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BRIDGE WITH MOVABLE FLOOR SYSTEM.

The engraving upon this page represents a bridge of most unique and interesting design, intended for the transfer of railroad trains, wagons, and foot passengers over streams upon which the passing of vessels is so frequent as to prevent the use of a drawbridge, and also where the banks of the river are of such a nature as to make it impracticable to construct a bridge of sufficient height to admit of ships passing under it. Although the bridge is shown, in the engraving, over the Hudson River opposite this city, it is applicable to all streams where the banks are low and traffic upon the river is extensive; for instance, such a region as the southern part of the Mississippi and its branches flow through.

The piers may be of iron or masonry, alone or combined, and are placed at suitable distances apart (those shown are 500 feet) for sustaining the superstructure. They are arranged in pairs, and are built to such a height that the elevated structure upon them will not interfere with navigation. Vertical trussed girders, placed parallel to each other upon the piers, are firmly united by transverse trusses. The floor beams are laid parallel with the chords, instead of at right angles as usual, and upon the beams are laid stringers which carry rails placed at any convenient distance apart.

Suspended from trucks formed with grooved or flanged wheels (the construction of this part is clearly shown in Fig. 1) is a platform, or movable floor system, sustained at the grade level of the railroad or street at the ends of the bridge. The suspender rods are properly braced transversely and also longitudinally of the platform by a storm brace. The length of the platform is equal to the distance of three piers, so that it will at all times be held laterally against wind pressure by the divided piers between which it passes; and to prevent it rubbing against the piers, friction rollers are provided, as shown in the cross sectional elevation and plan view, Figs. 2 and 3. From the trucks ropes pass to suitable winding machinery operated by stationary engines for moving the trucks and suspended platform from side to side of the river.

The platform being at one side of the river, the train or other load is run on, when the trucks are started. When the other side is reached the train is run off, and the platform is ready for a return load. In this manner the transfer of passengers and freight can be readily and quickly accomplished without impeding navigation, as the spaces between the piers will be free except during the passage of the platform, and without the expense of building long and high approaches in order to give space for vessels or to clear floods and ice.

In certain localities exposed to high winds, side supplementary piers, united to the main piers by bracing and guy rods extending to the top, may be necessary. These piers may be placed at any suitable distance to the side of the central ones, in order that the guys leading to the tops may better resist lateral strains.

By the new method of dredging, cylinders for piers have been sunk to a depth of 125 feet, and yet the limit has not been reached. By this plan the depth of water causes but little or no hinderance, and the cost is so small in comparison with former methods that piers can now be placed at points where work of this kind has been heretofore thought impossible. The field for undertakings of this kind is, therefore, very much enlarged.

This bridge was designed and has been patented by Mr. John F. Anderson, of Room 12, Tribune Building, New York city.

Stopping Vibrations.

In an establishment where numbers of sewing machines are used there was much annoyance from the ring and singing of the machines in motion. The manager raised them from the floor, and put slips of rubber under the legs. The device was useless, and bits of lead were substituted with no relief. An intelligent mechanic was called in, and he drilled holes in the legs, and even in the tables of the machines, countersunk them, introduced plugs of soft bar lead, and riveted them in. There were no more noisy vibrations. To determine the place of the vibration, he used an ordinary spirit level in an iron case, and holding it against an upright portion, as a leg, so that the bubble was visible, he detected the vibration by the change in shape of the bubble.

BRIDGE WITH MOVABLE FLOOR SYSTEM.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT,

No. 473,

For the Week Ending January 24, 1885.

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THE NEW ORLEANS EXPOSITION.

It is perhaps to be regretted that the managers of this great enterprise threw open the doors to the public while there was yet so much to do to place the Exposition in complete order. There was some excuse for this in the unexpected magnitude which the enterprise assumed, and then some exhibitors always will be tardy, no matter how much time is allowed them for completing their arrangements; besides, the railroads seem to have made very inefficient provision for handling the great quantities of freight. The incompleteness of the show at first was, however, probably less of a drawback than the weather, rain having fallen almost continuously for the first three weeks. With the getting of the display in perfect running order, and the advent of brighter skies, there is now a much larger attendance of visitors than there was at first, and the managers are looking confidently for a steady increase.

February will, according to all former experiences with the weather in New Orleans, be the most pleasant month in which to visit the great Exposition there. Ordinarily then the foliage is green, and there is an abundance of flowers and fruit, while the air is as balmy as that of a May day at the North. The Louisiana Jockey Club races commence January 20, and racing is announced for every intervening day for five or six weeks. A contract, it is said, has also been entered into for a series of Spanish bull fights, but this cruel sport, it is hoped, the managers will refuse to tolerate. In February, also, will occur the great Mardi Gras Carnival, a festival of Spanish origin, entirely unknown in the rest of our country, but which has always marked the season of greatest activity in the metropolis of the Southwest.

With all the last named attractions, added to those of the great Exposition, which should be at its best next month, New Orleans ought to be crowded with people from every part of our country, and likely it will be.

THE TAPER FIT.

This method of fitting holes has been used less than it should have been; it was too much trouble in the olden time. A straight hole and a straight plug was considered cheaper, and therefore better. It cost little skill or wages for a good workman to bore a straight hole and turn a straight plug; while to taper the hole and taper-turn the plug, and make a finish fit, required skill and time.

For some purposes there is nothing that will take the place of a taper fit. Recently a crosshead pin of crucible steel was noticed in a cast iron crosshead. It had two tapers, not on the same grade, one in one wing of the crosshead and the other in the other wing. The two tapers were not made by a single reamer with a uniform slant; they were different in diameter and in "slash," or degree of taper, and yet the fit was admirable. When the steel pin came to its bed, or home, it was secure without urgent persuasion; a slight tap of a soft metal mallet seated it. No keyway and spline was needed to hold this union as one, but a simple cross pin, only enough to prevent jar from starting the fit, was required.

These taper fits are useful when well made from their readiness of removal; a taper fit means that the parts do not fit at all until "they are home;" whereas a straight fit must "feel its way" its whole length, and sometimes—as when a steel plug fits an iron hole—it must partly cut its way and seat itself. It costs more to make taper fits than straight fits, but when the more perfect union of parts is assured, and the readiness of the parts to be separated on demand is considered, it is the best fit of cylinder to cylinder that is possible.

WOOD CARVING.

The hand carving of wood for house finish and interior decoration is becoming a distinct and permanent branch of industry. Much of this work has been done by amateurs as a pastime, but it has lately developed, to a considerable extent, into a "trade," industrially speaking. For fine furniture the carving of wood has for a long time had a place, but there appears to be a prospect that to the joiner's shop and work will be added those of the carver as a means of finishing interiors. Foreign workmen, at present, comprise the larger part of the workers in this industry, but the attention of our native workers has been directed to it, with the result of bringing it into general notice.

The idea that artistic hand work should be confined only to rare and costly material is hardly consistent with the demands of taste. In the woods there is scarcely one that will not be beautified by hand carving. So common a wood as white pine is susceptible of producing very fine effects even when the wood is left in its natural condition. When first worked, it is a creamy white well calculated to show the shadows of relief; and exposure to the air soon deepens its tint. A thin varnish of shellac will tone its whiteness without producing a shiny surface. White wood is also a wood well adapted to carving, and the yellow birch is even finer. To these light colored woods may be added the three varieties of maple and also beech. The darker woods admit of bolder work—greater relief—and when united with the lighter colored woods make a fine combination. Carved white wood as a cornice for a room, the figures only slightly cut in, with cherry for the projecting moulding, produces an elegant effect in a parlor. The only finish is a thin varnish of shellac dissolved in alcohol, no touch of sandpaper being allowed to subdue the sharp cuts of the carving tool. There is scarcely any limit to the possibilities of wood under the hands of a skillful carver; straight lines and sweeping curves are not alone among its capabilities; it may be fretted, diapered, dentaled, and stippled, and cut into fine cross-hatcheling, if the workman has good tools and knows how to use them. As this is written, there lies on the desk a piece of butternut wood six inches long and about one inch diameter, that is cut into a triple spiral, of about three turns, each spiral being round and about the size of a rye straw. This shows the capabilities of wood.

Wood carving is a pleasant occupation, combining the attraction of taste with the pleasure of work. In many instances the carver is his own designer; it is better so, and the business is incompletely learned where the carver cannot originate, or at least design, his own work. The designs for an elaborate job are usually two, a plan and a profile. The profile is drawn in differently colored lines to indicate the relative depth or projection of the parts. The business offers an attractive field for workers who are artistically inclined.

MAKING CHERRIES.

No allusion to horticulture is intended. "Cherries" are mills or reamers for cutting out—or rather for finishing—hollows of a cylindrical or ovate form; a familiar instance being the hollowed jaws of bullet moulds. These moulds are formed in steel or in tough iron, and are "made out of the solid." Sometimes they are drilled and then shaped by the cherry, but of late years they are forged in the drop die or at the anvil by sledge and round-nosed former. The office of the cherry is to perfect the crudely shaped cavity, and to finish its walls.

Usually these cherries are scored into flutings like those on the milling tool or the reamer, by means of a file, awkwardly worked over the curve of the cherry, particularly on the stem side, as there is no opportunity to pass the stem, unless the flutings are slashed (made diagonal) enough to pass the diameter of the stem. To diagonal flutings on any tool there are reasonable mechanical objections—straight flutings are always preferable. But it is difficult to form the flutings of a globular or an ovate cherry by means of a milling tool, even if it is mounted on a lathe arbor and fed by hand; the fluting of a cherry is essentially a hand job.

A tool maker ought to be able to use all sorts of tools; but there are few machinists who can use the graver. It is not to be expected that machinists should be experienced engravers, but it is well to know not only the object of hand tools, but also something of their method of being used. In this case of fluting cherries the graver is very useful; by its proper handling the flutings can be pushed, cleanly and evenly, over the rotundity of the cherry to the stem, making a clear cut. For this purpose a V-graver should be used, known to some workmen as a "routing tool."

It can be obtained at any engraver's supply store. There are many jobs where a deft use of the graver will be handy to the machinist tool maker. The writer owed a marked success in perfecting a peculiar tool in a machine shop to his acquaintance with the uses of the graver by an apprenticeship of four years in a shop of engraving for calico printing.

Jarrah Wood.

In the course of a recent lecture before the Society of Arts, London, by Mr. P. L. Simmonds, he spoke of the excellent qualities of the Australian tree known as the jarrah.

In the discussion which followed, Mr. Simpson said he was connected with the timber trade, having had thirty-two years' experience in Western Australia. The jarrah wood of that colony was acknowledged, by those who knew its qualities, to be about the next thing to everlasting, and he hoped that in the next year a few cargoes would come to England. Almost everything in Western Australia was made of this timber, workboxes, pianofortes, buildings, wharves, and jetties; it seemed to defy all known forms of decay, and was untouched by white ants and all other insects, so that ships built of it did not require to be coppered. It had been used above ground and below, in almost every situation in which timber could be placed, and was durable in all. On the table was a specimen from a tree cut thirty-two years ago, which had lain on the surface nearly all that time; it had been exposed to bush fires every two or three years, to the sun during the summer, to wind and rain during the wet season, and was as sound now as the day it was felled. Another piece he had cut from a small sapling used in a bridge at Bunbury, and so certified by the Government Resident, which had been thirty-six years in use, and this piece he had taken just between wind and water.

There were about fifteen varieties of the timber, and it could be obtained of any reasonable length up to 60 or 80 feet, the trunk of the tree having no branches whatever. Another advantage was that it did not burn freely, but only charred, which made it additionally valuable for building. It was poisonous to all insects, and when put into a white ants' nest they would not touch it. If a sheet of glass and a piece of this timber were put into such a nest, the ants would bore through the glass rather than touch the jarrah. The fresh saw-dust put at the roots of a fruit tree would kill it, and it was stated by Baron Von Muller to contain not only tannic acid, but also sulphate of copper. Some of the wood was put into the Suez Canal seven years ago, and when examined lately was found as perfect as the day it was laid.

Mr. Cornish said he had seen jarrah timber in use in many places, partly in the wharves at Melbourne, where it was put in to replace the white and red gums which had been eaten through in the course of five to seven years; and the reports of the harbor master, and others, stated that it remained absolutely untouched. Some of her Majesty's ships which had been repaired with it when in Australia were found on examination in England afterward to have remained practically uninjured. For large works, such as the Suez Canal, piers, harbors, etc., it would be very valuable. The matter had been laid before the directors of the Suez Canal, with the view that if the canal were widened, and piled with this wood it would be practically everlasting. Jarrah would be equally valuable for use in the Manchester or Panama canal.

Mr. Simpson said he had known ships built of jarrah which had sailed for twenty or thirty years without any copper, and he himself was working lighters which had been in use fully that time, which had never been coppered. This timber would not grow on good soil, only where there was ironstone, tons weight of which were sometimes lifted by the roots. The more ironstone there was in the soil, and the higher the elevation, the better the trees grew.

It was one of the most remarkable facts connected with this timber, that if you put a bolt, no matter what size it might be, into it, when you took it out a bolt of precisely the same size would go into the hole again. The effect of the iron, apparently, was to preserve the timber, and of the timber to preserve the iron. He could not say what the action was, exactly, not being a chemist, but a slight black skin was formed between the two, and the iron appeared to remain as perfect as when put in. He had seen on the Fish Rock, at Fremantle, the whole of the guy chains supporting the beacon there entirely perished, and the copper fittings likewise, but the pole itself was found quite perfect, when examined, though it had been standing twenty-two years. Mr. Story, of Sunderland, and other ship-builders, said jarrah was far superior to teak; it was less liable to split, and it would bend freely, and without being steamed.

ASPECTS OF THE PLANETS FOR FEBRUARY.

JUPITER

is morning star until the 19th, when he commences his course as evening star. An event then occurs in the sun's family which is of special interest to the inhabitants of this planet. For Jupiter in opposition is a high festival occasion, regarded with wonder and admiration by terrestrial observers. The Prince of Planets takes on his most glorious form, and plainly shows that he is the power behind the throne, the rival of the great luminary whom he more closely resembles than he does any of his brother planets. At opposition, Jupiter comes into line with the earth and the sun, the earth being in the center, so that we are at our nearest point to him, and he is consequently larger and more brilliant than at other times. The magnificent planet holds his state as far away from the sun as possible, rising proudly in the east as the sun sinks slowly in the west, reaching the zenith with stately step as the sun touches the nadir, and gradually fading out of sight in the west as the sun appears rejoicing in the east.

We never behold Jupiter in his present phase without being grateful that the earth's position in the system is inside instead of outside of the giant of the brotherhood, and that we can therefore see him shining in the east at eventide or looking down with friendly gaze from the midnight blackness of the sky. It always seems to us as if the oppositions in the sun's family, that bring the planets into closer companionship, are like birthdays in terrestrial families, and as worthy of being celebrated. They are festival days to those whose hearts are attuned to the harmony of the spheres, and who have learned to follow with enthusiastic interest the ceaseless wandering steps of the sun's family of worlds. For with this sun and with these worlds our own present existence and our future destiny are indissolubly linked. The opposition of Jupiter occurs on the 19th, at 2 o'clock in the morning. He will not, however, be in his most beaming phase, for he must be at or near perihelion, and in his highest northern declination, to be seen under the most favorable circumstances. These conditions do not occur until 1892. But ordinary oppositions like the present show our shining brother in charming aspect.

There is no end to the interesting problems waiting for solution in regard to Jupiter. Telescopists are never weary of studying the numerous and varied markings on his surface. New lines of his changing belts, dots on his disk, bright spots near his equator, huge rifts in his cloud atmosphere, occultations, transits of his satellites and their shadows, are scanned by eagle-eyed observers, accurately mapped by skillful draughtsmen, and laid away to swell the fathomless pile of observations that, one of these days, when the Jovian alphabet has found an interpreter, will reveal perhaps the details of the process of world-making going on in a planet so vast in bulk that its primeval fire still burns.

The great red spot visible for years on Jupiter has come and gone. Its appearance was a mystery. Its disappearance is equally unaccountable. It left behind an unsolved problem: visible proof of the equatorial acceleration of the planet. The bright spots near the equator made a circuit round the planet in about five minutes less time than the great red spot that was situated 40° from the equator. In precisely the same way the spots on the sun's equator complete a revolution in less time than those nearer the poles. Here is another link connecting the great central orb more closely with his lordly son, and placing him within the bounds of solar mysteries. When we find out the reason why the equatorial sunspots move faster than the polar ones, we shall learn why the Jovian bright spots moved faster than the great red spot. We shall probably be convinced at the same time that the royal planet is more nearly in the condition of the sun than are his less massive and less richly endowed brethren.

Meantime, those who do not care to discuss Jovian problems must improve the present favorable opportunity for a telescopic view of the majestic planet, stately in form, delicate in tone, varied in hue, and dignified in pose, as with serenely beaming face he seems to hang low in the heavens, so near the space annihilating glass that it seems as if one can almost touch his shining disk by putting forth the hand. Jupiter, when, millions of years hence, he becomes fitted for the abode of animate life, will doubtless be a pleasant dwelling place, but there are drawbacks to all finite enjoyment. We shall not look upon an abode on this favored planet with envious eyes when it is remembered that the future Jovians will have a sun only one twenty-fifth as large as the glorious orb that illumines our sky, and that he will be blessed with only one twenty-fifth of the heat and light freely poured upon the earth from the solar rays. If, by that time, the sun's fires grow dim, the prospect of comfortable existence there will not be alluring for beings constituted like the human race.

The right ascension of Jupiter on the 1st is 10 h. 21 m., his declination is 11° 32′, his diameter is 42·4″, and he may be found in the constellation Leo.

Jupiter rises on the 1st about 7 o'clock in the evening; on the 28th he sets not far from a quarter after 6 o'clock in the morning.

