SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LII.—No. 6. [NEW SERIES.] NEW YORK, FEBRUARY 7, 1885. [$3.20 per Annum. [POSTAGE PREPAID.]

THE ATTOCK BRIDGE.

The bridge which we illustrate was built to carry the Punjaub Northern State Railway, and the trunk road between Lahore and Peshawar, across the river Indus, on the northwest frontier of India.

About thirty miles above Attock the river leaves the main ranges of the Himalayas, and spreads out into a wide, shallow bed, the average width being about two miles, to be again contracted by the ranges of hills which cross its course at Attock itself and further south. Through these latter ranges it winds its course for over 90 miles, the bed being sometimes narrowed to a width of a little over 100 yards and seldom exceeding 400 yards, until it finally debouches into the plains at Kala Bagh, the highest point to which the Lower Indus is navigable by steamers.

As a rule, the river is at its lowest from November until the early days of March; during this season the greatest depth of water in the contracted parts of the channel is about 30 feet, and of course less in wider places, but the highest floods have been known to rise as much as 70 feet above low water level.

A bridge of five spans, three being 250 feet and two 300 feet in the clear, was decided on, and contracts for the pier and girder work were let in England. Wrought iron was chosen as the best material for the piers, owing to the scarcity of good, sound building stone, and to the liability to extra heavy vibrations from earthquakes.

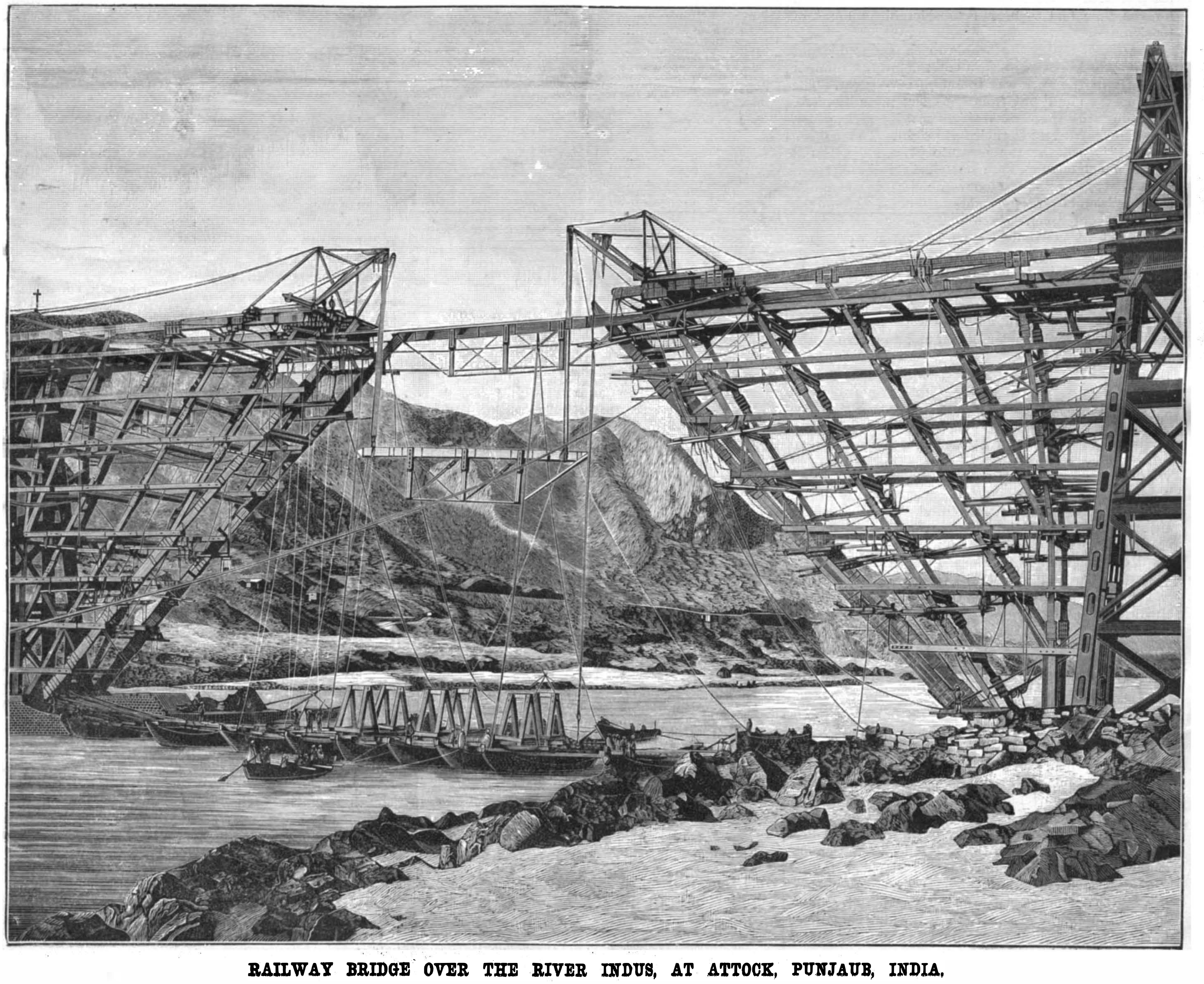
The surface of the rock at the site of the center pier, being, for the most part, exposed to the action of a strong current, was swept clean, except for fine micaceous sand which lodged in the crevasses; timber therefore could not be used to form a cofferdam. The foundation was secured by inclosing the space required with a wall made of Portland cement concrete. In the absence of driving plant a commencement was made by filling small cotton cloth bags with fine concrete and setting them by hand, the native divers first clearing the sand from the hollows in the rock, and then laying the bags in place.

The bags, capable of holding 1½ cubic feet, were about two-thirds filled with Portland cement concrete, and were laid on the rock and rammed into the cavities, and by this means the wall was gradually built up to water level. Cross walls were also put in of same material, and ten compartments formed.

Pumps were then got to work, and some of the compartments emptied. It was then found, says *Engineering*, that the surface of the rock was not so sound as had been supposed, being honeycombed and cut up by small fissures which it had been impossible for the native divers, working without diving apparatus, to close up with the cement concrete. The influx of water through these holes and fissures was too great to allow of the cells for the shoes of the pier standards being sunk into the rock.

Each compartment was then in turn filled up with cement concrete, which was allowed to set for three or four days, then a cell was cut down through it to the surface of the rock, and continued into the rock until found sound and perfectly solid. In two cases, after excavating a few feet into the rock, small passages communicating with the river outside were cut into, when the process had to be repeated over again. The cells were cut 7 feet square at top, or just a little larger than the shoes of the columns, and somewhat wider at the bottom. When all the eight cells were completed to the full depth required to insure a sound base, the bottom pieces of the column were cut to the necessary length, the shoes were riveted on, and each was lowered into its cell, and placed approximately at the proper level and position horizontally, resting on hard wood wedges. The next lengths were then bolted to them, and two tiers of horizontal braces with the intermediate cross braces were fixed in place with bolts. The whole base of the pier was now slightly raised by traversing screwjacks, and brought exactly into position both horizontally and vertically. Fine Portland cement concrete was carefully rammed under the shoes, also inside and around them, and the cells around the columns and also under them were filled with the same class of concrete up to the level of the top of the dam wall. This completed the foundation work of No. 3 pier, and the others were treated in a similar manner; there being, however, no water to contend with, they were set without difficulty of any kind.

For the two principal spans no intermediate supports could be erected, as they carry the main channel of the river, and the velocity of the water at its lowest exceeds five miles an hour in the third span, sweeping the rocky surface clean. The frequency also with which rafts of timber from the upper reaches pass, often without men to guide them, also large boats with produce, add to the



RAILWAY BRIDGE OVER THE RIVER INDUS, AT ATTOCK, PUNJAUB, INDIA.

dangers a staging with intermediate supports would have had to encounter. Moreover, it was desirable that any staging should be practically clear of cold seasons, minor floods, and should allow of a rise in the river of at least 30 feet without causing any material obstruction to the waterway.

The perspective view shows the staging in course of construction. It consisted of a series of long struts springing from a point near the base of each pier, and spreading out in a fan to support a horizontal beam of double whole timbers on which the platform was laid for erecting the girders. The corresponding struts in the up and down stream fans (which were 19 feet apart center to center, the same distance as the girders) were connected by horizontal braces, each brace being a pair of half timbers bolted together with the struts between them, and with diagonal struts in the rectangle between each pair of horizontal bracings. At equal vertical distances of 12 feet, ledgers of half timbers in pairs connected all the main struts of each fan with each other and with the main column of the pier with which they were in line, being clamped to the columns by heavy wrought iron straps. The outer main struts were built up of whole timbers clamped together, commencing at the bottom with three, one of which eventually branched into a secondary strut. Similarly the vertical next the pier commenced with two whole timbers, and divided afterward into two struts. At the level of each tier of ledgers above the fourth, counting from the bottom, sets of one inch chain horizontal diagonal bracings were put in. These chains were drawn tight by ordinary wagon screw couplings, four hundred of which were got out from England specially for the work.

The two outermost struts from opposite sides were connected at top by a beam of the same section being dropped in before the sill pieces were laid. This beam was 63 feet long and of sal wood (the rest of the staging being deodar), and was trussed by three vertical struts, 10 feet deep, with rods of 2 inches round iron forming a queen truss of 63 feet span. When in place this trussed beam, together with the long struts which it connected, formed a gigantic strut and straining beam truss under the sill pieces.

During erection and until the straining beams were in place each fan was tied back to the main column of the pier with which it was in line by the ledgers, which for the time had to bear a considerable amount of tension.

The timber readily procurable on the Indus does not exceed an average of 22 feet in length, and the number of joints in the work was therefore very great. The stagings were built out from the piers piece by piece, beginning with the vertical struts next the piers, which were soon carried up to their full height. To facilitate the hoisting of the timbers into place, two pairs of Manila 9 inch hawsers were stretched across each span, from the top of the 250 foot completed girders at the shore ends and over a pyramid of sleepers placed on the top of the center pier. From these hawsers tackles were suspended at convenient points as the work progressed.

When the building out of the fan portions was completed, rails were laid on the sills, and two large temporary cranes made for the purpose were moved out to the extremities. The 63 foot trusses were then built on boats, were brought under the cranes, and were raised into place, the cast iron angle sockets at the ends of the straining beams being dropped over the ends of the long struts, which were sprung back slightly to allow of this being done. When these were in place, the sill piece was completed over the top and the platform laid on, a line of rails to the meter gauge being put upon it to bring out the girder material. These stagings proved very satisfactory; levels were taken daily at several points during the time the girders were being built, to test the stagings for settlement, and, notwithstanding the great number of joints, the maximum deflection of the platforms under the full weight of over 600 tons (in addition to the weight of the staging itself) was only 1⅛ inches. The stagings were by far the most difficult, as well as tedious, part of the work of the construction of the bridge.

Heating by Electricity.

A correspondent in *The Electrician* gives the following reasons why electricity for heating purposes cannot be economically employed, if a steam or gas engine is used to produce the current in the first instance.

In the first case, one-tenth of the heat of the coal only is recovered; then, say, 25 per cent of power is lost in the dynamo; and finally, 25 per cent or more lost on conversion of the current into heat. Thus we get $0{\cdot}1 \times 0{\cdot}75 \times 0{\cdot}75$ of the heat of the coal $= 0{\cdot}05625$, or say, at best, $\frac{1}{20}$ only. Even if coal were burnt in an open fireplace, not more than half the heat is lost. With a gas engine matters are not much better. In short, taking the expense of machinery, etc., into consideration, it is fair to assume that heating by electricity is at least 50 or 60 times more expensive than burning coal direct in the most approved stoves, and 25 to 30 times dearer than coal burnt in an open fire.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

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One copy, six months, postage included.......................1 60

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NEW YORK, SATURDAY, FEBRUARY 7, 1885.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT,

No. 475,

For the Week Ending February 7, 1885.

Price 10 cents. For sale by all newsdealers.

ENCKE'S COMET.

There is an excitement in the celestial court. Encke's comet has arrived, and star gazers are turning their telescopes to the skies in eager haste to obtain a glimpse of the distinguished visitor. Our eccentric guest is not a prince among comets. It is not a *cometa horrendae magnitudinis*, like those members of the family that in the olden times swept over the heavens, and threw the beholders into an agony of superstitious terror. It does not burst upon the astonished gaze at noonday with a brilliancy akin to that of the sun; its tail is not curved like a Turkish cimeter, nor does it branch out into six tails, each 6,000,000 miles long. It does not span the celestial vault from horizon to zenith; there is no danger of its being considered the harbinger of war, pestilence, and the day of judgment; and there will be no prayers read in the churches beseeching deliverance from "the Turk, the devil, and the comet."

