condensers to land engines arrangements will in many cases have to be adopted differing greatly from those employed at sea. The condensing water available on land, in many instances is of such an impure kind that such condensers as are fitted to marine engines would be clogged by it in less than a week. In these cases the condensers should be so arranged as to permit of all parts being thoroughly accessible, and they should be made to stand rough work. Where the condensing water contains much floating matter, and where appliances for purifying it cannot conveniently be provided, evaporative surface condensers are particularly suitable, as they can be made without any passages to clog up, and with all the surfaces in contact with the condensing water fully exposed at all times. Condensers of this class, in fact, have been far from receiving the attention to which their simplicity and the comparatively small amount of water with which they can be worked, entitle them. Probably the chief objections to them are their cost and the space they occupy; but the first can scarcely be considered excessive, when their advantages are taken into consideration, and by a little management they can generally be arranged to occupy space which would not otherwise be turned to account.

In instances where, from some cause or another, surface condensers cannot be applied, and where, notwithstanding bad water being used, elaborate arrangements for treating it cannot be employed, attempts should still be made to cause the water to deposit the greater part of its impurities in a separate receiving vessel, in which the water may be heated under pressure, rather than in the boiler itself. The boiler should only be allowed to receive with the water such matters as cannot practically be removed elsewhere, and if this result were generally sought after, we should hear little of over-heating, distorted flues, and a host of other troubles which now annoy the boiler proprietor, to say nothing of the more serious failures which are but too frequently caused by incrustation.

THE LAND OF FIRE AND ICE.

By Professor Willard Fiske, in the Cornell Era.

Was there ever such an anomaly as the island of Iceland? Geographically it belongs to the Western continent, and yet, historically and politically, it is a member of the Eastern. It lies close under the Arctic circle, where winter prevails during three quarters of the year, and is surrounded by seas filled with icebergs; and yet boiling geysers and fountains of heated steam burst everywhere from its surface, while great volcanoes pour down into its valleys and upon its plains streams of molten lava. The nearest neighbors of the Icelanders are the Eskimos of Greenland; yet while the Eskimos are sunk to the nether level of ignorance, the Icelanders have raised themselves to an elevated plane of enlightenment. And so the wonderful island lies there, a link between the two hemispheres; a site where the most opposite of elements, heat and cold, are constantly contending for sovereignty; the seat of a race of the highest civilization in close contact with a race of the lowest barbarism. Nor does this end the chapter of contradictions. Lying almost beyond the range of either animal or vegetable production, the island still yields commodities which many more favored localities cannot furnish. It rivals semi-tropical Italy in the value of its sulphur mines, temperate Germany in the variety of its mineral waters, Scotland and Norway in the fertility of its salmon fisheries, and annually produces, in proportion to its population, three times the number of horses and sheep raised in our own State of New York. It exports several articles which are either found nowhere else, or, if found, are of greatly inferior quality, such as the down of the eider duck, which makes its way to every palace, and upon which the heads of all the kings of the earth easily or uneasily lie, the feldspar so largely used in optical experiments, and that semi-carbonized wood, known as surtubrandur, which, as a material for the manufacture of furniture, equals the famous ebony of the tropics. A land of glaciers, and suffering keenly from the chill winds that blow off the icy shores of Greenland, Iceland's chief harbors are open all the year round, while those of the Baltic, far to the south, are frequently closed. A treeless country, its inhabitants often burn the costliest of woods—mahogany, rosewood, and Brazil wood—which has been borne to them from the tropics, at no expense for freight, by the current of the Gulf Stream. A land where wheat will not ripen, its people possess in abundance a vegetable growth, the *lichen islandicus*, which, in far richer countries, is accounted a luxury. A nation almost destitute of schools, all of its sons and daughters are taught to read and write from their earliest years.

The history and philology of the island present features equally strange and striking. It is the smallest of all Teutonic communities, while its speech is the most ancient, and, grammatically, the richest of all the Teutonic dialects. In it are preserved the oldest poems, the oldest political orations, and the oldest religious ideas of our race. It is, as has been said, the feeblest of all Teutonic communities, yet it was the first to develop a republican system of government, the first to establish trial by jury, the first to compile codes of law. The colonization of the island furnished a parallel in the ninth century to the colonization of New England in the seventeenth, its pioneers seeking its barren shores for the self-same reason that led the Puritans to the rock-bound coasts of Massachusetts and Connecticut. Its sturdy sons helped to delay the fall of the Eastern Empire by enlisting in the body guard of the Byzantine monarchs; took part, under Rurik, in the foundation of the Russian monarchy; took part, under Rollo, in the establishment of that Norman dynasty which subsequently conquered England; set up kingdoms, and left traces of their speech, in Ireland and Scotland; built churches and towns in Greenland; and preceded Columbus, by five hundred years, on the dreary, watery path which led to the mainland of America.

No nation so small as Iceland has so large a literature The number of printed books amounts to many thousands, and the number of unprinted works, preserved as manuscripts in the public libraries of Europe, is at least equally great. Nor is this literature, as is the case with many minor nationalities, and with most colonial communities, made up of translations, but is almost wholly composed of original works. With the exception of the Bible and a few theological works, Homer and one or two other classics, Milton, Klopstock, Pope, and portions of Shakespeare, Byron, and Burns, very little of the literature of other nations has been translated into Icelandic. The modern literature, especially of this century, is rich in poetry and in poetical works.

The Icelandic throws a flood of light upon the history of the English language. In their early stages, so nearly connected were the two tongues that we can very well imagine an intelligent Anglo-Saxon and an intelligent Icelander making themselves mutually understood, with some little slowness and difficulty perhaps. At a later period the Icelandic greatly influenced the English, especially in its northern dialects, so that most of the dialectic words used by Burns are at once comprehensible to the student of the insular language. Yet, notwithstanding its importance to the English scholar, the Icelandic has hitherto been, to the great mass of students of English lineage, a sealed book. While the philologists of Scandinavia were making broad reputations by their investigations in the old Northern domain, while the philologists of Germany were cleverly availing themselves of this field, the English knew so little of the harvest which was awaiting the reaper, that the number of men in England and America who had ever paid any attention to Icelandic might almost, until within the last decade, have been reckoned up on the fingers of a single man. But in England a new era has dawned. The labors of Laing and Dasent and Thorpe in Icelandic literature are beginning to excite interest in the Icelandic language, and a great impulse has latterly been given to the new movement by the publication of the first part of an excellent Icelandic-English lexicon, through the agency of the University of Oxford.

But through it all, through the present days when its speech opens up a mine of wealth to the linguist of every Germanic tribe, as through those past days when its writers were the chroniclers of all the neighboring Germanic nations, the venerable island floats upon the gray waters of the distant Northern sea, the wonder alike of the naturalist and the philosopher. The former sees in it a display of nature's powers under forms which they nowhere else assume; the latter sees in it a nation, weak in numbers, maintaining unchanged for almost a thousand years, against obstacles never before surmounted by man, its language, its literature, and its customs.

The Prussian Percussion Fuse.

The percussion fuse used by the Prussian artillery consists of a small metal socket into which fits a metal striker, which is a nearly cylindrical piece of brass, having at one end a needle point. The socket with the striker in it is carried in the shell, being fixed in its place by means of a screw plug which screws into the nose of the shell. The screw plug is tapped for the reception of a small detonator, which, however, is not screwed in until the shell is required to be used. The striker, being free to move forward by its own weight, would, of course, be liable directly the detonating plug is screwed in, to cause an explosion by falling forward upon it, either by the accidental tilting forward of the head of the shell, or from the jar given in loading, or by the sudden movement of the parts at the moment of firing. To prevent this, a stout iron pin is passed through the head of the shell, and through the fuse between the striker and the detonator, preventing any contact between the two. The centrifugal force generated by the rotation of the shell throws out the pin immediately the shell has left the bore, and there is now nothing to prevent the striker from coming into contact with the detonator. But this it cannot do until something occurs to suddenly check the flight of the shell—in other words, until the projectile impacts upon the ground or against some obstacle, such as a man's body, which will momentarily reduce its velocity. At that moment the striker falls forward, on the same principle and from the same cause as a bad rider is thrown over his horse's head when the beast stops suddenly in its gallop. These fuses have been much extolled, and some writers have not hesitated to ascribe to them a great part of the successes of the Prussian artillery, yet, says the *Pall Mall Gazette*, they are open to many serious objections, and very far from uniform or satisfactory in their action, even in peace time. The Belgians, who copy the Prussians very closely in their artillery *matériel*, use the Prussian percussion fuse, and Capt. Nicaise says that out of 8,245 shells and shrapnel fired with this fuse between 1863 and 1869, there were 128 premature bursts=1·5 per cent; 433 fuses slow in action=5·25 per cent; 131 blind fuses=1·59 per cent; being a total of 692 failures=8·39 per cent. Exception may also be taken to the employment of a fuse which necessitates the operation of fixing a detonator and pin at the moment of firing—an operation which has to be very carefully performed for fear of accidents. If in the hurry of action the pin should be omitted, or if it should fall out of the shell, or if the man holding the shell and charged with the duty of keeping the pin in its place should happen to be shot, an ac cidental explosion, likely to be attended with fatal consequences to the gun detachment, must also certainly result. Other reasons might be given for not accepting the high estimate of this fuse, which, on insufficient grounds, seems to have been hastily formed. That the fuses have done better than the exceedingly defective French time fuse, does not prove much. Nevertheless, it may be fully admitted that the percussion fuse problem is very far from having yet been satisfactorily solved by our artillerists. It is one of exceeding difficulty; and it is quite certain that if not solved in England, they are just as far or farther from having satisfactorily solved it in Prussia. In France it seems to have been abandoned in despair, and Belgium can think of nothing better than following the Prussians.

The Catacombs of Rome.

Few travelers come to Rome without making a visit to the Catacombs, although few penetrate far into those dark and intricate recesses. Their origin is unknown—at least, there are no authentic records of their excavation. The purpose for which they were last used—the burial of the Christian dead—does not necessarily indicate the purpose for which they were formed. It is probable that they were dug out in order to obtain, for building purposes, the volcanic stone and sand which underlie the whole Campagna; but when, or by whom, is not known. The excavations may have been commenced before the time of the ancient Romans; but if so, they were continued in their day, as they contained the material required for the construction of many of their works. It was taken out by quarrying or digging, leaving only enough to sustain the superincumbent mass of earth. They are of great extent, reaching in every direction as far as modern research has extended. The whole Campagna is honeycombed by them. Openings occur in various places, and accidents have not been uncommon, in which riders over the Campagna have broken in and sustained severe injury. They are regarded as so unsafe, that visitors are usually taken only through a limited portion of those connected with the Church of St. Sebastian on the Appian Way. The rock and earth are liable to fall, and sad indeed would be the fate of those who should be buried beneath the falling mass; and sadder, yet, of those whose retreat should be cut off, while they were left to wander hopelessly, until compelled by weariness and weakness to lie down and die. Several years ago, a school, consisting of a teacher and more than twenty boys, descended into this subterranean city of the ancient dead, but not one of them returned to tell what was their fate. The fall of the earth over one of the passages by which they had left the main route, rendered their escape by the same way impossible; and although diligent search was made, nothing is known to this day of how or where in the vast labyrinth they met their death.

The peculiar interest attaching to these Catacombs is, that during the early ages of Christianity, in the times of persecutions by the Roman Emperors, they were the resort of Christians who fled to these recesses for safety, and probably to some extent for worship.

The passages are very narrow, not more than three or four feet wide, and about six feet in hight. On each side and throughout their whole extent they are lined with niches, or shelves, cut into the wall one above another and usually four or five in hight, in each of which there was just room for a body to be laid lengthwise. The fronts of the niches were closed with long slabs of terra cotta, cemented. Occasionally marble was used, with an inscription, containing some motto or symbol expressive of the wishes or hopes of the living for the dead. These niches are now all tenantless and open, but we could see where the dead had been reposing. The inscriptions are preserved elsewhere as relics. One of the long halls of the Vatican is lined with the marbles taken from these tombs.

The Catacombs connected with the church of St. Agnese, in another part of the Campagna, are nearly in the state in which they were discovered. The excavations are much more regular and on a larger scale than those which we had previously seen. Instead of being more unsafe, as they are generally supposed to be, they are less liable to crumble and fall. The rock in which the excavations are made is more solid, allowing the passages to be cut with more exactness, and they run often to a great distance in a right line. The roofs are vaulted with regularity, and the sides cut perfectly square. The same niches occur as in the other Catacombs, and rise above one another to the number of five or six, but they have not been rifled excepting to remove the slabs and inscriptions. The bones of the dead by hundreds and even thousands are lying where they were deposited sixteen or eighteen centuries ago.

After walking for a long time through these halls, some seventy feet below the surface of the ground, and having entered several chambers painted rudely in fresco, we ascended to another story, but not to the light of day. These passages are generally two or three stories in hight, but seldom have any intercommunication. The air is exceedingly dry, and the temperature higher than that of the air above, but after a time it becomes stifling, although there is nothing unpleasant in other respects. It appears to be perfectly pure.

The inscriptions which are found upon the marble slabs with which the niches were closed, are an interesting study, and may be seen at any time in the main entrance to the museum of the Vatican. There are many pieces of rude sculpture in bas-relief, representing Scripture scenes, and generally those scenes which were most appropriate to the persecuted state of the early Christians. The three children in the fiery furnace, and Daniel in the lion's den, are frequently represented. The baptism of Christ and various scenes in his life are sculptured in the same manner. The dove, as an emblem of peace, occurs very often. I give the translation of a few as a specimen:

"Lannes, the martyr of Christ, rests here. He suffered under Diocletian."

"In the time of the Emperor Adrian, Marius, a young military leader, who had lived long enough: with his blood he gave up his life for Christ. At length he rested in peace. The well-deserving, with tears and fears, erected this on the Ides of December, VI."

"Here lies Gordianus, deputy of Gaul, murdered with all his family for his faith. They rest in peace. Theophila, his maid, erected this."

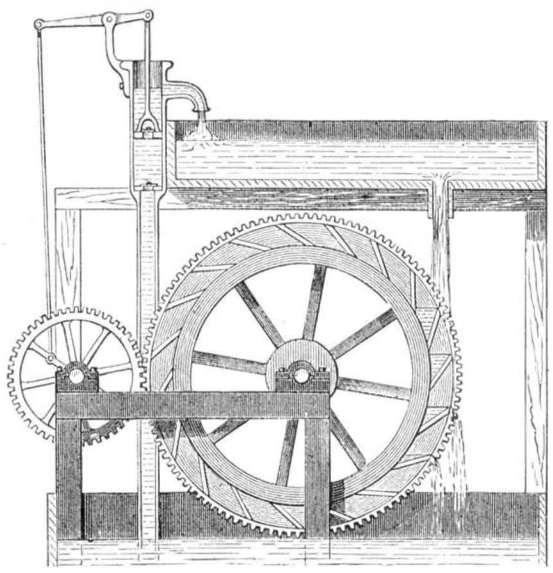
"In peace," and "In Christ," frequently occur upon the slabs which closed the graves.—*N. Y. Observer.*

PERPETUAL MOTION.

NUMBER XI.

Fig. 24 shows a principle so often employed for the production of self-moving machines that it ranks next to that of perpetually eccentric weights, in its delusive power upon minds of inventors. The attempt to compel a water wheel to raise the water which drives it, is, in one form or other, perpetually recurring in devices upon which our counsel and opinion is sought. The worst of the matter is, that in most

FIG. 24.



cases our advice to drop such absurd projects is received as evidence of our want of sagacity and knowledge, and our would-be client becomes the dupe of some not over conscientious patent agent, who pockets his fee, and laughs in his sleeve at the greenness of the applicant.

The device illustrated is one submitted by one of these enthusiastic individuals who, without understanding the first principles of mechanics, believes he is about to revolutionize the industry of the world by his grand discovery; and as honor, and not pecuniary reward, is his object, he seeks to make public his invention through the wide circulation of this journal. He is quite willing we should adversely criticise the device, because its merits are so great that no amount of skepticism, resulting from our blind prejudice, can, he thinks, influence candid minds against a principle so obviously sound and sublimely simple. It is unnecessary for us to describe the device, as it explains itself. The inventor has not tried it to see whether it will work. What need, when anybody can see on paper that "*it must go?*"

FIG. 25.

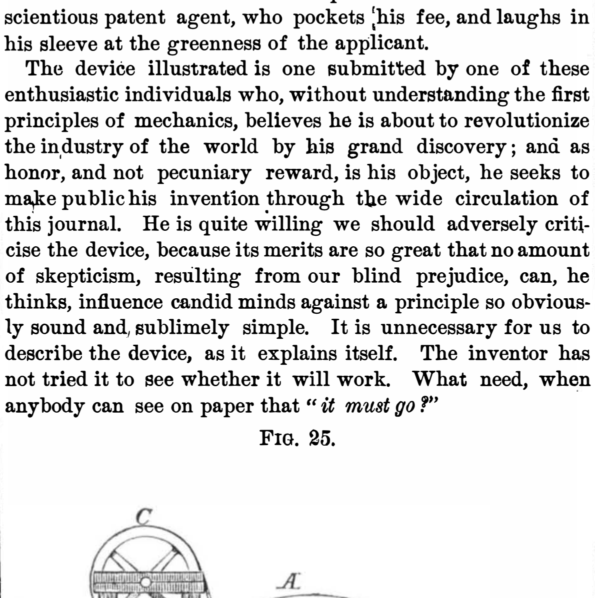


Fig. 25 represents an attempt at securing the desired object by means of eccentric weights, kept so by means of an endless belt and pulleys, of which the inventor thus writes:

The annexed drawing shows how I have at length taken this enticing jilt (perpetual motion), though after a long and weary chase—

Through pleasant and delightful fields,
Through barren tracts and lonely wilds;
Mongst quagmires, mosses, muirs, and marshes
Where deil or spunkie never scarce is!
By chance I happened on her den,
And took her where she didna ken.

A represents a wheel with twelve hollow spokes, in each of which there is a rolling weight or ball. B is a belt passing over two pulleys, C. There is an opening round the wheel from the nave to the circumference, so as to allow the belt to pass freely and to meet the weights. The weights are met by the belt as the wheel revolves, and are raised from the circumference till they are at last brought close to the nave, where they remain till, by the revolution of the wheel, they are allowed to roll out to the circumference. By this arrangement, the weights are, on one side of the wheel, always at the circumference, so that that side is more powerful than the other, which causes the wheel continually to revolve. D is the frame of the machine. The arrow points out the direction in which the wheel turns.—DIXON VALLANCE, Liberton Lanarkshire, Nov. 10, 1825.

In 1612, Thomas Tymme, Professor of Divinity, published a philosophical dialogue, in which he discourses of the perpetual motion invented by Cornelius van Drebble, a Dutchman, who was engineer to King James, in England.

Tymme's work is a small quarto. The author's name on the title papers occurs in the smallest type. It is repeated again in full—'Thomas Tymme'—both to the dedication "To the right Honourable Sir Edward Coke, Lord Chiefe Justice, &c., &c.," and also the Address to the Reader, which latter concludes:

And for that rare things move much, I have thought it pertinent to this Treatise, to set before thee a most strange and wittie invention of another Archimedes which concerneth Artificial perpetual motion, immitating nature by a lively patterne of the Instrument it selfe, as it was presented to the King's most royall hands, by Cornelius Drebble, of Alchmar in Holland, and entertained according to the worthinesse of such, a gift my paines herein bestowed and intended for thy profit and pleasure, if it seeme but as iron, yet let it serve for the Forge and Anvill of good conceit, if the discourse seeme rough, shadow it, I pray thee, with the curtaine of smooth excuse: &c.