MARS

is evening star until the 11th, when he joins the ranks of the morning stars. On the 11th, at 7 o'clock in the evening, he is in conjunction with the sun, reversing the role played by his brother planet Jupiter, thus illustrating almost side by side the two great epochs of the outer planets, conjunction and opposition. Mars is in line with the sun and the earth, but with the sun in the middle, being, to terrestrial observation, beyond the sun and as far from the earth as possible. He is at the same time in conjunction, or "joined to" the sun, rising and setting with the sun and completely hidden in his bright beams.

MARS,

after conjunction, passes to the sun's western side, and commences his role as morning star, and, at the same time, turns his steps toward opposition, which he will not reach till March, 1886. For months to come he will be of little account, insignificant in size, and close to the sun. Indeed, he never counts for much, excepting for a month before and after opposition, while oppositions specially favorable occur only at intervals of fifteen years. In 1892, when the next opposition rolls round under the best auspices, it may be discovered that his two tiny moons, first known as members of the system in 1877, are nothing but captured asteroids. Mars is in perihelion on the 28th. He is then 26,000,000 miles nearer the sun than in aphelion, but is so far away that we gain nothing by the occurrence of the epoch.

The right ascension of Mars on the 1st is 21 h. 11 m.; his declination is 17° 21′ south; his diameter is 4·2″; and he may be found in the constellation Capricornus.

Mars sets on the 1st about a quarter after 5 o'clock in the evening; on the 28th he rises about half past 6 o'clock in the morning.

NEPTUNE

is morning star throughout the month. He reaches an important time-mark in his course. On the 8th, at 9 o'clock in the evening, he is in quadrature with the sun on his eastern side, half his course from opposition to conjunction being completed. If we had eyes to see our most distant brother planet at quadrature, he would be visible at sunset, looking down from the meridian, just 90° east of the sun.

The right ascension of Neptune on the 1st is 3 h. 14 m.; his declination is 16° 12′ north; his diameter is 2·6″; and he is in the constellation Taurus.

Neptune sets on the 1st about half past 1 o'clock in the morning; on the 28th he sets about half past 11 o'clock in the evening.

VENUS

is morning star. Her luster grows dim, and her size diminishes as she draws nearer the sun, and rises later every morning. She is still beautiful to behold as she makes her appearance in the morning dawn an hour before sunrise. Her diameter is now but 11·2″, against 64″ at the time of her inferior conjunction. We see, however, a much larger portion of her illumined disk than she turns toward us when at her period of greatest brilliancy. Seen in the telescope, she is now in gibbous phase, like the moon approaching the full. If, when nearest to the earth, she could take on her present aspect, our sky would show a planet glorious to behold.

On the 11th, at 7 o'clock in the evening, Venus is in conjunction with Mercury, being 44′ north. The conjunction is invisible, but the planets will not be far apart on the morning of the 12th, when perhaps an opera glass will be a successful assistant in picking up Mercury.

The right ascension of Venus on the 1st is 19 h. 32 m.; her declination is 21° 52′ south; her diameter is 11·2″; and she is in the constellation Sagittarius.

Venus rises on the 1st not far from 6 o'clock in the morning; on the 28th she rises at nearly the same time.

MERCURY

is morning star, and keeps near Venus during the whole month. On the 1st he makes his transit five minutes earlier than Venus, on the 11th at the same time, and on the 28th he is twenty-four minutes behind his fairer companion. He is in conjunction with Venus on the 11th, as already stated.

The right ascension of Mercury on the 1st is 19° 27′; his declination is 22° south; his diameter is 6″; and he is in the constellation Sagittarius.

Mercury rises on the 1st a few minutes before 6 o'clock in the morning; on the 28th he rises about half past 6 o'clock.

SATURN

is evening star. Though he contributes no incident to enliven the annals of the month, he takes the second place among the twinkling mysteries that stud the winter sky. He remains through the month in a position so nearly stationary that he may easily be mistaken for one of the distant suns that beam from the star depths. A careful observer, however, will notice the softness and serenity of his light, in striking contrast with the twinkling of his companions, thus showing that he is a planet, and shines by reflected light.

The right ascension of Saturn on the 1st is 5 h. 6 m.; his declination is 21° 32′ north; his diameter is 18·6″; and he may be found in the constellation Taurus.

Saturn sets on the 1st about half past 3 o'clock in the morning; on the 28th he sets about a quarter before 2 o'clock.

URANUS

is morning star, and drawing near to opposition, the last of the four giant planets to reach the point where they are most interesting to terrestrial observers. At the close of the month, Venus, Mercury, Uranus, and Mars are morning stars; Neptune, Saturn, and Jupiter are evening stars.

The right ascension of Uranus on the 1st is 12 h. 10 m.; his declination is 0° 20′ south; his diameter 3·8″; and he is in the constellation Virgo.

Uranus rises on the 1st at half past 9 o'clock in the evening; on the 28th he rises at half past 7 o'clock.

THE MOON.

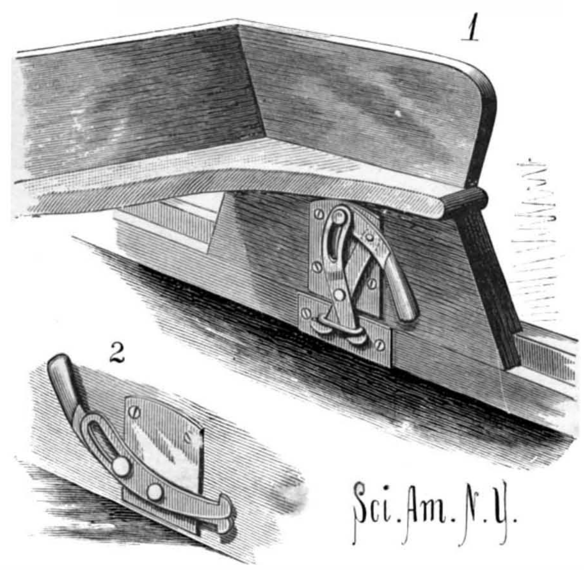
The February moon fulls on the 28th, at 11 o'clock in the evening, so that we shall come within an hour of having no full moon in February. The moon is in conjunction with Uranus on the 3d, three days before her last quarter. She is in conjunction with Venus on the 13th at 18 minutes after 5 o'clock in the morning, and is at her nearest point to Mercury on the same morning, 24 minutes later. She is in conjunction with Mars on the 14th, the day of her change, with Neptune on the 21st, with Saturn on the 23d, and with Jupiter on the 28th.

The moon occults a few small stars as she speeds on her course during the month, but a telescope is required for observing these occultations.

She occults the planet Uranus on the 2d, but the phenomenon will be invisible on this portion of the globe. Observers under favorable conditions between the limiting parallels of 37° and 90° southern latitude will have the opportunity of seeing our satellite hide from view the small sea-green orb that marks the presence of Uranus in the heavens. A good telescope will be required for the observation, as this planet is only visible to the naked eye as a star of the sixth magnitude when near opposition.

IMPROVED SEAT LOCK.

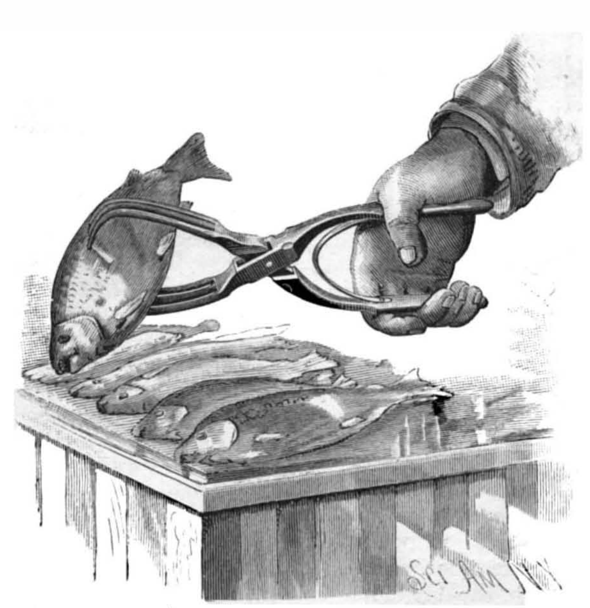
In a seat lock lately patented by Mr. Gottlieb Maibach, of Tremont, Ill., the object is to promote convenience and safety in securing seats to the bodies of buggies and other vehicles. Fig. 1 is a perspective view showing the fastening applied to the body, and Fig. 2 shows the fastening turned back, to allow the seat to stand squarely when detached. The lower edge of the seat riser may be rabbeted to rest upon the upper edge of the body and of a cleat. To the inner side of the seat is attached a plate, to which are pivoted two bars having upon their lower ends hooks projecting in opposite directions. To the upper end of one of the bars is pivoted a lever, in the forward end of which is a pin that passes through a slot formed longitudinally in the upper part of the other bar, so that the hooked ends can be forced apart or together by moving the bar. Attached to the cleat is a keeper made of such a length that the two hooks when drawn together can pass through it. When the hooks are spread apart and brought in contact with the keeper, they will draw the seat riser down snugly upon the body, thus preventing all rattling. When locked in place, the hooks are not liable to become unfastened accidentally.



MAIBACH'S IMPROVED SEAT LOCK.

DESIGN FOR SPRING CLIP OR TONGS.

Our engraving shows a convenient device for handling beef, pork, fish, etc. A spring is placed between the handle portions of the two crossing limbs of the tongs. One jaw is of a regular curvilinear shape, having a convex back and concave face, with an outer tapering edge form. This jaw has a fork-prong-like appearance, being on an open-work design. The second jaw is of like design on its face and back, and has a crooked form at its outer end portion, as shown in the engraving. The rear portions of the limbs are of a straight flat shape where they cross, terminating by easy curves in straight extremities, which are flattened at their outer ends.



MAYNARD'S DESIGN FOR SPRING CLIP OR TONGS.

This invention has been patented by Mr. Frank M. Maynard, of Erwin Center, N. Y.

CONFECTIONER—"Remember, that all the French candy is in this case." New Clerk—"How do you get it fresh?" "Fresh! Why, why we make it, of course." "But I thought French candy was imported." "Oh! no. We make it ourselves." "But, then, why is it called French candy? Do the ingredients come from France?" "Well, I don't know, may be the plaster of Paris does."

White Bronze.

Experiments are being made, according to the *Polytechnische Notizblatt*, in Paris, with a new alloy having a white color, yet containing no nickel. It is said to be very strong and malleable. It is made of copper and ferro-manganese, the proportions being varied according to the purpose for which the alloy is to be employed.

An alloy of forty parts of copper and sixty parts of ferro-manganese, with a suitable quantity of some appropriate flux, produces a metal of such tenacity that it surpasses the best steel armor plates. The melted mixture is cast in blocks, and is perfectly malleable. To obtain a white metal that can be rolled out in sheets, the above alloy is melted again, and twenty or twenty-five per cent of zinc or white metal added, which imparts to it the desired quality.

A plate of the first named alloy two inches thick was found by experiment to offer more resistance to a cannon ball than a steel armor plate of the same thickness.

This new kind of "white bronze" is not to be confounded with the alloy used in this country under the same name for gravestones and monuments, and which consists principally of zinc.

CHECK BILLIARD MARKER.

The engraving shows a device for marking in the games of billiards and keeping a register of the number of games played. The front of the box is provided with a door or cover formed with two longitudinal slots, in which move the two pointers, which project over the upper and lower edges of wider slots. At one end of the cover is a solid part formed with a slot, through which the register marking the number of games can be seen. Beneath each of the long wide slots is journaled a roller marked with five rows of numerals from 0 to 99. In the middle of the third row is the numeral 50 which is of a different color from the rest, so that it can be easily distinguished. In the outer ends of the rollers are short shafts, journaled in a frame projecting from the back of the box, and provided at their outer ends with crank handles; they are also surrounded by springs (shown in Fig. 1), for throwing them back after they have been turned by the handles. On each shaft is an arm carrying a pawl which is pressed against a ratchet wheel mounted on the end of the roller, whereby the latter will be turned the distance of one tooth by turning the corresponding shaft. (This construction is shown in Fig. 2. Figs. 3 and 4 are views at the other end of the rollers.) When the player has made a certain number of points, he moves one of the pointers to the corresponding number. Every time twenty points have been made, the roller is turned to expose a new line of figures in one of the slots. After a game has been played and all the points counted, it is necessary to throw the rollers back to their first position. This is accomplished by means of springs held on the opposite ends (Fig. 4) of the rollers. To permit the springs to act, the pawls are raised clear of the ratchet wheels by the center handle, which is prevented from swinging back too far by suitable stop pins. The mechanism by which this is performed is shown in Fig. 2. The games are automatically registered by three rollers or disks (Fig. 4) so arranged that the first disk registers up to 9, the first and second up to 99, and all three up to 999. One of the special features of the machine is that as soon as one of the shafts (provided with a crank handle, is turned, the first disk is moved the distance of one number, thus making it impossible for a person to play more than 20 points without registering a game. Of course it will be understood that the numbers on the rollers can be arranged in different ways, according to the customary manner of playing and marking.

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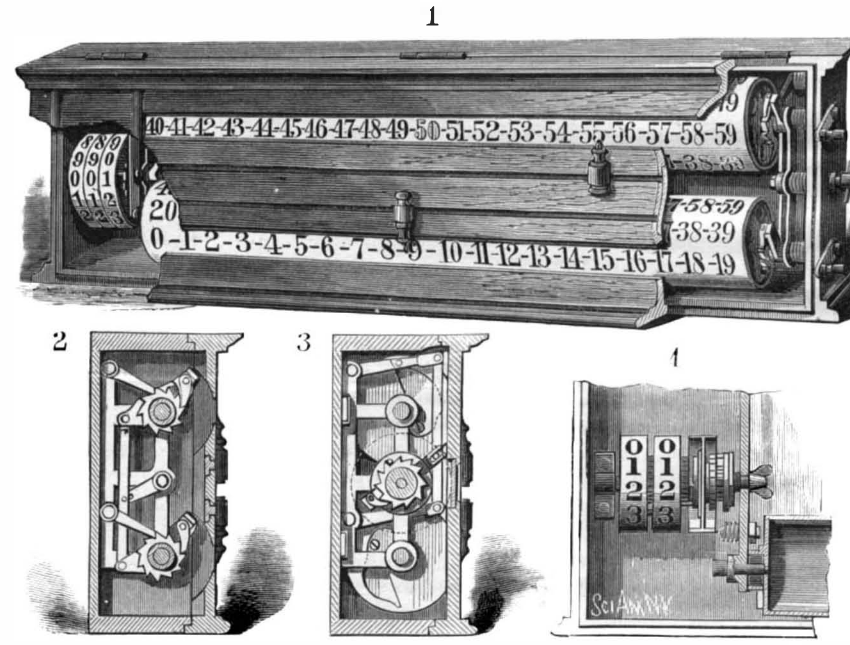


JENKINS' CHECK BILLIARD MARKER.

Further particulars regarding this invention may be obtained by addressing the patentee, Mr. Thomas C. Jenkins, P. O. Box 56, Wellington, New Zealand.

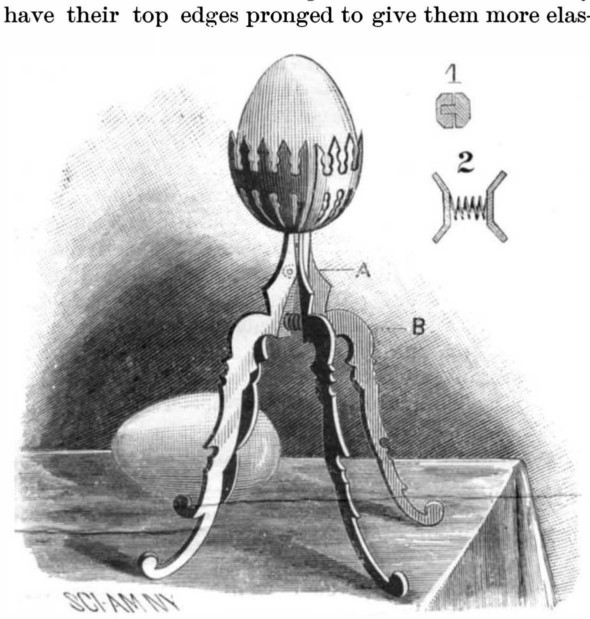
Temporary Repairs of Ships.

We have received, says *Engineering*, from a correspondent an account of a method of effecting temporary repairs of iron ships that are damaged at or below the water line, which in his hands has proved very effective, and has enabled vessels which have received injuries in places where no shipbuilding establishments exist to make safe and successful voyages home. He has already put his plan into execution on two occasions with capital results: one vessel reshipped her cargo and delivered it in Liverpool in good condition; the other, after a repair at the Cape of Good Hope, steamed to Liverpool without a cargo, there being none available at the time. The method by which the restoration is effected will be best understood by an account of the two cases just referred to. The first was a vessel of 2,000 tons returning to England from India with a full cargo. She was run into by a steamer which attempted to cross her bows. The force of the collision broke the stem of the cargo ship a little under the hawse hole, down to within 12 inches of the forefoot, carrying both it and the bow plating for some 5 feet aft right away. The collision bulkhead kept the ship afloat, and she was brought into Gibraltar Bay. There she was trimmed till her forefoot came above water, and a temporary stem of pitch pine (4 inches by 9 inches) was worked in from the forefoot to an undamaged part of the plating at the upper portion of the fracture, and from the stem to the uninjured bow plates, planks of 3 inches thick were secured, forming when complete a wooden bow of symmetrical appearance. The collision chamber was then filled with good cement concrete, as high as the chain pipes, and when this was complete the ship was trimmed back to her deep draught, and was found to be perfectly tight in the repaired section. She then steamed to Liverpool, where the cargo was discharged in good condition. The second case is that of a well known steamship of about 3,000 tons. On an outward voyage, full of troops, she struck on a rock near the Cape of Good Hope, and was so much damaged that she was unable to proceed on her voyage to Natal. The force of the collision broke the stem about 2 feet abaft the forefoot, and the collision chamber was laid open from that point up to the eleven foot mark, the stem and the fractured plates being forced bodily over to one side of the ship. To effect this repair the stem was cut away a little below the eleven foot mark, and holes for 1¼ inch bolts were drilled through the broken plates, from side to side, and bolts put through across the opening to prevent extension of the fracture. Inside the ship, and resting on the bolts, a stout wooden bottom was laid and made fairly tight; on this a filling of concrete was placed, and carried up to above the partial bulkheads, in the chamber, or nearly 2 feet above the highest fractured portion. This work was all carried out under water, a diver mechanic being employed to cut away the stem and drill the bolt holes. The ship was perfectly water tight after the repair, and was by surveyors pronounced to be fit to carry cargo to any part of the world. Drawings of a coffer dam to be built round the ship's bows were sent by the owners to the Cape, and it was estimated that its construction alone would have cost more than the entire expense of the repair by the method described, and no more than a temporary repair made. It will be seen that in each case the essential feature was the use of cement concrete to make tight the temporary work, and to fill the spaces which had been laid open to the sea. Of course the above examples were favorable opportunities for the exercise of this method of repair, and did not present nearly as great difficulties as would be found if the injury were to some other part of the ship. But still there are many other situations to which, by the aid of a little ingenuity, it might be applied, and where it would give equally satisfactory results. We have pleasure in publishing the account, as some of our readers may some day be placed in a situation where they may be glad to carry out further trials of this novel expedient.