Encke's comet is interesting chiefly for being the first known comet of a short period, for making the shortest circuit of any member of its class, for performing its revolution within the boundaries of the solar system, and for the reason that it seems to be more amenable to physical law than some of the more imposing members of the cometary family, those vast ethereal creations that visit our domain and then rush off into fathomless space,

"On the long travel of a thousand years."

This comet has a history. It is known as Encke's comet because the distinguished German astronomer was the first to carefully investigate its motion. It was first detected in 1786, again by Miss Caroline Herschel in 1795, again in 1805, and finally by Pons, the great comet finder, in 1818. He found on calculating its orbit that it was identical with the comet of 1805, but made no estimate of the length of the period. Encke then took up the task, and studied its movements with a thoroughness before unknown. He established beyond a doubt that the comet's orbit was an ellipse, that its period was about 1,212 days, and that it had made four complete revolutions between 1805 and 1818. These facts being sure, there was no difficulty in identifying it with the comets of 1786 and 1795, and in concluding that in the intermediate returns to perihelion its position had been so unfavorable that it was not seen.

Encke predicted its return in 1822, pointed out the position it would occupy among the stars, and also announced that it would be visible only in the southern hemisphere. He had the happiness of seeing his predictions verified by the observations of an astronomer in New South Wales, who followed the comet during its whole visible course.

Since that time this eccentric visitor has not failed to return to perihelion very nearly at the computed time, although at some returns it has been visible only in the southern hemisphere, and at other returns it position has been so unfavorable that the closest scrutiny has been of no avail in picking it up. Encke's comet is a veteran among comets of a short period, reaching next January the centennial anniversary of its discovery. Why should not the event be celebrated? It deserves to be, for this eccentric member of the system is an exceptionally well behaved comet, except in the matter of yielding to the influence of a resisting medium or some other mysterious power. It has neither been turned into a new path by the disturbing form of Jupiter—sometimes its near neighbor—nor has it split in two parts like Biela's comet, nor is it disintegrating into meteors, like Tempel's comet and the second comet of 1862, that lead the long procession of meteors in the November and August meteor zones.

The orbit of Encke's comet is an ellipse, inclined at an angle of 13° to the plane of the earth's orbit. At perihelion it is 31,000,000 miles, and at aphelion 377,000,000 miles from the sun. Its perihelion is between the sun and Mercury, and its aphelion is between Jupiter and the asteroids. Its motion is from west to east, and its revolution, in the days of its early history, was performed in about 1,212 days.

Encke's comet is by no means a remarkable one. It is a telescopic comet, and consists of a patch of circular light, somewhat condensed toward the center. Though usually visible only through the telescope, it has been seen by the naked eye. Such was its appearance in 1828, when it was in an exceptionally favorable position for observation, and its light was equivalent to a star of the fifth magnitude. At common times there is little trace of a tail, but, on rare occasions, a slight one has been detected, like a faint brush of light, and sometimes with a second appendage opposite the first. Its tenuity is so great that, at its return in 1878, the center of the comet passed directly over a star of the tenth magnitude lying in its path. The star was undimmed by the transit of the densest portion of the comet, and shone through the misty medium as brightly as it had before shone against the dark background of the sky.

This insignificant mass of nebulosity has been of use to astronomers. When at its nearest point to Jupiter, the mass of the huge planet was more accurately determined by means of its "excessive perturbations." In the same way, when it was nearest to Mercury, it was the means of detecting an error in the mass of the fiery little orb.

But the movements of comets, like "the course of true love, never did run smooth." This member of the family does not complete its revolution on time. Its periodic time is constantly diminishing. Its circuits round the sun grow less and less. The German astronomer did not fail to attack the problem, indeed, he may be said to have devoted the labor of his life to its solution. His conclusion was, that the comet met with a resisting medium in space, a medium too ethereal to disturb such masses as the planets are made of, but powerful enough to affect a body of extreme tenuity like a comet. This theory has it supporters and its opponents, but no other comet, as far as is known, is affected in the same way. The existence of a resisting medium in interplanetary space, and the cause of the retardation of Encke's comet, are still mooted questions that vex the astronomical soul. At any rate, the comet's period is now about 4 days less than it was at the time of its first computation in 1819. The effect of retardation will be to diminish the comet's velocity in its orbit, in consequence of which it will be drawn nearer to the sun. The final result will be that, ages hence, the comet will be precipitated into the sun.

Encke's comet, at its present return, was first seen on the 13th of December, by Herr Tempel of the Arcetri Observatory, Florence, and is described as a faint, nebulous looking object. It was seen on the 17th of December by Professor Young, of the Halstead Observatory. He describes it as extremely faint and somewhat irregular in outline. The best view, thus far reported, was obtained on the 5th of January, by Professor Brooks, of the Red House Observatory at Phelps, New York. He describes it as faint, slightly elongated, and with a small central condensation. It was then in the head of the Western Fish, and moving slowly eastward. It makes its perihelion passage on the 7th of March, will grow brighter until that time, and will soon be visible in small telescopes. The comet was last in perihelion on the 15th of November, 1881. Its period of revolution is now about 1207·86 days, nearly 4 days less than when its orbit was determined by Encke in 1819.

SHOP DRIVING.

There are men who get position by audacity, and not by merit. Such men are sometimes found in the workshop in the position of foremen or bosses, and they make trouble for men and expense for proprietors. Such a foreman appears, always, as though in a great hurry; gives short replies to questions, as though time and words were exceedingly valuable with him; rushes about the shop as though pursued by a constable with an uncollected debt against him; and turns from a possible customer at an important point in conversation to attend to a trifle that would more appropriately be left to a subordinate.

Among the workmen such foremen are troublous; they make quiet workers nervous, unfinished workmen apprehensive, and old stagers angry. They upset the plans of careful, systematic workmen, and induce the "green hand" to imagine that pretense of doing is as good as done. Such a foreman does other mischief; he is not content with infecting others with his superficial activity; he injures the self-respect of the workman, and impairs his usefulness. With the useless drive that comes with the foreman when he goes the rounds of the shop, comes the expectation of relaxation when he goes, and this letting down of workmanlike energy is a natural rebound from the pressure of a strain that is repulsive. This foreman never commends; he criticises and questions. "What! these studs not yet turned? What's the trouble?" "Be sure and get this fit right; don't you know how to do this job?" Such greetings do not put much force into a workman's muscles, nor increase his desire to excel.

These men are north winds or western gales with a notification to all to lie low. They impose for a while even on the workmen, but the workmen find them out sooner than do the shop proprietors.

ASBESTOS IN MECHANICS.

The incombustible and heat-enduring quality of the mineral asbestos has always recommended it for certain purposes; but it is not until within a comparatively recent period that it has come into extensive use in the mechanic arts. For sheathing steam pipes and for steam packing, preparations of asbestos are undeniably valuable, but recently it has been applied to the packing of cocks—plug cocks—for steam, hot water, and acids, with excellent results. The principle of its application is that of a packing, except that, instead of the packing being applied only at one or both ends of the plug of the cock, it extends its entire length. If the plug of a cock is ground to seat, it must be reground as often as it wears to a leak, and under the cutting influence of high pressure steam this wear is very rapid. The plug and its case do not always expand alike under steam heat, and this causes either leaking or binding.

The asbestos, being in the form of disintegrated fibers, lacks the cohesiveness necessary for keeping in place as a packing, and therefore a small proportion of rubber is used as a cement. The proportion of rubber is very small, being from one to six by weight, down to one to twelve by weight, and as asbestos is very light, the amount of rubber is only enough to unite the asbestos fibers. The prepared asbestos is tamped into longitudinal channels in the case or shell of the cock, the channels being four in number, equidistant, and cut in dovetail section, so that the packing may be retained in place. The tamping or driving in of the packing is done by means of set chisels or tamping pins and hammers while the plug is in place, and when the packing is completed, the cock, with its packing, is submitted to a heat of from 340° to 360° Fah. by means of superheated steam at 145 pounds pressure, which vulcanizes the rubber, and makes a solid of the asbestos and rubber combined. This heat and pressure is greater than any steam cock will ever be made to bear so that the packing is practically indestructible by steam.

From this description it will be seen that the plug of the cock has a bearing on four longitudinal packings, its entire length, instead of a solid circumferential bearing, metal to metal. The slight elasticity of the packing allows for unequal expansion of the plug and case, keeping the plug always tight. The packing also reduces the friction of the plug in its case, so that a cock of four inches diameter can be opened and closed with very slight exertion. A ring or washer of the packing is also used at the top and bottom of the plug.

In connection with the Barff process of coating iron, indestructible cocks are made of iron with this packing at a much lower cost than those of brass or gun metal. The Barffed cocks cannot rust, and their surfaces are like hardened cast steel for durability. This method of using asbestos is an English invention, but it has recently been put in practice by a firm in Hartford, Conn., acting under the original English patents. They intend, also, to manufacture this packing in glands for pump and steam packing, for manholes, handholes, and other purposes.

The New Orleans Exposition.

Notwithstanding all the complaints that have been made, the great Exposition is admitted on all sides to be wonderfully interesting. The exhibits, as they now stand, will compare favorably in extent, variety, and attractiveness with those of the Centennial Exhibition at Philadelphia in 1876, although some departments are yet incomplete. Visitors from the North seem never to be tired of roaming over the grounds, now that days of warmth and brightness have succeeded to the dismal weather which marked the opening weeks; the grass is of luxuriant growth, newly-planted shrubbery is sprouting, rose twigs from California are beginning to leaf, and tropical plants of almost indescribable variety contribute their portion toward making a scene of beauty which it would be hard at present to match in any other locality in our own country, if indeed its counterpart could be found in any part of the world.

The feeling of uncertainty regarding the financial prospects of the enterprise, on which, of course, largely depends the smooth working of the show in a great many respects, has been almost entirely removed by the action of the N. O. Cotton Exchange. Director-General Burke asked that body for $60,000, which was promptly raised, and the money used for indebtedness for current expenses, that had got in arrears, owing to delays in getting things in order and the restriction of attendance by the bad weather of the first few weeks. For the last week, however, the main building has been in quite a presentable condition, the boxes, crates, etc., in which goods were packed having generally been removed, while the workmen have put most of the final touches on the stands of the different exhibitors.

The main building, covering more than thirty-three acres, offers never-ending subjects of interest to the visitor, as those will appreciate who remember the amount of time required to obtain any adequate idea of what was contained in the principal structure at Philadelphia, which was only about half its size. Here is presented a representative panorama, through its broad vistas, of the productions and resources of the United States and nearly all foreign countries. It is the greatest school for the dissemination of practical and useful knowledge in the world to-day; the mechanic, the engineer, the farmer—the producer in every walk of life—can here find food for study, with amplest exemplifications of the experience of others, and the would-be man of the world can, figuratively, go into all foreign countries and learn much of their productions and characteristics—all under the same roof.

One of the most complete industrial exhibitions in the main building is that of a Connecticut company making cotton thread. In this display is also included an automatic spool turning machine, where the workman puts armfuls of small cylinders of wood into a hopper, and they come out perfectly made spools. The cotton is taken from the bale here, and goes through all the processes of manufacture till it is finally wound on the spools—eight spools of 200 yards of thread each a minute—when these spools are put into a slide, the labels cut and pasted, and they are ready for boxing—the entire work requiring twenty machines, and the exhibit taking up a space of 24 by 260 feet.

In cotton working and other machinery the Patent Office makes a most interesting display, the growth and development of many of our industries being shown by means of the models of labor-saving appliances. Perhaps the most historically interesting is the model of the original cotton gin invented by Eli Whitney. There is also a model of a contrivance for lifting vessels over shoals, patented by Abraham Lincoln; and another of the Hoe cylinder printing press.

Of interest to those concerned in ship building will be the large collection of models furnished by the United States Government, while the Smithsonian Institution exhibit shows the styles of marine architecture prevalent in various eras and nations, and the Army Department exhibits craft adapted for hospital purposes. Pusey & Jones, of Wilmington, Del., exhibit a handsome model of the iron steamship Hudson, built by them, and plying between New Orleans and New York. The hull is of iron, and the deckhouses, masts, spars, and trimmings are of silver with gold decorations. John Roach also has an expensive collection of models of merchantmen, passenger steamers, and war vessels.

The Chinese exhibit presents many novelties, some of which it is rather difficult for our citizens to comprehend. One of these is a model of a primitive irrigating pump, a hand pump showing one end in the water, and the power applied by a man treading around on a series of handles that project from the top piece; there is also one worked by ox power, the animal turning a crank. One significant feature in this department is the display of cotton cloth of all grades, from the coarsest bagging to a quality so fine as to be more valuable than silk goods. This is a "cotton centennial," it is true, but more than two thousand years before modern industry found profitable employment in working up this fiber for universal use, cotton was largely used in the domestic manufactures of India; and two centuries before the Christian era cotton cloth was either paid in tribute or offered in presents to the Emperors of China as a thing rare and precious, and some of these gossamer filaments are on exhibition here by the side of the products of our modern factories.