The work is divided into two parts, the first containing six, the second four chapters.

Chap. 3.—Concerneth the nature and qualitie of the earth: and the handling of a question whether the earth hath naturall motion or no.

Also herein is described an Instrument of Perpetuall Motion, as stated in the list of Contents.

At page 56 commences chapter 3, from which we extract the following:

PHILADELPH.—For as much as the Earth and Sea make but one globous body united and combined together, I pray you describe the form thereof to me.

This is explained by Theophrast—the dialogue occupying four pages—at last he says:

. . . And to make plaine the demonstration unto you, that the Heavens move, and not the earth, I will set before you a memorable Modell and Patterne, respecting the motion of the Heavens about the fixed earth, made by Art in the imitation of Nature, by a gentleman of Holland, named Cornelius Drebble, which instrument is perpetually in motion without the meanes of Steele, Springs, and waights.

PHIL.—I much desire to see this strange Invention. Therefore I pray thee, good Theophrast, set it here before me, and the use thereof.

THEO.—It is not in my hands to show, but in the custody of King James, to whom it was presented. But yet behold the description thereof here after fixed.

PHIL.—What use hath the globe, marked with the letter A?

THEO.—It representeth the Earth: and it containeth in the hollow body thereof divers wheels of brasse, carried about with moving, two pointers on each side of the Globe doe proportion and shew forth the times of dayes, moneths, and yeeres, like a perpetuall Almanacke.

PHIL.—Both doth it also represent and set forth the motions of the Heavens?

THEO.—It setteth forth these particulars of Celestiall motion. First, the houres of the rising and setting of the Sunne, from day to day continually. Secondly, hereby is to be seene, what signe the Motion is in every 24 houres. Thirdly, in what degree the Sunne is distant from the Moone. Fourthly, how many degrees the Sunne and Moone are distant from us every houre of the day and night. Fifthly, in what signe of the Zodiacke, the sun is every Moneth.

PHIL.—What doth the circumference represent, which compasseth the Globe about?

THEO.—That circumference is a ring of Cristall glass, which being hollow, hath in it water, representing the sea, which water riseth and falleth, as doth the floud, and ebbe twice in 24 houres, according to the course of the tides in those parts, where this instrument shall be placed, whereby is to be seene how the Tides keepe their course by day or by night.

PHIL.—What meaneth the little globe above the ring of the Glasse?

THEO.—That little Globe, as it carrieth the forme of a moone cressent, so it turneth about once in a moneth, setting forth the encrease and decrease of the Moone's brightnesse, from the wane to the full, by turning round every moneth in the yeere.

PHIL.—Can you yeeld me any reason to perswade me concerning the possibility of the perpetuity of this motion?

THEO.—You have heard before that fire is the most active and powerful Element, and the cause of all motion in nature. This was well knowne to Cornelius, by his practise in the untwining of the elements, and therefore to the effecting of this great worke, he extracted a fierie spirit, out of the minerall matter, joining the same with his proper aire, which encluded in the Axeltree, being hollow, carrieth the wheeles, making a continuall rotation or revolution, except issue or vent be given to the Axeltree, whereby that imprisoned spirit may get forth. I am bold thus to conjecture, because I did at sundry times pry into the practise of this gentleman, with whom I was very familiar. Moreover, when as the King, our Soveraigne, could hardly beeleve that this motion should be perpetuall, except the misterie were revealed unto him: this cunning Bezaleel, in secret manner, disclosed to his Majestie the secret, whereupon he applauded the rare invention. The fame hereof caused the Emperor to entreate his most excellent Majestie to licence Cornelius Bezaleel to come to his Court, there to effect the like Instruments for him, sending unto Cornelius a rich chaine of gold.

PHIL.—It becometh not me to make question concerning the certaintie of that, which so mighty Potentates out of the limity of their wisedomes have approved, yet me thinketh that time and rust, which corrupteth and weareth out all earthly things, may bring an end to this motion in a few yeeres.

THEO.—To the end of time may not weare these wheeles by their motion, you must know that they move in such slow measure, that they cannot weare, and the lesse, for that they are not forced by any poyse of waight. It is reported in the preface of *Euclydes Elements*, by John Dee, that he and Hieronimus Cardanus saw an instrument of perpetuall motion, which was solde for 20 talents of gold, and after presented to Charles the fift, Emperour: wherein was one wheele of such invisible motion, that in 70 yeeres onely his owne period should be finished. Such slow motion cannot weare the wheeles. And to the end rust may not cause decay, every Engine belonging to this instrument, is double guilded with fine gold, which preserveth from rust and corruption.

PHIL.—This wonderful demonstration of Artificiall motion, immitating the motion Celestiall, about the fixed earth, doth more prevaill with me to approve your reasons before aleadged, concerning the moving of the Heavens, and the stability of the Earth, then can Copernicus assertions, which concerne the motion of the Earth. I have heard and read of manie strange motions artificiall, as were the inventions of Boetius.

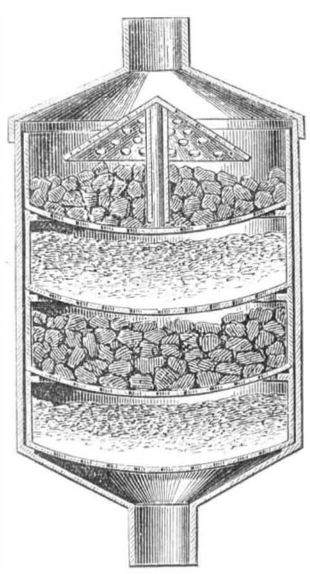
After enumerating these and others, Phil. concludes:

These were ingenious inventions, but none of them are comparable to this perpetuall motion here described, which time by triall in ages to come, will much commend.

THEO.—These great misteries were attained by spending more oyle than wine: by taking more paines than following pleasure.

IMPROVED CISTERN FILTER.

This filter is the invention of G. W. Lampson, of Waterloo,

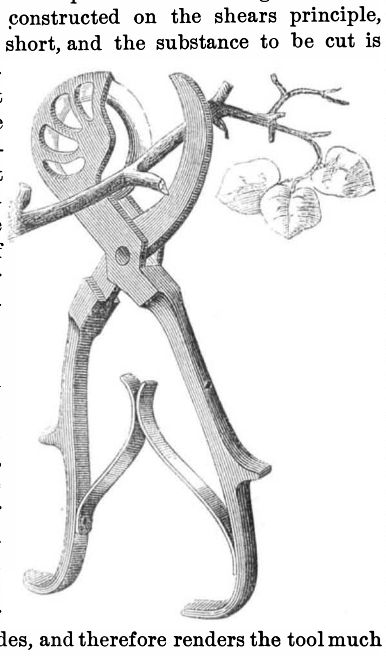


N. Y. It consists in a series of pans arranged one above the other, in the manner shown, in a suitable receptacle. Charcoal and gravel may be used as filtering material, or any other approved material found convenient may be substituted. The water entering the filter falls upon a perforated cone, which distributes it over the filtering material in the upper pan. It then passes through the substances placed in the lower pans, and is drawn off free from impurities at the bottom.

PRUNING SHEARS.

It is well known that a curved edge, or one which cuts obliquely across the grain of wood, is more effective than a straight edge, cutting square across the grain. This principle has long been recognized in the construction of turning tools, carving tools, axes, etc.; and even in the use of tools with straight edges, the apprentice soon learns unconsciously to give the edge a slight inclination, finding that in that position the cutting is accomplished with much greater ease.

In the use of tools constructed on the shears principle, where the blades are short, and the substance to be cut is thick, the latter is liable to be thrust out from between the blades, and thus defeat the attempt at cutting it. Especially has this been the case in the use of shears for pruning trees, vines, and hedges where the branches vary greatly in size. The invention shown in the annexed engraving shows a form of pruning shears, wherein the principle of inclined cutting edges is combined with a curved blade, which prevents the branch from slipipng



from between the blades, and therefore renders the tool much more effective than those with straight blades. The branch is also liable to force its way between the blades and strain the pivot. In this device this is prevented by a blunt blade, which construction gives two points of support for the branch instead of one, as in the old form of shears.

This tool is the invention of George H. Clinton and D. H. Harris, of New Haven, Conn., and has been patented.

American Needles.

A new demand for articles of American industry has, says the *Bureau*, just come to light in the shape of an order from England, to the agent of one of the largest manufacturers in this country, for 50,000 American needles to be sent to Birmingham, England, which was for years the only city in the world in which the manufacture of needles and fish-hooks in a large scale was carried on. For something more than a year past the same concern has been shipping fish-hooks to England in considerable quantities. The reason for this order is that we are making good needles cheaper than they can be made in the Old World, on account of the improved machinery in use in our factories. This exchange of business seems very strange at first, but we will soon become accustomed to it and expect it. A large number of articles are now made here for shipment to England and the Continent, which a few years ago were not manufactured in this country at all; and many articles are now exported, which we have procured abroad for many years, and which are now made much cheaper in this country than any other.

The Broken Atlantic Cables.

The recent failure of the two British cables leaves both continents at the mercy of the single French submarine telegraph, and considering that damage to the latter may occur at any time, it is of the utmost importance to the commercial world that the repairs be made at once.

What the trouble is, with the two cables that have ceased working, is difficult to apprehend, but that some under-current has moved the cables upon the edge of a cliff or rocky point, till the coatings are abraded and insulation destroyed, is not improbable. The *Robert Lowe* (British steamer) is at St. John's, Newfoundland, on a grappling and repairing expedition, and it is to be hoped that we may soon hear that both cables are perfect and communication restored. The survey of the bed of the Atlantic ocean is now so complete, that, in any future cable there will be less difficulty in placing portions of wire rope, heavier and better protected, in such parts as the difficult places at the bottom of the sea may make necessary.

The damage is known to have occurred at about 65 miles from Heart's Content, Newfoundland. The grappling for the cables is simple enough, but the rough weather, usual at this time of year, off Cape Race, may delay the completion of the work until Spring.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

A Defect in the Patent Law of 1870.

MESSRS. EDITORS:—Allow me to call your attention, and that of your readers, to the closing paragraph of section 33 of the new patent law. The whole section reads as follows:

SEC. 33. *And be it further enacted*, That patents may be granted and issued or reissued to the assignee of the inventor or discoverer, the assignment thereof being first entered of record in the Patent Office; but in such case the application for the patent shall be made and the specification sworn to by the inventor or discoverer; and, also, if he be living, in case of an application for reissue.

This closing paragraph enacts that all applications for reissues shall be sworn to by the original inventor, if he be living.

This is not only a great hardship on assignees, but will probably prove disastrous to inventors, if it be not speedily abrogated. The hardship of it upon assignees is well illustrated by a case which has lately come up in my practice as an attorney. A manufacturing company paid some $30,000 to an inventor, for his patent of an improvement in the manufacture of an article which is one of their staples. He squandered the money, and then attempted to make precisely the thing he had before sold to the company, who, of course, resorted to legal proceedings and stopped him. This naturally left bad blood between them.

Now other parties, having discovered an oversight in this patent, have procured patents based thereon, and are proceeding to claim as their own that which plainly belongs to the company. To stop these pirates, it is first necessary to reissue the company's patent; but, under the present law, to do this, they must procure the oath of the original inventor, who would about as soon part with his right hand as thus oblige the company. It is useless to talk about bills in equity; he would soon put himself beyond the bailiwick of any officer, if this were attempted. Now, is this an isolated case? Probably four out of every ten assignees would at this moment find it very difficult to ascertain the whereabouts of their assignors, and equally difficult to procure their oaths when found, except upon payment of considerable, and oftentimes large, sums of money.

In just the degree that this provision is found a hardship on assignees, will it prove disastrous to the interests of inventors, as a rule. To a large majority of inventors their inventions are valueless if they cannot sell them, for very few inventors are, themselves, possessed of means to manufacture and introduce their inventions; and if purchasers are to be practically almost deprived of the right to reissue the patents they purchase, thus putting it out of their power to suppress ingenious evasions of their rights, they will be very slow to purchase even valuable inventions. Poor inventors find abundance of difficulty now in disposing of their patents, and they can ill afford to have this heavy load put upon their camel's back. They will surely revolt when they come to understand the practical working of this seemingly harmless little enactment.

The new patent law was, probably, drafted by the late Commissioner of Patents; and this provision must have taken its rise in a curious hostility that he seems to have had against reissues, a hostility that he carried so far as to push him into —as the writer believes—an unprecedented overslaughing of the acts and decisions of his predecessors—a charge which, when made, it is perhaps well to illustrate.

The writer had, during the late Commissioner's term of office, occasion to prosecute an extension case on a reissued patent, before the Office; it was favorably reported upon by the examiner who had it in charge, and on the last day before the expiration of the patent it came before the Commissioner in person for his final approval. He made no objection to the findings and decision of the examiner below, but refused the extension on the ground that the reissue contained new matter not in the original patent.

Now, as this very question had been expressly decided upon when the patent was reissued by one of his predecessors, every way competent and fit for his office; and as a Commissioner is not, in law, a court of appeal to overturn the decisions of his predecessors; and as the late Commissioner, being a trained lawer, cannot be ignorant of the true doctrine of *stare decisis*, it is fair to put this act down as most arbitrary, and, with his approval of the enactment spoken of above, as indicating a strong hostility to reissue.

Inventors and owners of patents should lose no time in pressing upon their Representatives and Senators in Congress, to have this enactment repealed, and that right speedily.

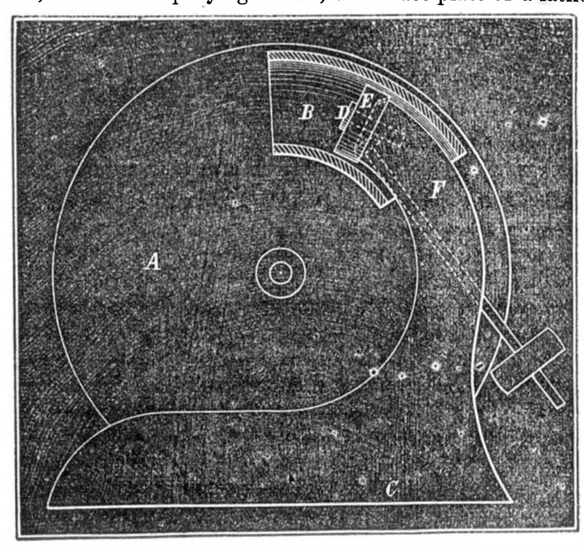
W. E. SIMONDS.

Hartford, Conn.

Boring out Curved Cylinders.

MESSRS. EDITORS:—Permit me to give you a solution of L. Q.'s problem in your issue of Nov. 20th.

A, in the accompanying sketch, is the face plate of a lathe



on which B, the piece to be bored, is fastened (by blocking and straps, not shown) at the right distance from the center to give the desired curve to the hole. A cast-iron piece, C, is to be bolted to the lathe bed, while the part, F, (which is cast at about the same curve that it is desired to give to the hole) is set so that, when the face plate is turned backward, it will enter B centrally. D is a pin passing through E, and driven or screwed into E is a revolving head, which carries one or more cutters, and is made to turn on the pin, D, by means of internal bevel teeth, which engage with the pinion shown in dotted lines. A strip of tin soldered to the revolving head, and projecting back a little over B, will keep the chips out of the gears.

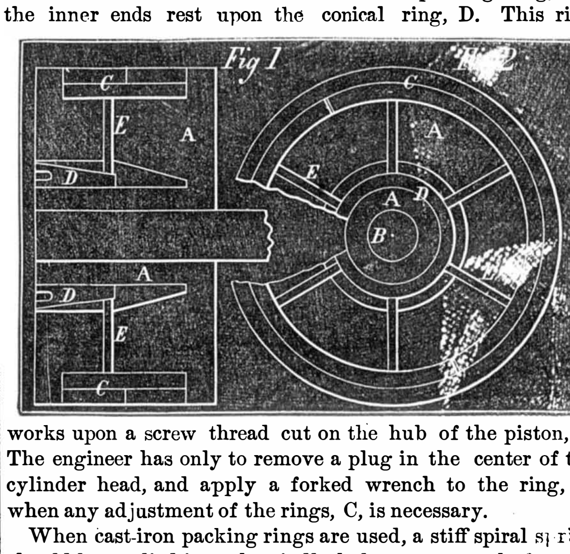
S. G. STODDARD.

Bridgeport, Conn.

A New Piston.

MESSRS. EDITORS:—The annexed diagram is illustrative of a new steam engine piston, which is so constructed that its rings may be set out or adjusted without removing either of the heads of the cylinder. I know that this feature in a piston is not new, but I am sure that I have never seen one of so easy mechanical construction and so simple and perfect in adjustment as this one.

The body, A, of the piston has several radial holes for the reception of the spindles, E. These spindles fit easily in the holes, and are of course exactly of the same length. Their outer ends are in contact with the inner packing ring, and the inner ends rest upon the conical ring, D. This ring



works upon a screw thread cut on the hub of the piston, A. The engineer has only to remove a plug in the center of the cylinder head, and apply a forked wrench to the ring, D, when any adjustment of the rings, C, is necessary.

When cast-iron packing rings are used, a stiff spiral spring should be applied in each spindle hole to prevent chafing the cylinder.

F. G. W.

Preservation of Honey. Invention Wanted.

MESSRS. EDITORS:—Whenever we desire light upon subjects of general interest, or wish to call out new inventions, we are wont to turn to the SCIENTIFIC AMERICAN, and seldom fail to awaken attention, and elicit a satisfactory reply from some of your many readers.

Every one who is at all acquainted with the nature of honey knows that in a short time the transparent, viscid liquid changes to a thick candied substance. On placing a jar of this candied honey in warm water, it will soon return to its former transparency. But dealers who have tuns of it on hand cannot profitably, with the present appliances, do this; consequently it depreciates very much in value, though the nature of honey, and the remedy for the evil, be explained to the purchaser.

The honey now shipped in such quantities to the cities is produced directly from the comb with the honey emptying machine, and this machine is destined to revolutionize the culture of the honey bee. Apiaries that formerly afforded but little profit now produce a hundred fold, and as a consequence, a widespread interest in the management of this industrious little insect is manifesting itself throughout the country. But just as the interest is becoming one of national importance, one of our largest honey merchants in New York city says: "Mel-extracted honey sold lavishly for a time, but it has candied now, and looks like lard, and is of very dull sale. There must be some means devised to use it, or mel-extracted honey will prove a failure." Many other experienced dealers and apiarists express the same opinion.

Now, I have faith in the modern idea that "whenever an article or process becomes absolutely necessary, there is some one created for the purpose of inventing it."

I wish the army of inventors who read the SCIENTIFIC AMERICAN would devise some simple method to prevent pure, transparent honey from taking the appearance of lard. Could not the covers to the glass jars, in which the honey is sent to market, be so constructed that several hundred jars could be connected with a battery, and a strong current of electricity sent through the honey, creating heat enough to prevent candying?

Can honey or any of its elements be used extensively for manufacturing purposes?

Will some one versed in the mysteries of chemistry give the entire chemical composition of honey? I doubt not that, with proper attention from persons skilled in chemical manipulation, much benefit would arise from the study of honey.

Chemists have brought forth the beautiful aniline colors from the dirty refuse of the gas house. Why not endeavor to produce something equally useful from one of the most abundant of nature's sweets? J. H. M.

Hartford, N. Y.

Roman and Egyptian Artificial Stone Reproduced. Paving Blocks, etc.