ONE of the women said to have been lately cured of her malady through the prayers of a miracle worker proves to be a kleptomaniac.

EGG HOLDER.

The holder is formed of two hollow semi-ellipsoidal sections made of sheet metal, wire, glass, or other suitable material. On the lower part of each section a stem, A, is formed, which terminates in two outwardly curved legs, B, of any desired design. The stems are pivoted to each other a short distance below their upper ends (Fig. 1 is a cross section through this portion), and between their lower ends is a spiral spring (Fig. 2) which presses them apart, thereby pressing the edges of the two hollow sections together. These sections may have their top edges pronged to give them more elas-



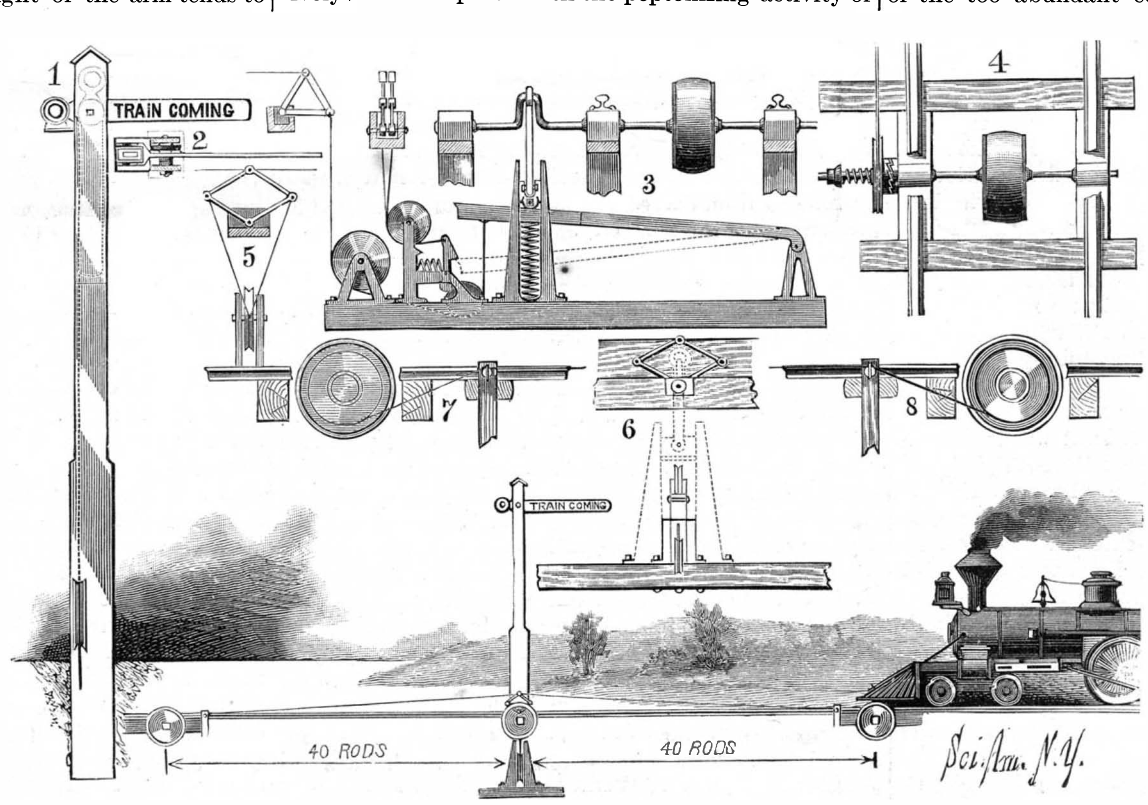
HERVEY'S EGG HOLDER.

ticity, and they may be ornamented in any appropriate manner. By pressing the two pairs of legs together the sections are separated and an egg can be placed between them, where it will be firmly held by the action of the spring. The holder can also be used for taking eggs from boiling water.

This invention has been patented by Mrs. F. P. Hervey, of Brenham, Texas.

AUTOMATIC SIGNAL FOR RAILROAD CROSSINGS.

The engravings show the various parts of an automatic device for signaling the approach of trains, patented by Mr. T. H. A. Tregea, of Pontiac, Mich. The invention belongs to that class of signals in which a semaphore is moved mechanically by the passing of trains. The signal consists of a post, Fig. 1, erected at a suitable distance from the track and carrying a semaphore arm, pivoted to the post, and having at the rear end a pair of disks arranged to cover the opposite sides of a lamp, supported by the post, so that the different positions of the arm will serve to signal to persons using the crossing, both during the day and night. (This construction will be clearly understood from the sectional view, Fig. 2.) The weight of the arm tends to maintain it in the vertical position, shown by the dotted lines. The arm is moved by a chain, which passes around a pulley at the foot of the post, and is secured to and passed over a pulley attached to the arm. The signal releasing mechanism consists of a lever (Fig. 3) pivoted at one end to a bracket in a chamber below the track; the opposite end of the lever is raised by a spring, and to it is attached a cord passing around two guide pulleys to a crank lever, shown at the left in Fig. 3. Pivoted to the frame is a pawl, thrown forward by a spring and arranged so as to be thrown back by the contact with the end of the lever; the shoulder retains the lever in the position shown by the dotted lines. Transversely across the track extends a crank shaft connected by a rod to a guide block sliding in a bracket which supports the lever spring; the shaft carries a drum between the rails. To the upper end of the pawl or trigger are attached two cords extending to two bell-crank levers placed near the level of the ground. Each setting mechanism consists of a shaft (Fig. 4), supporting a drum between the rails and carrying at one end a clutch engaging with a similar clutch at the side of a loose pulley. From each loose pulley extends a cord to one of the bell-crank levers, Fig. 3. The drums are covered with rubber, and are of such size and so arranged as to be struck by the cow-catcher so as to be turned by the passing train.



TREGEA'S AUTOMATIC SIGNAL FOR RAILROAD CROSSINGS.

As the train passes in either direction over the signal releasing mechanism (Fig. 3), it will turn the drum and its crank in one direction or the other, in either case moving the block and insuring the catching of the lever in case the trigger should slip upon the first movement of the lever. As the lever is depressed it slackens the cords leading to the crank lever, and the signal arm assumes its lowest position. The train then passes the signal and travels over the further drum, Fig. 4, which is turned without any effect upon the signaling apparatus, but upon another train passing over it and turning it in the opposite direction, thereby turning the loose pulley by means of the clutch and drawing upon the cord to draw back the trigger and release the lever, which, being raised by the spring, draws upon the cord leading to the crank lever and raises the signal arm. The train then strikes the drum, Fig. 3, and releases the arm, and then passing to the other setting mechanism adjusts it so as to be operated by another train.

Figs. 5 and 6 are elevations of parts of Fig. 3; Fig. 4 is a plan view of one of the signal setting devices; and Figs. 7 and 8 are side elevations of each of the setting devices.

It will be seen that each train, coming from either direction, draws back the trigger and insures the display of the signal as soon as it is within forty rods therof; the signal retains its position until the train has passed it. The various parts are positive in their action, and are so constructed as to work effectively when at considerable distances apart, and in addition they are not liable to be affected by snow or ice.

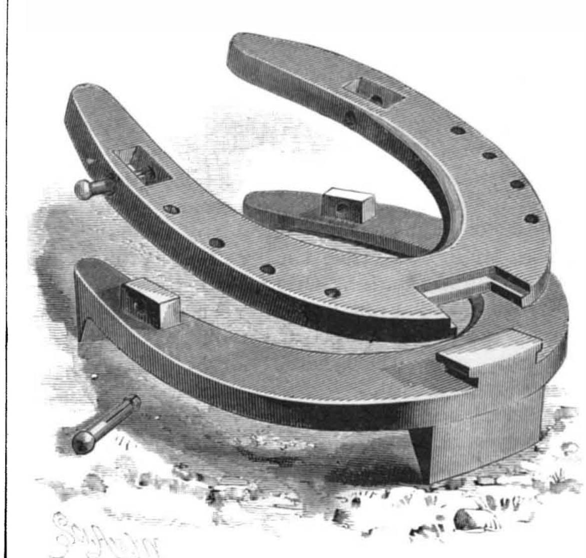
Peptonization.

An observation communicated by M. Marcano to the Academy of Sciences is suggestive of what may prove a valuable process for the conversion of albuminoids into peptones. If a small quantity of the fresh sap of certain plants—the agave, for example—be added to chopped meat first covered with water, and the mixture be kept at a temperature of 39° to 40° C., an active fermentation is immediately set up, with evolution of inodorous gases. At the end of thirty-six hours the fibrin has disappeared, and a liquid is left containing peptone equal in weight, when dried in a stove, to one-fifth the fresh meat used. This fermentation appears to M. Marcano to be due to the vital action of micro-organisms, and to resemble the peptonization of the gluten of flour by a bacterium which is said to take place in bread making.

In confirmation of this view it is stated that if the juice of the plant be saturated with chloroform the fermentation is not set up. Moreover, a "mucorinee" may be cultivated by sowing a few drops of agave sap in sugared water. This mucorinee is capable of completely dissolving fibrin in the presence of water. A large number of other fruits and juices are stated to be endowed with properties similar to those possessed by the sap of the agave. Papaw juice is said to be relatively weak compared with the peptonizing activity of other juices which contain no digestive principle like "pepsin." M. Marcano is of opinion that the new method of peptonization will afford a simple and economic means of preparing pure peptone quickly and at a low price, and suggests that it might be applied upon a large scale, so as to allow of the export of meat from South America in a form more nutritious and economical than the extracts.—*Lancet.*

A NOVEL HORSESHOE.

The engraving shows a horseshoe recently patented by Mr. David J. Pryor, of Roxbury, Mass. The shoe is made of malleable iron, and consists of two parts, one of which is formed with heel and toe calks and the other with side rows of holes in the usual manner. The upper part is nailed to the hoof in the same way that the common shoe is. The method of uniting the two parts is clearly shown in the cut. The toe portion is slipped into the flanged recess in the upper or permanent part, and the two lugs at the heel enter openings, and are firmly held by split keys. In icy weather the



PRYOR'S NOVEL HORSESHOE.

smooth shoe can be removed, and the one formed with calks secured in its place in a very short time; the operation is simple and easy, and can be performed by any one. The upper plate will last for a very long time, being subjected to little or no wear. When the hoofs are to be trimmed down, the same shoe is replaced. Should the horse interfere when shod with calks, or should he become uneasy in the stable, the under part can be taken off. When considered necessary, an elastic packing can be placed between the two parts. By the use of these shoes, visits to the blacksmith need not be so frequently made, and the cost of shoeing will not be so great as when the old style shoes are used.

The Condition of Our Country.

Cheap wheat, cheap iron, cheap money, are the raw materials of prosperity, and these the United States now has in abundance. While our population has been increasing, deposits have been accumulating in the banks, inventions have been multiplied, intelligence has been spreading, and all the processes of civilization have been going on, the course of industrial readjustment has been strengthening all the foundations of our prosperity. Credits have been revised, and many abuses which grew up during the generous practices of the too abundant confidence of a few years ago have been put an end to. Tendencies to extravagant living have been checked, and it is a very rare exception that people are not living within their means. Frauds that take root naturally and flourish in eras of expansion have been overtaken and exposed. Enormous masses of debt have been liquidated. The commercial observer will, on the whole, probably find it impossible to discover in any preceding period of the history of this country a greater accumulation than that which he can now easily find of what we term the raw materials of prosperity.—*The Age of Steel.*

BOGUS GOLD DUST.—Under this heading we lately gave an account of the transmission to the Philadelphia mint of a package of metallic dust, apparently gold, but which proved on assay to be in great part spurious. The grains consisted of iron filings galvanized with gold. The specimen was, it appears, forwarded by Mr. Stifft, the well known jeweler of Little Rock, who bought it for the genuine gold; but subsequently becoming suspicious that he had been imposed upon, he sent it to the mint in order to have its value exactly determined. Mr. S. writes us that he lost $100 by the deception, but would give another hundred for the arrest of the swindler.

Electric Lighting in America.

At a recent meeting of the Society of Arts held at London, the chair was taken by Sir F. Bramwell, and a paper was read by Mr. W. H. Preece, F.R.S., who described electric lighting as he saw it during his late visit to the United States. Electric lighting, he said, was flourishing in America much more than at home. There were probably 90,000 arc lamps alight every night in the States, and there were many central stations working regularly, both with arc and with glow lamps. Contrasting the brilliantly illuminated avenues of New York with the dull and dark streets of London, he stated that on the evening of October 21 he drove from the Windsor Hotel, New York, to the Cunard Wharf, a distance of about four miles, through streets entirely lighted by electricity. On the 30th of October he drove from Euston to Waterloo, without seeing a single electric light. He visited Montreal, Philadelphia, Buffalo, Cleveland, Chicago, St. Louis, Indianapolis, Boston, and New York, and found in each city the principal streets and warehouses, as well as stores and places of public resort, lighted by arc lamps. It was with arc lighting that the greatest advances had been made in the States. One manufacturer told him that he was turning out 800,000 carbons for arc lamps per month; another said that his output of plant was 50 arc lamps and three dynamos per day; and while he was present at a third factory an order was received for an electric lighting plant of 330 arc lamps requiring 14 24-light dynamo machines, intended for an installation to light up a park in the environs of Chicago.

In that city the number of arc lamps installed had doubled, increasing from 1,000 to 2,000 during the past 12 months. More than one electric light company paid dividends to its shareholders, and all the manufacturers as well as the lighting companies seemed to be full of work. The principal systems in use were, for arc lamps, the Brush, the Weston, and the Thomson-Houston; but there were other arc systems, not so well known on this side of the Atlantic, such as the Hochhausen, the Van de Poel, the Western Electric, the Fuller, the Sperry, etc.; for glow lamps, the Edison and the Weston. Mentioning a considerable improvement which had been made in the Brush dynamo machine, he gave some account of the Weston system, which, looked at from a mechanical point of view, struck him as being probably the best in use in the States. Of the Thomson-Houston system, unknown at present in England, and containing some considerable and ingenious novelties, he gave a more detailed account. The Hochhausen system was known in this country from its recent use at the Health Exhibition.

Visiting central stations in various towns, he found 164 Thomson-Houston arc lamps alight in the public streets and shops in Montreal. The rate was 50 cents per lamp per night from dark to midnight, or over £35 per lamp per annum. At Philadelphia the Brush system, employing 1,200 horse power, supplied electricity for nearly 1,000 lamps, for which £60 per lamp per annum was the charge. The Brush people had also two central stations at Boston, lighting up 816 arc lamps; in fact, there were few towns of any consequence in the States that did not possess central stations worked by the Brush Company, and probably there were 25,000 Brush arc lamps in use in the United States. At Chicago all the drives in the Lincoln Park were lighted by arc lamps with very good effect, especially on the unique drive skirting the shore of Lake Michigan. Other companies also had central stations in Chicago. He did not see in the States one single instance of street lighting by glow lamps. In every case arc lamps were used for this purpose, and they were usually fixed on much taller posts than in England. Although brilliant, the effect was by no means perfect, and no effort seemed to be made to distribute the light uniformly, as had been done in England by Mr. Trotter. The price paid in New York was 70 cents per night, or £50 per annum, for each arc lamp; a fine of about 6s. for each time any lamp was reported out was inflicted.

Turning then to methods of incandescent lighting, he remarked that these did not seem to have flourished so much as arc lighting, nor indeed had they been applied to private houses to the same extent as in England. The principal system in practical use was that of Edison. House lighting had been attacked principally by the Edison Company. They had a central station in New York, which was opened on the 3d of September, 1882, and from that date to the time of Mr. Preece's visit there had been only two hours and a half stoppage, and that due solely to carelessness. There were 587 subscribers, using altogether 12,764 lamps served day and night. The price charged was the same as that which would be paid if gas were supplied at 7s. 6d. per 1,000 cubic feet, the price of gas having now been reduced to 5s. 9d. The use of secondary batteries had not received so much attention as on this side of the water. No difficulty was found in determining by the Edison meters the charge to be made, the subscribers paying for the light they received and not for the current they used. These bottle measurements were unquestionably accurate within one per cent.