The National Cotton Planters' Association will assemble here on February 10, and President Arthur has accepted the invitation of the president of the association to be present. Cotton men from all parts of the world have responded favorably to the invitation sent out by the association through Secretary of State Frelinghuysen, and it will undoubtedly be the greatest assemblage of cotton men the world has ever seen.

The horticultural department of the exhibition received an immense impetus from the recent assembling here of the Mississippi Valley Horticultural Society, which had been given the especial charge of organizing such exhibits.

The society undertook to make a display which would give "large opportunity to study the effects of climate and soil, of latitude and longitude and altitude, in the modification of plant and tree growths, and upon the size, form, texture, quality, durability, and beauty of the fruits of the world," a task to which it has devoted the most earnest effort, and in which it has accomplished great results. Over 8,000 specimens of forest, fruit, and ornamental trees were planted in the exhibition park, the California tree exhibit alone including over 700 species. There is a valuable and complete classified collection of American grape vines, and one bed alone contains 20,000 hyacinths, the total planting of these bulbs by one house amounting to 230,000.

The facilities for the accommodation of visitors and to promote their convenience in attending the exposition are now better than they were immediately after the opening. The buildings are about six miles from the heart of the city, and are reached either by the horse car lines or by steamboats on the river, but the work of getting to and from the grounds should, and probably will, be materially lessened with the coming of the additional crowds expected during February, March, and April. The managers have lately organized a department of information and accommodation for visitors, and are now furnishing lists of places where board and lodging can be had, with prices. The charge for furnished rooms, on the schedule thus made, runs from 50 cents to $2.00 per day, and for board and lodging from $1.50 to $3.50 per day, with, of course, material reductions for weekly or monthly guests. Circulars are also issued giving other valuable information to strangers visiting the city. * *

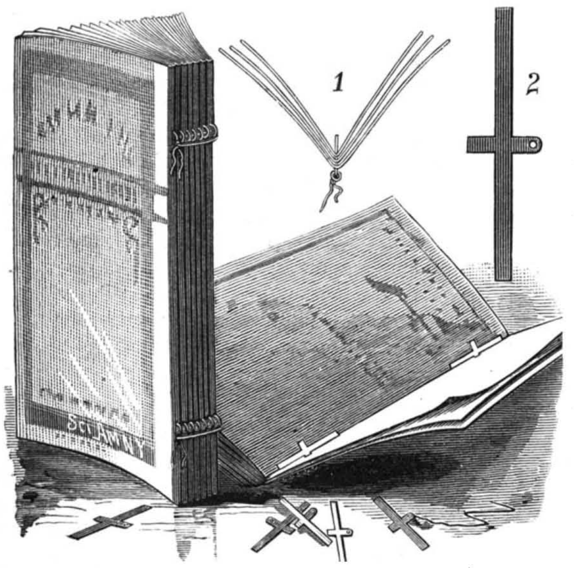
New Orleans, January 29, 1885.

The Electric Light as a Scarf Pin.

Messrs. Stout, Meadowcroft & Co., whose advertisement appears in another column, are now supplying these curious little electrical devices in first class style. It consists of a miniature Edison electrical lamp, attached to a pin, which is fastened in the scarf or necktie. A couple of fine wires lead from the lamp to a small battery, made in the form of a book and carried in the pocket. By touching a button, also arranged in one's pocket, the necktie lamp is instantly lighted, and continues as long as the button is pressed. The battery becomes exhausted after considerable use, but may be easily replenished. This is a device of genuine excellence, and well illustrates the progress of practical electricity.

BINDING EYELET FOR PAPERS, MAGAZINES, ETC.

A thin, narrow strip of metal, Fig. 2, is formed at its middle with two projecting ears, one of which is provided with an aperture. The sheets to be bound are placed within each other, and at the fold are perforated to permit the passage of the apertured ear; the



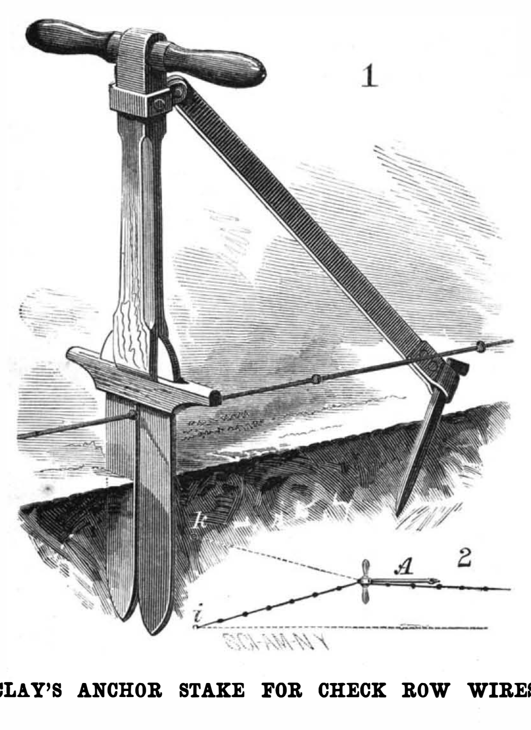
JOHNSON'S BINDING EYELET FOR PAPERS ETC.

strip rests within and between the sheets, against which it bears as a brace. A number of magazines or packages of sheets, being provided with the binding eye, are placed together, and a cord or wire passed through the several apertures, and its end tied to prevent it from being withdrawn. If the packages to be bound are large, two eyelets for each may be employed, as shown in Fig. 1. The ears which are not perforated serve as handles by which to insert the strips. The ears of the several signatures or packages of sheets must be in straight lines. Signatures can easily be added as may be necessary, or can be quickly removed. The books thus formed are flexible and firm. The binding eyes cost but little, and can be used for binding ordinary writing paper, printed matter, etc., to preserve them for rebinding in permanent form.

This invention has been patented by Mr. E. A. Johnson, of 104 Fayette Street, Allegheny City, Pa.

ANCHOR STAKE FOR CHECK ROW WIRES.

In planting corn with a machine provided with a check rower, the wire is anchored at the ends of the field,



CLAY'S ANCHOR STAKE FOR CHECK ROW WIRES.

and the anchors are shifted as the planter reaches the ends of the rows, so that the machine can be turned and started on a new row. In this shifting of the wire it is almost impossible to reset the anchor so as to give the wire the same tension each time, especially when the field is a long one, and the result is usually that the rows are not planted correctly. To obviate this difficulty is the object of an invention lately patented by Mr. William H. Clay, of Paris, Ky.

The anchor stake consists of a straight shank portion, fitted with a cross handle at its upper end, and carrying at its lower end a blade formed with a lengthwise slot just wide enough to pass freely over the wire. At the top of the blade is a cross piece, forming foot rests for use in pressing the blade into the ground. Jointed to the upper end of the stake is a brace, in whose outer end is a hole to receive a pin by which the end of the brace is fastened to the ground. The use of a stake with a planter is illustrated in Fig. 2. Suppose *i* to represent the fastening of the wire at the end of a row; when the planter reaches that point, the stake, A, is to be placed at a point half way between the points *i* and *k*, and a short distance from the end and behind the planter. Thus located, the stake will hold the main portion of the wire stretched while its end is carried to and anchored at *k*, and the machine turned around. The stake, A, being removed, the wire has the same tension as before, and the planting will be done correctly.

A Sanitary Canal for Paris.

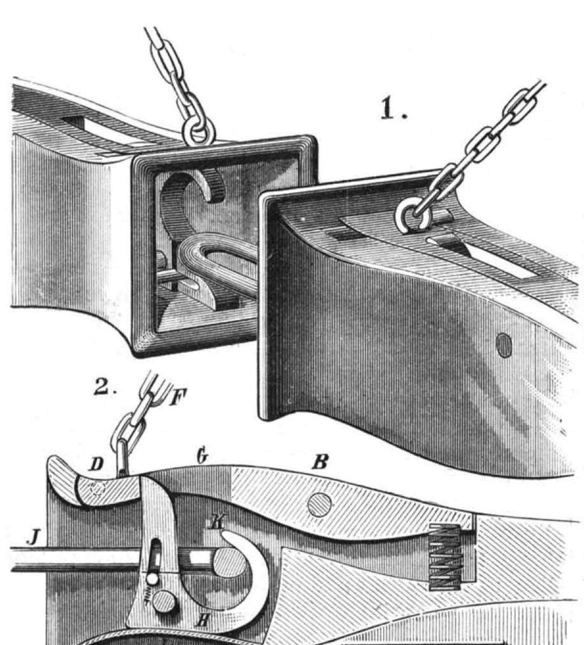
A project for a sanitary canal between Paris and the sea has been brought before the French Academy of Sciences by M. A. Dumont. The author points out that although the experiments of the city of Paris engineers at Gennevilliers appear to show that irrigation is the best means of disposing of the drainage of Paris, it is very doubtful if the space available at the forest of St. Germain is sufficient for the purpose—the drainage waters of Paris amounting to over 100 million cubic meters per annum. Hence his idea of a canal to the sea to carry off the daily accumulation of 300,000 cubic meters of sewage. The starting point of the proposed canal would be a covered reservoir at Herblay on the right bank of the Seine. From Herblay to a point on the coast between Dieppe and Treport the canal would be 152 kilometers long, and covered throughout. The route of this canal would be by Eragny (crossing the Oise by a viaduct 25 meters high), thence to Serifontaine, Neufchatel, St. Martin, and Greges, to the Channel at a point 7 kilometers from Dieppe, and 17 kilometers from Treport, where the current and trend of the coast would prevent any nuisance to these ports. Pumping would be resorted to at some points; but at the outfall motive power could be obtained from the waters.

A more important point in connection with the new scheme is that it would admit of the water being utilized for irrigation purposes *en route*, and during two-thirds of the year probably all the sewage would be thus disposed of. The estimated cost of the canal is 60 millions, and the expense of pumping would be largely covered by the sale of the waters along the track of the canal. The section of the latter would permit the flow of at least 500,000 cubic meters per diem. The scheme is well worthy the consideration of other crowded centers, since it unites the utilization of the sewage at separate districts along a considerable length of country together with the advantages of a covered drain. It is, in fact, virtually a means of distributing sewage waters for irrigation purposes. For Paris the work would be highly beneficial on the score of health.

IMPROVED CAR COUPLING.

In the top of the drawhead of a car coupling patented by Mr. Aaron L. Sanders, of Falcon, Tenn., is a longitudinal slot, in which the piece, B, is pivoted. The rear end of the piece is pressed upward by a spring, and the front end is provided with a crosspin, D, to prevent it from being pressed down too far. On the forward end of the piece is a staple, to which is secured the end of a chain, F, leading to a lever on the roof of the car, or it may be connected with levers extending to the sides of the car. In the end of the piece is the longitudinal slot, G. Pivoted in the drawhead is the coupling-pin tumbler, H, one shank of which forms a hook, K, and the other has a slot that carries a bar to form a support and guide for the link, and which is supported by spiral springs. The spring strip, L, rests against the bottom edge of the tumbler, and holds it in place.

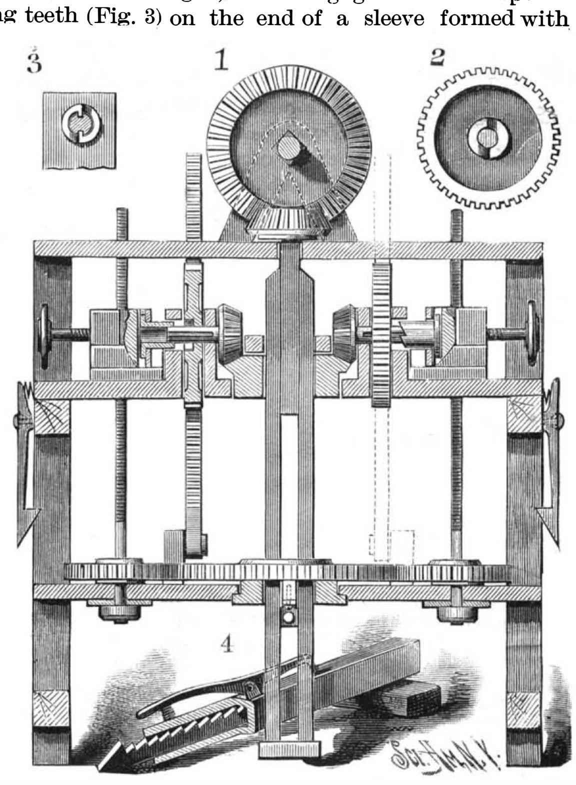
As the link enters the drawhead, Fig. 1, its end strikes the hook, K, and swings the slotted shank upward; the end of the shank strikes and lifts the end of the piece, B, and enters the slot, G; the cars are now coupled, as shown in Fig. 2. When the cars are to be uncoupled, the end of the piece, B, is lifted to release the upper end of the slotted shank, which swings down as the link is drawn out. The spring, L, holds the tumbler in either of its two positions.