MESSRS. EDITORS:—In No. 2, current volume, page 28, I notice an article on Pavements, with 10 or 11 requisites. Such a pavement will be hard to meet with, unless you resort to the old Roman, Pompeian, or Egyptian stone pavement. This stone is artificial. Of the Egyptian stone, (paving stone) I have had some specimens. I have analyzed it, tested it, and have made similar stone, quite equal in quality, from material found in the mountains of Virginia. I have also had a piece of a sanitary tube with which Pompeii is sewered, and have seen oval-shaped sanitary tubes 9×6, two feet long, commonly called egg shape, coated inside and outside with glass, as the American term the glaze on the Scotch sanitary tube, but which is in reality produced by the volatilization of salt, burned on at a high degree of heat, and best known as "salt glaze." The ancients, more especially the Egyptians, certainly did understand building, paving, and sewering, better than we know-alls of the present day.

For paving blocks this stone certainly does possess all the requirements you name; besides, it can be made of three or four different colors—red, blue, white, and cream—not artificially, but naturally; and it forms a very beautiful carpet-like footpath up each side of the street. I do not mean the encaustic tile of Staffordshire, England, but the old Roman stone or flint (rough to walk on) paving blocks 12×8×6; that is 12 inches long, 8 inches broad, and 6 inches thick. One thousand of these blocks will cover 74 square yards, and could be made for about $100 per 1,000.

Perhaps a prettier pavement is made of blocks 12×12×9, with tongue and groove, or dove-tailed, so that the blocks will fit tight in each other and cannot be moved; requiring neither cement nor mortar, but only to be bedded in sand.

With regard to horse or wagon roads, color is not of so great importance as utility. The thing required is a hard, rough, even, and sure-footed pavement. These blocks can be made so as to fit into each other with as little labor as ordinary paving blocks, and can be taken up with the least trouble by loosening one of them. They could be made for $150 per 1,000, which number will pave about 111 square yards.

My errand into this country from the Staffordshire tileries, in England, is to search for material of which to make the real Roman and Egyptian stone. I have spent more than two years exploring some parts of the great Blue Ridge and Alleghany mountains, and have found more than I ever expected to. I have now specimens of these blocks, Roman stone, sanitary tubes, or flint tubes, salt glazed inside and outside, or coated with glass, and imperishable in water. Unlike iron, they are incorrodible.

I have bricks imperishable in water, coated on two sides with glass for culvert purposes; also red, white and blue Egyptian flint bricks, imperishable in atmosphere, for building purposes, and almost proof against the ravages of time, made from what is termed by practical claymen, Egyptian clay. I have a brick or block imperishable in fire; the Egyptian swimming brick, which is almost a non-conductor of heat, proof against fire, weighs only about 17 ounces, and is 9×4½×2, suitable for ships' cooking apparatus and powder magazines; paving blocks for stables and other uses, as known best to the Egyptians.

If any of your scientific readers would like to see specimens in miniature of the above materials, I should feel great pleasure in sending the same to them before I return home.

Before I go back, I purpose giving you some account of the *scientific principles* of burning the above-mentioned articles, as adopted by the ancients, so much superior to anything of the present day; especially of burning bricks for building purposes.

I wish most heartily all success to the SCIENTIFIC AMERICAN. "Go on and prosper."

Lynchburg, Va. JOHN DIMELOW.

Patents, or No Patents.

MESSRS. EDITORS:—I read in the Cincinnati *Gazette* for 1871, that the editors of that journal will oppose the present system of patents, and will favor the giving, to inventors of improvements deemed valuable, a suitable reward down, and then give the invention to the public. It seems to me, that to a poor fellow without means, or friends to introduce his discovery to public notice, this scheme is very favorable if it can be properly carried out.

In order to do this, it would be necessary to have a committee or board perfectly competent to judge of the merits of every device submitted to them. They must know whether it be practicable or not, so as not to pay for a worthless invention. They must be able to judge of the extent of its usefulness, so as to reward according to merit, and not give to one a large sum for a small improvement, and to another a small sum for a great improvement. They must be thoroughly informed on all matters on which they have to act, so that they may not be imposed on by any one palming off another's discovery for his own. They must be men of impregnable integrity, who will not favor one more than another, nor take a bribe, nor be partial.

It will need a large appropriation of money to pay for all the good inventions that will yet be brought out. To supply this, a tax proportionate to the amount required will be necessary. And as it cannot be known which branch of industry will be benefited most, all must be taxed alike. The farmer must help to pay for improvements in manufactures. The artisan must help to pay for improvements in navigation. Users of steam engines must help to pay for improvements in windmills, and *vice versâ*. If otherwise, the inventors must wait till their improvements are adopted, and the users of them taxed to pay for them. In which case, perhaps while the grass was growing, the horse might starve to death. Or, to anticipate the time, he might sell his claim; and thus bring about the state of affairs complained of under the present system—the inventor getting little, and the speculator getting all.

On the whole, the cure seems worse than the disease. I think the present plan the best. Let the fees be reduced as low as possible, that all may be able to secure a patent. Then it rests on its merit. If good, the inventor may reap his reward. If worthless, the people are not taxed for it. Those who use inventions are taxed for the benefit of the inventor. Those who do not like to pay this tax have only to refrain from using the article. If the sewing machine that is sold for sixty dollars does only cost twenty, and you find it to your advantage to buy one at that price, who loses by it? But somebody makes an enormous profit off it. And somebody ought to make an enormous profit off so useful an invention. Of course the inventor ought to have the lion's share. If he does not, more's the pity. I would hail any plan that would give it to him. But I feel sure, that that of the *Gazette* would not produce a result so desirable.

Charleston, W. Va. THOMAS SWINBURN.

The Tides in New York Harbor.

A lecture by Professor J. E. Hilgard, before the American Institute, was illustrated by twenty diagrams shown upon a screen, on a very enlarged scale, by means of the magic lantern. New York Harbor has two entrances—one from Long Island Sound, the other by way of Sandy Hook. The former is a natural depression, or arm of the sea, which is not changed by the forces now in operation. The tidal currents which flow through it do not change the channel, but are obliged to follow it in its tortuous course. The Sandy Hook entrance, on the contrary, is characterized by a cordon of sands, extending from Sandy Hook to Coney Island, intersected by channels, which are maintained against the action of the sea, that tends to fill them up by the scour of the ebb tide from the tidal basin of New York Harbor.

The depth of twenty-four feet at low water which the harbor now possesses in a direct channel, may be considered as depending upon the following elements: 1. The large basin between Sandy Hook and Staten Island, including Raritan Bay, which furnishes more than one half of the ebb scour, 2. What is called the Upper Bay, including the Jersey Flats and Newark Bay. 3. The North river, as far as Dobbs' Ferry, maintaining the head of the ebb tide, although not directly taking part in the outflow. 4. A portion of the Sound tide which flows in through Hell Gate. The two tides, from the Sound and from Sandy Hook, meet and overlap each other at Hell Gate; and since they differ from each other in times and hights, they cause differences of elevation between the Sound and Harbor, which produce the violent currents which traverse the East River.

The conditions of the tidal circulation through Hell Gate are such that if there were a partition across it, the water would at times stand nearly five feet higher on one side than the other, and again five feet lower on the same side. The westerly current, usually called the ebb stream, taking place when the Sound tide is highest, starts from a level 3½ feet higher than the easterly current, and thus a much larger amount of water flows out through the Sandy Hook channels than through Throgg's Neck. It is apparent, then, that this portion of the ebb stream, reinforcing, as it does, the ebb stream of the harbor proper, at the most unfavorable times, performs a most important part in maintaining the channels through the Sandy Hook bar. It may be estimated that the closing of Hell Gate would cause a loss of certainly not less than four feet in the depth of those channels. In order to procure the depth which we now have, it is important that the area of the tidal basin should not be encroached upon. In proportion as that is diminished, the depth of the channels will decrease. The flats, just bare at low water, but covered at high tide, perform as important a part as any other portion, for it is obvious that it is only the tidal pressure that does any work in scouring the channels. The water on the flats is especially useful by retarding outflow, thus allowing a greater difference of level to be reached between the basin and the ocean.

When we yield to the demands of commerce any portion of the tidal territory, we must do so with full cognizance of the sacrifice we are about to make in the depth of water in the channel. From what has been said with regard to the meetings of the tides in Hell Gate, it will be seen that the violent currents experienced in that locality are due to causes beyond our control. The dangers to navigation arising from these currents, however, by their settling vessels upon the rocks and reefs, may, in a great measure, be done away with by the removal of the obstructions, in which work considerable progress has been made. The removal of reefs at Hallett's Point, which is now looked for, will doubtless, in a great degree, do away with the eddies and currents produced by the sharp turn which the channel now takes at that point. It is not improbable that the Sound entrance may yet become the entrance of New York Harbor.

The Ninth Census Complete.

The following table, prepared by the Census Bureau at Washington, gives the total population of all the States and territories of the Union, by the enumeration of 1870, as compared with that of 1860. Several statements, purporting to give the result of the last census, have been floating through the newspapers, but this is the first that has appeared with the official sanction. It will be seen that the total population of the United States in 1870 was 38,538,180, an increase in ten years of 7,094,859. The greatest percentage of increase is in Nevada, and after it, Nebraska. Two States only exhibit a decrease, Maine and New Hampshire. All the Western States show heavy percentages of increase, the Southern and Middle States, a small increase, while New England is almost at a standstill. The table is interesting and instructive.

STATES.	1870.	1860.	Gain, p. c.
Alabama	996,988	964,201	3·5
Arkansas	483,179	435,450	11·0
California	560,285	379,994	47·5
Connecticut	537,418	460,147	16·8
Delaware	125,015	112,416	11·5
Florida	187,756	140,424	33·8
Georgia	1,200,609	1,057,286	13·6
Illinois	2,539,638	1,711,951	48·4
Indiana	1,673,046	1,350,428	23·9
Iowa	1,191,802	674,913	76·6
Kansas	362,872	107,206	238·5
Kentucky	1,321,001	1,155,684	14·4
Louisiana	732,731	708,002	3·5
Maine	626,463	628,279	*·29
Maryland	780,806	687,049	13·7
Massachusetts	1,457,351	1,231,066	18·4
Michigan	1,184,296	749,113	58·1
Minnesota	435,511	172,023	153·2
Mississippi	834,170	791,305	5·5
Missouri	1,715,000	1,182,012	45·1
Nebraska	123,000	28,841	326·5
Nevada	42,491	6,857	519·7
New Hampshire	318,300	326,073	*2·4
New Jersey	905,794	672,035	34·8
New York	4,364,411	3,880,735	12·5
North Carolina	1,069,614	992,622	7·8
Ohio	2,662,214	2,339,511	13·8
Oregon	90,922	52,465	73·4
Pennsylvania	3,515,993	2,906,215	21·0
Rhode Island	217,356	174,620	24·5
South Carolina	728,000	703,708	3·5
Tennessee	1,255,983	1,109,801	13·4
Texas	797,500	604,215	32·0
Vermont	330,552	315,098	5·0
Virginia	1,224,830	1,219,030	·43
West Virginia	445,616	376,688	18·3
Wisconsin	1,055,167	775,881	36·0
Total	38,095,680	31,183,744	21·1
District of Columbia	131,706	75,089	75·5
TERRITORIES.			
Arizona	9,658	......	....
Colorado	39,706	34,277	15·9
Dakota	14,181	4,837	193·2
Idaho	14,998	......	....
Montana	20,594	......	....
New Mexico	91,852	93,516	*1·8
Utah	80,786	40,273	115·6
Washington	23,901	11,594	106·2
Wyoming	9,118	......	....
Total District and Territories	442,500	259,577	
Total of States	38,095,680	31,183,744	21·1
Total United States	38,538,180	31,443,321	22·6

* Loss.

BALLOONS AS A MEANS FOR ARCTIC RESEARCH.—The long voyages, made with entire safety, from the city of Paris, have concentrated much attention on the subject of ballooning. A correspondent, J. M., of Baltimore, suggests that any future expedition to the Arctic Ocean be furnished with balloons, properly fitted to secure the voyagers from the cold air, by which the eternal ice could be passed over, and the open polar sea reached. When the North Pole was once gained, the return voyage could be made easily, as whatever might be the direction of the wind, the balloon would be carried out of the circle into one hemisphere or the other.

A RESIDENT of Taunton, Mass., has obtained his ice for summer use for several winters past, in the following manner: Procuring about fifty empty flour barrels, at a cost of twenty cents each, he gradually pours in water, until each contains a solid mass of ice. The barrels are then put away in his cellar, and entirely covered with sawdust. As ice is required, a barrel is tapped.

A ROMANCE OF SCIENCE.

Under the above caption, *Chambers' Journal* gives an account of a passage in the life of the celebrated scientist, M. Arago, from which we extract the following portions. The story, as here told, of the pursuit of knowledge under difficulties, certainly reads almost like some of Charles Reade's sensational stories:

It is to be presumed that all well-informed persons are aware that the system of linear measurement used in France and most continental nations is based upon the meter, which has been extended to measures and weights in general, and carried into practice by a decimal system of computation. At the same time, few are conversant with the circumstances under which the metrical system was established at the commencement of the present century, and the difficulties encountered by the *savants* of the period in prosecuting their scientific operations for that purpose. Scientific expeditions were fitted out in France to determine a standard linear measure, by the admeasurement of a great arc of the earth's circumference, as nearly as possible at a fixed parallel of latitude, from which a fractional section would be taken as an unalterable basis. It is well known that the circumference of the earth is greatest at the equator, and gradually decreases towards the poles. As a medium between these two extremes, it was determined that the parallel of latitude forty-five degrees north should be the basis, especially as it intersected a part of Europe where a great arc of the meridian could be measured by a trigonometrical survey.

In making the survey in Spain, where the members of the expedition, headed by M. Arago, prepared to leave the isles of Formentera and Iviza, and remove their astronomical instruments to the mainland of Spain, the curate of the district where M. Biot was situated requested permission for himself and some of the inhabitants to see their instruments. Though one of the inferior clergy of Spain, yet he took considerable interest in scientific operations, and appreciated the instruments in the observatory. On the other hand, those islanders permitted to enter the building gazed on them with the astonishment of savages. It was a Sunday and a fête day, when a troop of them came in the evening, with the alcalde at their head, dancing and singing in a most extraordinary manner, both men and women. The men clattered with their feet in a kind of half African, half European dance; while the women, having their hair plaited into long pendent queues, turned and pirouetted on their naked feet, without raising them off the ground, like puppets on springs. The music that accompanied these strange postures was quite as barbarous in character; one played on a species of flute, another struck a tambourine, and some had wooden clappers, while the alcalde kept measured time by striking a large metal plate with a piece of iron. As each one, however, entered the observatory, he made his observations in silence; presenting a contrast between civilization and barbarism—a contrast of the most sublime science and the most profound ignorance. It must be admitted, however, that though ignorant of the instruments and objects of the expedition to their solitary isles, these people in no way interfered with the mission, but assisted its members in their simple way when they could be of use.

Not so with the inhabitants of the island of Majorca, where M. Arago was stationed with Señor Rodriguez, on the summit of Mount Galatzo, making his final observations, which he successfully accomplished. While on the eve of departure, the rumor suddenly spread amongst the inhabitants that these operations, these instruments, those fires, these signal lights, were for the purpose of guiding the enemies of Spain to conquer the island. It must be remembered that the fears of the ignorant islanders were excited by the accounts from the mainland. Napoleon was at that time preparing for his Peninsular campaign, and as the leader of the scientific expedition was a Frenchman, they concluded that he and his companions were emissaries of Bonaparte come to spy the land. Galatzo was instantly up in arms, and cries of treason and death to the traitors were raised by the excited peasantry. Fortunately, M. Arago obtained intelligence of these rumors in time to send the report of his observations by a faithful messenger to Palma, a town in the island of Majorca, with instructions to send the expeditionary vessel there to convey the instruments from the observatory in safety to the mainland. This was effected, and M. Arago himself managed to escape, and get on board the vessel.

Instead, however, of finding that an inviolable asylum, the learned French astronomer found new alarms for his safety as soon as he got on board; and from that time he experienced a series of mishaps in the Mediterranean, in his endeavors to reach a port belonging to his own country, that practically illustrate the pursuit of knowledge under difficulties. Hitherto, the captain of this vessel, which was attached to the expedition by the Spanish government, had behaved in a most friendly manner to M. Arago; but, whether from treachery or weakness, he not only refused to take him back to the mainland, but handed him over a prisoner to the custody of the captain-general of Majorca. Here he was confined in the citadel for many months, not merely regretting his want of liberty, but apprehensive of some design on his life. Upon this, his colleague, Señor Rodriguez, considering that the honor of his government was at stake, in the forcible detention of a peaceful *savant*, under its protection, boldly demanded his instant release. This was consented to, provided that M. Arago took his departure in a small trading bark bound for Algiers. Accordingly, he left these inhospitable islands, accompanied by a Majorcan sailor, named Damian, who took charge of the astronomical instruments.

Arrived safely at that city, M. Arago called upon the French consul, who received him with great kindness, and soon found a passage for him in an Algerian trader bound for Marseilles. After a fair and quick passage, the vessel came within sight of that port, when she was attacked by a Spanish privateer, seized, and taken as a prize into the port of Rosas. Here M. Arago thought he could easily escape across the Pyrenean frontier into France, but he was again unfortunate. He was entered on the list of passengers as a German merchant, but, by an unlucky chance, one of the privateersmen recognized him as a Frenchman, and thereupon M. Arago, together with the crew and passengers, were plunged into a frightful captivity.

At this time, Spain and Algiers were on friendly terms; consequently, this seizure of an Algerian vessel by a Spanish cruiser was contrary to international law. As soon as the Dey of Algiers was informed of this insult to his flag, he demanded instant reparation—the restoration of the ship, cargo, crew, and passengers; threatening, in case of refusal, to declare war. This had the desired effect. M. Arago and his fellow prisoners were released, and allowed to re-embark in their ship, to complete its voyage to Marseilles. Again she came within view of that port, but a frightful tempest from the northeast came on, which prevented her entering the harbor, and afterwards drove the vessel to seek shelter on the coast of Sardinia. Here was another peril to encounter; the Sardinians and Algerians were at war, and if the vessel were seized by a cruiser, they would again suffer captivity. Accordingly, it was decided to run for the coast of Africa before the tempest, and at last the vessel safely entered the small port of Bougiah, a hundred miles east of Algiers.

At this place they learned that the Dey who had acted so promptly in demanding their release from the Spanish prison and the restoration of the vessel, was dead. He had been killed in an *émeuté* among his barbarous subjects. Another ruler was in his place, who was of a less enlightened character. The customs officials at Bougiah boarded the vessel, and carefully examined the cargo. When they came to the cases of astronomical instruments, and felt their weight, they suspected that these contained heavy articles of gold. Their suspicions increased on opening the cases, and finding them filled with the highly polished instruments, so carefully wrapped up. They were quite sure they must be made of gold, on that account, and refused to deliver them up to M. Arago. Seeing the difficulty of treating with ignorant barbarians, whose cupidity had been excited, he resolved to venture on the journey by land to Algiers, where the road crosses a mountain chain, and travelers are in peril from the lawlessness of the people. In order to avoid notice, he dressed himself in Algerian costume, and in company with some friendly natives, made the journey without molestation.