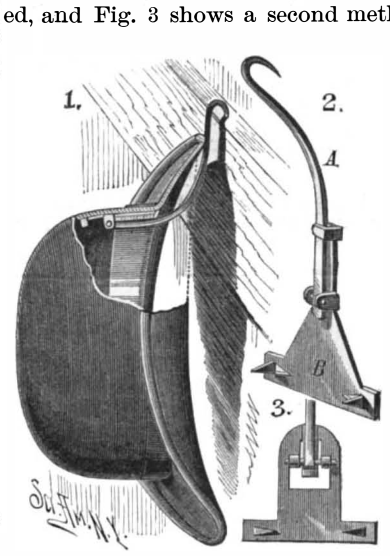
At present the electric light in England must be regarded as a luxury, and must be paid for as a luxury, but there was no reason why it should remain a luxury. Pointing out improvements in dynamos and lamps which had already effected a reduction of cost, he observed that there was still vast room for economy, and it was clear that the prices now required to make electric lighting pay would be brought down. Even now it was possible in England to make a system pay at the rate of a halfpenny per glow lamp per hour. In conclusion, he spoke of the influence of electric street lighting upon the morality and safety of the public. The Chief of Police of New York had gone so far as to say that "every electric light erected means a policeman removed."

In a discussion which followed, Mr. Crompton gave reasons for believing that with regard to steam engines, dynamos, and lamps, and consequent economy and efficiency, we had little to learn from the United States. Professor G. Forbes spoke of the important element in the question of the experience gained in the United States in the supply of the current from central stations. Mr. Hammond, agreeing that in point of quality arc lighting was better done in England on the whole than in the United States, said the love of the electric light there was to be measured by the commercial instinct of the consumer.

The chairman, in closing the proceedings, pointed to the unfair conditions of an Act of Parliament as the true reason why electric lighting from a central source had not been developed in this country. The thing had been done with the express purpose of stopping the introduction of electric lighting from a central source, and only a strong expression of public opinion would remove this unreasonable obstacle to a great improvement.

HAT HOLDER.

The hat holder shown in the cut can be attached directly to the hat, and is so arranged as to be folded into the crown when not in use. Fig. 1 shows a hat provided with the holder, Fig. 2 shows the holder detached, and Fig. 3 shows a second method of locking the hook back into the crown. The hook, A, is made of a narrow strip of metal, and is hinged to a plate, B, attached to the sweat band inside of the hat by means of points stamped out of the plate. As represented in Fig. 2, the plate is made with an extension formed with a holding lip under which the hook is adapted to be sprung for holding it turned back into the crown. The plate may be formed with a spring tongue (Fig. 3), so arranged as to press against the end of the hook for holding it folded back and also when brought to the position shown in Fig. 1. The device is cheap and convenient, is adapted to different styles of hats, and does not interfere with the wearing of the hat. Further particulars may be had by addressing the inventor, Mr. Oscar H. Haubner, 306 West 36th Street, New York city.



Experimental Surgery.

The London *Times* says: "While the Bishop of Oxford and Prof. Ruskin were, on somewhat intangible grounds, denouncing vivisection at Oxford last Tuesday afternoon, there sat at one of the windows of the Hospital for Epilepsy and Paralysis, in Regent's Park, in an invalid chair, propped up with pillows, pale and careworn, but with a hopeful smile on his face, a man who could have spoken a really pertinent word upon the subject, and told the Right Rev. prelate and the great art critic that he owed his life, and his wife and children their rescue from bereavement and penury, to some of these experiments on living animals which they so roundly condemned. The case of this man has been watched with intense interest by the medical profession, for it is of a unique description, and inaugurates a new era in cerebral surgery; and now that it has been brought to a successful issue, it seems desirable that a brief outline of it should be placed before the general public, because it illustrates vividly the benefits that physiological explorations may confer on mankind, shows how speedily useful fruit may be gathered from researches undertaken in the pursuit of knowledge and with no immediate practical aim, and reveals impressively the precision and veracity of modern medical science.

"This case, then—this impressive and illustrative case—is that of a man who, when admitted to the Hospital for Epilepsy and Paralysis, presented a group of symptoms which pointed to tumor of the brain—a distressing and hitherto necessarily fatal malady, for the diagnosis or recognition of which we are indebted to bedside experience and post-mortem examination. But while clinical and pathological observations have supplied us with knowledge which enables us to detect the existence of tumors of the brain, they have not afforded us any clew to the situation of these morbid growths in the brain mass, and it was not until Prof. Ferrier had, by his experiments on animals, demonstrated the localization of sensory and motor functions in the cerebral hemispheres that the position of any diseased process by which they might be invaded could be definitely determined. By the light of these experiments it is now possible in many instances to map out the seat of certain pathological changes in these hemispheres with as much nicety and certainty as if the skull and its coverings and linings had become transparent, so that the surface of the brain was exposed to direct inspection. And thus in the case to which I am referring, Dr. Hughes Bennett, under whose care the patient was, guided by Ferrier's experiments, skillfully interpreted the palsies and convulsive movements which the man exhibited, and deduced from them that a small tumor was lodged at one particular point in his "dome of thought," and was silently and relentlessly eating its way into surrounding textures. Not more surely do the fidgetings of the electric needle intimate their origin and convey a meaning to the telegraph clerk than did the twitchings of this man's muscles announce to Dr. Hughes Bennett that a tumor of limited dimensions was ensconced at a particular point of a particular fold or convolution of the brain—the ascending frontal convolution on the right side.

"Very brilliant diagnosis this, it may be remarked, and nothing more. A conclusion has been arrived at which, should it prove correct, will gratify professional pride; but as it cannot be confirmed or refuted until the poor patient is no longer interested in the matter, and cannot be made the basis of any active interference, no great advance has been made after all, and vivisection has yielded only some barren knowledge. Until quite recently, criticism of this kind would have been justifiable in a sense, but now it is happily no longer possible, for another series of experiments on living animals, undertaken by Profs. Ferrier and Yeo, have proved that through our power of localizing brain lesions we may open a gateway for their removal or relief. The old notion that the brain is an inviolable organ with *noli me tangere* for its motto—a mysterious and secluded oracle of God that simply falls down and dies when its fane is desecrated by intrusion—has been dissipated by these experiments; and we now know that under punctilious antiseptic precautions the brain, in the lower animals at any rate, may be submitted to various operative procedures without risk to life or fear of permanent injury. Emboldened by this knowledge, Dr. Hughes Bennett devised a way of helping his patient, whose disease he had diagnosed with such remarkable exactitude, and gave him one chance, if he had the courage to embrace it, of saving his life and recovering his health.

"The patient had the position in which he stood faithfully explained to him. He was told that he labored under a malady which medicines were powerless to touch, and that if left unassisted he must die in a few months at latest, after prolonged sufferings similar to those which had already brought him to the verge of exhaustion, and which could be only partially alleviated by drugs; but that one outlet of escape, narrow and dangerous, but still an outlet, was open to him in an operation of a formidable nature and never before performed on a human being, under which he might, perhaps, sink and die, but from which he might, perhaps, obtain complete relief. The man, who had faith in his doctor, and no fine-spun scruples about availing him self of the results of vivisectional discoveries, eagerly chose the operation. On Nov. 25th, accordingly, Mr. Godlee, surgeon to University College Hospital, in the midst of an earnest and anxious band of medical men, made an opening in the scalp, skull, and brain membranes of this man at the point where Dr. Hughes Bennett had placed his divining finger, the point corresponding with the convolution where he declared the peccant body to be, and where sure enough it was discovered. In the substance of the brain, exactly where Dr. Hughes Bennett had predicted, a tumor the size of a walnut was found—a tumor which Mr. Godlee removed without difficulty. The man is now convalescent, having never had a bad symptom, and full of gratitude for the relief afforded him. He has been snatched from the grave and from much suffering, and there is a good prospect that he will be restored to a life of comfort and usefulness. In that case he will be a living monument of the value of vivisection. The medical profession will declare with one voice that he owes his life to Ferrier's experiments, without which it would have been impossible to localize his malady or attempt its removal, and that his case opens us new and far-reaching vistas of hopefulness in brain surgery. Many men and women will henceforth, there is reason to anticipate, be saved from prolonged torture and death by a kind of treatment that has been made practicable by the sacrifice, under anæsthetics, of a few rabbits and monkeys."

Correspondence.

Is the Entrance to New York Harbor too Shallow for the Steamship of the Future?

To the Editor of the Scientific American:

The nature of what has been said and published on this subject is certainly discouraging; and in the practice of constructing steam vessels about ten times the length of their beam, with depth not much less than the latter, we have certainly approached the limit of dimensions in transatlantic ships.

But there is still some hope of an early disposition on the part of marine architects to abandon the elongated clipper ship system, or, rather, the steam sea serpent that rolls seas over and under, and, while preserving length, adopt a greater beam with much less depth, and propel with twin screws. By this improvement a vessel would run much more evenly, vary less in her draught from consumption of fuel on a voyage, and, properly powered, make much better speed and uniformity of time between ports.

In the construction of vessels the fact appears to be overlooked that buoyancy increases more rapidly than dimensions, or, in other words, weight in the vessel diminishes in a greater ratio to that of the water displaced. Hence steamers constructed according to practice, unless well balasted, become top heavy and great rollers in a rough sea, or, when loaded down, if of a large class, expensive to drive through the increased resistance of deeper water. Considering the traffic that vessels of the desired improvement in form would stimulate, through greater comfort in their movements, and the economy it would afford to ocean travel. I would suggest, for an example of what might be, the monster Great Eastern, which is 690 feet long and 82 feet beam (neither dimensions so far being too great for the present day), but with a vertical measurement of only 35 to 40 feet, thus reducing her draught of water to 18 or 20 feet, and supplied with twin propellers with power due to her capacity. I say thus improved, and past experience as to steamer time, who can doubt her passages being made between Liverpool and New York in about six days, and with marked regularity?

It is the pitching or plunging of a vessel at sea that greatly retards her speed. The writer has been out in that great ship twice, on one passage encountering severe weather and heavy seas, in the worst of which, owing to great length, her pitching did not exceed five degrees; but with her heavy, wide, and eighth of a mile long iron deck, her great lofty paddle boxes, spars, and ordinary heavy deck hamper nearly sixty feet above her keel, or more than thirty feet above water level, she became famed for rolling, the extent of which Mr. Russell of the *Times* (London) very aptly called "a grand swing"—the weight of her cargo, coals, and machinery, affording but a small extent of ballast for so tall, topheavy a bulk.

Steam has long since deprived the stately masts and sails of their original poetry, and the decks of the kind of vessel that should make up a ferry between New York and Europe should not be encumbered with the expensive resistance they greatly make to high speed, and this in addition to the cost of seamen to work them; and this is leaving out of count the costly equipment. And as to the question of their utility in case of broken machinery, it is but fair to say that if the action of the latter is properly regulated in speed, that is, the steam power automatically supplied to the engine exactly or coincidently with the varying dip of the propeller in rough seas, and "racing" of the engines prevented, all of which is carefully looked after by companies whose steamers are intelligently engineered, there is no more reason for broken screw shafts or other parts of a ship's machinery failing, but even less—the screw shafting of ships being made of superior strength—than there is of any similar parts of the same in factories, rolling mills, or the engines of your printing presses, to any of which serious damage rarely occurs; and a second propeller on a ship will always afford a superior means of speedily making port to the uncertain wind.

Let us, then, discourage the further construction of the present system of great steam sea serpents, and urge the early forthcoming of vessels of such self-ballasting form, which, though they may be of twenty thousand tons capacity, will find plenty of water off Sandy Hook for passage at almost any time of tide; and though there may be no objection to confining the construction of vessels for our inland waters or coasting service to domestic manufacture, depend upon it, when we become favored with a government that will afford us the privilege enjoyed by other nations, or, shall we say, representatives in Congress who cannot be bought by the European steam liners (for it is not fair to charge Mr. Roach with the entire extinction of our foreign commerce), that is, of building vessels that are to compete in the oceanic race where they can be procured the cheapest. This at any rate will not discourage domestic competition nor subsidizing by our government, and we may then through some means possess at an early day steamers that will sweep the present elongated clipper ships from the transatlantic service as successfully as the Donald McKay clipper sailing ships drove the old blunt hulks out of existence. But, any way, ships are not articles of ordinary human consumption, and should not be taxed; the interests of commerce only should shape their existence and ends.

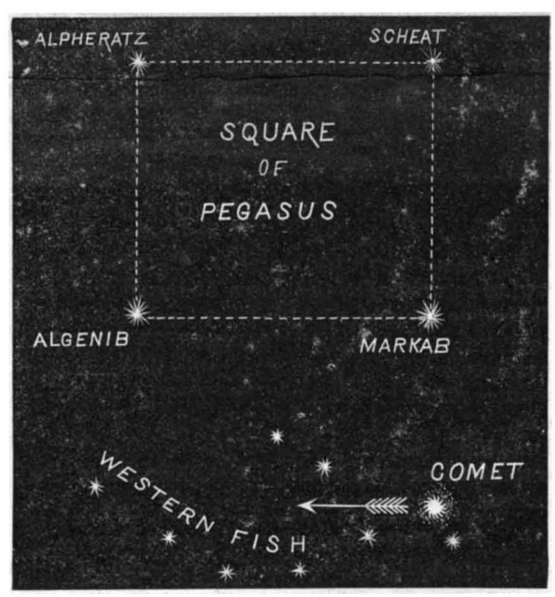
T. SILVER.

[FOR THE SCIENTIFIC AMERICAN.]

Encke's Comet.

An observation of Encke's comet was obtained by me last night with the nine inch reflector. It was a faint and difficult object as seen through slight haze. Its form was irregular, slightly elongated north and south, and with small central condensation. At the time of my observation it was in the upper part of the head of the Western Fish—Piscis Occidentalis—or just above the star Beta of that constellation.

For the benefit of those who would like to pick up this interesting comet, I append a small chart of the stars in its vicinity. The Square of Pegasus may be readily found high up in the southwest in early evening, and as will be seen by the chart the stars Scheat and Markab point very nearly to the comet's present position. It is moving very slowly indeed eastward, or very slightly north of east, as indicated by the arrow; and as it will not move out of this constellation for several weeks, there will be no trouble in finding it



with adequate telescopic power. After a while the comet will move more rapidly and grow much brighter so as to be visible in quite small telescopes.

This is the shortest periodic comet known, making its revolution about the sun in about three and one-third years. It was first seen on its present return to visibility by Professor Young, of Princeton—probably with the magnificent 23 inch equatorial of that observatory.

WILLIAM R. BROOKS.

Red House Observatory, Phelps, N. Y., Jan. 5, 1885.

English and Foreign Labor Compared.

Mr. J. S. Jeans, the Secretary of the Iron and Steel Institute, lately read a paper on the comparative efficiency and earnings of labor at home and abroad. The author furnished a number of interesting tables, designed to show the proportions of the population of each country engaged in agricultural, industrial, commercial, and professional pursuits respectively. Taking his figures from the census reports of 1881, he computed that the fourteen million people belonging to the wage earning class in the United Kingdom in that year had earned a total sum of over £580,000,000, the average being about £42 per head, which was an increase of 10 per cent on the sum computed by Mr. Leone Levi to represent the average earnings of the working classes of this country in 1867. A large number of details were given respecting the earnings of the working classes abroad in comparison with those of the United Kingdom, and the conclusion come to on an analysis of official returns as to the wages for each of the leading countries of the world was that in the United Kingdom the average wages paid were 45 per cent under those of the United States, 42 per cent above those of Germany, and 58 per cent above those of France.

It was also shown that between 1850 and 1883 the average earnings paid in a large number of leading industries in the United Kingdom had increased to the extent of 40 per cent, while in France during the same interval the average increase of wages was 53 per cent in Paris and 65 per cent in this country. In the United States within a much shorter interval, viz., between 1860 and 1883, the increase of wages had been practically identical with that in the United Kingdom for the longer interval stated, viz., 40 per cent. A comparison was made of the proportions of wage earning families and children relatively to the whole population in the leading industrial countries of the world, showing that women were more largely employed in Austria and France than in any other country, and that the largest number of juvenile workers was to be found in the United States. The largest population engaged in manufactures is to be found in the United Kingdom, where it numbers 23 per cent of the whole population, against only 13 per cent in Prussia, 12 per cent in France, and 7½ per cent in the United States. With respect to the efficiency of labor the author showed from statistics of work done in cotton factories, in mineral industries, in bricklaying, and earthwork, and other occupations, that English labor was considerably more efficient than that of any other country with regard to the quantity produced in a given time.

The Piece Dyer's Troubles.

In woolen piece dyeing numerous mishaps occur, for which the dyer is generally held responsible, and which often cause most serious troubles, litigation, loss of time, work, money, and patronage, unless he can positively lay the fault at somebody else's door. If in weaving the yarn is not kept uniformly moist, the natural consequence is, that the tissue is not evenly close in all its portions, wet yarn working in closer than dry, and this is the reason why some parts of the piece absorb more dyestuff, that is, appear darker than others; the pieces show various shades of color. From the same cause arise fusty stains, while the pieces are piled upon one another in drying.

Silver stains, blue or white coloring upon the cut, dark clouds, are liberally charged to the dyer. They are caused by soap contained in the material, which was imperfectly washed before being brought to the dyehouse. Fulled goods being not unfrequently rinsed in calcareous water, a lime soap is formed in the fiber, which resists any dyestuff. This is particularly the case with thin goods, as with heavy goods the greater quantity of alkalies contained in them is apt to neutralize the effect of the lime salts. When the lime soap is once formed by the use of hard water, a perfect dye is rendered impossible; still the dyer is blamed for not boiling the goods long enough in the bath, as if that could have remedied a fault in the goods which he has no means to discover beforehand. He can however use precautions, which may be unnecessary in some instances, but will aways place him on the safe side, and ought not, therefore, to be neglected in any case. They consist simply in running the tissues, before dyeing, in hot water to remove any traces of soap which may have been left in it by neglect in previous manipulations.

If the dye does not turn out level, however, the dyer cannot always shirk the responsibility, as the fault is often his own. Saving of time and labor is saving of money, but injudiciously applied that rule works the other way. To produce a good, level dye no solids whatever, either mordants or dyestuffs, ought to be thrown into the bath, but must be added after completely dissolving them separately. No general rule is more frequently failed against, and no surveillance can be too strict in this respect.