SANDERS' IMPROVED CAR COUPLING.

POST HOLE AUGER.

On a shaft journaled in two uprights on top of the frame of the machine is a beveled cog wheel engaging with a pinion mounted on the upper end of a square shaft held between uprights united at the lower ends by a cross piece; these bars form the holder for the auger bit, and slide vertically on the square shaft. The bars pass through a horizontal cog wheel, mounted to revolve on a platform, and between the bars is a U-shaped piece, secured to the under side of the wheel, which receives the end of the stock holding the bit. Engaging with the center cog wheel at diametrically opposite points are two wheels rigidly mounted on the ends of screw spindles, the upper ends of which pass through an intermediate platform and through the top of the frame. Two rack bars, hinged to jaws projecting upward from the lower platform, engage with cog wheels mounted loosely on shafts journaled in uprights on the intermediate platform. On the inner end of each shaft is a beveled cog wheel engaging with a wheel through which the two bars pass, so that the latter will revolve with the wheel. Each of the cog wheels engaging the rack bars is provided in its outer flat surface with two ratchet teeth (shown in Fig. 2) which engage with corresponding teeth (Fig. 3) on the end of a sleeve formed with



ROBINSON'S POST HOLE AUGER.

two longitudinal ribs on its inner surface, which pass into grooves on the shaft, as indicated in Fig. 3. The outer end of each sleeve is flanged, and is held so as to revolve in a block provided with a threaded aperture, and forming one-half of a nut for the corresponding vertical spindle. One of the blocks constituting the nut is rigidly mounted, and the other is movable. A screw having a right and left thread works in the blocks, or half nuts; by turning the screw, the block and the sleeve to which it is attached will be moved toward or from the corresponding rack-bar cog wheel. The lower platform is held at any desired height by means of two hook latches pivoted to the sides of the frame. In each leg of the frame is a toothed bar terminating in a triangular foot, Fig. 4. A prong on one end of a spring latch engages with the teeth of the rack. This construction permits of the leveling of the machine and holding it any suitable distance from the ground.

When the upper shaft is revolved, the square shaft and two parallel bars are also revolved, causing the bit or scoop to form a hole in the ground. It is necessary to press the lower platform downward continually, as the center cog wheel is mounted upon it. This is accomplished by the vertical screw spindles, which are revolved from the center wheel, the nut sections, or blocks, being locked together. When it is desired to withdraw the auger, the nut blocks are separated by turning the hand screw. This will throw the sleeves into engagement with the shaft by means of the tongue and groove, and with the rack-bar cog wheel by means of the teeth formed in the end of the sleeve and side of the wheel. The beveled wheel on the two bars will then turn the two shafts and cog wheels, and the rack bars will be moved upward, thereby raising the lower platform.

This invention has been patented by Mr. Isiah Robinson, and further particulars can be had by addressing Mr. J. W. Sublett, of Mansfield, Tex.

A "SOCIETY of Mechanic Arts" has been started in the brisk manufacturing center of Worcester, Mass., including in its membership members of firms and young mechanics of intelligence. Each member is in turn to present papers on subjects of interest at the monthly meetings. H. W. Wyman is President, H. C. Hastings Vice-President, and E. H. Park, Secretary.

A NEW ELECTRO MAGNET.

The ordinary electro magnet has the inconvenience of ceasing to exert an influence upon the armature at a short distance (generally a quarter of an inch) from its poles.

Mr. Stanley Currie has recently devised a new form, whose field of attraction is much greater, since it acts at a distance of 3½ inches. This new magnet is a com-

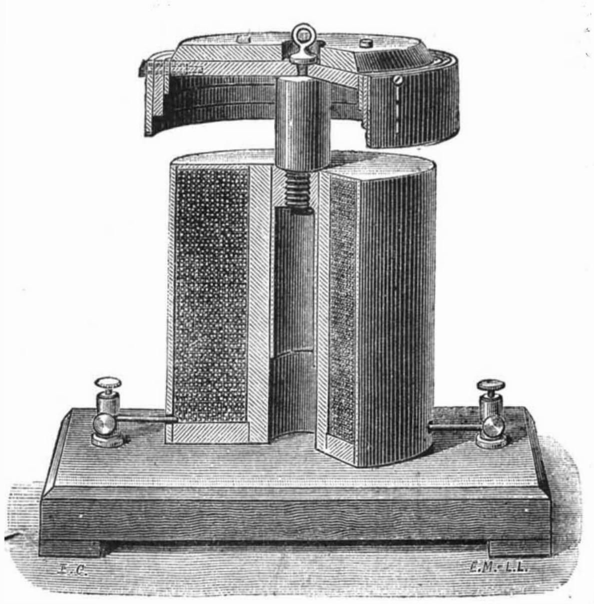


Fig. 1.—CURRIE'S ELECTRO MAGNET.

bination of the horseshoe electro magnet and the solenoid. As shown in the engraving, it consists of a vertical bobbin with a tubular soft iron core. The wire which is wound upon the bobbin is surrounded by an envelope of soft iron of the same weight as the core, with a soft iron tube at the end of the bobbin that connects the core with the external envelope. The top of the bobbin is covered with a brass disk. The copper wire used is No. 18, Birmingham gauge, and 0·048 inch in diameter.

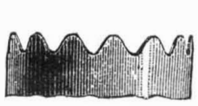


FIG. 2

The armature consists of three parts, viz., of an iron rod inclosed in a brass tube, which is longed beneath it so as to guide it in its upward and ward motion in the tubular core, and of a soft iron cover fixed to the top of the central rod, and connected with the cylinder which forms the external envelope of the bobbin. This cover is preferably made with two or more layers of flat plate, so as to facilitate demagnetization, but it must be thick enough not to be saturated by an ordinary current. The cylinder has a rim that enters the field of attraction of the external envelope as soon as the lower extremity of the central rod enters the tubular core. When the effect of such attraction has made itself felt, the upper flat plate is in the field of attraction not only of the envelope, but also of the internal core, and the field of attraction of the magnet is, so to speak, prolonged.

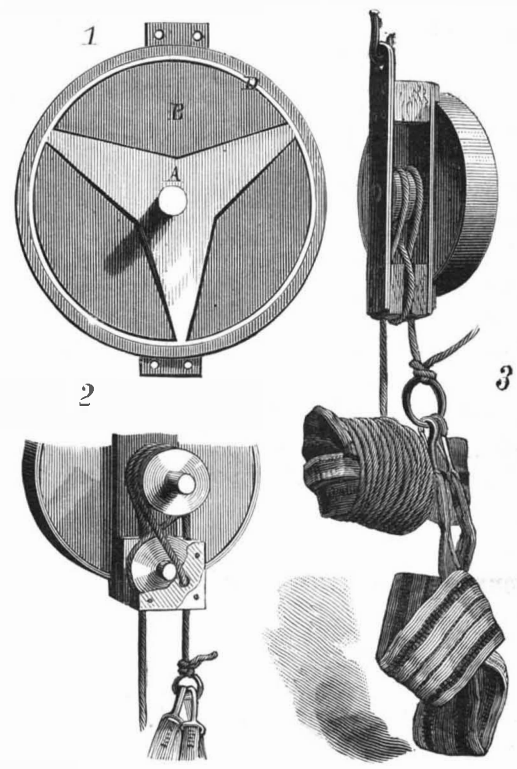
As long as the central rod is exterior to the core of the bobbin, the attraction to which it is submitted is always in ratio inverse the square of its distance from the bobbin; but, as soon as the extremity of the iron rod enters the aperture in the core, the part that rests therein loses its power of attraction. The same diminution of attractive power occurs in the rim of the armature's disk as soon as its lower edge passes under the upper edge of the bobbin. The power of attraction likewise varies directly as the mass of the body attracted, and these two effects have been combined in order to regulate the attraction so that it shall be approximately uniform across the field of 3½ inches. This is effected by cutting the lower end of the rod of the armature, as well as the rim. If necessary, the thickness of the upper disk and the width and thickness of the rim may be varied. The latter may also have its edge scalloped (Fig. 2), so as to prevent a sudden increase of attraction in measure as the disk approaches the bobbin. The result of this arrangement is to increase the stress upon the disk in measure as the latter approaches the pole of the magnet, when the force of the stress upon the armature rod and rim is diminishing. In this way, and by the combination of a counterpoise, there may be obtained a sufficiently uniform stress with considerable travel, and a violent contact be avoided when the disk reaches the pole of the magnet.

The stress or range of the attraction may be doubled with a pair of these magnets placed at a certain distance apart, and having the same armature rod. The lower armature is fixed to the rod, and the other simply bears against it through a projection. The upper armature is first attracted, and, when it has placed itself upon its own bobbin, the lower one has come into the field of attraction of *its* bobbin, and may be attracted to it, so that, by this process, the travel is doubled.—*La Lumiere Electrique.*

AUTOMATIC FIRE ESCAPE.

A simple automatic fire escape, recently patented by Mr. Frank A. Bone, of Lebanon, O., is shown in the accompanying engraving. It consists of an axis fastened to the center of a governor—shown in cross section in Fig. 1—and passed through the center of a frame. Passing through the bottom of the frame and over a roller on the axis is a rope of cotton or other suitable material, on each end of which is a belt provided with a snap catch. When not in use, one end of the rope is drawn up to the frame, and the other is coiled as shown in Fig. 3. The escape can be kept in any convenient place, and since it weighs but about 12 pounds, it can be carried easily to the place it is to be used, where a strong hook is provided to attach it to. In large buildings these hooks should be placed on all sides, so that escape could be made in any direction.

The escape having been attached to the hook, it is only necessary for the person who wishes to descend to snap the belt (the one which is at the top) about his body, and then swing out of the window, when he will descend at an easy and regular speed to the ground. The opposite end of the rope will then be at the top ready for use by a second person. The governor for regulating the descent is formed with a star shaped center, A, the rapid revolution of which forces the pieces, B, outward, causing them to press against the fixed band, D, which acts as a brake.



BONE'S AUTOMATIC FIRE ESCAPE.

AN AZTEC WARRIOR.

Mr. Eugene Boban, an antiquarian and traveler, well known to anthropologists and ethnographers, recently invited us to visit his establishment on Boulevard Saint Martin, in order to see the curious restoration he has made of the costume of a young Aztec warrior, a chevalier of the army of Montezuma (*Moctheuzoma*). The personage figures as a very skillfully executed manikin, which we represent in the accompanying cut. This truly remarkable object is designed for one of the largest ethnographic collections of Mexico.

The Mexican warrior of the epoch of the conquest (1521) was, as may be seen, clad in a material spotted to resemble the skin of a tiger, and wore a helmet shaped like the head of that animal. This extraordinary costume is assuredly one of the most remarkable that can be mentioned among military uniforms. The numerous voyages that Mr. Boban has made to Mexico, the innumerable documents that he has collected upon the antiquities of that interesting country, and the ability that the persevering antiquarian has acquired through study and research are so many guarantees of the accuracy of the restoration.

The warrior's mask was moulded upon the head of a living native of the valley of Mexico. The head of the tiger (*Ocelotl* in Aztec) is made of wood, just as it was by the ancient Mexicans. It is armed with long teeth, and is intentionally enlarged so as to form, through the open jaws, a true helmet. This latter not only served to protect the head of the combatant, but also to strike terror among the enemy. This idea of frightening the enemy was one of the principal studies of the military organizers of antiquity, and it has prevailed up to our own epoch, for otherwise we could not explain the presence of tufts of hair and large plumes upon modern helmets. The object of these is assuredly to increase the height of the soldier's head, and make him more imposing in the eyes of those whom he is attacking.

In Græco-Roman times we find that there were soldiers in the armies who were muffled up in lion and tiger skins for the purpose of giving themselves a formidable aspect. This usage still obtains to a high degree at present in the extreme East, among the Chinese and Japanese.

The young Mexican warrior whom we picture wears the *tentetl* in his lower lip. This was a cylindrical piece of rock crystal (*teuilotl*), known in Spanish as *sombrerito*, "little hat." In fact, the object somewhat resembles our high hats. The *tentetl* was introduced into a perforation previously made in the lip. This custom of perforating the lips and inserting ornaments of varying size into them exists over the entire American continent, from Cape Horn to Behring Strait, and also in the equatorial parts of Africa.

The rock crystal *tentetl* was the badge of the officers of the Emperor's house, and was generally given as a reward to those who had taken prisoners.

Mr. Boban, like the old Mexicans, has used a spotted fabric for manufacturing the warrior's costume, the only difference being that the material is of linen, while that of the Mexicans was of cotton. The warrior is resting his right hand upon his sword—a sort of club armed with thin pieces of obsidian. This was moulded on a specimen brought by Mr. Boban from Mexico with his great collection, that is now on exhibition at the Ethnographic Museum of the Trocadero.