When M. Arago called on the French consul at Algiers, that functionary was much astonished to see him dressed like a Mussulman; at the same time he gave his learned guest a hearty reception. Through his official position, the instruments were claimed, and ultimately delivered up. But it was chiefly on account of the Algerians finding them made of brass, and not of gold, that this was done. Even then it was a difficult matter to get them restored, so that M. Arago was detained six months at Algiers. By that time, the French consul had obtained permission to leave that consulate; and on appealing to Paris, the Emperor gave orders that a ship of war should convey him, his family, and M. Arago to Marseilles. They set sail with a fleet of merchantmen under convoy, and arrived in sight of that port. Here an English squadron blockaded the passage, ordering the French vessels to proceed as prizes to the island of Minorca. All obeyed the order except the ship in which M. Arago was, which, by a slant of wind, got safely into harbor.

Thus, after many " hair-breadth 'scapes by flood and field," this hero of science returned to Paris, where he received the reward of his genius and indomitable perseverance, in being appointed Astronomer-royal, which post he filled to a venerable age, and obtained a European reputation. Though he encountered more of the vicissitudes and dangers of travel than any of his colleagues in the expedition, yet he suffered less in health. One member, M. Chaix, fairly succumbed under the fatigue, and died at the town of San Felipe, in Spain, whither he had retired to recruit his strength. M. Biot suffered also from the exigencies of the expedition. His exposure on the island of Formentera brought on an attack of fever, which laid him prostrate for twelve days. After recovery, he embarked in a small Algerine vessel at Iviza, to return to Spain. On the passage it was seized by a privateer of Ragusa, on the Dalmatian coast, sailing under the English flag with " letters of marque." The captors declared this a lawful prize, and would have taken the vessel into the port of Oran, in Algeria; but on M. Biot exhibiting his safe-conduct pass from the British government, and his scientific instruments, he and his companions were allowed to proceed on their voyage. However, they kept several ounces of gold, which M. Biot had with him, and he thought himself lucky in getting off so easily. At last, he arrived safely at Denia, in Alicante, where he passed a short quarantine in an old chateau, formerly the residence of the Dukes of Medina-Cœli, during the time of their puissance in Spain. From thence he passed without hindrance into France, and reported the progress of his operations to the Institute.

LEAD ore lately brought from Jefferson county, Ohio, possessed the extraordinary proportion of 88 per cent of lead and 2 per cent of silver. The *Ohio Farmer* states that the ore was found only ten feet below the surface. When we add to its intrinsic value and its proximity, the fact that coal of the best smelting quality is abundant in the neighborhood, our readers will see the value and importance of the discovery.

Inventions Suggested by the Late Civil War.

The inventions to which our late war gave rise are as multifarious as were its wants. Some idea of its achievements may be gained by a look at the cases of models in the United States Patent Office. Shelf after shelf is loaded with inventions suggested by the necessities of war. Not a piece of ordnance, nor firearm, nor vehicle, nor tent, camp chest, cooking utensil, nor appurtenance of war of any kind, but was "improved" by the indomitable, self-confident, inventive, "tinkering" fellow. The caisson, gun carriage, bomb shell, gun wad, the cap, and the bullet, are all of new fashion. There are new modes of working, packing, transporting, cleaning, and loading such antiquated instruments of warfare as are permitted still to exist—new kinds of priming, new methods of ignition, and new-fashioned cartridges, with new machines for cutting, trimming, pressing, filling, and packing. An officer's arms must be attached by a modern method; his shoulder straps be fastened on with a spring; and even the old flag is expected to run up the staff and unfurl to the breeze by means of some new-fangled, patent contrivance.

As great ingenuity, if not as great genius, is shown in models of apparatus designed to promote the comfort of the sick or wounded. In the beginning of the war there was no hospital tent which gave satisfaction. That used in France is the same which answers the ordinary purposes of shelter—the regulation tent, as it is called—by its conical shape giving to the tented field a picturesqueness gratifying, no doubt, to French love of effect, but inclosing too many feet of useless space to suit Americans. The English "marquee" serves an excellent purpose after it is pitched and ready for use, but the qualities of compactness, portableness, convenience in pitching and striking are quite overlooked. It is substantial, ponderous, costly, but it isn't *handy;* and this, to Americans, is objection enough. A score or more are there, of all shapes and sizes, but that finally adopted and used during the war—the wall tent, with sloping roof and straight sides, is pre-eminently superior. It is light, easily managed, portable, and cheap. An umbrella tent was suggested and even made, having a central pole or handle, radiating arms, upon which the cover is spread, a hoisting apparatus raising and shutting it. But it was too complicated.

Still pursuing our search we see miniature ambulances, a procession of which adorns the shelves. The ambulance in use of old was bare of all comfort. Look now inside one of these new models, and you see every contrivance imaginable to lessen the suffering of the sick or wounded. The ambulance is no longer an instrument of torture. The mattresses, used as stretchers also, slide along the floor on rollers fastened to a frame work resting upon springs beneath and at the sides. An immense amount of ingenuity is shown in economizing and utilizing means and space. Each appliance is made to serve many purposes. Seats are used as beds; iron wheels answer for legs. A second tier of berths is suspended from the sides of the wagon by rubber rings. Seats, readily put out of the way, are placed outside for attendants. Each is furnished with a chest for supplies, ice, and water tanks. The cover is of enameled cloth, light and impermeable. Two horses can draw it, while on European battle fields four are required. The American ambulance combines strength and lightness; the European, with its wooden cover, enormous weight, and small capacity, carrying but two persons, supposes strength and clumsiness to be inseparable.

Inventive genius does not desert the soldier, after wounding him according to scientific methods and nursing him to health with the aid of its improved apparatus. It also does its best to make good his loss of members. The Patent Office shows a hundred model legs and arms, which seem so excellent, with all their springs and cords, tendons and joints, that if it were not for a suspicion that we might be as stupid as the Irishwomen with the washing machine, we should almost regret having no use for them. A dear old lady from the country, whose eyesight was poor, had her attention called to these models. Glancing at them without her "specs," she said, in a tone of deepest sympathy, "And these are the limbs of our soldiers' shot to pieces in battle? Poor fellows! And now their legs are brought up here for *koorosities!*" There are arms which bend backward to the shoulder, and over the head; hands of which the fingers and palm act with such facility that a pen or a playing card is held with ease. At the Paris Exposition the American specimens of this class were pronounced superior to all others. One is surprised to observe how greatly we are indebted to the use of caoutchouc for this degree of excellence. In this direction, as well as in the manufacture of surgical instruments and dentistry, it has effected a revolution. Contrary to the general rule, too, that cheapening processes are inferior processes, this substance is superior for the surgeon's use to the costly metals it supersedes. Mr. Seward's face bears testimony to its utility, one of the bones broken by the assassin's blow being restored to shape by its help. The capability which caoutchouc possesses of hardness or elasticity, its susceptibility of molding and coloring, the fact that it is incorrupti ble and inoxidizable, and cannot therefore poison or irritate the flesh, give it an essential advantage over any other material.—*From Lippincott's Magazine.*

THE frequent damage to trees by high winds and cattle will render the following directions for tree-surgery interesting to farmers: Let the broken limb be put into its place, and the torn and bruised bark be covered with clay and bound up, as in grafting. A correspondent of the *Cincinnati Gazette* reports the recovery of a cherry tree, broken by a horse. The writer supported the tree by tying it to a stake, and covered the broken place with grafting wax. The success was complete.

Improved Dovetailing Machine.

We illustrate herewith a dovetailing machine that for simplicity, strength, efficiency in operation, and accuracy of performance, will, we think, commend itself to all who may inspect its working.

The cutters are arranged in a gang, shown at A, and are driven by a belt, B, which passes alternately over and under pulleys on the cutter arbors. A vertical guide bar, C, descends from a sliding way upon which the cutter head rests, and slides up and down with it in suitable guides, when actuated by the hand lever, D, the rock lever, J, and the connecting rod, I.

From the side of the cutter head, A, extends a collar which slides on the guide lever, K. This guide lever is pivoted at the bottom, and being set at the proper angle by means of a graduated arc, and held in place by a set screw, it causes the cutter head to move laterally upon the sliding way which supports it, whenever it is raised or lowered by the lever, D, rock bar, J, and connecting rod, I, the resultant movement of the vertical and lateral motions being oblique to the vertical axis of the guide bar, C. When the pivoted guide bar, K, is set to the center of the graduated arc, the motion of the cutter head will be vertical.

The guide lever, K, is adjustable vertically with the graduated arc, by means of the screw, H, which raises or lowers it, so that when raised the motion of K to the right or left of the center of the graduated arc increases or diminishes the lateral motion of the cutter head, according as it is set higher or lower. The motion of the guide lever, K, is limited and regulated by means of set screws at the ends of the arch bar.

In dovetailing with this machine, the mortises are cut in the following manner: A number of pieces are placed on the bed of the machine and adjusted laterally by guide plates moved by the screws, G. The pieces are held down firmly by a vertical screw, F, and a foot plate which rests on the top of the upper piece of the boards to be worked. The cutter arbors being armed with tools, the sectional outline of which, on the axis of revolution, is that of the mortises: and the guide lever, K, being set to the center of the arc, the machine is set in motion, and the lever, D, being moved outward, causes the cutters to rise vertically, cutting through the ends of the boards, and by a single upward movement forming a large number of mortises.

In making the tenons, as well as the mortises, the ends of the board are placed against a guide plate attached to the cutter head, by which they are uniformly adjusted.

In tenoning, only single pieces are worked, as many tenons being cut simultaneously, as the number of cutters, if desired.

The piece is clamped in the same way as in mortising. The guide lever, K, is first moved to the extremity of the arc on one side, and the cutters being raised by the lever, D, move upward obliquely, and cut one side of the tenons to the previously adjusted bevel. The cutter head thus rises till it engages with a stop previously fixed to regulate the depth of the cuts. The lever, K, is then pressed over to the opposite side of the arc, which causes the cutters to traverse laterally and complete the cuts, except beveling the remaining side of the mortise, which is done by reversing the position of the lever, D, which causes the cutters to descend in the proper angle.

The cutter head is counterpoised as shown, and the distances of the cutters are uniformly and simultaneously adjusted by the hand screw, E.

The inner angles of the dovetailed mortises are rounded in blind dovetailing, and the tools for cutting the tenons are shaped to give the corresponding form to tenons.

This machine makes a complete dovetail instead of a substitute for it, and does not weaken the work by cutting away wood unnecessarily for the sole purpose of making a fit. The cuttings are made by rotating cutters, which cut into the side of the grain of the wood, by which it is claimed they will retain a sharp edge to do four times the work that can be done by tools cutting endwise of the grain. This method of cutting also prevents splintering, in obstinate kinds of timber.

The lateral adjustment of the cutters to any desired width within the limits of the machine, without loss of time, attained by the use of the screw, E, is a great advantage.

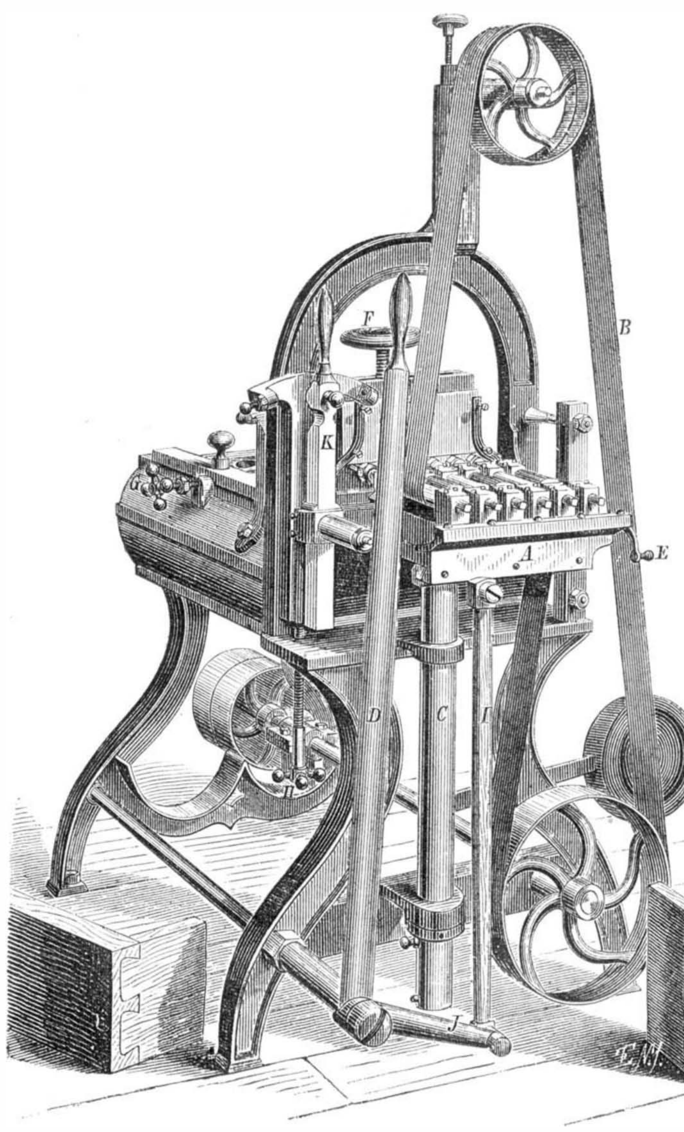
The perfect adjustability of all the parts of the machine, is an important improvement, and it is claimed that it is more durable, and will perform more work in a given time, than other machines of its class.

We have seen the machine at work, but not under circumstances to test its speed of performance. Of the accuracy and beauty of its work we are, however, perfectly satisfied.

Patented June 7, 1870, and Jan. 3, 1871. For rights and other particulars, address H. H. Evarts, 93 Liberty st., N. Y., where a machine may be seen in operation, or at 66 Twenty-fourth st., Chicago, Ill., or Trevor & Co., manufacturers, Lockport, N. Y.

Trial of the New San Francisco Flying Machine.

The newly invented "flying machine," of which our readers have heard so much during the last year or two, was recently tried again, and, according to the San Francisco *Bulletin*, with considerable success. When everything was tightened and got in good running order, and the propeller arranged to cause elevation, it was just quarter of one o'clock. The fire for raising steam was kindled, and in one minute and a quarter steam was opened. At thirteen minutes to one the machine was cut loose, and the propellers started. She then rose most gracefully in the air, amid the cheers of the crowd who had gathered to witness the ascension. The machine was guided by cords attached to both ends of the balloon, and in the hands of persons on the ground. She ascended fifty feet, and sailed along about a block, when she was pulled down to have her boiler replenished. Again she rose, this time to a hight of about 200 feet. All the machinery connected with it worked to the perfect satisfaction of the inventor, who intends to place it on exhibition at some place, of which notice will be given. The name given her is "America."

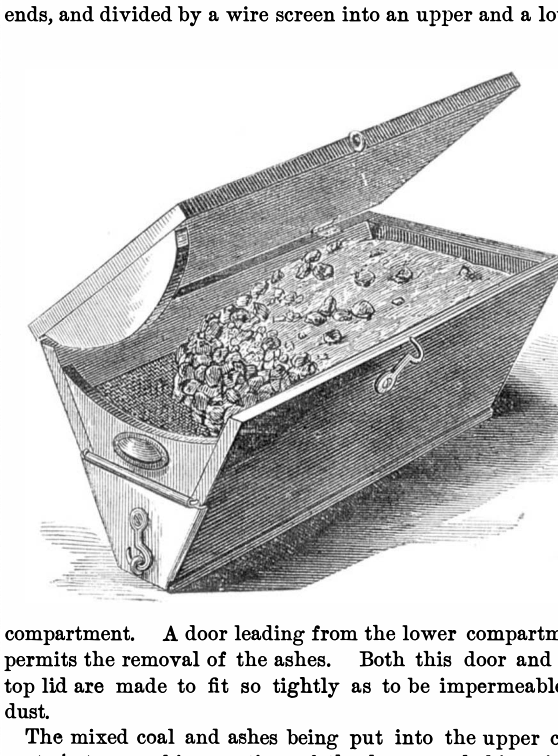


DOVETAILING MACHINE.

IMPROVED COAL ASH SIFTER.

Our engraving illustrates the form of a new device for sifting coal ashes, by the use of which the inconveniences of dust are wholly obviated.

The sifter is a box of the form shown, with handles at the ends, and divided by a wire screen into an upper and a lower



compartment. A door leading from the lower compartment permits the removal of the ashes. Both this door and the top lid are made to fit so tightly as to be impermeable to dust.

The mixed coal and ashes being put into the upper compartment, a rocking motion of the box, or shaking it by means of the handles, separates the ashes from the coal and cinders, and this may be done on the stove or carpet without the escape of dust. The device seems well adapted to the purpose designed, can be furnished cheaply, and will prove a useful household utensil.

Patented through the Scientific American Patent Agency, Nov. 8, 1870. State, county, and manufacturer's rights for sale. Address W. S. Estey and I. S. Clough, patentees, 63 Fulton street, N. Y. B. T. Clough, of Waltham, Mass., may be addressed for rights in Massachusetts.

The Bituminous Coal Trade of 1870.

A Pittsburgh exchange says:—The total production of bituminous coal in this country, in 1870, amounted to fully 18,000,000 tuns. The bituminous trade bids fair to eclipse the anthracite in a few years. The latter amounted last year (as far as reported in Pennsylvania) to only 16,889,505 tuns. In Boston, in 1870, the anthracite trade fell off 36,400 while the bituminous increased 49,709 tuns. During the past year, the Baltimore and Ohio Railroad, with the Chesapeake and Ohio Canal, brought to market 1,717,075 tuns of Cumberland coal, a decrease of 165,000 tuns. The Huntingdon and Broad Top Railroad transported 313,822 tuns, a decrease of 46,850 tuns. The Tyrone and Clearfield branch of the Pennsylvania Central carried 345,000 tuns of the Phœnix Vein, while Alleghany Mountain mines shipped 90,000 tuns, mostly for local consumption. The Blossburg and the Towanda mines, which largely supply New York State and the Lake region, supplied, as near as can be ascertained, 500,000 tuns. Thus, the total consumption of bituminous coal, for iron, steam, and domestic uses, on the seaboard north of Cape Henry, aggregated 3,000,000 tuns. In addition, the gas coals of Western Pennsylvania and Virginia gave 1,500,000 tuns, of which one half was brought eastward by the Pennsylvania Central. The statistics of the western bituminous trade are only approximate.

It is an authenticated fact that Pittsburgh, beside consuming locally 600,000 tuns, shipped 2,000,000 tuns down the Ohio, at $2 each; yet so inadequate was the supply that it commanded $8 a tun at Memphis. Cleveland received, for its own consumption and for transportation on the lakes, nearly 1,000,000 tuns, by the Cleveland and Pittsburgh, and the Cleveland and Mahoning railroads. The great West and Northwest, taking the statistics of the "Panhandle" and the Pittsburgh, Fort Wayne and Chicago Railroads, consumed an additional 2,000,000 tuns. As near as can be ascertained, the Indiana, Illinois, Michigan, and Kentucky mines yielded nearly 4,000,000 tuns; and to these are to be added the productions of the vicinity of Richmond, Va., of Alabama and Tennessee. In view of this great and increasing production, the strikes of the anthracite miners will yearly become of less practical value. A silent revolution is at work in the coal trade. Baltimore seems to be losing the supremacy on the seaboard once held by the Cumberland coal, owing to the valuable tracts opened up in Clearfield county, Pa., during the last three years; but by the completion of the Cumberland Valley Railroad to the Potomac river, Baltimore retaliates by a sharp competition in the iron manufacturing regions of Central Pennsylvania. And while Philadelphia enjoys the benefits which Baltimore had by her Cumberland mines, Pittsburgh will lose command of the gas coal trade, by the completion of the Pittsburgh and Connellsville Railroad, opening up to Baltimore and the seaboard the rich gas coals of the Youghiogheny Valley. The present year promises to make some other important changes in the coal trade.