Probably every dyer who has tried to make work short by sewing many pieces together and running them at an increased speed, has made the experience that the goods looked cloudy. Notwithstanding their expeditiousness, the material had a too long time to lie doubled up. For dark colors it is not advisable to run more than one hundred yards at a time. Another often neglected precaution is, to let the pieces cool down in the tub before reeling up. If lifted while hot, and allowed to lie for any length of time, creases and fold marks are produced which are hard to remove. With some colors, particularly those dyed upon chrome mordant, this precaution is absolutely indispensable, as they are apt to deepen and become uneven, if the pieces are reeled up while hot.

Upon vat blue or green pieces, white, yellow, or light blue sparks make sometimes their appearance, for which the dyer is almost always called to account, though the fault lies in the raw material, and can be only charged, if to anybody, to the wool sorter. They are caused by diseased or dead wool, whose presence can be detected at the first run in the vat or dye tub, as only the top end of the hair absorbs the dyestuff, while the lower part remains colorless or turns yellow, as is the case with green.

That aniline dyestuffs must be added to the bath gradually, is a rule known to every dyer; it is even more strictly to be observed in piece dyeing than in yarn dyeing.—*Textile Colorist.*

A Young Hero.

Although only thirteen years of age, Elmer Dwyer, of Lynn, Mass., is a hero, having recently saved two lads from drowning at the risk of his own life. The rescued lads broke through the ice into the deepest part of a pond. Dwyer, hearing the cries of the drowning lads, ran for assistance, and finding no one at hand, took a ladder from a yard near by, and, after several heroic attempts, succeeded in placing it on the treacherous ice. He then crawled on the ladder to the drowning boys, and by almost supernatural power succeeded in getting them on to it and thence to the shore in safety. The rescuer is a lad of slight strength and not very good health, and in his bold act was wet through to the skin.

What Fossils Teach.

In a recent lecture Dr. P. H. Carpenter, of Eton College, mentioned the case of Greenland as an illustration of the manner in which the earth's history is read from fossils, those remains of by-gone life which in the middle ages were regarded as "sports of nature." Fossils of four climates, all warmer than the present icy one, are found in that country. Remains of the oak and the maple tell us that the climate was once very similar to that of England to-day, and the coal, found lower down, shows that something approaching tropical heat prevailed at an earlier period. The fossils of certain sea creatures appear on the land, and that Greenland once lay beneath the sea and that its water was temperate, while the coral, obtained still lower down, must have grown when the waters were still warmer.

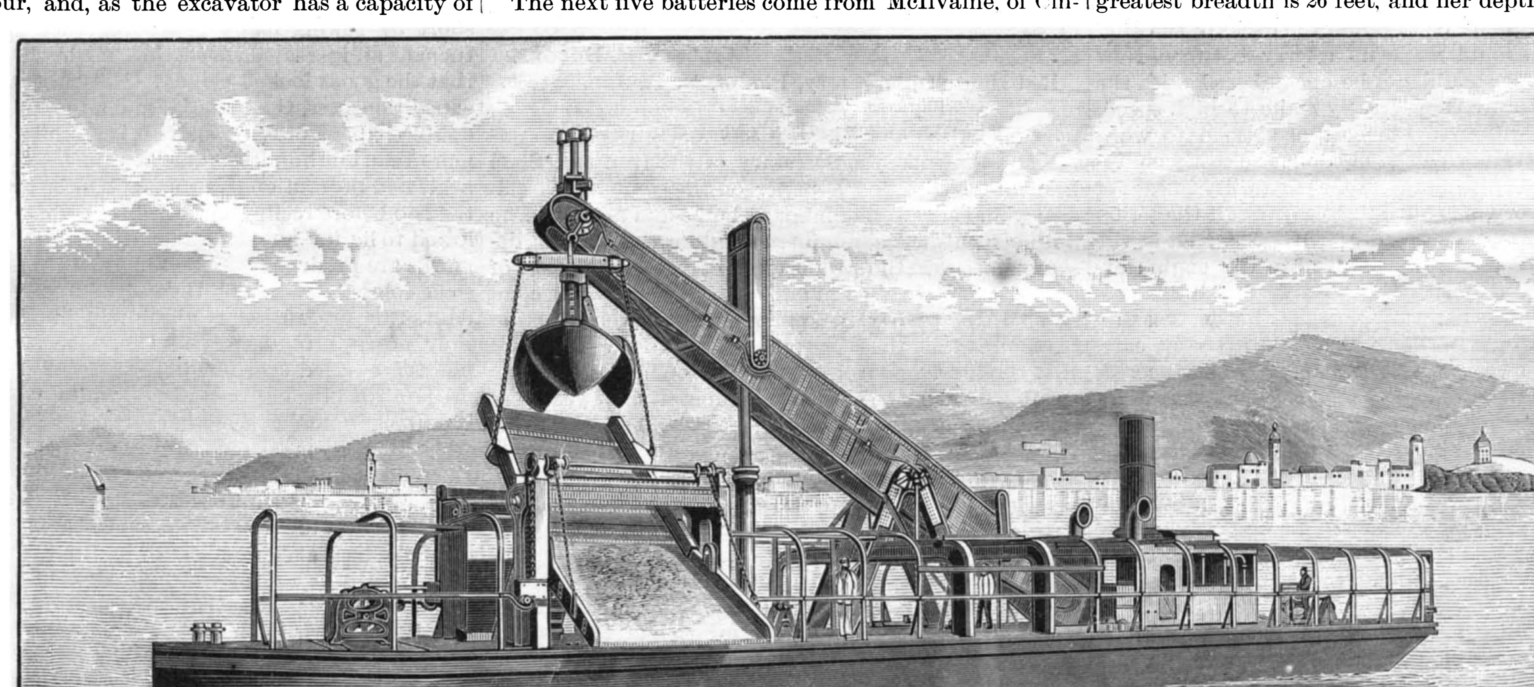
IMPROVED DREDGER.

The engraving herewith represents a dredger, on Messrs. Bruce & Batho's system, lately constructed for use in British Burmah. It is designed to work to a depth of 15 feet, and is of the following general dimensions: Length, 120 feet; breadth, 32 feet; depth, 7 feet; and mean draught, 3 feet. The vessel is propelled by twin screws worked by independent pairs of high pressure engines, supplied by steam from an ordinary marine multitubular boiler, 9 feet in diameter by 9 feet 6 inches long.

The whole of the operations involved in working the excavator are, says *Engineering*, performed by hydraulic power, which is furnished by a pair of direct-acting differential pumping engines with steam cylinders 15 inches in diameter and pumps $4\frac{1}{4}$ inches in diameter, the stroke of both being 18 inches. All the rams are controlled by slide valves placid amidships, so that one man can regulate the whole of the motions without leaving his station. The excavator is mounted on the end of a beam pivoted on frames fixed to the deck. This beam is raised into the position in which it is shown in the engraving by a hydraulic ram about half way between the center and the excavator, and it is caused to descend partly by the weight of the excavator, and partly by a smaller hydraulic ram near the other end. The excavator itself is worked by two rams coupled together by side rods, so that they move in unison. The lower and larger ram is connected by rods to the three segmental scoops, and serves to draw them together when they are receiving a load of soil, shingle, or rock, a pressure of 30 tons being available and amply sufficient for that purpose. The smaller ram opens the excavator when it is raised.

The two hydraulic cylinders with the hemispherical shell, and the casting to which its component parts are attached, are hinged to the beam by a universal joint, through the trunnions of which the pressure water enters. The chute for discharging the spoil is connected to the beam, and follows the excavators ready to receive its load as it falls. The speed of working is about forty lifts an hour, and, as the excavator has a capacity of 160 cubic feet, the work done amounts to 300 tons per hour.

As may be seen from the official reports to the Government of India, the cost of dredging with one of these machines is now only 1d. per cubic yard, while after some years of work the dredger was described as "perfect in every way." The fact that all the working parts are either on board, out of water, or above the material acted upon by the excavator, accounts for the great differences in wear and tear as compared with the bucket and ladder type of dredger.



IMPROVED HYDRAULIC DREDGER.

MAGICAL APPARITION OF A DRAWING ON WHITE PAPER.

It is well known that the vapors of mercury are very diffusive in their nature, and some quite singular experiments have been devised based upon this, and upon the fact that the salts of silver and the cholorides of gold, platinum, iridium, and palladium are affected by these mercurial vapors.

If any one, for instance, should write upon a sheet of white paper with chloride of platinum, no mark would be visible, as the liquid is quite colorless. If, however, the same sheet of paper should be held over a little mercury, the metal will be brought out on the paper in dark tints. This magical apparition of a figure or drawing on a sheet of paper which appears to be perfectly white is very astonishing to the spectator.

On the other hand, reversing the experiment, a no less marvelous result is obtained. At first expose the drawing in writing to the gases of mercury; the lines will become charged with mercury, and then by simply bringing the drawing in contact with a sheet of paper previously sensitized with a solution of platinum, the drawing will be reproduced, line for line, on the white paper.

MAGICAL APPARITION OF A DRAWING ON WHITE PAPER.

Drawings made in this way give a charming effect, the tones being very soft and the lines being distinct and clear.—*Le Science and La Nature.*

The Boiler Batteries at New Orleans.

Just outside the Main Building, beyond Machinery Hall, are the monster batteries of boilers that supply the steam power to the stupendous engines of the Exposition.

The first battery is composed of four boilers, 28 feet long, 48 inches in diameter, occupying a frontage of 22 feet, having each two 16 inch flues and of 200 horse power. They were built by William Mitchell, of Louisville.

The next five batteries come from McIlvaine, of Cincinnati. They have each four boilers, 28 feet long, 48 inches in diameter, and occupy a space 22 feet front. Each boiler has two 16 inch flues and a capacity of 200 horse power.

Then follow three batteries of six water-tube boilers, manufactured by Babcock & Wilcox, of New York, and having each 500 horse power.

John Ward, of New Orleans, furnishes the next battery of three boilers. These are 24 feet long, 48 inches in diameter, have each seventeen 6 inch flues and a capacity of 200 horse power.

The American Steam Boiler Company, of Chicago, furnishes a battery of two boilers, 60 inches in diameter, 16 feet long, containing fifty 4 inch tubes; two boilers 54 inches in diameter, 16 feet long, containing fifty-seven $3\frac{1}{2}$ inch tubes; horse power, 500.

The next battery is from William Mitchell, of Louisville, and is an exact duplicate of battery No. 1.

Armstrong Bros., of Springfield, O., have two batteries of four boilers, 28 feet long, 42 inches in diameter, and two 16 inch flues each, and are 200 horse power.

These batteries are so arranged as to be used all together or independently. They all lead into one main steam pipe, 500 feet long and 30 inches in diameter, and built of 5-16 homogeneous steel. The water supply is furnished by a system of duplex pumps that discharge into one main, with branches leading to each battery of boilers. The pressure in the water main is always maintained from 20 to 30 pounds greater than the pressure in the boilers, so as to equalize all frictional resistance in the pipes and bends, and thus insure at all times a constant supply of water to any or all the boilers. Each battery is regulated independently of the others by separate valves in charge of the engineer on watch.

The water supplied is taken up cold by the pumps and discharged into a manifold having a four inch steam pipe connection, and is forced through about 1,200 feet of four inch pipe that is incased in the main exhaust pipe, which is 40 inches in diameter, built of quarter inch iron. The water is thus heated 210° and 212°, at which temperature it is delivered into the boilers. The frontage occupied by the several batteries is 400 feet, and they will have a combined force of 6,000 horse power.

Each battery has its own smoke stack, the draught of each being wholly independent of that of the others. The furnaces employed, and on which most of the boilers sit, are of a style that has been successfully in use for years throughout the Western and Southern States, and which has a record of evaporation of 10 pounds of water per pound of combustible. They are constructed on the regenerative principle, the object sought being complete combustion and the prevention of the smoke nuisance so much complained of in all large cities. The smoke stacks of the different batteries run from 45 to 110 feet in height and from 40 to 60 inches in diameter. The building of most of the furnaces and the supervision of the entire line of boilers is under the general superintendence of Mr. Louis Metesser, of Indianapolis, a gentleman highly qualified by education and experience for the position.—*Times-Democrat.*

Scotch Dredges for the Panama Canal.

A Panama dispatch says: The first of the Scotch dredges for canal work arrived in this bay on November 24, having made the voyage from Scotland in eighty-eight days. The dredge is 170 feet long, her greatest breadth is 26 feet, and her depth 12 feet. She has two compound engines—one for driving the vessel and one for working the dredging machinery. Each engine is 80 horse power, but can be worked up to 400. When clean, she steams eight knots an hour. She is the most powerful vessel of the class yet bought by the canal company, and she will be followed by several others. Their special work will be cutting the main channel in shore, from in front of the anchorage of the steamers at Flamenco to the entrance of the canal at the back of Ancon Mountain. By January it is expected that at least two of them will be at work.

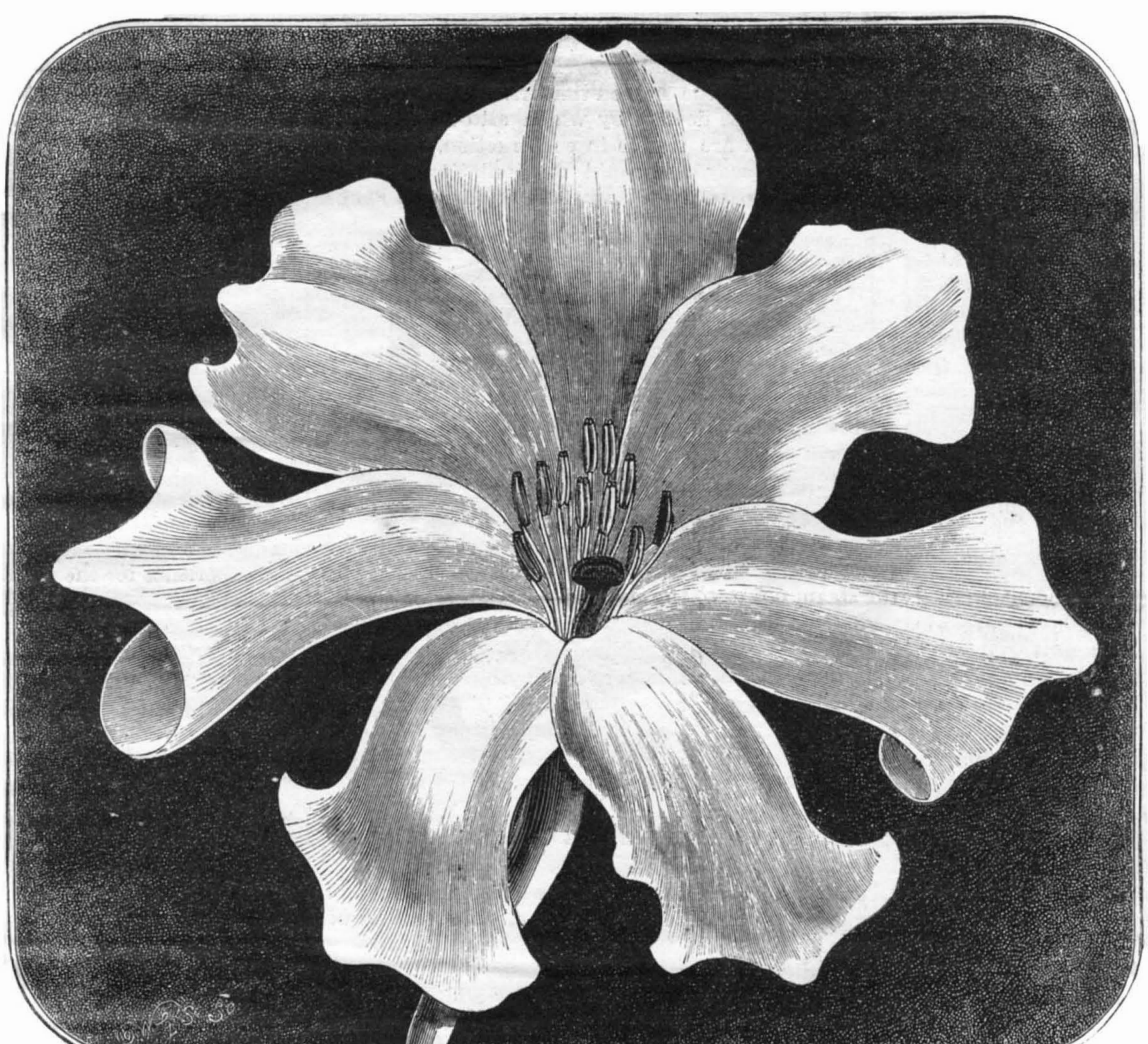
RHODODENDRON TOVERENÆ.*

Sp. n., F. von Muell.

During a recent ascent of ranges fully 6,000 feet high in southeastern New Guinea, it fell to the fortunate lot of Mr. Carl Hunstein to discover a grand epiphyte, of which he brought a solitary flower, but made a colored sketch of the latter also (see Figure). Though it is unusual to define any plant botanically from a single flower, I feel no scruples in this exceptional case in placing at once this superb production of the Papuan flora on descriptive record, especially as the material, although scanty, allows of referring the plant clearly to the genus Rhododendron. Thus also I am enabled to fulfill a long-cherished wish to connect with some splendid floral treasure the name of the Marquis Goyzueta de Toverena, Consul-General in Australia for the Italian kingdom, a nobleman who has given much encouragement to my researches while worthily representing there for a series of years his great country.

Four species of Rhododendron are described from New Guinea in Dr. Beccari's *Malesia*, i., pp. 200, 202; they all came from Mount Arfak; so that the addition of a southeastern species renders it probable that these superb plants occur in numerous specific forms throughout the higher regions of the Papuan island. This fifth congener differs in its white and very large flowers from the other four; but R. Konori has also a 7 lobed corolla (a characteristic otherwise only recorded in R. Fortunei), and the number of stamens is also about the same as in R. Toverenæ, while the anthers are likewise remarkably elongated. Among the Sikkim species of Rhododendron our new one approaches to R. Edgworthi; but the flowers are numerous (forming indeed, according to the collector's note, magnificent umbel-like bunches of over a foot's width), the limb of the corolla is broader, the tube much longer, the stamens become increased in proportion to the corolla lobes, and the anthers are longer and pale colored, while (as noted by the finder of the plant) the stigma and upper part of the style are deep red; the foliage may also prove very different.