In his left hand the warrior carries a circular shield covered with buckskin. In the center of this is figured a hieroglyphic characteristic of the order of the Chevaliers of the Tiger. Around the wrists and ankles of the warrior are fixed enormous tiger's claws, and his feet are shod with *cactli*, a kind of sandals that are still in use among the aborigines. His head is surmounted with a plume of long, brilliant feathers.—*La Nature.*

AN AZTEC WARRIOR OF MONTEZUMA'S ARMY.

METEORIC DUST.—A metallic substance in powder or small granules has been sent to the *Science News* laboratory for examination. It proves to be meteoric dust, largely composed of iron, nickel, and silica. Dr. Batchelder, of Pelham, N. H., who sent the specimen, states that he collected the dust on the walk in front of his house after a smart thunder shower. It is probable that large quantities of this material fall upon the earth, but remain unnoticed. Much of the iron found in soils is due to precipitation from interstellar spaces, the particles becoming entangled in our atmosphere.—*Pop. Sci. News.*

Durable Timber.

One of the properties conducive to durability in timber is its odoriferousness; woods which are so being chiefly the most durable. Close and compact woods, which make the most charcoal, are more permanent than open and porous qualities. The chestnut has rather more carbonaceous matter than oak, and, therefore, by reason of it, is more durable. Experiment has, however, shown the error of relying too much on these broad theories. One writer alludes to an experiment made to determine the comparative durability of woods. Planks of trees 1½ inches thick, of from 30 to 45 years' growth, were exposed to the weather 10 years. Cedar and chestnut were perfectly sound, spruce and fir sound, larch sound in heart, silver fir in decay, Scotch fir decayed, beech sound, walnut in decay, sycamore much decayed, birch quite rotten.

We must accept even these facts with caution. The questions whether the planks had been cut the same length of time, how they had been dried or seasoned, and the position they had occupied, are pertinent to the inquiry. The same wood often shows varying degrees of durability, owing to the position of the tree. If grown in moist and shady parts, the wood is inferior to that which grows in an exposed situation open to the sun and air. Some timber is more durable in wet ground or immersed in water; such are elm, beech, alder; while others, such as ash, oak, and fir, are more durable in dry situations. The increase in strength due to seasoning of different woods is given as follows: White pine, 9 per cent; elm, 12·3 per cent; oak, 26·6 per cent; ash, 44·7 per cent; beech, 61·9 per cent.

The comparative value of different woods, showing their crushing strength and stiffness, is: Teak, 6,555; English oak, 4,074; ash, 3,571; elm, 3,468; beech, 3,079; mahogany, 2,571; spruce, 2,522; yellow pine, 2,193; sycamore, 1,833; cedar, 700.

Regarding the relative degrees of hardness, shell-bark hickory stands highest; calling that 100, white oak is 84; white ash, 77; dogwood, 75; scrub oak, 73; white hazel, 72; apple, 70; red oak, 69; beech, 65; black walnut, 65; yellow oak, 60; white elm, 58; hard maple, 56; wild cedar, 55; yellow pine, 54; chestnut, 52; white pine, 30.

For furniture, hard birch, ebony, mahogany, maple, sycamore, and walnut are commonly used; while for turnery, acacia, hard hawthorn, holly, hard laurel, lignum vitæ, poplar, sassafras, sycamore, and yew are employed. For very great hardness, ironwood, hornbeam, almond, hard beech, teak, thorn, are serviceable. Myrtle, lime, box, olive, pear-tree, sycamore, kauri wood, pine, and holly are also very even, close grained, and hard.—*Building News.*

Electric Cables.

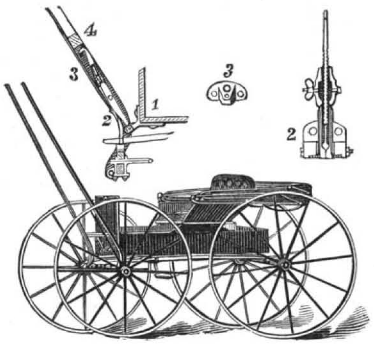
The attempts which are made to devise a practical and cheap system of undergound telegraphs continue to be numerous, but the actual progress which is made is not very marked. A history of underground telegraphs would indeed be a long list of failures, commencing in 1837 with the so-called "fossil" telegraph of Wheatstone, which consisted of bare wires placed in grooves in lengths of oak scantling. Most of these failures have not been due so much to radical defects in the inventions as to the inability of the inventors to push their commodities, owing to force of circumstances. The use of gutta percha shows no signs of falling off, and no substance has yet been brought into the market which has been proved to be a substitute for it.

Great attention is now being paid, says the *Electrical Review* (London), to lead-covered cables, the insulation of the latter, as in the Berthoud-Borel system, being due to resinous substances, which are far cheaper than gutta percha. Provided the lead covering remains intact, there is no reason whatever why such cables should not remain good for an indefinite period. In certain soils lead is practically imperishable; but, again, where clay is present, rapid decay occurs. About ten years ago a cable consisting of a cotton-covered wire placed in a lead pipe, the latter being filled with paraffine wax, was laid in Windsor Park in a clay soil; in a very short time this line became defective, and on examination it was found that the lead covering had been eaten into holes, which, by admitting moisture, rendered the wire useless; in this case the paraffine wax was not able to effectually coat the copper core. Excellent as paraffine wax is as an insulator, it has the great defect that it shrinks very considerably on cooling, and is therefore extremely liable to crack; indeed, most substances of this nature possess this element of uncertainty, and when used as insulators they practically can only be relied upon as "separators" to prevent metallic contact between a number of wires, or between the latter and a metal sheathing, the sheathing being the medium which keeps moisture out.

Lead, as a protecting covering, necessarily means considerable weight, and as a means of preserving single wires could hardly be adopted to any great extent. Multiple cables would have more chance of success, though the fact that the units of which they are built up are practically inseparable is a disadvantage; and, moreover, if moisture does penetrate, it means that nearly all, if not all, the wires will become defective. For very special purposes, however, the lead-covered cables should prove to be all that can be desired. The use of paraffine oil as an insulator in the Brooks system has yielded excellent results, and is an undoubted success, but we are inclined think that more satisfactory results might be obtained from a semi-fluid material, *i. e.*, one which would not be liable to become dispersed by leakage; but which would at the same time have the property of settling down if by any chance it were disturbed, and thus sealing up accidental faults. There seems at present but little chance of India rubber or gutta percha being superseded for submarine purposes, but the employment of a cheap yet efficient substitute for either of these materials would probably give a renewed impulse to such telegraphy, and would richly reward the inventor.

IMPROVED SHAFT SUPPORT.

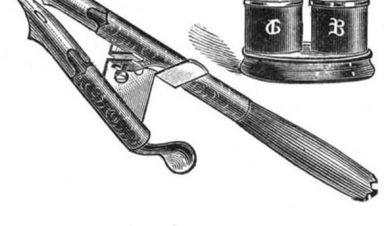
Attached to the forward part of the body of the vehicle is an angle plate or casting, from the outer angle of which project two lugs, between which the end of the fork is bolted. The plate may be secured to the center of the front of the body or to one corner, and can be fitted to vehicles having bodies of different forms. Each shank of the fork—shown detached in Fig. 2—is provided with a bend forming a recess for receiving clamping plates which have their adjoining faces serrated. A right and left hand screw is passed through the plates, between which is held a longitudinally slotted bar serrated on both sides to correspond with the serrations on the plates. The free end of the bar is formed with a downwardly projecting hook. When the shafts are to be held in a raised position, this hook enters a pocket (Fig. 3) secured to the shafts. The fork is pressed upward by a powerful spring, one end of which is held between the lugs projecting from the angle plate, while the other end bears against the under side of the fork. The length of the shaft support can be varied by moving the slotted bar in or out, the latter being firmly held in any desired position by the clamping plates. When not in use, the support is held in a vertical position in front of the dash board.



This invention has been patented by Mr. James F. Pace, and particulars can be obtained from from Messrs. Pace & Feibleman, of Simsboro. La.

AUTOMATIC DOUBLE-POINTED PEN HOLDER.

The pen herewith illustrated is specially adapted to the use of bankers, architects, bookkeepers, etc., and with it two lines can be ruled at once with different colored inks. Although expressly designed for ruling purposes, it gives most satisfactory results when used for ornamental or fancy writing. From the side of each holder projects a plate, the ends of the plates being pivoted together. Each of the adjoining ends of the plates is formed with an ear, one of which is apertured and threaded to receive a set screw, by means of which the pens can be adjusted to rule lines of any desired distance apart up to three-quarters of an inch. The pen holders are held pressed toward each other by a spring that permits the writer to separate the pens and take ink as quickly as with the common pen. Any kind or size of gold or steel pen can be used.



The inventor and manufacturer of this pen holder, Mr. C. R. Arnold, of Wellsville, Ohio, has designed a two-well inkstand, shown in the engraving, and a three-fourths-round ruler for use with the holder. Most favorable testimonials have been received from those who have used these holders.

Pyronaphtha.

According to the *Organ fur Oelhandel*, an interesting trial was lately made in St. Petersburg with a new illuminating material, which is destined, it is considered, to take the place of kerosene. This is a new illuminating oil, absolutely free from danger of fire. An experiment was made as to the power which pyronaphtha has of extinguishing fire; and it was found that burning kerosene was easily put out by it. Pyronaphtha can, however, itself be extinguished by water. It is a product of the distillation of naphtha residue, of which large quantities remain from the Baku distillation of petroleum. From these illuminating gas is produced, and likewise pyronaphtha. The idea would seem to have hitherto been carried out only by the firm of Ragosin & Co., of Baku. The celebrated Russian chemist, Prof. Beilstein, has examined pyronaphtha, and has expressed his conviction that it has a brilliant future before it, and that it must eventually replace American and Russian kerosene. The specific gravity of pyronaphtha is 0·864, and it ignites only at 230° Fah. It burns without smoke and vapor at 257°; gives a better light than kerosene; is consumed less rapidly; while its prime cost is less. At St. Petersburg it is being adopted for domestic use; and a special burner has been constructed for the purpose.

Habits of the Scorpion.

A writer in *Land and Water* relates his experience with scorpions as follows:

A few years ago, while in the island of Jamaica, it was my fortunate chance to have an opportunity of observing some very curious facts in connection with that genus of the Arachnida class commonly known as the scorpion, and the curious traits of character in these insects. Turning over some old papers in my office one day, I suddenly came upon a large black scorpion, who promptly tried to beat a precipitate retreat. Having read or heard somewhere that if you blow on a scorpion he will not move, I tried the experiment, and was greatly astonished to find that it had the desired effect. The scorpion stopped instantly, flattened himself close to the paper on which he had been running, and had all the appearance of "holding on" for dear life. While I continued to blow even quite lightly he refused to move, though I pushed him with a pencil and shook the paper to which he clung so tenaciously. Directly I ceased blowing he advanced cautiously, only to stop again at the slightest breath. I was thus able to secure him in a glass tumbler which happened to be within reach, and then I determined to try another experiment as to the suicidal tendencies which I had heard ran in the veins of the Pedipalpi family.

On the stone floor of the kitchen attached to my office I arranged a circle of burning sticks about three yards in circumference, the sticks being so placed that though there were no means of exit through the fire, it was not intense, but small and quite bearable as regards heat within a few inches, so that the central part of the circle was perfectly cool. Into this center I accordingly dropped my scorpion, who, on touching *terra firma*, darted off in a great hurry, only to be quickly brought to a halt on reaching within a few inches of the periphery of the circle. After a short pause of reflection he deviated to the right, and ran once completely round the circle as near to the fire sticks as it was prudent to venture. This he did three times, often approaching the burning sticks quite closely in his anxious endeavors to escape. In about a quarter of an hour, finding that his efforts were useless, he retired almost into the exact center of the circle, and there in a tragic manner raised his tail till the sting or spur was close to his head, gave himself two deliberate prods in the back of the neck, and thus miserably perished by his own hand. As I placed the body of the suicide in a bottle of spirits, I almost regretted that I had not let him escape before he had resorted to such an extreme measure.

My last experience is even more curious than the preceding, as it shows a remarkable provision of nature that is almost incredible. All I have ever read on this point is contained in the following words:

"The young scorpions are produced at various intervals, and are carried by the parent for several days upon her back, during which time she never leaves her retreat."