COD-LIVER OIL.

In every country on the earth there are to be found sufferers whose chief reliance against the ravages of damp and cold air is found in the oil from the codfish liver (*jecus aselli*). It is not, therefore, surprising that the single port of St. John, Newfoundland, exported last year nearly 350 tuns of this invaluable medicine. The declared value of this quantity is about $110,000. The oil is dissolved from the livers by gentle heat, in a tin vessel placed in boiling water, and filtered twice. The last filtration is made through heavy woolen cloth, and takes from the oil nearly all its odor and color, leaving in it all the iodine to which, in combination with its carbon, its alterative, fattening, and heat-creating properties are due. It is not only in consumption, but in scrofulous affections and diseases wasting the tissues, that its value is felt. The sickly infants of poor mothers, whose atrophy, from bad and insufficient food, commences even before their birth, can be nursed into health and plumpness by its aid. From its first introduction to the world in the year 1782, the use of it has been steadily on the increase; and the recent annual report of one of the largest of the London hospitals shows that 70 per cent of the patients of all classes are largely benefited by its use. It was first introduced into medicine by Dr. Percival.

Death of a Well-known Manufacturer.

Mr. James Albro, a well-known citizen of Elizabeth, who died on Friday, the 27th ult., had, in his special branch of business, a national reputation, as being the first American who had made original designs for oilcloth manufactured in this country. His experiments commenced as early as 1835 or 1836. At that time almost all the oilcloth used in the country was imported from England; the quality of the cloth manufactured here being inferior, and the patterns being copied from English cloths. Taking a national pride in producing, in price and quality, American goods that should give the imported cloths a less brisk market than they were enjoying, he devoted his attention exclusively to the improvement of the American oilcloths, and with such gratifying result that at the World's Fair in London, in 1862, the first prize was awarded to the firm of which he was the head.

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Contents:

(Illustrated articles are marked with an asterisk.)

AN INVENTION WANTED TO CLEAN THE STREETS OF SNOW. SOLUTION OF THE PROBLEM TO BE FOUND IN STEAM.

The municipal government of the city of New York pays, we understand, fifty cents per load of twenty-seven cubic feet for carting away the snow from the streets. During the last few days, heavy snow storms have visited the city, and the bill for street cleaning will amount to a large sum. Besides, the method is a very slow one, and the carts employed increase the blockade of vehicles which any obstruction to travel is sure to cause in our crowded thoroughfares.

On the principal horse railway lines the companies labor, at great expense, and with terrible exactions upon their overworked horses, to maintain their roads in a barely passable condition. As fast as their snowplows throw the slush to the sides of the tracks, it is thrown back again by the constantly plying carts, omnibusses, and other vehicles, and the work has to be repeated over and over again, until such time as sun and south wind shall diminish the volume of impeding snow so much as to render the snowplows superfluous. During the thaws the water runs to the center of the streets (the gutters being obstructed by snow and ice) and, freezing, renders the services of an army of men necessary to clean out, with ice picks and shovels, the obstructed tramways.

In reflecting upon ways and means whereby all this trouble and expense—or at least a great portion of it—might be saved, we have come to the conclusion that steam offers a complete solution of the problem. We shall explain the general principles upon which we base this belief, leaving it for inventors to devise means for their practical application.

Various authorities give as the weight of a cubic foot of snow one eighth to one fourth that of a cubic foot of water. In other words, a cubic foot of snow, melted, will make from one eighth to one quarter its bulk of water. We consider this a large estimate, but, admitting its truth, a fair average of light and heavy snow would give three sixteenths of a cubic foot of water for every cubic foot of snow melted, or 11·72 pounds of water.

To change a pound of ice or snow at 32° Fah., to water at 32° requires an expenditure of 142·4 heat units. To change a cubic foot of snow at 32° Fah. (weight 11·72 pounds) to water at 32° Fah. will require 1668·93 heat units. But as the average temperature of the snow is less than 32° Fah.—say probably about 20°—an addition of 6·1 heat units must be added for each pound melted, or 71·5 heat units for each cubic foot of snow, making the total 1740·43 heat units required to melt a cubic foot of snow at 20° into water at 32°. Probably, also, to secure the fluidity of the water until it could run off into the sewers, the temperature would need to be raised to 40° by the addition of 8 heat units more per pound melted, or 94 heat units per cubic foot of snow, making a total of 1834·43 heat units for every cubic foot of snow run off.

Steam at 212° contains 1178 heat units per pound. A pound of steam condensed to water at 40° would therefore give off 1133 heat units, and it would take 1·6 pounds of steam to melt a cubic foot of snow.

The cost of removing the snow by carting is, at present rates, a trifle over 1·85 cents per cubic foot.

A cubic foot of water is, in good steam boilers, converted into steam at 212° by the consumption of ten pounds of coal. Some boilers will do much better than this, and some do worse, but we wish to be within bounds in our calculations. Supposing the cost of the coal to be $6 per tun, the cost of fuel to evaporate a cubic foot of water is 3 cents, but the 62·5 pounds of steam at 212°, thus produced, would, according to our preceding calculations, melt and run off 39 cubic feet of snow, at a cost of .077 of a cent per cubic foot, as against 1·85 cents per cubic foot now paid. The cost of attendance and working of the boiler would, of course, have to be added to the cost of fuel in making a complete comparison of steam with the present system of carting, which would diminish the margin somewhat, but the latter will stand a large percentage of diminution, and still show an enormous saving.

The rapidity with which steam melts snow is only appreciated by those who have tried it. Let any one who is skeptical run a rubber hose from a boiler, and let a jet of steam escape directly into the heart of a huge snow bank, and he will be astonished at the rapid collapse of the drift. Whether it would be better to use hose from boilers in the manner indicated, or in other ways that suggest themselves, we leave to inventors, not doubting that the hints given in this article will open their eyes to a new and profitable field of invention.

The use of steam would get rid of the obstruction at once and permanently; an important consideration to horse-railroad companies, and one they would not be slow to see, should some ingenious engineer put these ideas into a practical form.

THE ADULTERATION OF PETROLEUM.

The systematic adulteration of petroleum is a constantly increasing evil, and one that demands immediate reform. It is high time that the attention of the police, of the fire department, and of the press, was concentrated upon the discovery of a full and speedy remedy. The enormous manufacture of naphtha as an incidental product, for which there is little demand, offers a great temptation to dealers in petroleum to increase their profits by the admixture of the dangerous ether; and the lax state of our laws, and the carelessness of the insurance patrol, tend to perpetuate an evil that ought not to be tolerated for a moment in any well regulated and civilized community.

What can be done to prevent the dangerous adulteration of refined petroleum, is a question of the utmost importance to all who burn it as an illuminating material.

Unfortunately, most of the regulations adopted by the police, or by the legislature, have thrown impediments in the way of trade, without producing any good results. The authorities are in the habit of representing petroleum as a highly inflammable and dangerous substance, when in fact, the refined article, free from naphtha, is scarcely more dangerous than sperm oil. The storage of large quantities of petroleum in the business portions of cities, has been prohibited under severe penalties, and these regulations have been prepared as if petroleum were gunpowder. The idea seems to prevail that the refined article is just as explosive as the crude, while it is really less inflammable than alcohol, about the storage of which no such stringent rules are laid. Alcohol takes fire the moment a burning match is applied to it; properly refined petroleum does not ignite, does not flash, as it is called, until it has been heated up to 100° or 110° Fah. Alcohol more readily evolves combustible vapors; well refined petroleum forms neither gases nor vapors, and evaporates, even when exposed in shallow vessels, very slowly, and in the summer does not occasion the formation of explosive gas mixtures; in fact, it is not nearly so dangerous as we are in the habit of suspecting. Throwing obstacles in the way of its sale does not appear to be the best measure to prevent accidents. If the authorities, in the interest of the public, are willing to take the matter in hand, it will not be difficult to suggest a remedy. It will only be necessary to make a distinction between a safe and a dangerous petroleum, and to publish a single test, by the use of which, this point can be easily settled. The taking of the specific gravity is worthless, because the adulteration by the lighter naphtha can be disguised by the addition of a heavy oil. The color and odor are also not to be relied upon. The only reliable test is the temperature of the flashing point; that is, the temperature at which the petroleum takes fire when a burning match is applied to its surface. The test can be easily applied. Into a flat dish or saucer, pour the oil to be tried, until it is at least half an inch deep; then hold a burning match or taper near the surface. At the point of contact the combustion is often very lively, as the taper draws up some of the liquid, but if the petroleum be safe and free from naphtha, the flame does not spread over the surface. If the petroleum have been adulterated, as soon as the match touches the surface a blue lambent flame flashes across it, and in a few moments the body of the oil will be on fire. Such an oil is dangerous—liable to explode in lamps, and to give off inflammable vapors at all times. Any oil which takes fire when a match is held near its surface, and continues to burn, ought te be condemned at once and thrown into the streets. We lay some stress upon this experiment, because we have actually seen a country merchant pour petroleum into a saucer and ignite it in this way as a proof that it was not dangerous.

There is no doubt whatsoever, that all of the accidents can be traced to adulterated and worthless petroleum. The pure article never explodes in lamps, even when they are filled at night, with a candle by their side; but it is never safe to try this experiment, as we cannot rely upon the quality of the oil we buy. The sale of petroleum containing naphtha ought to be stopped at all hazard, and if a police officer were detailed to walk up and down before the store to warn all customers of danger, and the names of the iniquitous tradesmen were to be publicly posted, and heavy fines were to be imposed, the great loss of life and property that has been occasioned by this nefarious business would justify the severity of the measures adopted to repress the evil. We need some stringent laws on the subject, and after they are passed, let them be enforced without fear or favor.

"AND THERE WERE GIANTS IN THOSE DAYS."---THE LARGEST INVENTOR YET---A MOST REMARKABLE FAMILY OF GIGANTIC TURKS.

On Friday, January 27, the floor of our office trembled under the tread of the largest client that ever pressed its boards since Munn & Co. commenced business. Seating himself at our desk, on a chair (as much out of proportion to his bulk as an ordinary baby's chair would be to a common-sized man) this huge individual explained to us the nature of an invention for which he was desirous to secure a patent. Having transacted his business, and created a very unusual sensation among the numerous attachés of the office, he rose to depart. On his way out, our associate editor adroitly approached him, and succeeded in gaining from him the following statement, the publication of which, in our sober columns, will, we are sure, minister to that love of the marvelous, a trace of which always remains, even in the most philosophic bosom.

The name of the individual referred to is Colonel Ruth Goshen, and he resides at present in Algonquin, Ill. He is a native of Turkey in Asia, and was born among the hills of Palestine. He is the fifteenth, and last child (the baby) of a family of fifteen—ten sons and five daughters—sired by a patriarch now 90 years old, living in the valley of Damascus, and by occupation a coffee planter. This venerable sire weighs, at the present time, 520 pounds avoirdupois, and his wife, aged 67, weighs 560 pounds.

The entire family are living, and not one of them weighs less than 500 pounds. The oldest son weighs 630 pounds, and the youngest, our huge client, outstripping them all, weighs 650 pounds. Not one of the family is less than 7 feet in hight, and the Colonel is a stripling of only 7 feet 8 inches in his stockings. He is not an unduly fat man, is merely what would be called moderately portly, and is 33 years old.

He was a colonel in the Austrian army in 1859, and a colonel commanding in the Mexican army at the battle of Puebla, May 5th, 1862, in which the Mexicans were victorious. His father at one time resided in Leeds, Eng., but returned to Turkey in 1845.

The colonel states that there has never been any sickness in the family to speak of, and that all are—so far as he knows—well and hearty. It was at Leipsic, Germany, that the colonel met his fate in the person of a fair *mädchen*, weighing 190 pounds, and 5 feet 9 inches in hight, and the union has been blessed with two sons, who give promise of rivalling their father in stature.

The colonel is a finely-proportioned man, and walks with a firm and elastic step. He is as straight as an arrow, and has coal-black eyes, hair, and mustache.

He is an actor by profession. He informs us that his last engagement was at Simm's Theater, in Baltimore, and that he expects to play an engagement in New York during the present season.

EXCAVATION AND EMBANKMENT TABLES.

The preparation of these tables, for the use of engineers and contractors, involves an amount of labor, even when worked out by means of differences or increments, which those who have calculated them can well appreciate. The labor in calculating, say a table increasing by one tenth of a foot, up to seventy-five feet in depth or hight; with one hundred feet stations, or less, by the rules of areas and distances, would be immense; and the table liable to errors, there being no general check on its accuracy; and by differences or increments, the labor would still be great, and the liability to error not much decreased.

We have lately been shown a simple, rapid, and correct method for making such tables, discovered by G. R. Nash, C.E., of North Adams, Mass., which we insert for the benefit of engineers and others, whereby much valuable time may be saved. Rule—

1. Arrange the hights or depths for calculation in vertical columns, each of 27 lines.

2. In any three (3) columns, the third column is equal to twice the second, plus 81, minus the first column (where the depths increase by tenths of a foot, with 100 feet stations).

Note—

1. For shorter or longer stations than 100 feet, add the proportional part, or multiple, of the quantity required to be added for 100 feet.

2. For increasing the series of hights and depths, multiply 81 by the square of the increment in tenths, and the product will be the constant number to add.

3. Verify in any table calculated, the last column, which proves the whole, as any error in any of the preceding columns, increases in geometrical progression to that column, and being greatly magnified, is at once discovered.

4. In compiling any table, it is necessary to calculate, by areas and distances, the first two columns, after which the table can be extended to any length by the above process.

If any one knows an easier, more rapid, or more accurate method than this, we should be glad to hear of it.

THE ALLOYS OF COPPER.

From time immemorial, copper has been extensively used for forming compounds with other metals. The ancients whose works of art still remain to us, appear to have wrought it chiefly in combination; and, at the present day, the employment of the pure metal is less general than that of its alloys. It is not improbable that copper will unite with all the metallic elements, but its alloys with zinc, tin, nickel, and the precious metals, are the most valuable and best known. The most useful is "brass," consisting essentially of copper and zinc. It is first mentioned by Aristotle, who states that the people who inhabited a country adjoining the Black Sea, prepared their copper of a beautiful white color by mixing it with an earth found there, and not with tin, as was the custom in other lands. The ancients, however, were not acquainted with the nature of the change that took place; and it is a remarkable example of the slowness by which man arrives at truth when led by experience alone, that brass should have been made during a period of 2,000 years without the metal which brought about the change in the copper being discovered. Brass was made with the utmost secrecy in Germany during several centuries, and some families were raised to great opulence by its manufacture.

The first brass works in England were put into operation in 1649, in the county of Surrey, and the whole of the metal was then made of "rose" copper from Sweden. The first mill for drawing brass wire was erected in 1663. The advantages of brass over copper are its less cost, it being partly composed of a metal cheaper than copper; it is harder, does not oxidize or rust so easily; it melts at a lower temperature, and is hence better for small castings; it has not that tendency to fill with minute bubbles, which property is so disadvantageous in copper founding; it cuts smoother in the lathe, and will bear a higher polish; its color may be made to resemble gold, which adapts it for ornamental purposes; and, lastly, it is more ductile and tenacious. Generally, as the proportion of zinc rises, the hardness and fusibility increases, while the malleability and weight decrease. The brass founder in speaking of his mixtures, specifies the amount of zinc only, it being understood that the ratio is to the pound of copper. The largest consumption of brass is in the manufacture of pins. Brass foil is made from a very thin sheet of brass of 11 copper to 2 zinc.

The next alloy in importance is called "bronze." Tin is now substituted for zinc. Like brass, it is harder and more fusible than copper, and denser than the mean of its constituents. Its color is usually reddish-yellow, but when exposed to the air, a basic carbonate of copper is formed, which furnishes the greenish hue commonly seen on the surface of statues, and by which the alloy is best known. Bronze possesses the singular property of becoming so malleable, that it may be hammered and coined when it is heated and rapidly cooled; and by heating it, and allowing it to cool slowly, it may be made to regain its former hardness and brittleness. Bronze for statuary, for cannon, for bells, and for gongs, is, respectively, of the following proportions of copper and tin: 84 to 11, 89 to 11, 78 to 22, 76 to 22.

Speculum metal is the third alloy in importance, the standard proportions being about 66 copper to 34 tin. The speculum of the great Rosse telescope is composed of copper, with a little less than half its weight of tin, making a composition very hard and brittle, and capable of very fine polish.

German silver is a mixture of copper, 57, nickel, 24, and zinc, 13, and originated in China under the name of "packfong." Large quantities are manufactured at Sheffield, in England, where it is formed into forks, spoons, and vessels for the table, and being plated with silver by the electrotype process, is sold as a substitute for silver. When well made, it cannot be distinguished by an unpractised eye from many of the silver alloys, even when brought on the touchstone; but by dissolving a small piece in nitric acid, and adding a few drops of hydrochloric acid, no milky precipitate is formed, which would be the case were a silver alloy so treated. Good German silver is tougher and harder than brass, and resists the action of air better. Lastly, copper is used, in various proportions, to give the requisite durability to gold and silver coins.

The foregoing are the principal alloys of copper; there are a number of others, the names and properties of which are known to artisans. An alloy of 90 copper to 10 arsenic, is white, slightly ductile, and more fusible than copper, and is not attacked by the atmosphere. This is used for scales of thermometers and barometers, for dials, candlesticks, etc. With iron, copper combines in small proportions; 1 per cent, however, causes iron to weld badly. With aluminum it forms an alloy of considerable malleability and great hardness, capable of taking a very high polish.

THE DOWNFALL OF PARIS.

"Plenty more at the same shop. Country orders executed with neatness and dispatch," exclaimed the renowned Dick Swiveller, after administering a wholesome chastisement to Quilp the Dwarf. The facility with which that well-earned drubbing was administered, and the profound repose with which the chastiser rested upon his laurels, have been, to illustrate great things by small, repeated in the Franco-Prussian war, and in the attitude of Germany toward France, in the hour of her deserved humiliation. France has been whipped as easily as Dick Swiveller punished the dwarf, and her capital has succumbed to a fate that has long been inevitable.

The causes which led to the war have been sufficiently discussed; the causes of the defeat of France, and the effect which the triumph of the German arms will have upon Europe and the world at large, are fruitful themes.

Many will attribute the Prussian success to superiority of numbers. Others will see in it only a triumph of one breech-loading gun over another. Others will see deeper reasons in the difference of the character of the two nations, and, searching for the cause of the difference, will find it in their systems of education, which, on the one hand, has created a nation of educated soldiers, and, on the other, has led to the mental, moral, and physical degeneration of a nation, once the terror of all Europe.

We quote the following eloquent extract from an article written for the London *Fortnightly Review*, by Emile De Laveleye:

The most formidable corps in the French armies was, it used to be said, the Turcos and the Zephyrs. They met men in spectacles, coming from universities, speaking ancient and modern languages, and writing on occasion letters in Hebrew or Sanskrit. The men in spectacles have beaten the wild beasts from Africa. In other words, intelligence has beaten savagery. Are we to be surprised at this, when we know that war, like industry, is becoming more and more an affair of science?