Our plant comes nearer to R. Falconeri, so far as the copious masses of its flowers, the much-lobed corolla, and the numerous stamens are concerned; but the length and width of the flowers is much greater, and the shape of the corolla is not campanulate. Indeed, only R. Griffithi in its variety Aucklandi comes up to the size of the flowers of R. Toverenæ; the latter, however, is distinguished by the comparatively slender corolla tube, much longer anthers, and a denser vestiture of the pistil. Mr. Hunstein speaks of pink leaves next the flowers, which would accord with young leaf-shoots of red tinge, such as are observed in several Rhododendrons, particularly R. Fortunei and R. Hookeri. A consideration of the fact that the calyx in many species of Rhododendron becomes obliterated strengthens the view that the floral envelope of Proteaceæ and a few orders allied to them is petaline, not calycine.—*Ferd. von Mueller, The Gardeners' Chronicle.*



NEW RHODODENDRON FROM NEW GUINEA.—FLOWERS WHITE.

The Microphotoscope.

Mr. R. G. Mason, of Douglas, Isle of Man, is the author of the following:

The microphotoscope consists of a pair of spectacles, eyeglasses, or an eyeglass, with one or a number of minute photographs arranged in or along the rim of the spectacles, eyeglasses, or eyeglass.

The minute photographs are placed behind suitable minute magnifying glasses, and are so arranged in or along the rims of the spectacles or eyeglasses that the eyes of the wearer may see either one or all of the photographs without moving the spectacles.

The rim in or along which the minute photographs are placed may be either the rim of the spectacles themselves or a detachable rim, which may be applied to any spectacles, eyeglasses, or eyeglass.

The minute photographs may be photographs of written or printed matter, maps, charts, views, landscapes, or any object or group of objects from which a photograph may be taken.

Some of the uses to which the microphotoscope could be applied are the following:

For a student.—The series of microphotographs in the rims of the spectacles might consist of copies of an epitomized grammar, history, geography, or any subject the student wished to study. Thus, the subject he was studying would be constantly before his eyes for reference in his spare moments without the trouble of carrying books about with him.

The rims containing the microphotographs being detachable, he could at any time change the subjects.

A lecturer might have the heads of his lectures photographed and placed in the rims of his spectacles; a lawyer, his briefs; a clergyman, his sermons; a bicyclist, tricyclist, or other tourist, maps, views, and plans of the country through which he traveled; a shopkeeper, a calendar, ready-reckoner, etc.; a timber merchant or builder, cubes, measurements, and rules; travelers on the Continent, list of foreign terms, names of articles, foreign money, tables, and so on; a correspondent, an abridged dictionary of technical or difficult words; a member of Parliament, facts and figures relating to the subject of his speech; a doctor, formulæ; a public entertainer, recitations, songs, *bon-mots*, etc.; a musician, whole pieces of music; a detective, criminals wanted.

The inventor says: "It will also be evident that the microphotoscope may be applied to a variety of other uses too numerous to mention."

It will be understood that the spectacle or eyeglass frames may have in them ordinary reading-glasses when worn by those who need them, and when worn by those who do not, they may have either plain glasses or no glasses at all.

Influence of Petroleum Cans on the Compass.

It is now claimed that refined petroleum in tin cases exerts an influence on the compasses of a vessel equal to the same amount of iron or steel. The masters of the German ship J. Weisselholm and the schooner Maggie Dalling have made written reports confirming the above, and in the latter case the captain claims that his vessel went ashore through an error caused by cased petroleum.

The Uses of Old Bones.

A ton of ordinary bones in the principal markets today is worth about as much as a ton of American pig iron, and a ton of the best bones is worth about four times as much. For a number of manufacturing purposes, bones are valuable. The ordinary bones which are collected around through the country are burnt to get the animal charcoal or boneblack, or converted into fertilizers, and are worth about $18 per ton. There are many fertilizer manufactories in the country which grind bones, and some of them also make boneblack.

Boneblack is generally in good demand at good prices by the sugar refineries for filtering, and bones used for this purpose yield a better return than when made into fertilizers, for which accordingly only the poorer grades are used. These are the ordinary body bones of cattle and sheep, the skull being converted into fertilizing material also. The bones are rendered by being boiled in an open kettle or in closed tanks under a pressure of from 15 to 40 pounds. The tank-boiled bones are very much preferred by the boneblack manufacturers, as by this process the nitrogen is removed and the carbon left.

The leg bones of cattle and sheep are used for a number of different purposes. The shin bones and feet of cattle contain considerable neatsfoot oil; about a pint being obtained on an average from every four feet of good sized cattle. The skin and thigh bones are thoroughly cleansed of all meat and grease. The liquor in which they were boiled was formerly thrown away, but now a very fair quality of sizing glue is manufactured from it. Some shin bones are burnt for boneblack or converted into fertilizers, but the bulk of them are worked up into knife handles.

The round shin bone comes from the hind leg, and the flat from the fore leg. The bulk of the shin bones in the Eastern market are shipped to Europe, though there is a manufactory at Newburyport, Mass. The knuckles of the shin bones are sawed off, and used either for lampblack or fertilizers. Shin bones for knife handles will bring over $40 per ton, but for burning, etc., only about $25 per ton. The knuckles of thigh bones are also sawed off and used for boneblack or fertilizers. The thigh bones are worth $80 per ton, and are manufactured into tooth brush handles. Very few are exported.

The front leg bones of cattle are worth about $30 per ton, and manufactured into collar buttons, fancy bone trimmings, jewelry, parasol handles, etc., both here and in England. The American factories are in Connecticut, Long Island, and Philadelphia. Sheep's legs are also manufactured into parasol handles and various fancy articles. The bone waste and dust caused by the sawing, etc., is used as a feed for cattle and hens, and is also worked up into boneblack and fertilizers.

Boston, according to the *Commercial Bulletin* of that city, is a smaller bone market than formerly, as the gradual falling off in the slaughter of cattle in that vicinity, and the increase in the West, has caused a decrease in the amount of bones coming into that market. Occasionally cargoes of South American bones are received at that port, and are either bought by boneblack or fertilizer manufacturers or shipped to England.

Coal in Wyoming.

In cutting the 1,400 foot tunnel of the Oregon Short Line at Twin Creek, Wyoming, seven veins of coal were pierced. These dip at an angle of about 40 degrees, and are 5, 7, 8, and 20 feet thick. On the west side of tunnel, at Mine No. 1, the road is taking coal from three veins, respectively 5, 8, and 10 feet, and is tunneling for another vein 18 feet thick. At Mine No. 2 they are extracting from a 14 foot vein. This coal burns to a white ash, is a good steaming coal, but possesses the defect of slaking badly upon exposure to the air. In mining, about one-fourth is waste, because of this disposition to slake and crumble.

A VIRGINIA walnut tree was recently sold for $600. It was so big the purchasers made money.

* *Rhododendron Toverenæ.*—Corymbs containing about twelve flowers, each on an average 6 inches long and wide; calyx reduced to a terminal narrow oblique expansion of the stalklet, the latter nearly glabrous; corolla pure white, its tube slender cylindrical, about 3 inches long, but not half an inch wide at the middle, slightly widened upward, lobes seven, horizontal, oblong-ovate, somewhat waved, scantily reflexed at the margin for short spaces, rounded-blunt or according to the sketch) occasionally sinuous at the summit or there produced into two or three lobules; stamens fourteen, somewhat exserted, about 4 inches long, filaments in their lower portion densely beset with short spreading hair, in the upper portion nearly glabrous; anthers linear-cylindrical, nearly or fully half an inch long; pistil hardly longer than the corolla tube, cover of the stigma patellar, ovary 7 celled, stigma 7 lobed, style abont 1½ inches long, as well as the ovary fulvous-velvety, except toward the summit.—*F. v. M.*

Surface Life in the Gulf Stream.

The explorations of the U. S. Fish Commission, chiefly within the last two years, have brought to light many wonderful facts connected with the Gulf Stream. The deep water dredgings of 1883, and now more strikingly of 1884, have added multitudes of new types of both vertebrates and invertebrates, illustrating those features of the deep sea fauna which have been becoming so conspicuous and characteristic in the zoological reports of the last year and more. It is not with the individual forms that we have now to deal, but merely with the fact that in those immense depths, 2,000 fathoms and beyond, the bottom of the sea swarms with animal life to a degree that appears almost incredible. The actual bed itself is alive with crustaceans, mollusks, radiates, etc., while the stratum of water so near to it as to be within the depth of a trawl's mouth is filled with fishes prowling about for food. Whether the mass of water between these strata of the bottom and those of the surface is full of living objects, we have as yet no means of knowing.

The trawls pass through all in their descent and their ascent, and part of what they eventually contain may perhaps have been captured in mid-depth, but it is not probable that this can take place to any considerable extent.

At all events, our real explorations have to do chiefly with the surface and the bottom; and the results obtained at the surface are in some respects more wonderful than those from the deep dredgings. The working of the trawls has been freely described and figured, but little has been said of the collections made within a depth of less than two feet, and yet zoologically they are rich beyond all description, and biologically they set before us a problem which is not easy of solution. The means of collecting are exceedingly simple. It is done either with hand nets or drag nets, being in either case a metallic ring to which a deep gauze bag is attached. They can be used to advantage only while the vessel is in very gentle motion; and the first impression made by the use of a drag net in the Gulf Stream for even a very short time is of simple, unbounded astonishment at the apparently limitless profusion of animal life. One is tempted to believe that the vessel is floating, not on water which contains animals, but on a sea of minute living objects with barely sufficient water to give them freedom of motion. The gauze bag speedily becomes so completely clogged with its living load that no water can pass through it until it is cleared. Drawing it in and emptying it into a bucket, perhaps a gallon of "pudding" is secured, which contains probably a greater number of distinct and independent living beings than there are human inhabitants of the earth at this moment.

This is no exaggeration. The numbers are utterly beyond computation. Of course all of these are of extreme minuteness, for the larger species easily escape the slow moving net. The smaller crustacea (oopepods, branchiopods, etc.), the swimming mollusks (pteropods mostly, though not a few cephalopods are among them), various forms of annelids, the tunicates (most especially the salpæ)—these are swept into the net, through whose interstices in the mean time the more minute objects have been escaping; but as the soft and yielding mass gradually thickens the gauze the little things which are really microscopic are detained on its surface, and serve to increase the mass, though hundreds of thousands and even millions are needed before they become fairly appreciable. The larval stage of the echinoderms is represented with an almost infinite richness, and with them come the hydroids and jelly fishes, and then the infusoria, the foraminifera, till we reach absolutely the lowest grades of animal life, including the well known globigerinæ, whose microscopic silicious shells are constantly helping to build up the soft ooze at the greatest ocean depths. These are the objects which the gauze net has collected while dragged slowly along for perhaps one to two hundred yards. And if we have gathered our hundreds of millions of individuals within such an extent, what effort of the imagination can stretch out to numbers which shall even approximately reckon up the surface life in the Gulf Stream, were we to take but even a single square mile of its extent? For it is worthy of note that this richness is not the result of concentration.

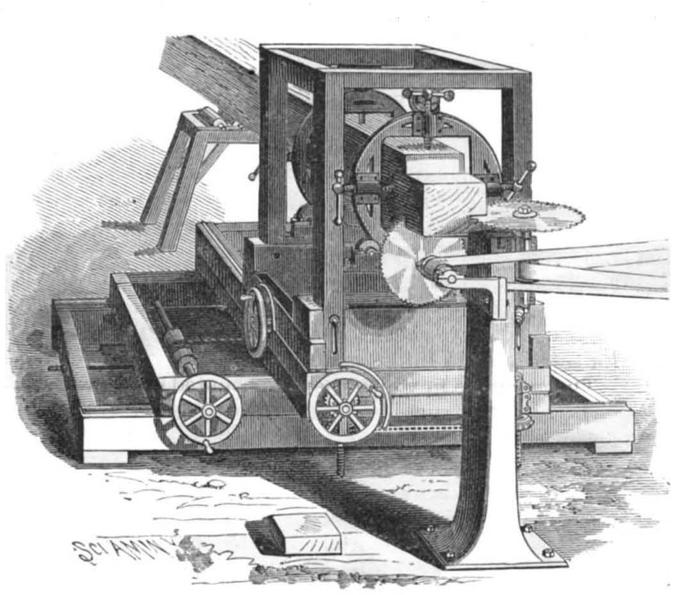
In other places (we have a notable example at Wood's Holl) there are certain occasions when, for a brief period, owing to the run of the tide, and the eddies caused thereby, we may find a state of swarming animal life as remarkable as that which we have specified, but it is only for a very restricted space; whereas in the Gulf Stream, so evenly diffused are the teeming myriads, that out of 150 sweeps of the net only one or two will fail to realize very nearly what we have stated.

Nor is it only in numbers of individuals that the lavish profusion exists; the catalogue of distinct types, reckoned as species, is certainly full of suggestiveness. Without counting the majestic and powerful animals, drawn together in their wide sea rovings by the abundant supply of food—the whales, blackfish, porpoises, etc., and with them the fierce sharks in swarms, together with the fleet and savage dolphins, albicore, bassacudas, and so on—it is safe to count the smaller fishes up to 25 at the very least. Of the crustacea in their various grades, there are certainly 50 species. The mollusca have 60 distinct specific forms, probably more. Of the annelids we find 15; of the tunicates, 8; of the polyzoa, not less than 10; of the echinoderms, 5; of the hydrozoa, certainly as many as 25; while the radiolaria, foraminifera, and other infusoria reckon up 30 as a minimum. These give us 228 species, which total will surely be enlarged by further research.

MACHINE FOR FRAMING TIMBER.

The engraving shows a machine for cutting tenons on the ends of timbers, such as the "square set" for supporting the earth and rock around shaft, drift, and tunnel cuttings, and for use in framing timbers for other purposes. The two saws are mounted upon a fixed frame so as to rotate at right angles to each other, and so as to cut to the same line both ways through the timber. The timber carriage has a forward and backward motion, and is provided with rotatable timber clamps, by which the timber may be turned axially, in order to present all of its faces to the saws. That portion of the carriage which carries the clamps is so mounted as to rotate horizontally, thus permitting both ends of the timber to be presented to the saws. The timber clamp frame is adjustable toward and away from the saws, to govern the length of the framed timbers.

The various devices by which all of these motions are effected are simple in construction, durable, and permit of easy and rapid manipulation, and are so placed as to be within convenient reach of the operator. It will also be seen that when once placed in the machine the timber is under complete control of the operator.



BLEY'S MACHINE FOR FRAMING TIMBER.

Additional information concerning this timber framing machine can be obtained by addressing the inventor, Mr. William J. Bley, of Silver King, Arizona.

An Electric Tram Car.

Experiments have been carried out for a few months past in a quiet and systematic way with a view of determining the value of secondary batteries, in conjunction with electro motors, for the propulsion of tram cars in crowded cities. Mr. A. Reckenzaun has designed, and the Electrical Power Storage Company has constructed, apparatus which, says the *Engineer*, promises a very handy means of locomotion on street rails, and for more than two months past a car has been running on a line put down for experimental purposes in the yard of the Storage Company at Millwall. The line—4 feet 8½ inches gauge—is 400 feet long, forming a right angle of nearly equal sides, so that about half way a curve of 35 feet radius has to be passed. From one end, as far as the commencement of the curve, the road is tolerably level; but with this curve commences an incline of 1 in 40, which rises gradually until it reaches the maximum of 1 in 17 nearly at the end of the up journey; thus it is impossible to make a rush for the hill, on account of the sharp curve intervening. The car itself is an old one procured from one of the metropolitan tramways, and it has done many years' service while drawn by horses on the Greenwich, Westminster line. The body of this vehicle weighs 2½ tons, and it accommodates forty-six passengers. The accumulators furnishing the electric energy are of a special type manufactured by the Storage Company, to the designs of Mr. Reckenzaun. Stowed under the seat on long trays, which run on rollers for their speedy removal, they are out of sight, and the whole car internally and externally has the ordinary appearance. The motor and gearing—Reckenzan's patent—are placed underneath the car, and occupy so little space that to an ordinary observer they are invisible. The speed may be varied from three miles to ten miles per hour.

Electric tram cars propelled by accumulators have been made and tried on several occasions in London, Paris, and Brussels, but hitherto with little success, and eminent men have pronounced the accumulator system of motive power as impracticable. One of the main reasons assigned was that batteries were much too heavy. The Electrical Power Storage Company has, we are told, reduced the weight without sacrificing either efficiency or durability. The accumulators in the car under notice weigh 1¼ tons, the motor, gearing, and accessories weigh about ½ ton, bringing the total weight of motive power to 1¾ tons for a car which, with its full complement of passengers, weighs itself 5½ tons; while the batteries, motor, and gearing are capable of furnishing at any desired moment a power of sixteen horses if required. Comparing this weight of 1¾ tons, with that of a steam tramway locomotive, or a compressed air locomotive, either of which will weigh some eight or ten tons to do the same amount of useful work, stored electricity has the advantage in proportion of about five to one, so long as the propelling force is directly proportional to the weight moved. It has also been said that there is a great waste of power in the use of accumulators for motive power, as the conversion of energy has to pass through several stages, viz., steam into electric current, current into oxygen and hydrogen, and these again into current and electro-motive power. It can be shown from prolonged experiments and practice that the total loss of energy with all these transformations is 66 per cent between the steam engine and the tram rails. Tramway steam locomotives consume from three to four times as much fuel per horse power as large stationary engines, such as would be used for driving dynamo machines; and bearing this in mind, an efficiency in the electrical tram car far below the one quoted above would still be considered economical. The prime cost of the electrically propelled cars with the charging station is less than steam cars, and the depreciation and repairs of machinery must also be less, on account of the few wearing parts and the complete protection from dirt.