I was playing a game of billiards in a small village in the Blue Mountains; there was no ceiling to the room, the roof being covered, as is the universal custom in Jamaica, with cedar wood shingles. My opponent was smoking a large pipe, and suddenly, just as I was about to play a stroke, what I thought was the contents of my friend's pipe fell on the table close to the ball at which I was aiming. Instinctively I was on the point of brushing it off with my hand, when, to my amazement, I saw it was a moving mass, which on closer inspection turned out to be a very large female specimen of a scorpion, from which ran away in every direction a number of perfectly formed little scorpions about a quarter of an inch in length. The mother scorpion lay dying upon the billiard cloth, and soon ended her feeble struggles, the whole of her back eaten out by her own offspring, of which as they could not escape over the raised edge of the billiard table, we killed the astonishing number of thirty-eight. They had not only been "carried by their parent," but they had lived on her, cleaning out her body from the shell of her back, so that she looked like an inverted cooked crab from which the edible portions have been removed. She had clung to her retreat in the shingled roof until near the approach of death, when she had fallen and given us this curious spectacle. I was told by the attendant that the young scorpions always live thus at the expense of their mother's life, and that by the time her strength is exhausted the horrid offspring are ready to shift for themselves.

Curious Experiments in the Transfusion of Blood.

The transfer of blood from the bodies of healthy persons to those of the sick for the purpose of sustaining the strength and prolonging life has been practiced by physicians, with limited success, for several centuries.

Some very curious experiments in this direction have been lately made in Denver, Col., by Mr. G. A. Armitage, an account of which, written by his assistant, Mr. James L. Finch, was given in the Denver *Daily News*, from which we quote the following:

The subject operated upon was a medium sized terrier dog. It was securely tied, and an incision made in an artery in his neck, by which the animal was bled to death. He certainly passed through all the symptoms of dying, and soon after the last blood issued from the wound his frame became fixed and rigid, and his eyes showed the senseless glare of death. The room was kept at a temperature of 70° Fah., while the dog lay for three hours dead. By this time he had become very stiff and cold. He was now placed in a warm water bath that was constantly maintained at a temperature of 105°, and was continually and thoroughly rubbed, and as he became pliant his limbs were gently worked about and his whole body rendered supple. A half pint of hot water was now passed into his stomach through a hard rubber tube that was forced down his œsophagus. When this was accomplished, the mouth of a rubber tube, attached to a bellows, was introduced into his windpipe, and as the bellows were provided with a double valve, by which the air could be withdrawn as well as inhaled, the dog's nose was securely fastened up.

A large and powerful Newfoundland dog that had been obtained for the purpose had been tied near by, and was now bled, while the attending surgeon proceeded to adjust the transfusing apparatus, and began to slowly inject the live dog's blood into the dead one. Simultaneously Mr. Armitage began slowly working the respiratory bellows, while I kept rubbing the animal and bending his limbs and body to facilitate circulation. We could not have been more anxious about the issue of our efforts if they had been made on a human being instead of a dumb brute. When a pint of fresh blood had been injected, I could see some change about the eyes of the dog. But no one spoke. One thought was common to all—would life come back? In a few moments more there was certainly a convulsive tremor noticeable in the body. Mr. Armitage in undisguised excitement said to the surgeon, "Press the blood." In a minute or two more the dog gasps, and soon attempts to eject the respiratory tube, which was accordingly withdrawn. This was followed by gasps and a catching of the breath, while the eyes grow brighter and more natural. The rubbing and blood injecting were yet applied, and the dog was struggling as if in a fit. But his efforts soon became less violent, and he begins a low whine. A compress was now placed on the artery, and in twenty-two minutes after the first blood was injected, he sits up, after having been dead three hours and twenty minutes. The dog then drank a broth that had been prepared for him in case of his revival, and soon got up, and walked about. He was furnished a comfortable bed near the stove, and from this time forward his recovery was so rapid that in two days he was turned out to run the streets. He is now a rugged character in good health, with seemingly no bad remembrance of his resurrection.

The second case was tested on the second day of December. The subject selected was a calf six weeks old. The details of treatment were similar to the foregoing, except for greater convenience a hot vapor bath was substituted for the warm water immersion. The calf, after being bled to death, was left for twelve hours before its resuscitation was undertaken, as it was desirable to see if a longer death interval could be successfully passed over. The fresh blood injected into its circulatory system was drawn from a yearling steer. It required thirty-five minutes to restore the calf to life after the transfusion of the first blood. The calf then drank some warm milk, and has since grown and thriven without perceptible interruption or ailment.

The next experiment was of a different character, and was made with a view to see if a drowned animal could be restored to life. A small dog was forced under water, and drowned. He was then taken out, and laid with his head inclined downward to drain his lungs of water, and left for four hours in a warm room. It will be noticed that this was quite a different and more hopeless case than the preceding, as the dog had all his own blood yet in his veins. After an hour in the warm bath, and constant rubbing and working, his veins were opened at three different points to admit of the escape of any blood that might issue from them, and the injecting apparatus was vigorously applied to the arterial system. After fifty minutes of anxious labor, signs of revivification were observable. The poor beast whined piteously as life was being once more enthroned within him. Notwithstanding great care was taken of him, he remained weak for several days, but seems now to be in good condition.

A fourth case was recently tried, in which the subject was a dog that was strangled and afterward frozen—as he could not be frozen without strangling—was unsuccessful. After four hours of labor, no signs of returning life were notable. It is believed, however, that this experiment may yet succeed, and the life of a frozen animal restored.

It is proper to add that, in the first cases, after the blood ceased to flow from the wound, measures were taken to prevent air entering the circulatory system as the animal cooled, and in all the cases the respiratory apparatus was nicely adjusted to the capacity of the animal. If the lungs in any case had been ruptured or overstrained, hæmorrhage would have subsequently ensued.

The first dog operated upon is now in the possession of Mr. George Woodside, No 831 Champa Street, and the calf is in the stock lot of Mr. Boyd, west of the Platte, near the Thirtieth Street bridge. Any one having the curiosity to see animals that have once been dead, and afterward scientifically restored to life, can do so by calling at these places.

A LETTER FROM MR. ARMITAGE.

To the Editor of the Scientific American:

Please find inclosed herein a relation of my assistant, Mr. J. L. Finch, in regard to some experiments instituted by myself in this city on revitalizing dead animals. The account was published in the Denver *News* five days ago. It is proper for me to add to this account that since then I have successfully restored life to a dog that had been dead *eighteen hours*—his death having been effected by blood-letting. After he became unconscious, he was treated similarly to the dog first mentioned in the article inclosed, except that the temperature of the room in which he lay was maintained at 40° Fah., to prevent any probable change of tissue taking place. This case was brought to a successful termination last night. The dog is doing well, has eaten some to-day, but seems somewhat weak.

The results of these experiments appear most momentous to me, and I am desirous of having them repeated by others, and my own work corroborated. I believe they will be of value to mankind, and in order to introduce them to more general attention I submit them for your consideration, or for such a publication of the facts as may seem proper.

G. A. ARMITAGE.

Denver, Col., January 22, 1885.

Medical Notes.

Oxide of Zinc in the Treatment of Wounds.—Socin (*Deutsche Med. Zeitung*) speaks highly of this substance as an antiseptic in surgical practice. For the irrigation of deep wounds he uses a one per cent mixture with water; superficial open wounds should be washed with a ten per cent mixture. Large raw surfaces, burns, contusions, etc., are dusted with the powder. As a permanent dressing, the writer recommends a paste composed of fifty parts, each, of water and oxide of zinc, and five parts of chloride of zinc. It forms a dry coating, beneath which healing takes place with unusual rapidity. Stress is laid on the fact that zinc is of little service in the case of a wound that is already septic.

Aseptic Silk for Sutures.—Partsch (*Ibid.*) recommends that ordinary silk be soaked for two days in a ten per cent solution of iodoform in ether, and then dried by wrapping it in blotting paper. The advantages are said to be that it can be kept for a long time without deteriorating, and that it does not cause suppuration when left in a wound. It is consequently useful in the operation for laceration of the cervix uteri.

Jaborandi in Erysipelas.—Dr. Sydney Thompson (*Therap. Gazette*; Edinburgh *Med. Jour.*) suggests the following formula: Fluid extract of jaborandi, 24 parts; laudanum and glycerine, each, 4 parts. This mixture is to be painted over the affected surfaces every four hours.

Oil of Peppermint in Burns.—Brame (cited in the *Lancet*) recommends this drug as an external application in cases of burns. The burned surface is moistened with water, and then painted over with the oil, the effect being to relieve the pain very quickly.

Verbena as a Sudorific.—*Verbena hastata* is recommended by Weber (*Ibid.*) as a valuable sudorific, when given in doses of half a drachm or a drachm of the fluid extract.

An Application for Painful Dentition.—According to the *American Journal of Pharmacy*, Hager recommends the following: Chloroform, 10 drops; tincture of Spanish crocus, half a drachm; honey, half an ounce; glycerine, 1 ounce. To be rubbed on the gums, to allay irritation.

Valoid of Coca is mentioned by the *Lancet* as a "new and reliable preparation," and is specially recommended for nervousness and sleeplessness from mental causes.

Cold in the Treatment of Sciatica.—Debove (*Prog. Med.*) recommends the direct application of cold along the course of the sciatic nerve, and especially over the painful points, by means of a spray of chloride of methyl. He reports several successful cases. The atomization is continued until the patient complains of a burning pain over the seat of the application.—*N. Y. Med. Jour.*

The Novorossick Railway.

The Russian Minister of Railways has completed his preparations for the Novorossick line, the first sod of which will be cut, it is expected, in a few weeks' time. The railway is, says *Engineering*, of a highly important character, and, from the rocky nature of the country traversed, will afford plenty of opportunities for a display of skillful engineering. Novorossick is one of the best ports on the Caucasus coast, if not indeed the best. In importance it ranks after Batoum and Poti. These two ports serve as outlets for the region south of the Caucasus ridge, which region—Transcaucasia—is traversed by a railway passing from the Caspian to the Black Sea, and uniting Baku with Poti and Batoum. The line proposed will ultimately unite the Caspian and the Black Sea north of the Caucasus ridge. The Caspian terminus will be Petrovsk, and the Black Sea one Novorossick.

At present the whole of the vast fertile region lying north of the Caucasus ridge is devoid of good outlets. The Rostoff-Vladikavkay Railway runs through the middle of it, from the Caucasus to the mouth of the Don, but it throws out no branches right or left. The consequence is that the produce of a region larger than the United Kingdom flows into a shallow port at the mouth of a river which is frozen over three or four months every year. The railway now sanctioned will put an end to this condition of things. Starting from a point about midway between Vladikavkay and Rostoff, it will proceed straight to the Black Sea, where it will find a terminus in Novorossick, which is never frozen over, and possesses a capacious bay fifteen miles in circumference, capable of accommodating the largest possible amount of shipping. Thus the outlet will be one that will meet in every respect the requirements of a region remarkably rich in corn and oil. The Novorossick Railway will be 172½ miles long, and will cost, with £150,000 for improving the port, £1,400,000 sterling. The gauge will be 5 feet, the line will be single, and the rails of steel, manufactured in Russia.

The Koubon region, which it will traverse close to the coast, is one of the most inaccessible parts of the Caucasus, being so mountainous and embedded in forests that it is traversed by only one or two military roads, constructed during the wars with the Circassians at an immense cost. The engineers will thus have many difficulties to overcome, although they anticipate completing the line in a couple of years. When it is finished, perhaps even before then, a branch will be commenced on the opposite of the Rostoff-Vladikavkay Railway, and run to Petrovsk, on the Caspian. This will be a little longer, but it will be easier than the Novorossick line, and will be completed in about the same space of time. Thus, in about four years Russia will have a new railway from the Caspian to the Black Sea, to the north of the Caucasus, and being linked with the European system, people will be able to go from Calais to the Caspian all the way by railway. These considerations give special importance to the new undertaking, but there is another which will interest Europe still more. The Novorossick Railway will traverse the Black Sea petroleum region, and open up a country known to be as rich in oil as America, and which on examination may prove to be still richer. Already there is a refinery at Novorossick with a pipe line 60 miles long running to the wells in the interior, so that a start has been made with an industry which would have long ago assumed larger proportions but for the generally inaccessible character of the Koubon region.

A Novel Temperance Society.

On the night of December 31, 1883, three young men sat around a tavern fire in Georgetown, a little village in Connecticut. They were intoxicated, and were watching the old year out. As the clock struck twelve, one of the young men said: "Boys, the new year is here; now let's swear off, and form a temperance society." The others, in a spirit of fun, agreed. The articles of association were then and there drawn up. They were similar to the rules of other temperance organizations, with one exception. The clause containing the pledge had the following penalty attached: "And any one of us who shall drink any intoxicating liquor, for any purpose whatsoever, between now and midnight of December 31, 1884, shall be tarred and feathered."

This clause becoming known, gained the club the name of "The Tar and Feather Temperance Society." Meetings of the society of three were frequently held. Gradually applications for membership began to pour in, and before six months had passed the society numbered thirty members. The year of abstinence expired on new year's eve, and a grand ball was given by the society, to which a large number of the best people of the place were invited. The hall was filled. At midnight the president announced that the pledge had expired. By a unanimous vote it was renewed for another year, and some twenty names were added to the roll. The peculiar penalty proves an attractive advertisement, and the matter is the talk of the neighborhood. Nearly every resident wears the society's badge. The badge is a blue ribbon, with a lump of tar filled with chicken feathers attached.