Who does not know the immense sacrifices that Germany has made for the advancement and diffusion of knowledge—spending, for instance, twenty thousand pounds sterling at Bonn in a chemical laboratory, forty thousand at Heidelberg in a physical laboratory? Little Wurtemberg devoted more money to superior instruction than big France. A thing unheard of, France made the very fees of the university students a source of revenue. She gave, without counting it, more than a couple of millions of pounds sterling (between fifty and sixty million francs) for the new opera, and she refused forty thousand pounds for school buildings. Last year, on the deck of the steamer which was conveying us to the inauguration of the Suez Canal, M. Duruy, the one man of merit who ever served under the imperial government, told me the tale of his griefs in the ministry of public instruction. He wanted to introduce compulsory education; the Emperor supported him; he had all the other ministers against him. He had organized fifteen thousand night schools for adults; it was with difficulty that he succeeded in carrying off forty thousand pounds against the fatuous resistance of the Council of State. There was the whole system of public instruction to re-organize, and he could get nothing. They preferred to employ the gold of the country in maintaining the ladies of the ballet, in building barracks and palaces, in gilding monuments, the dome of the Invalides, the roof of the Sainte Chapelle. It was in vain that men like Jules Simon, Pelletan, Duruy, Jules Favre, cried out, year after year, "There must be millions for education, or France is lost." The Government was deaf. It denied nothing to pleasure, to luxury, to ostentation. It denied everything to education.

Again history repeats itself. Again a nation surrendering itself to the utmost refinement of luxury, and disseminating false tastes and demoralizing influences from its Capital to corrupt other nations, has found itself in the hour of peril, unable to resist an attack from a frugal and industrious people, by whom its luxury and pomp has been crushed into the very dust of humiliation.

A daily exchange has asked the question, How much debt can a nation endure and maintain its existence? and thinks the enormous debt of France will throw some light on this question. *We* ask, has it not been demonstrated in this short and decisive struggle, how much luxury a nation can endure and live?

For a long time, Paris has been the fashionable exemplar of the civilized world. What has been done in Paris has been feebly imitated in America, and has more or less influenced the diet, manners, dress, and even the literature of all other nations. The stage has been corrupted by it, and the polished iniquity of the modern Babylon has tainted, more or less, the morals of every capital city in the world. Babylon has fallen. It remains now to be seen whether the seeds of evil which have hitherto emanated from the chastised city, will exert their demoralizing power to the downfall of other nations.

There is no truth more deeply engraved on the pages of history, than that extreme luxury begets a contempt for the homely industries of life, a disregard of a high standard of popular intelligence and the means of maintaining it, a contempt for severe discipline, and rebellion against it, and a general weakness of character that renders a nation powerless against a race of sturdy, intelligent, enduring, and united people.

This war has been a triumph of knowledge and subordination over ignorance and insubordination; of settled earnest principle and purpose over passion and impulse; of thorough organization and fixed policy over incompetency and vacillation of purpose. It teaches a lesson all nations would do well to learn.

In this war the "spectacles" have won 800,000 prisoners, including the Emperor and the Marshals of France, 6,000 cannon, 112 eagles, and a large quantity of stores, munitions, and small arms. And all this has been done in a time so short, that history may be searched in vain for a precedent. The humiliation of the French nation is complete; perhaps the military pride of Germany will be stimulated in equal proportion, but we believe that a nation educated as are the Germans, will know how to use power in a manner that will add to, rather than diminish the glory of their great victory.

BOYNTON'S LIGHTNING SAW.

In another column will be found an advertisement of this saw, to which we would call the attention of those interested in the cutting of timber and cord wood, and in the manufacture of lumber. The teeth of this saw are of even length, double pointed, cutting only with the outside vertical and projecting edges, and clearing simultaneous with the same. All the teeth being M shaped, they are as easy for the unskilled laborer to sharpen and keep in order as the old-fashioned tooth. The two points of the tooth operate as one, preventing gouging out while cutting, and clearing by direct action beneath dust and fiber. These saws are gaining in public favor rapidly. In a trial of a cross-cut, operated by two sawyers, it, in our presence, has repeatedly cut off a beam of white oak, 12 by 6½ inches, in from five to seven seconds, and with from 8 to 10 strokes of the saw. The invention will, we think, greatly lessen the labor of a large class of the most industrious and hard-working men to be found on this continent—the lumbermen—and its use will result in a saving of both wood and labor, in the cutting of cord wood.

THE PRESENT AND THE PAST.

NUMBER III.

Why did mankind for so long a time fail to recognize the existence and the magnitude of the effects produced by these unceasing agencies of destruction? In great measure, because the ideas of civilized men, regarding the earth and its history, were cramped within the narrow scope of each one's limited, individual experience. Men living in temperate climates did not dream that in the circumpolar regions millions of tuns of rocks were annually riven from those frost-bound lands, were borne down to the sea upon the great glacier-rivers, and were set afloat on icebergs, to be finally scattered far and wide over the beds of distant oceans; nor did they ever calculate what would be the effects of a tropical rainfall, two, three, four, or even twenty times heavier than any which they themselves had ever witnessed; much less did they think of multiplying the mass of material removed in a single year by its repetition over a long series of past ages.

What if a village here and there, along the coast, were driven back, step by step, house by house, by the steady encroachment of the sea; what if its ancient church, formerly miles inland, now toppled on the verge of the treacherous cliff, and the bones of the dead in its churchyard, here projected from the topmost layer, there lay fallen on the beach, the prey of the relentless foe? This might be taking place in our village, but which of us reasoned, from these premises, that the whole coast of the British Islands—allowing for the few local exceptions, where sand banks or river rills are slightly encroaching on the sea—was being eaten into at an average rate of perhaps three feet in a century? Ours were clay cliffs, and readily crumbled; but the granite walls of Cornwall, whoever deemed them perishable, much less thought of estimating the rate of their destruction?

But, now-a-days, when each one of us may work the experiences of travelers in all parts of the world into his chain of reasoning, no one has a right to claim ignorance of these truths of nature. Read what Kane and Hayes have written of Greenland glaciers, and of the origin of icebergs; read what other explorers tell of the vast number of icebergs engaged in the unceasing task of burying the remains of the Antarctic continent in the waters of the great Southern Ocean; read what Alpine travelers narrate of the incessant crashing of displaced rocks, and constantly recurring roar of avalanches, laden with the ruins of the mountains, whose cliffs re-echo these, the prophetic sounds of their future doom; read such accounts—and they are at least as interesting to a well-cultivated mind as political diatribes, or sensational novels—and you will form some idea of the grand scale of King Frost's labors, and of the littleness of your own unaided experiences.

We know what heavy summer showers are in New York, where the annual rainfall is double that of damp, foggy London; but our rainfall is only half of the average under the equator, in which zone, moreover, there are vast regions that seldom, or never, receive even a passing shower, thus greatly raising the average of the other portions. In fact, we cannot rightly estimate the force of the rainfalls in the warmer parts of the earth by comparing total averages; the rain in those regions falls in a downpour concentrated into the course of but four or six months; a condition of things admirable described by the Indian lady, bewailing the rainy season:

> "They count our rainfall up in grudging measure,
> With gages all too shallow for our woes;
> They talk of inches of the liquid treasure—
> When we have yards with every wind that blows!"

And this is scarcely exaggeration. More rain has been recorded as falling in localities in India and Australia, in twenty-four hours, than falls in London in the whole year.

We read in Lyell of places where the rainfall amounts to 530 inches in six months, or about eleven times as much as falls in New York in the twelvemonth! No wonder that of such regions he adds: "Numerous landslides, some of them extending three or four thousand feet along the face of the mountains, composed of granite, gneiss and slate, descend into the beds of streams and dam them up for a time, causing temporary lakes, which soon burst their barriers. 'Day and night,' says Dr. Hooker, 'we heard the crashing of falling trees, and the sounds of boulders thrown violently against each other in the beds of torrents. By such wear and tear, rocky fragments, swept down from the hills, are in part converted into sand and fine mud; and the turbid Ganges, during its annual inundation, derives more of its sediment from this source than from the waste of the fine clay of the alluvial plains below.'"

You who watch the roadside rill perhaps have never thought what millions of such muddy streamlets are engaged all the land over in Nature's great freight trade; aye, and what millions of tuns of earthy freight they each day transport onwards towards the sea. The Ganges and the Brahmapootra have their sources in such rills, and it has been calculated that these two rivers together carry down from the interior of Southern Asia to their common delta about 2,500,000,000 tuns of solid matter in the course of the year. To modify Lyell's statement, if a fleet of more than 600 Indiamen, "each freighted with about 1,400 tuns weight of mud, were to sail down the river every hour of every day and night for four months continuously, they would only transport, from the higher country to the sea, a mass of solid matter equal to that borne down" by these two rivers. Such an accession of earth would cover annually 1,650 square miles of surface—or, in one year, one third more than the dry land of Rhode Island; in three years, nearly the area of Connecticut; and in twenty-eight years, nearly that of the State of New York, with a layer of soil one foot in thickness! And this amount is denuded from the water shed of but two rivers! "But," says the unconvinced reader, "how small is the area of New York State when compared with the vast extent of country drained by these mighty streams! The foot in New York State must be reduced to a fraction of an inch over the slopes of the Himalayas, and of Northern India." To which we reply, how short a time is twenty-eight years compared to the age of these rivers! For on this point other evidence steps in, and we learn that the deposits in their delta, even as far as our limited knowledge of them goes, are sufficient to cover our State with seven hundred feet of earth; or, in other words, that material enough to form a mountain range nine hundred miles in length, twenty-five miles in breadth, and sloping from the plain to a hight of twenty-eight hundred feet, has been in the course of time removed from the basins of the Ganges and the Brahmapootra. Should the reader figure this out he will say, "At this rate you give these rivers an antiquity of twenty thousand years." And why not? Or twice as long, if you will? Lyell, with very good grounds for the statement, says of the Mississippi, that it has been transporting its earthy burden to the ocean during a period far exceeding perhaps one hundred thousand years. Perchance, now, you begin to understand why men remained so long in ignorance of the vast operations of Nature? As long as the world was thought to be but six thousand years old, men saw no purpose in her slow movements, and the results she had already achieved were but so many incomprehensible puzzles.

SCIENTIFIC INTELLIGENCE.

COLORED CEMENTS.

Professor Bottger prepares cement of diverse colors and great hardness by mixing various bases with soluble glass.

Soluble soda glass of 33° B. is to be thoroughly stirred and mixed with fine chalk, and the coloring matter well incorporated. In the course of six or eight hours a hard cement will set, which is capable of a great variety of uses. Bottger recommends the following coloring matters:

1. Well sifted sulphide of antimony gives a black mass, which, after solidifying, can be polished with agate, and then possesses a fine metallic luster.
2. Fine iron dust, which gives a grey black cement.
3. Zinc dust. This makes a grey mass, exceedingly hard, which, on polishing, exhibits a brilliant metallic luster of zinc, so that broken or defective zinc castings can be mended and restored by a cement that might be called a cold zinc casting. It adheres firmly to metal, stone, and wood.
4. Carbonate of copper gives a bright green cement.
5. Sesquioxide of chromium gives a dark green cement.
6. Thénard's blue, a blue cement.
7. Litharge, a yellow.
8. Cinnabar, a bright red.
9. Carmine, a violet-red.

The soluble glass with fine chalk alone gives a white cement of great beauty and hardness.

Sulphide of antimony and iron dust, in equal proportions, stirred in with soluble glass, afford an exceedingly firm, black cement; zinc dust and iron in equal proportions yield a hard, dark grey cement.

As soluble glass can be kept on hand in liquid form, and the chalk and coloring matters are permanent and cheap, the colored cements can be readily prepared when wanted, and the material can be kept in stock, ready for use, at little expense. Soluble glass is fast becoming one of our most important articles of chemical production.

USE OF IODINE IN THE MANUFACTURE OF CHLORAL.

The enormous consumption of the hydrate of chloral as an anodyne and the expense of its manufacture, render any modification of the old process of its preparation very acceptable. F. Springmuhl, assistant in the laboratory of Breslau, proposes the employment of iodine as an improvement. To every half pound of alcohol he adds half a grain of iodine. The alcohol, which is colored brown by the iodine, soon becomes clear on passing chlorine gas through the mixture, and the hydrochloric acid produced by the decomposition of the alcohol is passed through water for its absorption; while the residue of the vapor is removed by sulphuric acid and chloride of calcium. The liquid becomes hot at first, and has to be cooled; it is afterwards heated to ebullition. After passing chlorine gas for twelve hours through the half pound of alcohol contained in a tubulated retort, no more hydrochloric acid is observed, and only pure chlorine gas passes over. The liquid in the retort is neutralized with caustic lime, filtered and distilled. At 161° Fah., all the iodide of ethyl goes over; and between 230° and 240° Fah., the chloral, which is separately condensed, is then mixed with concentrated sulphuric acid, once more distilled, and finally purified by sublimation. The hydrate of chloral obtained in this way amounted, in two experiments, to ninety and ninety-six per cent of the theoretical quantity, and was of the best quality and free from iodine.

It is said that the purification of the hydrate of chloral can be best accomplished by the use of chloroform, benzole, oil of turpentine, or bisulphide of carbon, as solvents.

If 1 part of the hydrate of chloral be dissolved in 5 or 6 parts of the oil of turpentine at between 86° and 104° Fah., and the liquid be slowly cooled, beautiful plates and tables separate. The best solvent is the bisulphide of carbon; at 60° Fah., 1 part of the hydrate of chloral is soluble in 45 parts of the bisulphide; but at temperatures below the boiling point of the solvent, 4 or 5 parts of the bisulphide are sufficient to 1 part of the chloral. By allowing the liquid to cool slowly, large prisms, sometimes an inch long, separate, and in the air rapidly lose all traces of the bisulphide. When prepared in this way, the perfectly pure hydrate of chloral fuses between 120° and 127° Fah.

For medicinal purposes only the pure, crystalline product ought to be employed.

ARTIFICIAL ALIZARINE.

One part of anthracen is boiled for a few minutes with 4 to 10 parts of concentrated sulphuric acid diluted with water, and neutralized with carbonate of lime, or with a carbonate of soda or potash; and the sulphates of these bases removed by filtration or crystalization. The resulting liquid is heated to from 356° to 500° Fah., with caustic potash, to which chlorate of potash or saltpeter in an amount equal to the anthracen employed has been added, so long as a violet-ble color is produced. From this product the alizarin is thrown down by acids.

RARE MINERALS.

Professor Rammelsberg, of Berlin, has recently analyzed two rare minerals, called Fergusonite and Tyrite, the former from Sweden, and the latter from Norway, the composition of which discloses substances so little known that it is difficult to see to what uses they could be applied, even if we had them in great abundance. It so often happens, however, that elements of rare occurrence eventually become the very corner stone in some new technical discovery, that it is never well to pass over any of them as of no value. We give below the constituents of the minerals, and doubt if many of our readers are familiar with the earths mentioned:

	Fergusonite.	Tyrite.
Tantalic acid	8·73	45·00
Columbic acid	40·16	.....
Stannic acid } Tungstic acid }	0·91	.....
Yttria	30·45	30·00
Ceria }	7·80	5·74
Lanthana } Didymia }		3·51
Iron	4·09	1·48
Urania	1·98	6·52
Lime	3·40	2·36
Alumina	....	1·05
Water	4·47	4·88
	101·99	100·54

The Insulation of Telegraph Wires in Cities.

Glass, when placed in the shade, becomes completely coated with a thin film of water whenever the moisture contained in the atmosphere amounts to above 40 per cent of saturation. During rain the atmosphere sometimes reaches the point of complete saturation, or 100 per cent. When this is the case, any article of glass, even if exposed to the atmosphere alone, and not to the direct action of the rain, is soon completely covered with moisture, and under these circumstances its surface becomes a conductor of electricity.

The atmosphere of all large cities is heavily charged with soot, smoke, and ammoniacal salts, arising from combustion; and these, being taken up by the particles of falling rain and moisture, increase the conducting power of the latter to an enormous extent. Careful experiments made in Manchester, England, where the atmosphere is very impure, showed that the conducting power of the rain water which fell in that city was more than 300 times that of distilled or absolutely pure water. Speaking of this subject, Latimer Clark says: "Pure water offers a very high resistance, but if it contain any acids or saline matters in solution, the resistance is much smaller; hence it is that clear rain in the country does not greatly injure the working of a line, but in towns, where the atmosphere is less pure, the insulation often becomes very imperfect in wet weather."

The comparative insulation of wires, in the city and country, under otherwise similar conditions, may be seen by the following actual measurements, taken at the New York office of the Western Union Company: No 1 wire east showed a mileage insulation, between 145 Broadway and Harlem river, of 66,000 ohms, while from Harlem river to New Haven, Conn., the same wire gave 282,000 ohms per mile No. 3 east, to Harlem, gave 53,500 per mile; from Harlem to Hartford, Conn., 218,000. The insulation in the country exceeded that in the city in the proportion of more than 4 to 1.

The European telegraphic engineers have endeavored to surmount this difficulty by changing the insulators at short intervals, as their surfaces became smoked and dirty. This, however, is but a partial remedy, as the trouble arises as much from the great conductivity of rain water, under the conditions referred to, as it does from dirt upon the surface of the insulators. They have also largely resorted to the expedient of running the wires underground, a method involving great expense, and yet of rather questionable benefit, as far as immunity from interruption is concerned. Considerable embarrassment is also occasioned by inductive action, when underground wires are employed, especially in working automatic or printing instruments.

It is to an American inventor that the credit is due of being the first to discover a practical and effectual means of insulating wires in cities; and equal credit should be accorded to the American telegraphic superintendent who had the boldness to put the plan into practice on a large scale, and with the most successful results—we refer to the magnificent lines built by General Anson Stager, of the Western Union Company, in the principal Western cities, which are considered by competent judges to be, perhaps, the finest examples of telegraphic construction in the world.

The hight of the city poles above the ground is sixty-five feet. They carry fifty No. 9 wires, arranged upon nine cross arms, and insulated with the Brooks insulator. A test of these lines in rain, after two years' exposure, shows the insulation, within eight miles from the office, to be so high as to be beyond the range of measurement of either the Siemens universal galvanometer or the Varley differential—the instrument usually employed for these tests. These lines, as specimens of telegraphic engineering, are equally creditable in a mechanical point of view. The massive spars, ranged with mathematical accuracy for miles along the straight and level streets of Chicago, instead of detracting from the appearance of the thoroughfares, are a positive ornament to them. The ordinary sized poles are twenty-one feet in hight, and fitted with similar insulation. These are used on the Central Pacific Railway line, the Michigan Central, and the Philadelphia and Reading Railroad line. The latter, by the way, is a very good specimen of substantial construction, eight wires being carried upon two cross arms, and not high enough from the ground to strain the poles too much upon the sharp curves which abound upon that road.—*The Telegrapher.*

NEW BOOKS AND PUBLICATIONS.

MINES AND MINING OF THE ROCKY MOUNTAINS, THE INLAND BASIN, AND THE PACIFIC SLOPE. Comprising Treatises on Mining Law, Mineral Deposits, Machinery, and Metallurgical Processes. By R. W. Raymond, Ph. Dr., U. S. Commissioner of Mining Statistics. Illustrated with 140 Engravings. Beveled boards, extra English cloth. New York: J. B. Ford & Co. 1871. Price, $4·50.

This volume contains, in a condensed form, a vast amount of information concerning our American mining industry, its condition, prospects, methods, and appliances. It comprises a description of all the gold and silver mining districts of the West; a careful discussion of the laws affecting their titles; a thorough essay on mineral deposits in general, their occurrences, characters, and classification: twenty-seven chapters, profusely illustrated, on the mechanical appliances of mining and on metallurgical processes; and an appendix, with valuable tables of statistical information. Three alphabetically arranged analytical indexes, one of Mines, one of Mining Districts, and one of Subjects, complete the work. With these the vast body of information contained in these 800 octavo pages is remarkably convenient and accessible for purposes of reference. The style of the book is free from obscure technicalities, and eminently adapted to interest and instruct the non-professional reader; while yet it is clear, terse, and accurate enough to satisfy the demand of experts.