The running cost, including 15 per cent depreciation on machinery and 50 per cent on accumulators, is given as 3·5d. per car mile, which is about one-half of the cost of horsing on tram lines. The car on the line at Millwall runs for two hours with one charge, starting, stopping, and reversing every sixty seconds, and the discharged accumulators can be replaced, it is said, almost as quickly as changing a pair of horses, by means of a trolly, which brings and removes the trays of cells, running on rollers. The whole arrangement has been very carefully worked out in every detail, the mechanical parts being as well arranged. The load is distributed upon two small bogies, so that no objection can be raised on the part of tramway companies using light rails laid for horse car traffic, and the old rolling stock can be readily utilized by putting the bogies which carry the motor under the car, and fitting the space under the seats for the reception of the accumulators. The car is brilliantly lighted by four 20 candle power Swan lamps, and bell pushes inside the vehicle enable the passengers to call the conductor and driver at the same time by the ringing of electric bells.

Rise of the Swedish Coast.

An examination of a series of water marks set in 1750 all round the Swedish coasts, from the mouth of the Tornea to the Naze, in order to settle a dispute between the Swedish astronomer Celsius and some Germans, as to whether the level of the Baltic had been rising or sinking, shows that both parties were right. The gauges were renewed in 1851, and again this year, and have been inspected regularly at short intervals, the observations being carefully recorded. It appears, says *Nature*, that the Swedish coast has been steadily rising, while that on the southern fringe of the Baltic has been as steadily falling. The dividing line, along which no change is perceptible, passes from Sweden to the Schleswig-Holstein coast, over Bornholm and Laland. The results have lately been published by the Swedish Academy of Sciences; and it appears from them that while during this period of 134 years the northern part of Sweden has risen about 7 feet, the rate of elevation gradually declines as we go southward, being only about one foot at the Naze, and nothing at Bornholm, which remains at the same level as in the middle of the last century. The general average result would be that the Swedish coast had risen about 56 inches during the last 134 years.

THE friends of Professor Huxley will be pained to learn that his health is so impaired that he is obliged to spend the winter in southern Europe. From last advices he was staying at Naples, and is already much the better for rest and change. He will pass a month or two at the interesting old city of Amalfi, where it is hoped he will regain perfect health.

Dearborn Observatory, Chicago.

Prof. G. W. Hough gives a very interesting report for 1884.

The instruments in constant use are the great equatorial, the Repsold meridian circle, chronograph, and the various standard clocks. All have been kept in good working order by making the necessary repairs.

Since the date of the last report the gas engine has been placed in the tower for turning the dome. It is connected with the crank shaft by means of bevel gear and one counter shaft, so that but very little of the power is consumed by the belting. It is started instantly, and requires no cleaning or adjusting. A little blacklead on the piston and slide valve once in two or three weeks is all the attention required. It has a working power of 8,000 foot pounds, or about one-fourth horse power.

During recent years a great deal has been said with regard to the construction of large domes, in order to make them readily manageable. From our experience with the Chicago dome, we believe the most satisfactory solution of the problem is the employment of some mechanical motor. There are three forms of force readily accessible to most observatories, viz., water power, gas, and electricity, either of which is readily manageable. Our small engine is capable of turning the dome through 180° in five minutes, so that the time lost in changing from one part of the heavens to another is a matter of no consequence.

As heretofore, standard time has been furnished to the city of Chicago daily. The signal clock has transmitted its beats to the fire alarm office without interruption during the year.

On nearly every clear day or night meridian observations for time have been made with the Repsold meridian circle. Since the date of the last report such observations have been secured on one hundred and fifty-six days, or an average of rather more than two and one-half days in each week. The time signals have generally been correct within two-tenths of a second, and the accumulated error during protracted cloudiness has rarely amounted to one second.

The going of the standard clock has been such that the probable error for one week would fall within one second. At 9 A.M. of each day all the clocks and the chronometer are compared on the chronograph, and the transmitting clock adjusted when necessary.

The standard meantime clock, placed in the city fire alarm office, has been kept as nearly correct as was practicable. Its error has been furnished to me daily by telegraph, and whenever it needed adjustment it has received my personal attention.

The work with the great equatorial has been confined to a few special subjects, viz., such observations as are only possible with the best telescopes.

The following objects were systematically observed:

Pons-Brooks comet.
Difficult double stars.
The planet Jupiter.
The satellites of Uranus.
Miscellaneous observations.

The Pons-Brooks Comet, although it did not attain great brilliancy, yet was an object of interest on account of its periodicity, being identical with the comet of 1812.

The head, or nucleus, was examined whenever the seeing was favorable for change of structure in the surrounding envelopes.

Near the time of greatest brilliancy the envelopes were fan-shaped, similar to the comet of 1861; but the changes in structure were not remarkable.

During the year I discovered thirty-two new double stars, most of which are difficult, and can only be observed when the seeing is good.

The micrometer measurements of double stars for the most part have been confined to those which I discovered in previous years.

The companion to Sirius, a difficult object for most telescopes, was systematically measured by Mr. S. W. Burnham and myself. On nights when the seeing was suitable for micrometer work on other objects, we had no difficulty in measuring it.

The observations of recent years seem to indicate that the period of revolution for the companion will be longer than that indicated by theory. But a few years more of careful observation will probably be necessary to definitely determine the orbit.

The planet Jupiter has been carefully observed on all possible occasions, and micrometer measurements made on the salient spots and markings, for the determination of their latitude and longitude. As the opposition of the planet occurs now at a very unfavorable season of the year, it is somewhat difficult to follow up the minor spots and markings, since they usually require first-class seeing for their observation.

In making physical observations on any celestial object, the quality of the image is an important matter, and unless it is carefully taken into account, may lead the observer to very erroneous conclusions regarding the phenomenon in question. This fact should especially be borne in mind in making physical observations on the disk of a planet.

We believe the erroneous statements regarding sudden changes on the disk of the planet Jupiter, made by both ancient and modern astronomers, are largely due to this cause.

During the past five years of our study of Jupiter we have met with so many instances of alleged phenomena which were not real, that we believe the subject requires very careful consideration on the part of all observers.

This criticism is not merely an opinion on our part, but is based on direct and positive knowledge.

As heretofore, the principal object of interest on the disk of Jupiter was the great red spot first noticed in 1878. During the past opposition it has usually been of a pale brown or pink color. When the seeing was unusually good, the color was unmistakably a pale pink.

This remarkable object has maintained its size, shape, and outline, with very slight change, during the whole five years of its observation here.

During the past opposition it was alleged in foreign journals that the spot had lost its outline, and become merged in a faint belt on the following end. This statement is entirely erroneous, as it was subsequently seen on various occasions with the Chicago telescope entirely separate and distinct from any belt, and presenting the same outline that it did in 1879.

The most marked change has been in its visibility. During the latter portion of the previous opposition it became very faint, and was announced to have disappeared; but observations were made on it at the Dearborn Observatory as long as the planet was visible.

During the present opposition, when the seeing was not good, micrometer observations of the spot were difficult, and hence the measures are subject to greater error than during the earlier years.

White spots, near the equator of the planet, were observed in different longitudes, all of which give essentially the same rotation period.

The observations of the principal spots observed in 1879 and subsequent years indicate a retardation in their motion, as compared with former observations.

The "equatorial white spot," so called, consists of a group of at least three or four distinct spots, lying in nearly the same latitude, and differing from four degrees to twenty-five degrees in longitude. Very often two or three of these objects are visible at the same time, and then again for considerable periods only one can be seen. During the past opposition two were usually observed. These spots were not absolutely fixed with reference to each other, but remained, however, for some months in the same vicinity.

The envelope in which they are situated moves with a velocity of 260 miles per hour, and makes a revolution around the planet in about 44½ days.

The approximate uniformity of this motion during so many years leads us to conclude that the force actuating its motion is of a degree of permanency similar to that of gravity. The problem of the physical constitution of the surface of Jupiter is yet a mystery. We need more exact and continuous observations on the minor details.

Curious Experiment with Sewage.

A curious experiment was shown a year or two ago, in which a long glass tube was filled with earth, and sewage poured in at the upper end. If the tube was long enough, perhaps six or eight feet, the liquid issued from the bottom clear and pure, its dissolved and suspended organic matters having been oxidized by the soil. If, however, before pouring in the sewage, a little dilute chloroform were allowed to filter through the earth, sewage subsequently applied passed through the tube without change, the oxidizing action of the soil being completely suspended. After some hours or days, the soil regained its oxidizing quality. This experiment was believed to show that the oxidation of organic matters in sewage was something more than a chemical reaction, and that it depended, at least to a certain extent, on the presence of small living organisms whose activity could be temporarily suspended by an anæsthetic, and with it the oxidation of the sewage.

This theory has now been confirmed by additional observations, and the little creature which converts into fixed and harmless salts the putrefying impurities of such sewage as it can reach is believed to be a micrococcus somewhat resembling the yeast plant. Many and varied tests have been made to determine the conditions under which the disinfecting microbe lives and acts, and a good deal has been learned about its habits. It is found that it flourishes best, and is most efficient, at a temperature of about ninety-eight degrees Fahrenheit, nearly the temperature of the blood. At higher or lower temperatures its action becomes more feeble, and ceases altogether near the freezing point, or above one hundred and thirty degrees. Experiments to show its distribution in a clay soil show that it is most abundant in the upper six inches, but is found to a depth of a foot and a half. Below that depth it cannot live, and soil taken more than eighteen inches below the surface has hitherto always failed to induce any change in nitrogenous solutions to which it was applied.

These experiments cast a great deal of light upon many questions of sewage disposal by subsoil or surface irrigation, and further tests, made with some reference to this, would be easily made, and extremely valuable. It is found, for instance, that nitrogenous solutions, in order to be acted upon by the oxidizing ferment, must be alkaline, acid liquids remaining unaffected. This observation shows at once that where sewage is to be purified by irrigation, chemical wastes must be kept out of the drains. Normal house sewage is generally slightly alkaline, and in good condition for conversion, but the admission of the acid or poisonous wastes from a dyehouse, metal working shop, or manufactory of any other kind might render the sewage of a whole town incapable of purification.—*Amer. Architect.*

Proposed Employment of Electric Motors on the Elevated Railways, New York City.

According to the calculations of Prof. Moses G. Farmer, it will only cost about one-quarter as much to run the elevated railways by electricity as is now paid for steam locomotives. His calculations are as follows:

A stationary plant can be erected somewhere near the middle of the line, not far from Sixty-third Street, this plant to consist of one or more stationary steam engines of the best type, capable of developing 1 horse power by the combustion of 1¾ pounds of coal per hour per horse power, by the use of such coal as does not cost over $2.50 per ton of 2,240 pounds.

There are in use on this line 20 locomotives of 110 horse power each at the busiest hour of the day, and that each locomotive consumes—per horse power per hour—5 pounds of coal that cost $4 per ton of 2,240 pounds.

The rails now in use are steel and weigh 70 pounds per yard, and that a central steel rail of 70 pounds per yard will be laid for the purpose of conveying the electric current to the motors.

One mile of such steel will offer about 1-20 of an ohm's resistance, and that the aggregate internal resistance of the dynamos concerned in producing the current will not exceed 1-200 of an ohm.

From the central station sufficient current will be supplied to both tracks to energize at the same instant all of the twenty electric locomotives, no matter on what part of the tracks these motors may be situated.

One horse power is the equivalent of 746 ampere-volts, and 20 x 110 x 746 = 1,641,200 ampere-volts, in the aggregate, reach these motors.

Dynamos can be constructed as shall convert 90 per cent of the mechanical power applied to them into current electricity, and I also assume that such electric motors can be constructed and used as shall convert 90 per cent of electricity which they receive into power used to draw the trains which are attached to them.

The Second Avenue Railway is 6½ miles in length.

Invention of Gunpowder.

In a paper recently read before the Shanghai branch of the Royal Asiatic Society, Dr. Macgowan affirms the claims of the Chinese to be the originators of gunpowder and firearms. This claim was examined in an elaborate paper some years ago by the late Mr. Mayers, and decided by him in the negative. Dr. Macgowan admits that gunpowder as now used is a European discovery. Anterior to its granulation by Schwartz it was a crude compound, of little use in propelling missiles; this, says the writer, is the article first used in China. The incendiary materials stated by a Greek historian to have been employed by the Hindoos against Alexander's army are stated to have been merely the naphthous or petroleum mixtures of the ancient Coreans, and in early times used by the Chinese. The "stink pots," so much used by Chinese pirates, are, it appears, a Cambodian invention. Dr. Macgowan states also that as early as the twelfth or thirteenth century the Chinese attempted submarine warfare, contriving rude torpedoes for that purpose. In the year 1000 an inventor exhibited to the then Emperor of China "a fire-gun and a fire-bomb." He says that while the Chinese discovered the explosive nature of niter, sulphur, and charcoal in combination, they were laggards in its application, from inability to perfect its manufacture; so, in the use of firearms, failing to prosecute experiment, they are found behind in the matter of scientific gunnery.

The Ammoniacal Ferment.

By ammoniacal ferment the author means that which transforms urea into ammonium carbonate. It exists in considerable quantities in the soil, in the atmosphere, in the waters on the surface of the earth, in rain, and in many underground waters. It acts as well in a barometric vacuum as at the normal pressure or even under a pressure of three atmospheres. It decomposes urea in presence of air, of oxygen, nitrogen, hydrogen, carbonic oxide, and nitrogen monoxide. With the exception of chloroform, which delays its action, anæsthetics have no effect upon it. Antiseptics do not interfere with its action, except when used in very large quantities.—*A. Ladureau.*

ENGINEERING INVENTIONS.

A car coupling has been patented by Mr. John G. Ogden, of No. 46 Jackson Street, Ill. This invention relates to means for automatically coupling and uncoupling railway cars without going between them, and to this end covers novel details of construction and arrangement of parts.

A steam boiler has been patented by Mr. Michael E. Herbert, of St. Joseph, Mo. The boiler combines an upper section with a semi-annular chamber communicating with a semi-cylindrical chamber at its rear end, the lower and inner section having a semi-annular chamber, and having the hollow bridge communicating therewith, circulating pipes connecting the sections together, and the coal magazine located at the front end of the boiler.

AGRICULTURAL INVENTIONS.

A cotton harvester has been patented by Mr. George W. Purcell, of Black Hawk, Miss. It is a device which can be held to the body and operated by hand, and combines a fork in which is journaled a picker disk, with cleaner brushes and means for revolving the disk.

A combined band cutter and feeder for thrashing machines has been patented by Mr. David Grubb, of Waldron, Ind. The cutters consist of circular disks with sharp edges to be pressed down in the sheaves, to insure the cutting of the bands, and the feeders have prongs or teeth to spread the grain and distribute it.

A roller bearing has been patented by Messrs. Henry H. Clay and Millard D. Philleo, of Cedar Falls, Iowa. The bearings are formed by ferrules fixed to the ends of the roller, to revolve in grooves in the faces of their supporting bars, with other novel features, the special object being to prevent clogging at their ends of endless carrier rollers of harvesting machines by straws and the like winding around the axles or gudgeons.

A convertible plow has been patented by Mr. Henry D. Terrell, of Covington, Ga. It is made with a foot plate or piece with edge flanges, and an offset shouldered end allowing the attachment thereto of interchangeable side plates or wings and plow points of various kinds, so as to make, as required, a scooter or bull nose plow, a turning plow, a shovel plow, and a scraper plow; also permitting small or short plow points to be used.

MISCELLANEOUS INVENTIONS.

An apparatus for the electrolytical separation and deposition of metals has been patented by Mr. Bernard Moebius, of Chihuahua, Mexico. This apparatus is for refining silver and separating it from gold, platinum, copper, lead, and other metals, by electricity. The anodes and cathodes form the elements of an electric battery, the solution of which is contained in a liquid proof tank, the contents of which may be heated by steam pipes as desired, enameled metal or earthenware being necessary for the tanks when the contents are to be heated. The cathodes and anodes have brushes for preventing the accumulation of metals and peroxides and bubbles of oxygen or hydrogen on the elements, and the exciting liquid consists of a solution of nitrate of silver acidulated with nitric acid, to which quantities of nitrate of copper are added. By heating the solution its resistance is decreased, and the decomposition of the anode is greatly facilitated. It is claimed for this apparatus that the operation is continuous and very simple, and large quantities of silver can be rapidly refined at a low cost, as only a small quantity of chemicals is used; the apparatus requires but little attention, all the parts can be easily replaced, and there is no need of filtering, transferring, or handling acids producing noxious and dangerous gases.

A bottle stopper has been patented by Mr. Charles L. Morehouse, of Brooklyn, N. Y. It is simple in construction, having a threaded screw ring and cap, and various novel features, making a strong and durable stopper to seal tightly fruit jars, cans, or other vessels.

A hub cap has been patented by Mr. Albert F. Taylor, of Pawtucket, R. I. This invention covers a novel construction and arrangement of parts for closing the outer end of a hub, and thus preventing the grease from flowing out and sand from passing in between the axle box and axle.

A garment has been patented by Mr. Ignac Pick, of London, Middlesex County, England. It combines in a single article a cape, boa, and muff, the muffs or pockets for the hands being at the lower edge of the cape, and the boa being stitched around the neck to form a collar.

A feathering paddle wheel has been patented by Mr. James Williams, of Laytonville, Md. This invention relates to such wheels formed with rotary paddles supported on radial shafts and operated by cams located within the wheel hub, and covers a special construction and arrangement of parts.

A detachable button or stud has been patented by Mr. Jacob L. Lindauer, of New York city. It is made with a back plate with a spring, and slotted to receive the bent parts of two J-shaped bars which have teeth in their adjacent convex surfaces, whereby both the bars will be turned by the movement of either.