REGISTERING THERMOMETERS AND PRESSURE GAUGES.

We illustrate herewith two apparatus which have the one feature in common of inscribing their indications in ink and in a continuous manner upon a sheet of paper which is carried along by a clockwork movement.

These apparatus are very portable, and can be applied everywhere without the necessity of having recourse to special employes to attend to them. They are constructed after the same pattern, and consist of a glass case which contains the mechanism and permits the tracing pen, as well as the paper band, to be seen from the exterior. The system of registering is identical in the two apparatus, and this accounts for the moderate price of them. The registering apparatus consists of a movable, vertical drum containing wheel work. The top of this contains two apertures for the insertion of the keys for winding, and which are closed by slides, and the bottom is traversed by an axle which carries externally a toothed pinion that gears with a fixed wheel. This latter is keyed to a rod mounted on the base of the apparatus and serving as a rotary axis for the drum. The toothed pinion performs the role of a planet wheel for bringing about a general rotation of the drum. This registering mechanism, as a whole, is capable of being easily separated from the rest of the system, it being only necessary to unscrew a button in order to disengage the drum without touching the other parts. By merely varying the proportions of the radii of the two planet wheels which regulate the final motion, the constructor can readily modify the velocity and consequently the duration of the revolution.

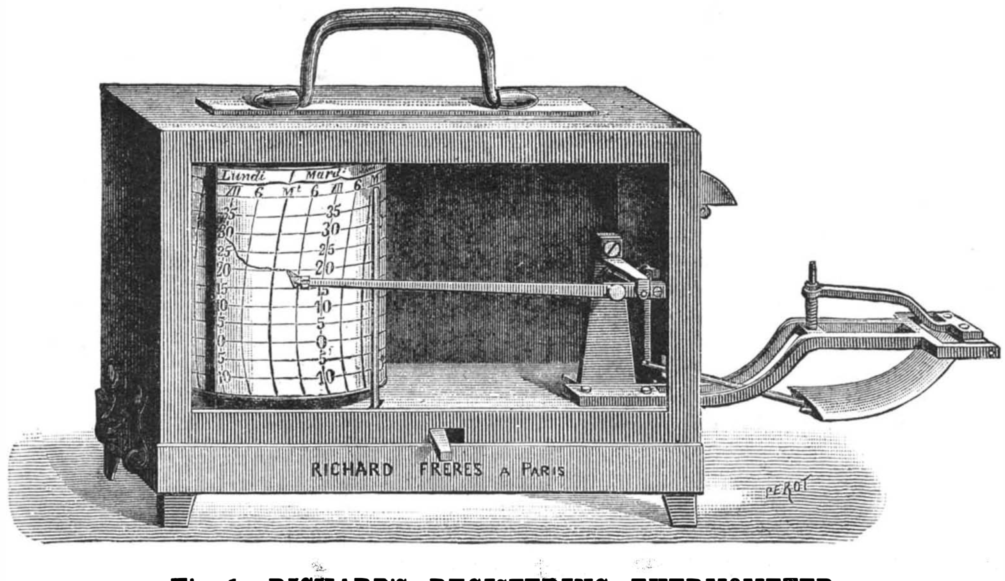


Fig. 1.—RICHARD'S REGISTERING THERMOMETER.

The bands of ruled paper that cover the drum are pointed beforehand, and the spacing of their horizontal lines, which are formed by circumferences parallel with the base of the drum, is regulated according to the nature of the instrument. The vertical lines measure the time, and their spacing is regulated according to the velocity at which the clockwork runs.

In the majority of cases, the duration of one revolution of the cylinder is one week and a few hours, so as to permit the bands to be changed every eight days at a given hour. The generatrices traced upon the ruled paper are spaced two hours apart, and are distributed in groups that represent an entire day. The names of the days of the week and the numbers of the hours are inscribed at the upper part. An interval of two hours is represented by a spacing of 0·12 of an inch. One can easily see by the eye half the distance between two lines that corresponds to the odd hours, and even a quarter of such interval.

Apparatus are likewise made in which the ban must be renewed every day.

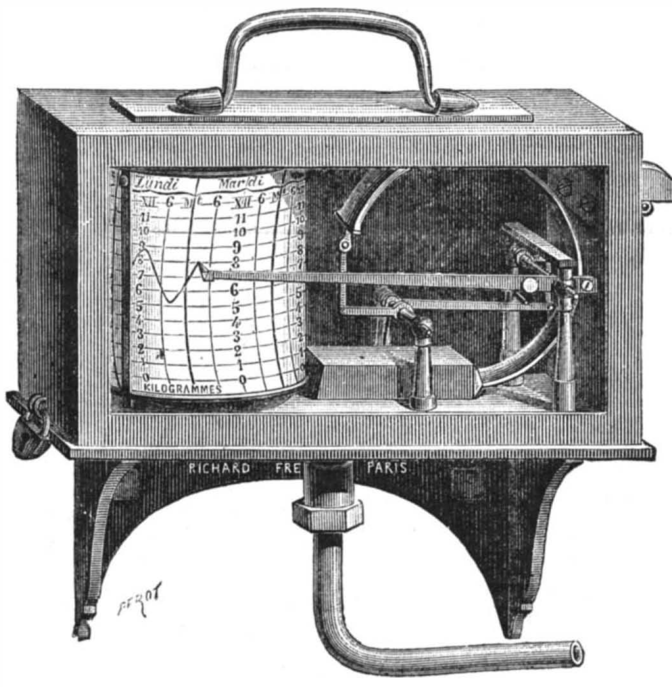


Fig. 2.—RICHARD'S REGISTERING PRESSURE GAUGE.

Were the lines exactly rectilinear, it would be necessary to give the pen a very accurate vertical motion, which would involve the necessity of making the mechanism complicated, and, by creating passive resistances, destroy the sensitiveness. This is one of the principal difficulties in the construction of registering apparatus. The Messrs. Richard, who are the manufacturers of the instruments under consideration, suppress this inconvenience very happily. They so arrange the apparatus whose indications are to be registered that the vertical plane described by the long movable style shall be tangential to the cylinder, and they mount the pen of the style in such a way that it shall come exactly against the generatrix of contact of the cylinder and plane when the style is in its mean position of oscillation. Owing to this arrangement, and to the transverse flexibility of the style, the pen, in its vertical motion, does not leave the surface of the cylinder upon which it is tracing a slightly inflexed line. The error which might result from this inflexion is corrected by arranging the ruled lines according to the curve thus described upon the cylinder.

In practice these lines are confounded on the paper with successive portions of circumferences that have a constant radius equal to the length of the style. In fact, this arrangement, which is so simple, renders the transverse motion of the style possible, and permits of receiving directly upon a rectangular tablet the tracings of all those registering apparatus whose indications are furnished by the motion of a needle over a dial.

Each sheet of ruled paper is fixed to the cylinder in the simplest manner, the overlapping edges being merely held by the pressure of a flat spring, and the lower edge resting upon a flange at the base of the cylinder, so as to secure a parallelism of the horizontal lines with the base of the drum. When the drum is thus covered, it may be turned by hand in any direction whatever, because the clockwork movement is connected with the cylinder by a socket with friction mounting, as in the wheelwork of clocks. This permits of bringing the point of the needle exactly opposite that division of the paper which corresponds to the hour at which one is operating. It suffices afterward to leave the apparatus to itself in order to have it begin the revolution, during which the divisions of the cylinder pass successively before the pen.

There is one arrangement which is common to the different types of these registering apparatus, and that is the arrangement of the pen. This latter is simply a small receptacle in the form of a triangular pyramid made of thin sheet metal. One of the faces of this is applied to the style, and fixed by a small socket. The opposite end grazes the paper, and the corresponding edge is split like the point of a pen, so as to bring about through capillarity a flow of ink. The ink used is made of aniline mixed with glycerine. A drop of this is placed in the reservoir of the pen. It is well to employ gelatinized paper in order to obtain sharp and fine lines, notwithstanding the prolonged contact of the pen upon the same points of the paper. The ink must be renewed every eight days, at the moment the paper is changed, and the clockwork wound up.

Fig. 1 represents a metallic thermometer whose operation is based upon the use of a bent Bourdon tube of copper having a flat section. This tube is filled with alcohol. It measures three-fourths of an inch in width and four inches in length. At first, it was, like the rest of the apparatus, covered with a metallic box.

An equilibrium of temperature between the interior of the latter and the atmosphere was established through two windows provided with wire gauze, and rapidly enough moreover to obtain diagrams representing exact thermometric means; but the curves produced by sudden variations in temperature were not rendered with all their instantaneousness. In order to obtain greater accuracy in the indications, the thermometer tube has been placed externally to the metallic box, so that it shall be in immediate contact with the atmosphere. This arrangement gives very satisfactory results as regards sharpness of the diagrams.

The dimensions of the levers are made such that a variation of one degree in the temperature shall be represented by a three-fifths inch displacement of the pen, this corresponding to the spacing of the divisions of the ruled paper.

These thermometers are very sensitive. The motive tube, by reason of its material, is an excellent conductor of heat. It has a large surface in contact with the air, and has but a slight capacity, thus permitting the alcohol to put itself quickly in equilibrium with the surrounding temperature.

Fig. 2 represents a registering pressure gauge, which is likewise formed of a Bourdon tube connected with a vessel containing steam. The motion of dilatation that results therefrom is transmitted directly to the needle that carries the pen charged with ink. There is constructed after the same type a gauge for measuring infinitesimal depressions, and in which the motor of the style consists of an extremely sensitive diaphragm. This instrument renders great services in the controlling of the pressure of gas or the draught of chimneys, through diagrams.—*Revue Industrielle.*

HYDRAULIC ACCUMULATORS FOR LOADING AND UNLOADING CARS.

There are at present few persons who have not had an opportunity of seeing what a series of maneuvers the loading and unloading of freight cars give rise to at the stations of large railways. The making up and breaking up of trains, and the loading and unloading of them, are so many operations that necessitate the shunting of cars from one track to another by means of switches and turntables. For all such maneuvers horses are employed. In ordinary weather a single animal will suffice to haul a car, but when the ground is slippery through rain or snow, it becomes necessary to employ two, three, and sometimes more. At large stations, where it becomes a question of shifting from 1,000 to 1,200 cars per day, it proves difficult, as may seem, to maneuver the number of men and horses necessitated by such work, without accident and loss of time, within a relatively contracted space. For this reason the

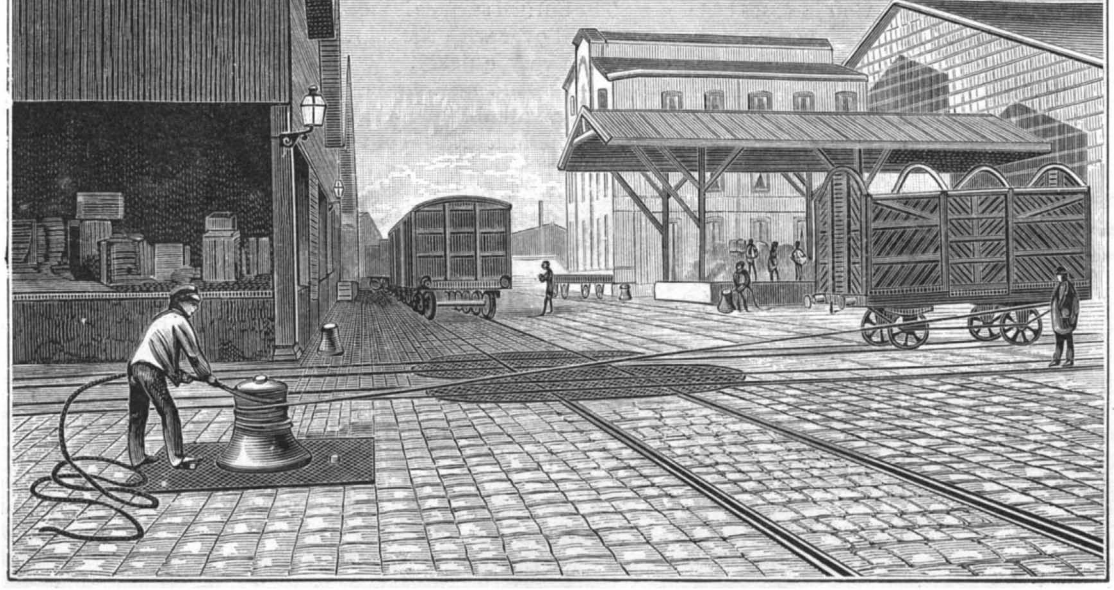


Fig. 1.—MANEUVER OF THE CAPSTAN.