VICKS' CATALOGUE AND FLORAL GUIDE.

One of the handsomest illustrated floral catalogues that come annually to our office is Vick's, of Rochester, N. Y. This year it comes to us more beautiful than ever. It is printed on tinted paper, and contains more than 200 engravings of the choicest varieties of flowers and vegetables, two of which occupy full pages, and are finely colored. Any one having a taste for horticulture should inclose 25 cents to James Vick, Rochester, N. Y., and have a copy of his catalogue and guide mailed to him.

HIDE AND SEEK. A Novel. By Wilkie Collins, Author of "Woman in White," "Dead Secret," and many other popular Novels.

Messrs. T. B. Peterson & Brothers, 306 Chestnut street, Philadelphia, have just issued an edition of "Hide and Seek." Price, 75 cents.

A TEXT-BOOK OF ELEMENTARY CHEMISTRY, THEORETICAL AND INORGANIC. By George F. Barker, M. D., Professor of Physiological Chemistry in Yale College. New Haven, Conn.: Charles C. Chatfield & Co.

Prof. Barker has brought to the preparation of this work extensive knowledge of his subject, and, what is perhaps even more important, the fruits of an experience only to be obtained in teaching, through the want of which many able men have failed in their attempts to write good text-books for students. We are, after examination, prepared to give the book hearty commendation. Not that it is wholly without fault in plan and execution, but that these are so few, and the merits of the book are so obvious, as to disarm criticism. Accustomed to different methods of thought, the slight defects referred to may, perhaps, be only such to us, and may appear merits to others. The book is admirably calculated to introduce beginners into the science of chemistry. It is printed and bound in beautiful style.

NOTICES OF MINING MACHINERY, AND VARIOUS APPLIANCES IN USE, CHIEFLY IN THE PACIFIC STATES AND TERRITORIES, FOR MINING, RAISING AND WORKING ORES. With Comparative Notices of Foreign Apparatus for Similar Purposes. By William P. Blake. New Haven, Conn.: Charles C. Chatfield & Co.

This work is a reprint of a part of a report made by its author to the U. S. Commissioner of Mining Statistics, and printed as Part. IV. of the Commissioner's Report to Congress for the year 1870. Since the preparation of the report, there have been important advances in the construction of mining machinery, which have suggested certain modifications in this reprint. The work is replete with important and valuable information.

ST. LOUIS, THE FUTURE GREAT CITY OF THE WORLD. Illustrated with a Map, by L. U. Reavis. Second Edition. St. Louis: Published by order of the St. Louis County Court.

This book contains a large mass of facts, historical, geographical, geological, mineralogical, and statistical, in regard to St. Louis, one of the most important commercial and manufacturing centers of the great West. The whole is arranged in a very readable style, and printed in large pamphlet form.

A CHRONOLOGY OF PAPER AND PAPER MAKING. By Joel Munsell. Fourth Edition. Albany: Joel Munsell, 82 State street.

To those who know with what ability Mr. Munsell can compile, and in what a fine style he can print a work of this character, we need not say one word in regard to the value of the one now announced; and readers of this class are not few. For the benefit of those who are not familiar with Mr. Munsell's works, we will say, however, that the volume opens with a history of paper and paper making, which is followed by a chronology of paper, including improvements in its manufacture, and various industrial applications, arranged as the author so well knows how to do, in admirable form for reference. The work should be in every technical library, and is full of interest to the general reader.

SCIENTIFIC ADDRESSES, by Prof. John Tyndall, LL.D., F.R.S., Royal Institution, on the Methods and Tendencies of Physical Investigation; on Haze and Dust; on the Scientific Use of the Imagination. New Haven, Conn.: Charles C. Chatfield & Co.

WE are indebted to Mr. Dewitt C. Cragier for a copy of the Ninth Annual Report of the Board of Public Works of the City of Chicago, a voluminous and well-prepared document. Mr. Cragier will please accept our acknowledgements.

THE ADVERTISING HANDBOOK for 1871 has been issued in very convenient form, by T. C. Evans, 106 Washington st., Boston, Mass. Advertisers will find it a very useful book of reference.

WE are indebted to Mr. John Eaton, Jr., Commissioner of Education, for a copy of his Annual Report for 1870. We have read a great deal of this most admirable public document. It abounds in valuable information and statistics upon the present condition of education in the various States in the Union, together with instructive papers upon several specific subjects.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

APPLICATIONS FOR LETTERS PATENT.

11.—CARRIAGE LAMPS, BURNERS, AND BRACKETS.—R. Spaulding Merrill, Boston, Mass. January 3, 1871.

21.—TUCK MARKER FOR SEWING MACHINES.—J. F. Kellogg, North Bridgewater, Mass., and E. A. Cutler, Providence, R. I. January 5, 1871.

29.—STEAM BOILERS.—W. B. Mack, Philadelphia, Pa., residing at Glasgow, January 6, 1871.

32.—REPEATING FIRE-ARMS.—Oliver F. Winchester, New Haven, Conn. January 6, 1871.

33.—PLUMBAGO PRESSES.—Hubert R. Ives, New Haven, Conn. January 6, 1871.

Business and Personal.

Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us: besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1·00 a line, under the head of "Business and Personal."

All reference to back numbers must be by volume and page.

GEARING CIRCULAR SAWS.—In answer to E. O. T.'s inquiry in regard to running a saw by gear direct from engine, I would say that there would be no trouble with the gear, but it would be folly to run a large saw in that way, owing to the great liability of the saw to be instantly stopped by the springing of timber, turning of logs, and other causes that practical sawyers know. My opinion is that if E. O. T. try it he will some day find his mill a wreck. I would also state that I have a gear of his description 2-feet diameter, 5-inch face, run by water power, that often makes 800 turns in a minute, used with belt for driving a 48-inch saw.—A. O. B., of Vt.

CEMENT.—F. P. B. can make a cement for fastening leather to iron or glass, as follows: To 1 quart of glue, after it is dissolved in good cider vinegar, add 1 ounce Venice turpentine; let it cook about half a day, when it is fit for use.—O. L. C., of N. H.

TURNING LATHE.—If M. C. R. will take a light cut from the bottom of the tail-stock, his lathe will turn true. The tail stock is evidently a little too high for the cone.—R. A. B., of Pa.

J. M. D.—The object of our query column, and column of answers to correspondents, is to benefit our readers at large, not individual readers. If you will send the recipes of which you speak we will publish them, but do not intend to make our office a medium of intercommunication on private business matters. The action of a steel magnet or any other magnet, will not render the air magnetic. A machine kept in motion by the attractive force of a permanent magnet would be a perpetual motion in the same sense as one kept in constant motion by the action of gravity. A water wheel placed in a never-failing stream is a perpetual motion in this sense. What is sought for is, however, a machine that will move itself independently of static force. Have you got such a machine? If so, we shall be glad to be introduced to it.

B. M. & Co., of Ind.—You are on the right track. By admitting air behind the bridge wall in the manner proposed, you will probably consume your smoke. We believe that heated air, if forced in under pressure, is better than cold air. If, however, it go in only under ordinary pressure, what you gain by increase of temperature will be, in great measure, lost by expansion, less oxygen entering in proportion to volume than when it enters cold.

J. A. H., of Ga.—There is no such substance as that you seek. The experiment you propose indicates that you do not understand the first principles of electrical science. Better get some good treatise, and inform yourself, than waste time and money in trying experiments which can not by any possibility teach you anything.

M. Y., of Ga.—We shall be glad to hear from you on the subject proposed, but cannot, of course, promise publication till we read your manuscript. The proportions for Babbitt metal, and method of making the alloy are as follows: Melt 4 parts of copper, and add by degrees 12 parts of best Banca tin, and 8 parts of regulus of antimony. When the mass is melted add 12 parts more of tin.

B. J. of Pa.—Rosner, a Danish Astronomer, first determined the velocity of light in 1675, by observing the eclipses of Jupiter's moons. It seems to require no time at all to pass over any distance of earth; the flash seems to be instantaneous.

E. M. F., of N. J.—You may use soda ash in your boiler to remove scale without any danger of hurting the boiler. In some cases it will loosen the scale, in others it will not. It will do no harm to try it.

G. F. C., of ——.—Plaster of Paris is prepared for taking casts by simply mixing it with water to the consistence of cream. The mixing must be done rapidly, or it will set before it can be poured into the mold.

O. W. Y. of Conn.—You will find the information you seek in an article on "Artificial Stone," page 263, Vol. XXIII. of the SCIENTIFIC AMERICAN.

L. R., of N. H.—The motive powers of streams, flowing equal volumes of water, will be directly as their falls. If a stream through which a given volume, at a given point, falls ten feet, produce at that point one hundred horse power, the same volume falling at another point twenty feet would yield two hundred horse power. The horse power of any body of falling water, is the weight in pounds which falls per minute, multiplied into the distance in feet through which it falls, and the product divided by 33,000.

Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers, and hope to be able to make this column of inquiries and answers a popular and useful feature of the paper.]

1.—CEMENT FOR LEATHER THAT WILL RESIST WATER AND HEAT.—I wish a cement for leather that will resist the action of water and moderate heat.—J. A. K.

2.—FILTER FOR CISTERNS.—I see some of your correspondents recommend a wall of soft-burnt bricks for cistern filters. Should the wall be laid up with mortar or cement, or simply with the bricks alone?—J. A. K.

3.—How can I render scrap lead (such as accumulates in a plumber's shop) as soft and tough as pure sheet lead or pig lead? I desire to make castings of a peculiar shape, and can do so with pure sheet or pig lead, but the scrap is too hard and brittle. Cheapness is of course an object.—H. W. J.

4.—HARDENING CAST IRON.—How can cast iron be hardened after it is fitted and finished, without injury to the finished surface, and so as to render it more durable under wear?—C. D. S.

5.—DRESSING FURS.—I wish some cheap way of dressing skins with the fur on, and polishing the hair after the skin is dressed?—J. P. H.

6.—DISTILLING TAR.—How can I distil pine tar so as to separate the grosser parts from the finer? What sort of still should I use, etc?

7.—IMITATION ROSEWOOD MOLDINGS.—How are imitation rosewood moldings made? How is the plaster made to adhere, and how are they finished?—W. S. H.

8.—POTTER'S CLAY.—How is potter's clay mixed and tempered?—G. F. C.

9.—EXPLOSION OF SCRAPPING FURNACE.—An explosion occurred in one of my furnaces recently, which I cannot explain or account for. The furnace is what is known as a cinder bottom scrapping furnace, with water chill inside, built very strongly, in use only two weeks, using mixed hard and soft coal, with blast. It exploded with great violence, just after the heat had been drawn, when the door was open, and when the heator had just taken his rabble out of the water bosh, and thrust it into the furnace, on the cinder bottom. The explosion was similar to the discharge of a cannon, and filled the mill with smoke and steam. The roof of the furnace was lifted, though not blown off, and the nine doors in the boiler wall were all blown open. The heator said no water had been put into the furnace to cool the bottom, as he had been accustomed to do, but explained it as resulting from the contact of a little wet cinder, about the size of a walnut, sticking on to the rabble, and coming in contact with the molten cinder in the furnace. But this explanation did not satisfy me, and as the occurrence was new to me, and very dangerous, and might be very expensive, I desire to ask the cause of the explosion, and the remedy. A similar occurrence happened at one of the large mills here in Reading, on the same day, and a few years since, at Phœnixville, Pa., a furnace was leveled with the ground from the same cause. Water is frequently thrown into the furnace to cool the bottom, without danger, and the heator says an explosion might not happen again in five years with the same treatment. What exploded, and what was the cause?—J. H. S.

10.—SAWING SOFT TIMBER WITH CIRCULAR SAWS.—With what form of teeth—filed square or shearing on top—can the best results be obtained in sawing soft timber with circular saws?—A. O. B.

11.—PRESERVING STARCH AND PASTE.—Is there any substance that, when put into boiled starch and flour paste, will preserve the starch and paste in a perfect state for months? Something that will prevent them from souring or watering?

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

COTTON CHOPPER.—Joseph R. Hood, Wedowee, Ala.—This invention consists in providing the frame of a cotton chopper with a hoe, arranged in such manner as to work from the side of the frame, for the purpose of thinning out the cotton crop.

WOOD-SPLITTING MACHINE.—Frank Ficht, Dyckeville, Wis.—This invention has for its object to furnish an improved machine for splitting cord wood, shingle bolts, and other short wood, and which shall be simple in construction, effective in operation, and conveniently operated.

CARTRIDGE BELT.—William B. Hayden, Columbus, Ohio.—This invention has for its object to so improve cartridge belts that the same may be revolved, to bring the filled pouches always to the front, and to improve the pouches so that the wads of the several cartridges will be retained in place.

HOLLOW AUGER.—Aaron Bauman and Orin O. Witherell, Toledo, Ohio.—This invention has for its object to furnish an improved hollow auger, which shall be simple and inexpensive in construction, not liable to get out of order, and which shall require less power to operate it than the hollow augers constructed in the ordinary manner.

SPADE.—Harrison Parkman, Philadelphia, Pa.—This invention consists in a spade whose lower end is beveled downward from each outer corner to a central point; which is wider at the lower than at the upper end; which in cross-section is concave on its front and convex on its rear side; and which longitudinally is straight on its rear side, from top to bottom.

WASHING MACHINE.—A. J. Nave, Columbus, Texas.—This invention has for its object to furnish an improved machine for washing wool, clothes, etc., which shall be simple in construction, convenient in use, and effective in operation, being so constructed as to wash the clothes quickly, thoroughly, and with very little wear.

INVALID BEDSTEAD.—Dr. William O. Reid, Vienna, N. C.—This invention relates to improvement on the bedstead patented to applicant March 1, 1870, and consists in mechanism whereby the patient is enabled to raise his body into a partially erect position, and otherwise assist himself in various ways, without the aid of an attendant.

BIN COVER.—Alonzo S. Maxwell, Dixon, Ill.—This invention relates to improvements in the bin covers made in the form of a segment of a circle, and moving on circular lines in opening and closing, and it consists in providing arms for the said covers, which are pivoted at the axis of the curve of the cover, and have curved heads, by which they are attached to the covers; said heads stretching across the ends of the covers at the inner sides in a way to brace and strengthen the covers; and the covers are supported on the pivots of the arms where they swing in opening and closing, so that they are held either open or closed, by gravity. The invention also consists in the application to the bins, of casings to prevent the contents of the bins working between the arms and the walls thereof; also a packing to exclude it from the space between the cover and the top of the case.

DRAWER PULL.—Charles H. Pierpoint, West Meriden, Conn.—This invention relates to improvements in that class of drawer pulls in which a handle is jointed to a shank projecting from the front of the drawer, to hang in a vertical position when not used for pulling the drawer, and it consists in the application to the said handle, of a cushion of india-rubber or other suitable elastic substance, to prevent rapping or defacing the front, also to prevent noise.

FILE AND BINDER FOR PAPERS, PAMPHLETS, ETC.—J. G. Floyd, Jr., New York city. This invention has for its object to furnish an improved file and binder for filing and binding, temporarily or permanently, papers, pamphlets, and other periodicals, successively, as they are received, and which shall be simple in construction, easily and conveniently manipulated, and will hold the papers securely and without mutilating them, or interfering with their being subsequently bound.

STAMP HOLDER.—Julius Ropes, Ishpeming, Mich.—This invention has for its object to furnish an improved device for holding postage and internal revenue stamps, designed more especially for use in post offices and other places where stamps are sold at retail, which shall be so constructed that the different denominations will be held distinctly in view, and in such a way that they may be easily and quickly detached when required, and which shall be simple in construction and easily and conveniently operated.

WELL AUGER.—Elijah Altman, Hamilton, Mo.—This invention has for its object to furnish an improved well auger, designed more particularly for boring through veins of quicksand, and which shall be simple in construction and effective in operation, taking out the water and dirt much cleaner than augers constructed in the ordinary manner.

SETTING FOR STONES AND JEWELS.—William Riker, Newark, N. J.—The object of this invention is to prepare a setting for precious stones and their imitations, in such manner that the gold plates supporting said stones can be completely finished and polished before receiving them and the projecting pins that hold the same in place. The invention consists in the application, to a perforated setting plate, of separate headed setting pins for holding the stone, said pins being applied only after the plate has been entirely finished and polished.

STAMP.—A. M. Darrell, Washington, D. C.—This invention relates to that class of stamps which indelibly mark an object by burning an impression into it with a heated die; and the object of the invention is to so improve the stamp that it shall be self-heating, and at the same time be neat, durable, cheap, and convenient, the heating apparatus being as capable of adaptation to small hand stamps as to the larger classes of spring stamps, etc.

ROACH AND BUG TRAP.—Thomas Williams, Tompkinsville, N. Y.—This invention consists in applying to the lower edge and outer side of the suspended funnel an annular flange, which constitutes a trough, in which liquid for preventing the escape of the animals may be contained.

FEED-WATER HEATER.—E. L. Jones, Memphis, Tenn.—This invention relates to improvements in feed-water heaters for steam boilers, and consists in a pipe or pipes arranged to traverse the furnace chamber, through which pipes water is supplied to the boiler by a force pump, and in which a current may be maintained when the pump has ceased its operation.

FOLDING DESK.—John Milwain, Nashville, Tenn.—This invention relates to improvements in folding school desks, and it consists in a combination with the folding table of the desk, of a strip or plate for closing the opening at the point where the table is folded down, and an arrangement of the pivot points, bracing arms, and guide grooves, for the latter, for operating the table, so as to effect the said closing of the joint, so that when the table is folded down, the book case beneath will be closed dust proof.

WASHING MACHINE.—E. P. Brown, Thomasville, Ga.—This invention relates to improvements in washing machines, and consists of two sets of rollers, each mounted in a frame, with spaces between them, one set arranged above the other, both in a rectangular case, and connected to a vibrating working bar, so that they will move simultaneously in opposite directions, the rollers of the upper set rolling up and down over the lower ones, and acting on the clothes placed between the two sets. The invention also comprises the application to the upper set of a spring for increasing the pressure on the clothes.

SPOKE-TENONING MACHINE.—Godfrey E. Culp and Matthew Flaig, Lockhaven, Pa.—This invention consists in an improved machine for tenoning spokes for wagon wheels; and consists in a peculiar construction and arrangement of parts, for effecting the operation in a rapid, neat, and effective manner.

STUFFING BOX FOR ENGINES.—Joel A. H. Ellis, Springfield, Vt.—This invention has for its object to prevent the escape into the atmosphere of vapor around the piston and valve rods, and the escape of the fluid from which the vapor is produced around the plunger of the force pump that supplies vapor generators.

VAPOR GENERATORS FOR VAPOR ENGINES.—Joel A. H. Ellis, Springfield, Vt.—This invention relates to a new means for utilizing the escape heat of a furnace and steam engine, for the purpose of vaporizing gasoline or other volatile substance used in a vapor engine.

MEDICAL COMPOUND.—Rebecca Gilkinson, New York city.—This invention and discovery relates to a new and useful improvement in a liniment for curing rheumatism and similar diseases.

DUST FLUE DAMPER.—James M. Frear, Pittstown, Pa.—The object of this invention is to obtain convenient and easy access to the bottom flues of stoves and ranges for the purpose of cleaning the same, and also to create an under draft for carrying off the ashes and dust which rise when raking or shaking the grate.

COMPOUND FOR VAPOR GENERATORS.—J. A. H. Ellis, Springfield, Vt.—This invention relates to a new compound fluid to be used in the vapor generators of vapor engines.