A harness and neck yoke for double teams has been patented by Mr. Roswell R. Noyes, of Darlington, Wis. The back pads or skirts have means for holding the ends of the neck yoke, and the neck yoke is adapted so to be held, whereby the weight of the tongue of the vehicle may be borne upon the backs instead of the necks of the horses.

A chamfering plane has been patented by Mr. Richard V. Wicks, of Brooklyn, N. Y. It has a peculiarly constructed stock with an enlarged oblique opening down through it for introducing a guide corresponding with the shape of the chamfer or moulding, and the cutter being also suitably formed, with other novel features.

A combination gauge has been patented by Mr. Andrew J. Hellings, of Philadelphia, Pa. This invention covers a novel design of gauge for use by mechanics for squaring corners and hexagonal corners, gauging equilateral triangles, finding the center of a square, measuring the angle of a center hole, measuring the depth of apertures, etc.

A dish warmer has been patented by Messrs. Richard V. Lewis and Henry C. Conger, of New York city. The device is constructed to inclose the dishes, and is designed to be placed near the table in the dining room, where the heat rising from the most convenient fuel or a lamp will heat the dishes and keep them warm till required for use.

A hoof clamp has been patented by Mr. Alexander H. Carroll, of Philadelphia, Pa. It is formed of two clips, each having a hook prong at the end on its inner surface, and a transverse dovetail groove in the front surface, with a key fitting in the groove to hold the clips together, the object being to hold split hoofs in correct position until the parts have grown together, when the clamp is removed.

A bag holder has been patented by Mr. John G. Wagner, of Cooperstown, Pa. In combination with a baseboard having staples is a standard with means for engaging the mouth of a bag, and with a base consisting of two crossbars having hooks or catches thereon adapted to be engaged by the staples, the standard having an adjustably connected band, and cam for holding the band to the mouth of a bag.

An improved sash for car windows has been patented by Mr. Eugene D. Mann, of New York city. Double panes of glass are used, forming a dead air space between them, and combined with them and with the frame are duplicate glazing strips and soft or flexible beddings for the panes and glazing strips, whereby the fullest advantages of the dead air space are obtained, and moisture and dust effectually excluded.

A fur clipping and unhairing machine has been patented by Mr. Theophil Rasmus, of New York city. The invention covers an improvement on a former patented invention of the same inventor; with a strip over which the fur is passed are knives for cutting off the hair, an air forcing apparatus, combs for holding down some of the hairs that have been laid by the current, the comb so arranged that they will be first moved toward each other, and then downward.

An automatic coffee roaster has been patented in the United States and the principal foreign countries by Mr. William H. Bruning, of Madison, Ind. The invention is intended especially for roasting coffee in large quantities, and requires but one skilled operator to roast one thousand bags of coffee per day. It consists of large revolving cylinders, the shell being unperforated and tightly calked, to protect the coffee from the smoke and gases of the fire. The cylinders have an apertured end with spiral conveyers within, which receive and retain the coffee when the cylinder is revolved in one direction, and discharge it when the motion is reversed. The device also has a breeching inclosing the open end, with a pipe at the top leading to a flue or chimney, to carry off all the steam and odor from the roasting, and a pipe at the bottom for spouting the roasted coffee into a covered cooler upon the same floor or floors below, preventing any coffee smoke or odor within the building.

NEW BOOKS AND PUBLICATIONS.

COAL MINING DESCRIBED AND ILLUSTRATED. By Thomas H. Walton. Henry Carey Baird & Co., Philadelphia. Price $5.

This quarto volume, of 175 pages of text and 24 large plates, after actual workings and apparatus, presents the latest modes of taking out coal contained in coal seams, as practiced in England and the United States. The book is the work of a practical mining engineer, and, with much general information concerning coal mines and miners, gives details and actual experiences connected with the working of many mines, treating especially of coal dust and gas, marsh gas, improved methods of ventilation, working levels, and district and panel workings, topographical features, reworking of old mines, drilling and blasting, drainage, underground fires, miners' tools, etc. The various branches of mining work are described in a plain, matter of fact way, easily understood by those previously entirely unacquainted with the subject.

MAGNETO AND DYNAMO ELECTRIC MACHINES: with a Description of Electric Accumulators. Edited by Paget Higgs. Symons & Co., London. Price 6s.

This volume is one of a "Specialists' Series" edited by Dr. Paget Higgs and Professor Charles Forbes, all containing much useful information on subjects of current interest, and, without adding much new matter, presents in condensed form an epitome of electrical progress up to recent dates.

A TEXT BOOK OF HYGIENE. By George H. Rohe. Thomas & Evans, Baltimore, Md.

This book is a treatise on the principles and practice of preventive medicine from an American standpoint, by a practitioner and professor of long experience. It is a book which cannot fail to be useful at a time when the public mind is in a state of apprehension as to the possible early advent of an epidemic.

COMPARATIVE PHYSIOGNOMY. By James W. Redfield. Fowler & Wells Co., New York.

This is a late edition of a book heretofore widely known. The publishers say of it that "one may read the book out of mere curiosity, or may look at it from a humorous point of view," but will in any case find suggestions of value—a statement which its reputation for many years attests.

Received.

METEOROLOGICAL OBSERVATIONS AT THE ADELAIDE OBSERVATORY AND ELSEWHERE IN AUSTRALIA, FOR 1881. Under the direction of Charles Todd, Observer and Superintendent of Telegraphs.

ARCHITECTS' AND STAIRBUILDERS' TABLES OF TREADS AND RISERS. By John A. Hamilton. William T. Comstock, New York.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Information requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter,** should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Minerals sent for examination should be distinctly marked or labeled.

(1) W. T. T. asks how to find the length diagonally of a given square. For instance, a true square 12'x20 measured diagonally from one corner to the other. A. Obtain the diagonal by squaring the sides; add them together. The square root of the sum is the length of the diagonal. Thus in your true square, $12^2=144$, $20^2=400$ } =544, the square root of which is 23·3238076 inches. We have no other printed catalogue of SCIENTIFIC AMERICAN articles than such as appear in the closing numbers of each volume.

(2) L. Y. asks: 1. What is good to put in a boiler to clear it of scale formed by the boiling water, and how use it? A. Many back numbers of SCIENTIFIC AMERICAN and the SUPPLEMENT treat of this subject at length. 2. What is the largest cylinder that could be used with a boiler 6 feet long, 4 feet in diameter, and what sized screw wheel would be suitable for such a machine? A. Cannot answer this without the detail of tubes, etc. A boiler of the size (a simple cylinder) would be of little use in a boat. 3. Is sturgeon oil a good lubricator? A. Sturgeon oil would probably be as good a lubricator as most fish oils. 4. What should be done with the machinery of a boat to keep it all right during winter? A. Paint all the finished parts with a mixture of white lead, tallow, and lard oil (equal parts); heat and thoroughly mix. Apply hot with a brush. Work a mixture of lard and kerosene oil through the steam chest and cylinder. Pump one or two quarts of kerosene oil into the boiler while steam is on, draw the fire, and blow out clean. Close all openings, and protect from the weather.

(3) H. P. writes: 1. By what means can I keep cold a gold ring or other jewelry that contains a precious stone while hard-soldering it? A. The safest way is to take the stone out. If the shank is very light, the setting may be wrapped in a rag and kept wet. 2. What does the pickle consist of which brass finishers use for brightening brass, such as clock trimmings? A. Dipping bath for sheet brass: Sulphuric acid 1 pound, nitric acid 1 ounce, muriatic acid 1 ounce, niter 1 pound, water 1 ounce. 3. How can I repair old zinc clock dials from which the enamel is partly chipped off? A. By filling the chipped places with thick white japan varnish, and baking as in the process of japanning. 4. What kind of varnish or lacquer is used on polished brass, and how is it to be applied? A. Thin shellac varnish. Heat the articles to 150° as near as you can guess, and varnish quickly with a flat camel's hair brush.

(4) R. B. asks for (1) a mixture or dip to clean brass ware, brass coach trimmings, something that would not be any worse than strong lye-water in its effects on the hand. A. Take 1 ounce oxalic acid, 6 ounces rotten stone, ½ ounce gum arabic, all in powder, 1 ounce sweet oil, and sufficient of water to make a paste. Apply a small portion, and rub dry with a flannel or leather. The liquid dip most generally used consists of nitric and sulphuric acids, but this is more corrosive even than the alkalies. 2. A receipt or direction as to the best manner of disguising the taste, or to take cod liver oil without buying the compounds they have on hand in drug stores? A. Make an infusion of Irish moss, strain, and agitate with equal parts of the cod liver oil, flavor with oil of wintergreen, or an emulsion can be made by agitating the oil with milk with a little gum arabic. Flavor as before.

(5) R. B. R. asks (1) why hemispherical cups, instead of conical, are used on the United States Signal Service Anemometers. A. The hemispherical cups are supposed to present less negative resistance to the force of the wind than any other form, the apex of a hemisphere being in the line of direction of the wind in all parts of its revolution. 2. How the velocity and force of the wind are determined by such anemometers? A. By trial or experiment. 3. If there is a constant ratio between the velocity of the wind and that of the cups; and if so, what the ratio is, and how calculated? A. The ratios of velocities are also found by experiment for a standard anemometer, when newly constructed ones are graduated by comparison.

(6) O. A. T. asks what kind of red paint would be most suitable for a towboat's funnel. At present I am using a wash made of red lead and buttermilk, but it is not desirable in wet weather, and red paint made with linseed oil don't keep its color on account of the heat. What would you recommend? A. We know of nothing better than red oxide of iron (Prince's metallic paint, and linseed oil). Any color will

turn dark by heat if mixed with any substance that resists water. You might try silicate of soda with a color and a little lime as a water color. 2. Please decide between two persons, A and B, the difference, if any, between a square foot of measurement and a foot square? A says there is no difference, while B maintains that a foot square is equal to a cubic foot. Who is right? A. There is no difference between a foot square and a square foot, but a great difference with any other number. A foot square is not a cubic foot. "Square feet" is superficial measure, while "cubic feet" is solid measure.

(7) O. F. T. writes: In "America; an Encyclopedia of its History and Biography," by Stephen Morrill Newman, M.A., speaking of steamboat speed, it says: "In 1873, at a trial of steamboat speed, the Mary Powell ran on the Hudson, from New York to Poughkeepsie, 76 miles, in 3 hours and 3 minutes," which would be nearly 25 miles an hour (24·9+). How is this? A. The speed given in the "American Encyclopedia" was probably attained on a strong flood tide, and perhaps strong wind in her favor. The distance to Poughkeepsie is 74½ miles, not 76 miles. This would reduce the speed to 24·44 miles per hour. A strong flood tide is from 3 to 3¼ miles, which deducted gives a speed through the water say of 21·44 miles. An average of several runs by same boat on her regular service, from accurate notes taken by Mr. Skeel, gave 19·2 miles. Haswell gives the result of a run to Poughkeepsie in 1867 on flood tide, a speed of 22·37 miles; deduct 3 miles for tide gives 19·37 miles through the water. We know of no greater speed by steamboat than made by this boat. We are quite sure no boat has ever made 25 miles per hour through the water.

(8) S. S. W. asks if there are any chemicals that can be used to remove paints and varnish from wood so it would not injure the wood. Something that has very little potash or soda in it, as the above articles are injurious to the wood. A. The best plan is to use either soda or potash. The following receipt is a good one: Mix 1 part by weight of American pearl ash with 3 parts quick stone lime, by slaking the lime in water and then adding the pearl ash, making the mixture about the consistence of paint. Lay the above over the whole of the work required to be cleaned, with an old brush; let it remain 14 or 16 hours, when the paint can be easily scraped off. If the foregoing is not satisfactory, the paint can be wetted with naphtha, repeating as often as is required, but frequently it is claimed one application will dissolve the paint. As soon as it is softened, rub the surface clean. Chloroform mixed with small quantity of spirit of ammonia has been employed very successfully to remove the stains of dry paint.

(9) G. H. P. asks (1) for a receipt for making white ink. A. White ink is prepared as follows: Mix pure, freshly precipitated barium sulphate or flake white with water containing enough gum arabic to prevent the intermediate settling of the substance. Starch or magnesium carbonate may be used in a similar way. These must be reduced to impalpable powder. 2. Also the composition of Chinese white, and the nature of it? A. For the manufacture of Chinese white: Take as much as is required of zinc white finely ground, put it on a marble or glass slab, mix it into a cream of the required consistence by adding mucilage of gum tragacanth, grinding with a glass muller. For quantity required to fill an ordinary sized Chinese white bottle, add to above 10 or 12 drops of thick gum arabic mucilage and 5 or 6 drops of pure glycerine; grind well together, and fill bottle by aid of palette knife.

(10) F. Y.—The height of hills can be readily measured by the aneroid barometer, 900 feet elevation to 1 inch depression of the barometer, or parts in proportion, for ordinary use. For more exact work see a work on the aneroid barometer and its use, by Plympton.

(11) F. L. N.—"B-ham," of which you write, means *Birmingham*, the English wire gauge. Its numbers are from one to two sizes larger than the American gauge. Any hardware store should have both kinds on hand.

(12) E. J. R. writes: I have a 4 inch exhaust pipe 60 feet high from the heater. Standing in the open air, the condensation is very great. What kind of condenser can I use that I may catch the water and lead it back by a drip pipe to the feed water tank? A. You may turn the exhaust pipe down into the mouth of a large receiver upon the roof, with a drip pipe from the bottom to your tank. Would not advise you to return the exhaust drip to your boiler.

(13) T. D. W. P.—There is very little reliable knowledge as to the average age of mankind in ancient times. The accounts of the ages of noted persons and rulers of ancient times go very little toward establishing the average of the common people. From considerations of the wastefulness of life, through a crude medical care, and exposure of children from ignorance and low state of civilization among the common people, as against a primitive vital strength, we are of the opinion that the average duration of modern life in civilized countries is increasing. You will derive much information on this subject in works on anthropology and ethnology.

(14) P. R. writes: I want to make a flue boiler of steel ⅛ inch thick, 4 feet long, 15 inches in diameter, with 22 one inch flues. Boiler to be a plain cylinder with fire under it, and the draught to return in the flues. The dealer the steel was got from said it had a strength of 65,000 pounds. Now, what pressure will the boiler safely stand, and please give me the rule for finding it, if there is a rule? A. For the bursting strength of your boiler, $\frac{65{,}000\text{ lb.}}{8} = 8{,}125\text{ lb.}$, strength for ⅛ inch thick; $\frac{8{,}125}{\text{half diameter of } 7\tfrac{1}{2} \text{ inch boiler}} = 1{,}083\text{ lb.}$, strength of steel for 15 inch shell; $\frac{1{,}083}{3} = 361\text{ lb.}$, strength of shell for good double riveted seams. This should stand a test of 150 lb., and be safe for 100 lb. steam pressure. The heads should be ¼ inch steel, well riveted, with expanded ends on tubes. Also a bolt brace from head to head in center of space above tubes.

(15) W. S. W. asks: What size boiler will be required to run an engine 1 in. by 1 in.? What pressure should it carry? How thick to carry twice that pressure? How long would a 2 in. iron pipe (such as is used for drive wells) have to be to furnish boiler capacity enough, and how much pressure would it stand with cast iron caps screwed on each end? A. Two square ft. of fire surface; 4 ft. of 2 in. pipe used as a generating surface will answer your purpose. If the pipe is good and lap welded, you can carry any pressure up to 100 lb. The pipe should be equal to 500 lb. pressure.

(16) J. G. H. asks for the best way of heating a large building—whether by having steam pipes around the building, or by heaters and blowing hot air around. A. Placing coils of pipe along the walls is far the cheapest and best method of heating factories.

(17) M. C. J. asks: 1. What is a good, clear, cheap, gold laquer for fine polished brass work? A. Make the lacquer with 95 per cent alcohol, 1 pint; best shellac or seed lac, 1 ounce; dragon's blood, 1 drachm; put all in a bottle and shake up every day for a week and let it settle. When settled, decant the clear lacquer into another bottle. Dilute with 95 per cent alcohol until it will spread with a camel's hair brush to suit. The color may be varied by using gamboge for yellow, which with the dragon's blood will give, by mixing, various shades from a deep yellow to orange. 2. How is it applied? A. Warm the brass work to 175°, or nearly the heat of boiling water, and spread the lacquer quickly with a flat camel's hair brush, one-half to one and a half inches wide, according to size of piece to be covered. Then place in a warm oven for half a minute, which gives to the lacquer a fine gloss. 3. What sort of metal or alloy is used for making cast iron door bells, and the process of casting the same? A. Cast iron bells are made in the same manner as other iron castings, but poured with hard iron.

(18) A. D. S.—The niter of salt you ask about is probably saltpeter, and may be sodium nitrate or potassium nitrate. Your salt soda you say is used in boiler is, no doubt, *sal soda*, or common washing soda; it is largely used to clear boilers of incrustation where hard water is used. It is harmless, and recommended such purposes.

(19) C. P. S. writes: 1. How can I arrange two vessels so that, when water or liquid is poured into one, the water will remain at a higher standpoint in the other? A. This cannot be done except by placing in the two vessels fluids of different specific gravities. For example, you may place water in one vessel and oil in the other. 2. Is there a siphon that, automatically, will take water from a vessel and convey it to a higher point or vessel? A. There is no siphon that will answer your purpose. 3. How can a name be put upon a razor, so that the letter will go below the surface, the handle being made of bone or gutta percha? A. Coat the razor blade with an asphaltum varnish or with ordinary beeswax, and trace the characters you wish to etch with a needle, then apply to the lines so traced a mixture of nitric and muriatic acids. 4. Where can I find out about the lost arts? What are the lost arts? A. A lecture delivered many times by Wendell Phillips covers the ground very entertainingly. 5. How can I make a fountain (miniature), so that it will throw water higher than the vessel supplying the same, the fountain working automatically? A. Herron's fountain, described in almost all works on physics, throws water higher than its source. 6. Is the construction of a perpetual motion a possibility? A. No.

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