SALT CELLAR.—John T. Walker, Brooklyn, N. Y.—This invention relates to a new salt cellar, which is provided with a clamping spring to be readily attached to and detached from the edge of a plate.

GRATE FOR FURNACES.—Alfred Dart, Carbondale, Pa.—In this invention, the fuel is fed upon a grate set at an inclination of about 45 degrees, and provided with a corrugated cover, whereby the fuel is kept in a thin stratum, and in a state of thorough and nearly uniform combustion.

SEWING-MACHINE MOTOR.—William C. Thornton and James D. Cooley, Hillsville, Va.—This invention relates to a stop-mechanism for sewing-machine motors, whereby the motion of the motor may be arrested instantly, and at any desired moment.

SOLUTION AND PROCESS FOR EMBALMING.—Dr. Benjamin F. Lyford, San Francisco, Cal.—This invention relates to a new compound for use in embalming, and a peculiar process of preparing and applying the same, whereby animal bodies may be perfectly preserved without appreciable deterioration for an indefinite period.

APPARATUS FOR PRESERVING MEATS, FRUITS, ETC.—Nicholas H. Shipley, Baltimore, Md.—In this invention an apparatus is provided for simultaneously exhausting the air from any number of vessels, with or without the application of heat thereto, for the purpose of scientific experiments, and for domestic use in preserving meats, fruits, vegetables, etc. The apparatus is also designed for the substitution of gases in place of the air exhausted and for the application of heat or cold to the vessels during the process.

COMBINED TAPE MEASURE AND SCREW DRIVER.—Moses W. Dillingham, Amsterdam, N. Y.—This invention relates to a new and useful improvement in a combination of well-known and useful articles more especially designed for undertaker's use, and it consists in combining with the pocket tape measure a screw driver and an awl, arranged to operate from a tube connected with the case of the tape measure.

DETACHABLE TACKLE BLOCK.—George Stancliff, New York city.—This invention has for its object to so provide tackle blocks that the load suspended from them may be readily detached when desired. The invention is chiefly applicable to davits for suspending boats from the sides of a vessel, and for permitting the rapid detachment of the same, but may also be used for other purposes.

Official List of Patents.

ISSUED BY THE U. S. PATENT OFFICE.

FOR THE WEEK ENDING JAN. 31, 1871.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT FEES

On each Caveat	$10
On each Trade-Mark	$25
On filing each application for a Patent, (seventeen years)	$15
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A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from $1
upward, but usually at the price above-named.
The full Specification of any patent issued since Nov. 20, 1866, at which time the Patent Office commenced printing them .... $1·25
Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.
Full information, as to price of drawings, in each case, may be had by addressing

MUNN & CO.,
Patent Solicitors, 37 Park Row, New York.

111,296.—ADJUSTABLE REAMER.—Edwin H. Adgate, Mittineague, Mass.
111,297.—FASTENING FOR DOOR-KNOB ROSES.—James M. Adolphus, Philadelphia, Pa. Antedated Jan. 21, 1871.
111,298.—STEAM GENERATOR.—Christopher Ahrens and Frank Kamman, Cincinnati, Ohio.
111,299.—MACHINE FOR WELDING TUBES.—William C. Allison (assignor to W. C. Allison & Sons), Philadelphia, Pa.
111,300.—WELL AUGER.—Elijah Altman, Hamilton, Mo.
111,301.—FODDER STAND.—John Antram and Elwood B. Mullin, Franklin, Ohio.
111,302.—MILK CAN.—Thomas M. Bell, New York city.
111,303.—PNEUMATIC SPRING.—John Bevan, Port Richmond, and Benjamin W. Hitchcock, West Flushing, N. Y.
111,304.—PRINTING PRESS GUIDE.—Alexander L. Bevans, Flushing, N. Y.
111,305.—MANUFACTURE OF COPPERAS.—R. DeWitt Birch, Philadelphia, Pa.
111,306.—APPARATUS FOR OPENING THE EYES OF PICKS.—Robert Blake, Scranton, Pa.
111,307.—METALLIC ROOFING.—George W. Bliss, Springfield, Mass.
111,308.—HORSE HAY RAKE.—Olpha Bonney, Jr., San Francisco, Cal.
111,309.—HAT SUPPORTER AND VENTILATOR COMBINED.—John A. Borthwick (assignor to himself and George W. Hess), Philadelphia, Pa.
111,310.—BEE HIVE.—Arthur Bradshaw, Rantoul, Ill.
111,311.—HEAD STOCK FOR MILLING MACHINES.—Amos H. Brainard, Hyde Park, Mass.
111,312.—WHEEL FOR VEHICLES.—Alexander D. Brown, Sr., Columbus, Ga.
111,313.—WASHING MACHINE.—Edmund P. Brown, Thomasville, Ga.
111,314.—HAY TEDDER.—Ezekiel W. Ballard, Barre, Mass.
111,315.—CRACKER MACHINE.—William Cairns, Jersey City N. J.
111,316.—PUMP.—Herman Camp, Rouseville, Pa.
111,317.—CULINARY VESSEL.—John H. Chappel (assignor to himself and Robert Seaman), New York city.
111,318.—COMPOUND FOR ENAMELING BRICK.—Decius W Clark, Chicago, Ill.
111,319.—CORN POPPER.—William F. Collier, Worcester, Mass.
111,320.—HORSE HAY RAKE.—Isaac N. Condra, Genoa, Iowa.
111,321.—BATH AND WASH STAND.—Royal Cooper, Georgetown, D. C.
111,322.—GATE.—Hosea Ballou Crandall, Brocton, N. Y.
111,323.—GRAIN, COFFEE, AND RICE CLEANER.—Andrew Crawford, Wilkesbarre, Pa., and Iram D. Crawford, Bloomington, Ill.
111,324.—HARNESS OPERATING MECHANISM FOR LOOMS.—George Crompton, Worcester, Mass.
111,325.—CARPET.—George Crompton, Worcester, Mass.
111,326.—PLATFORM HORSE POWER.—Frank J. Culver, Hartford, Vt.
111,327.—SCREW DRIVER.—Moses W. Dillingham, Amsterdam, N. Y.
111,328.—SCROLL SAW.—William H. Dobson (assignor to Henry Lampert), Rochester, N. Y.
111,329.—COMPOUND LIQUID FOR USE IN VAPOR ENGINES.—J. A. H. Ellis, Springfield, Vt.
111,330.—STUFFING BOX FOR ENGINES.—J. A. H. Ellis, Springfield, Vt.
111,331.—VAPOR GENERATOR FOR VAPOR ENGINES.—J. A. H. Ellis, Springfield, Vt.
111,332.—FLY CATCHER.—Harriet A. Farnam, South Bend, Ind.
111,333.—MACHINE FOR SPLITTING WOOD.—Frank Ficht, Dyckesville, Wis. Antedated Jan. 29, 1871.
111,334.—STEM-WINDING WATCH.—Walter H. Fitz Gerald, Carlstadt, N. J., assignor to Spad one & Fitz Gerald, New York city.
111,335.—PAPER FILE.—John G. Floyd, Jr., New York city.
111,336.—DAMPER.—James M. Frear, Pittstown, Pa.
111,337.—CARPET STRETCHER.—Charles E. Gale, Aurelius, N. Y.
111,338.—ROAD SCRAPER.—George B. Garlinghouse, North Madison, Ind.
111,339.—SASH HOLDER.—Philetus W. Gates (assignor to himself and D. R. Fraser), Chicago, Ill.
111,340.—RAILWAY CAR TRUCK.—Charles Graham, Kingston, Pa.
111,341.—VALVE FOR STEAM PUMPS.—Joseph F. Hamilton, Alliance, Ohio.
111,342.—DOOR HANGER AND RAIL.—Thomas Foster Hamilton, Geneseo, Ill.
111,343.—LOOM.—Emory B. Hastings, Palmer, Mass., assignor to himself, Edwin Sawyer, Daniel L. Thompson, and Charles A. Perley.
111,344.—HARVESTER RAKE.—George W. Hines, Brookfield, Wis. Antedated Jan. 28, 1871.
111,345.—REGISTERING TICKET PUNCH.—Austin D. Hoffman, Chicago, Ill., assignor to James H. Small, Buffalo, N. Y.
111,346.—COTTON CHOPPER.—Joseph R. Hood, Weedowee, Ala.
111,347.—GRAIN SEPARATOR FOR THRASHING MACHINES.—James W. Huntoon, St. Louis, Mo.
111,348.—ELECTRO-MOTORS FOR CARS.—Solomon Jones, New Orleans, La.
111,349.—PUMP.—T. O. Jones, Galesburg, Ill.
111,350.—CORN-SHELLING AND CLEANING MACHINE.—Louis Kamp, Vanderburg county, Ind.
111,351.—BUNG EXTRACTOR.—Josiah Kirby, Cincinnati, Ohio.
111,352.—BUNG.—Josiah Kirby, Cincinnati, Ohio.
111,353.—CAR STARTER.—George Byron Kirkham, New York city.
111,354.—PUMP.—T. J. Lapsley, Nashville, Tenn.
111,355.—CARPET CLEANER.—H. H. Lindhorst, St. Louis, Mo.
111,356.—HOISTING APPARATUS.—Andrew B. Lipsey, New York city.
111,357.—FERTILIZING COMPOUND.—J. M. Lowenstein, New Orleans, La.
111,358.—DISINFECTING AND VENTILATING BURIAL VAULTS.—B. F. Lyford, San Francisco, Cal.
111,359.—SEWING MACHINE.—William A. Mack, Norwalk, Ohio.
111,360.—LAMP.—C. D. Macqueen, Philadelphia, Pa.
111,361.—HOISTING FORK.—Elias Magruder, Cap Au Gris, Mo.
111,362.—SPRING BED BOTTOM.—Erwin Williams Maxson, Scranton, Pa.
111,363.—COVER FOR BINS.—Alonzo S. Maxwell, Dixon, Ill.
111,364.—BEDSTEAD AND SPRING BED BOTTOM.—William McArthur, Philadelphia, Pa.
111,365.—COMBINED ROCKING SOFA AND BEDSTEAD.—Wm McArthur, Philadelphia, Pa.
111,366.—SULKY PLOW.—Edward Meloy and A. R. Stanley, Shullsburg, Wis.
111,367.—THRASHING MACHINE.—J. H. Miller, Arcadia, N. C. Antedated January 23, 1871.
111,368.—LAMP CHIMNEY AND DISH WASHER.—C. S. Moore and Silas A. Moore (assigns his right to Harland Boyd), Worcester Mass.
111,369.—CULINARY VESSEL.—Francis Morandi, Malden, Mass.
111,370.—MANUFACTURE OF SUPERPHOSPHATE OF LIME.—Campbell Morfit, Sudbrook Park, England.
111,371.—FOLDING SETTEE.—Henry T. Morse (assignor to L. Morse & Son, Athol), Mass.
111,372.—SEEDER AND CULTIVATOR.—James T. Mott, Postville, Iowa.
111,373.—VALVE.—George Murray, Jr. (assignor to himself, George Murray, Sr., and Henry E. Snow), Cambridgeport, Mass.
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111,389.—BASE-BURNING STOVE.—J. Q. C. Searle, New Albany, Kansas.
111,390.—HEATER FOR PAPER-RULING MACHINES.—Louis Siebert and J. W. Lilley, Columbus, Ohio, assignors to J. R. Hool & Son, New York city.
111,391.—CULTIVATOR PLOW.—Joseph Singer, Mendota, Ill. Antedated Jan. 14, 1871.
111,392.—REGISTERING TICKET PUNCH.—J. H. Small, Buffalo, N. Y.
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111,404.—DIGGING MACHINE.—I. P. Tice, New York city. Antedated Jan. 21, 1871.
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111,424.—HARVESTER.—L. M. Batty, Canton, Ohio.
111,425.—WOOD PAVEMENT.—H. M. Beidler, Philadelphia, Pa.
111,426.—STALL FOR HORSES.—S. S. Bent, Port Chester, N. Y. Antedated Jan. 21, 1871.
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111,429.—MODE OF FORMING AIR CHAMBER IN DENTAL PLATES.—Mary Ann Boughton, Norwalk, Conn.
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111,452.—FEEDING MECHANISM FOR SEWING MACHINES.—Walter B. Higgins, San Francisco, Cal.
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111,456.—FASTENING FOR EPAULETTES.—Wm. J. Horstmann, Philadelphia, Pa.
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111,466.—BEE HIVE.—John Armstrong McAnulty, Gilpin, Pa.
111,467.—FRUIT DRYER.—John V. R. Miller, Richmond, Ind.
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111,469.—COMBINED BAND CUTTER AND FEEDER FOR THRASHING MACHINES.—Samuel S. Myers and James McCauley, McAlisterville, Pa.
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111,477.—STREET-SWEEPING MACHINE.—E. A. G. Roulstone, Boston, Mass.
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111,480.—CONCRETE BLOCKS FOR PAVING.—J. J. Schillinger, New York city.
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111,483.—HARVESTER REEL AND RAKE.—Wm. H. Seymour, Brockport, N. Y.
111,484.—WRINGING MACHINE.—Albert H. Spencer, Providence, R. I.
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111,486.—MANUFACTURE OF ILLUMINATING GAS.—Ira N. Stanley, Brooklyn, N. Y.
111,487.—UMBRELLA.—Nicholas Starr, Homer, N. Y.
111,488.—ELECTRO-MAGNETIC SEWING MACHINE.—George Stevens and Joshua Hendy, San Francisco, Cal.
111,489.—GUARD CHAIN FOR BRACELETS.—George D. Stevens, New York city.
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111,491.—CARRIAGE BODY.—Chauncey Thomas, Boston, Mass.
111,492.—VEHICLE.—Chauncey Thomas, Boston, Mass.
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111,494.—CHAIR.—Cyrus Tucker, Terre Haute, Ind.
111,495.—TRUSS.—Cornelius C. E. Van Alstine, New Haven, Conn.
111,496.—MACHINE FOR PREPARING WOOD PULP.—Michael Waissnix and Alois Waissnix, Reichenau, and Carl A. Specker, Vienna Austria.
111,497.—FLY EXTERMINATOR.—Amasa K. Walker, Hampden, Me.
111,498.—MODE OF LAYING PIPES ACROSS RIVERS.—John F. Ward, Jersey City, N. J.
111,499.—DOOR LOCK.—John Welsh, Canton, Ohio.
111,500.—REPEATING FIRE-ARM.—Luke Wheelock (assignor to the Winchester Repeating-arms Company), New Haven, Conn.
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111,502.—HARNESS SADDLE TREE.—Philip H. Wiedersum New York city.
111,503.—MECHANICAL MOVEMENT.—Jacob Woolf, Burr Oak Mich.
111,504.—MANUFACTURE OF STEEL, STEELY IRON, AND HOMOGENEOUS OR CRYSTALLINE IRON.—James D. Whelpley and Jacob J Storer, Boston, Mass.

REISSUES.

4,242.—REFRIGERATOR.—Joseph H. Fisher, Chicago, Ill.—Patent No. 49,098, dated Aug. 1, 1865.
4,243.—RUBBER ROLL FOR CLOTHES WRINGERS.—James B. Forsyth, Boston, Mass.—Patent No. 59,798, dated November 20, 1866.
4,244.—MANUFACTURE OF INDIA-RUBBER ROLLERS.—James B. Forsyth, Boston, Mass.—Patent No. 59,580, dated November 13, 1866; reissue No. 2,589, dated May 7, 1867.
4,245.—THRASHING MACHINE.—Hugh Hanna, Pittsburgh, Pa.—Patent No. 84,546, dated December 1, 1868.
4,246.—REGISTERING TICKET PUNCH.—Austin D. Hoffman, Chicago, Ill., assignor, by mesne assignments, to James H. Small, Buffalo, N. Y.—Patent No. 100,036, dated February 22, 1870.
4,247.—Division A.—CENTRIFUGAL SUGAR-DRAINING MACHINE.—Hugh W. Lafferty and Robert Lafferty, Gloucester City N. J.—Patent No. 88,185, dated March 23, 1869.
4,248.—Division B.—CENTRIFUGAL SUGAR-DRAINING MACHINE.—Hugh W. Lafferty and Robert Lafferty, Gloucester City, N. J.—Patent No. 88,185, dated March 23, 1869.
4,249.—SHAWL.—Martin Landenberger, Philadelphia, Pa.—Design No. 4,233, dated July 19, 1870.
4,250.—SLIDING STOP VALVE.—Henry G. Ludlow, 2d, (assignor to Ludlow Valve-manufacturing Company), Troy, N. Y.—Patent No. 33,309, dated September 17, 1861.
4,251.—HARVESTER.—Henry Waterman, Williamsburgh, N. Y.—Patent No. 13,512, dated August 28, 1855; extended seven years.

DESIGNS.

4,613 and 4,614.—DESSERT SET.—Charles Casper (assignor to the Meriden Silver-plate Company), Meriden, Conn. Two patents.
4,615.—PLOW CLEVIS.—John M. Cook, Marion, Ind.
4,616.—SEWING MACHINE SAMPLE TRUNK.—Frederick S. Fahnestock, Chicago, Ill.
4,617.—CORSET.—David H. Fanning, Worcester, Mass.
4,618.—CASTER BOTTLE.—Joshua B. Graves, New York city.
4,619.—BOTTLE STAND.—Cyrus H. Latham and George D. Dudley (assignors to Woods, Sherwood & Latham), Lowell, Mass.
4,620.—SODA FOUNTAIN.—George F. Meacham, Newton, assignor to James W. Tufts, Medford, Mass.
4,621.—SUSPENDER LINK.—Edwin Oldfield, Norwich, Conn.
4,622.—THREAD AND NEEDLE CASE.—Theodore R. Timby Saratoga, N. Y.

TRADE-MARKS.

146.—MOLASSES GATE.—George S. Lincoln & Co., Hartford, Conn.
147.—MEN'S CLOTHING.—Edward T. Steel & Co., Philadelphia, Pa.

EXTENSIONS.

CULTIVATOR TEETH.—James P. Cramer, Schuylerville, N. Y.—Letters Patent No. 16,364, dated January 6, 1857.
MACHINE FOR FORMING HAT BODIES.—Ira Gill, Walpole, Mass.—Letters Patent No. 16,426, dated January 13, 1857.
MODE OF LATHING AND PLASTERING.—John G. Vaughan, Middleborough, Mass.—Letters Patent No. 16,425, dated January 13, 1857.

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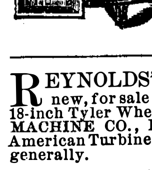

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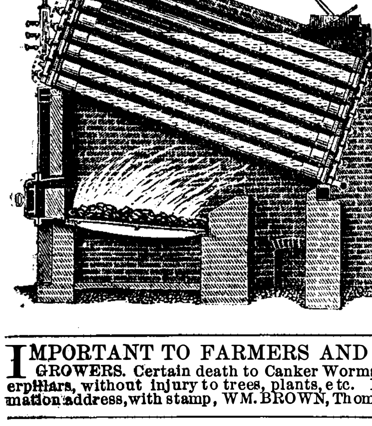

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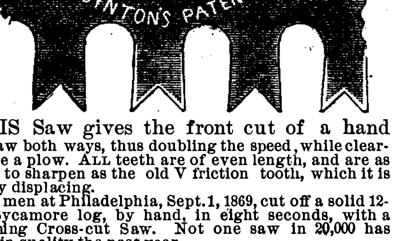

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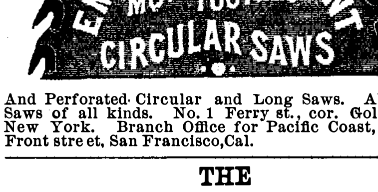

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