Company of the North (France), abandoned the use of this primitive system a few years ago at its La Chapelle station, and, for horses, substituted machines analogous to those that have for a long time been employed in England. These apparatus, which are giving very satisfactory results, will themselves be replaced before long by more improved ones in which the transmission of power to a distance through electricity will perform the greatest role. The matter is now under study, and it is here again that the Railway Company of the North is at the head of such progress.

Our readers will be informed in due time as to the results of the experiments, and, in the mean time, we shall merely endeavor to describe and make understood the system at present in use.

Since the number of cars to be shifted varies at every instant, it requires considerable power at some moments, and not much at others. Under such circumstances, if, for example, a powerful steam engine were located at some central point, a portion of the power that it developed would not be utilized most of the time. If, on another hand, smaller engines were placed at different points around the station, the result would be the same—not economical—since it would often happen that one or several of the engines would not be employed. This, in addition, would be attended with the grave drawback that the number of enginemen and stokers would be multiplied.

The problem has been solved in another way, and that is by the use of an accumulator. This word is not used here in the sense of *reservoir of electricity*, that we have become accustomed to attribute to it since Gaston Plante's admirable discovery, for the apparatus under consideration are in no wise electrical.

Everybody knows, moreover, that "accumulator" is a general name for apparatus that are designed for the storage of any force whatever that cannot be utilized directly, and for restoring it at the moment desired, either all at once, if we need a powerful and momentary stress, or slowly and continuously (as in clockwork movements), or, finally, by fractions as small as may be desired, and at any intervals of time whatever. This sort of apparatus was therefore fully indicated for the particular case that occupies us.

Our engraving (Fig. 3) represents the central works in which force is accumulated. The accumulator consists of a series of cast iron disks of large dimensions, placed one upon another and resting upon the head of a plunger, as may be seen in the engraving. A 15 H.P. steam engine continuously actuates a pump whose gearings are seen to the right, and which, sucking water from the reservoir above, forces it under the plunger. In this way, the relatively low power that the engine develops is constantly employed in lifting the accumulator, and the latter is always ready to descend again, either wholly or partially, according as the water imprisoned under the plunger that supports it is allowed to escape for a greater or less length of time. When we state that its weight is 88,000 pounds, it will be understood that the force that we have at our disposal is considerable. In order to transmit this to the different points where it is to be utilized, and which are now twelve in number throughout the station, the hydraulic method was adopted, since this adapts itself to every circumvolution possible. At each of the twelve points selected there was accordingly arranged a capstan actuated by a hydraulic motor of the Brotherhood system; and there was laid a line of cast iron piping for connecting the pump chambers with each of the motors, to which latter the pressure exerted by the accumulator is thus directly transmitted. In these motors, the cock that admits water into the distributing slide valve is actuated by a pedal placed alongside of the capstan, thus permitting of setting them in motion and stopping them at the moment desired, without the aid of the hands. Both the piping and the motors are 30 inches beneath the surface, so as to place them out of the reach of frost. There is a special conduit provided for leading the water back to the reservoir after it has been utilized in the motors. The water used is therefore always the same—an economical provision that in certain cases is not to be despised.

The pressure conduit is circular; that is to say, starting from the accumulator and running to the right, for example, it returns to the left after passing in proximity to the motors, with which it is connected by branch pipes. This arrangement permits of isolating any point whatever for repairs without interrupting the service. With this same object, and to avoid a standstill, the machinery is double. In Fig. 3, the second accumulator may be seen at rest behind its mate.

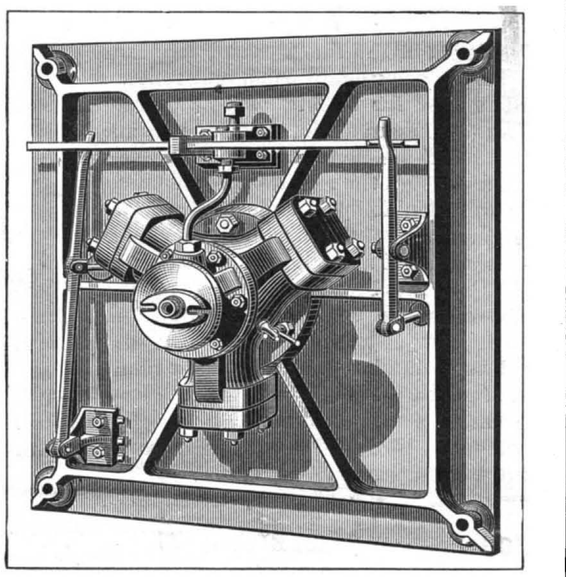


Fig. 2.—ARRANGEMENT OF THE BROTHERHOOD HYDRAULIC MOTOR.

Fig. 1 shows the arrangement of two maneuvers effected simultaneously on tracks at right angles with each other. In one of them, shown in the foreground, we see a man who has just wound a rope around the capstan, and is putting his foot upon the pedal. This rope may simply make two revolutions, and the adherence be sufficient to move the car attached to its other extremity as soon as the capstan is set in motion. The latter is stopped by ceasing to press upon the pedal as soon as the impulsion given the car is sufficient to make it continue its course by virtue of the velocity acquired. As soon as it reaches its destination, it is stopped by a man who has followed it for that purpose.

Each capstan is capable of doing duty for four or five turntables and all the tracks within a radius of 325 feet around it, either directly or by means of guide pulleys. Fig. 2 shows the arrangement of the Brotherhood motor that actuates the capstans.

It will be seen that with such arrangements it is possible to shift a car quickly from one extremity of the station to the other, and in any direction whatever.

One is struck with astonishment upon seeing the ease, rapidity, and safety with which these maneuvers are performed by a number of men which is relatively small in comparison with the large number of cars handled. The estimates made by the Company of the North establish the fact that loading and unloading effected in this way is three and a half times quicker than when horses are used.—*La Nature.*

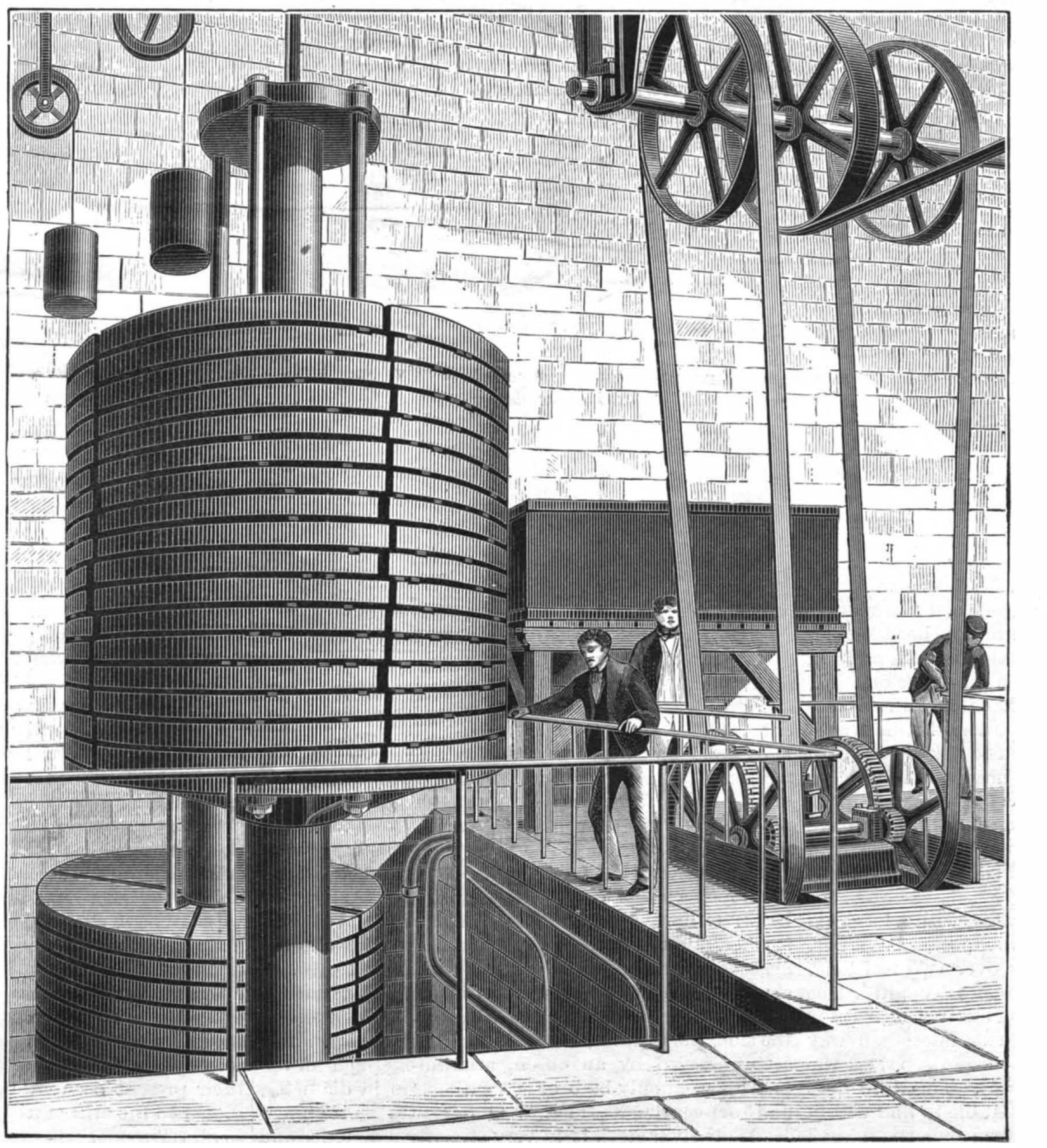


Fig. 3.—HYDRAULIC ACCUMULATORS OF THE LA CHAPELLE STATION, RAILWAY OF THE NORTH.

Bleaching with Gaseous Chlorine.

M. Albert Scheurer, at a recent meeting of the Societe Industrielle du Mulhouse, presented a note on the employment of gaseous chlorine as a discharge on indigo.

Chlorine, even when moist, destroys indigo but slowly. But if we print a thickened caustic alkali on an indigo ground, the discharge by means of gaseous chlorine is immediate. The same is true of Turkey-red. By this process colored discharges on blue and on red grounds may be produced. If we print a mixture of oxide of lead and oxide of chromium dissolved in soda, we produce by synthesis the chromate of lead; the blue is destroyed, and we obtain a yellow discharge.

To produce red discharges on indigo, we print with very alkaline aluminate of soda and expose to chlorine, then dissolve out the gum or thickening, and dye with alizarine.

The Allen Ice Machine on Shipboard.

In the SCIENTIFIC AMERICAN of June 14, 1884, we illustrated and described the Allen Dense Air Ice Machine. One of these machines, having a capacity of about 1,000 pounds of ice per day, has been placed upon Mr. James Gordon Bennett's yacht Namouna. One peculiarity of the invention is the small space occupied by the machine, which in this example is only 7 feet long, 4 feet wide, and 4 feet high. The residual cold air over and above what is needed for freezing the required ice is employed for cooling two refrigerating rooms, the larger of which is placed in the hold of the vessel, and is designed to be used as a store room; the other is located on the lower deck, and is intended to receive temporary supplies. The machine is worked with steam from the main boilers.

These machines are particularly applicable to service on board ship, since they are compact, they require but little attention, and all the working parts can be easily reached. They are manufactured by the Allen Dense Air Ice Machine Company, Delamater Iron Works, foot of West 13th Street, New York city.

Building a Bridge Over the Jordan, in Palestine.

U. S. Consul Merrill, at Jerusalem, reports that, during the past summer, an attempt has been made to build a bridge over the Jordan at Jericho. It has progressed slowly, however, as the lumber furnished had to be brought from Europe, and carried on the backs of camels from the port of Jaffa to the river. The Consul suggests that there might be some market in Palestine for American lumber, as the Austrian and Turkish lumber now used there is of poor quality and high priced, but the country is probably too poor to make much of a market for anything at present; the whole yearly imports at Jaffa, which is the Mediterranean seaport for Jerusalem, amount to only about $600,000.

The Pileated Woodpecker.

(*Hylotomus pileatus.*)

To those of the readers of the SCIENTIFIC AMERICAN who have never been in Florida, before describing the habits of the pileated woodpecker, let me first attempt to describe as near as possible a genuine Florida swamp. Imagine, if you can, a vast wilderness extending for miles in every direction, made up of tall cypress trees and water oaks, draped with a profusion of Spanish moss, which lends a gray aspect to the whole scenery, interspersed here and there with a maple, and the cabbage palmetto in profusion, and the whole interwoven with a strong network of creeping vines, thorn bushes, roots, and fallen trees, with anywhere from six inches to two feet of water covering the whole, and broken here and there by some deep creek or inlet, then you have before you some faint idea of a tropical swamp.

It is in such a place as this that the pileated woodpecker may be found most abundant, and where I have been for the past week closely studying him. To one who has spent an hour in trying to obtain a shot at a golden winged woodpecker, and at length given it up with the opinion that that Colaptes was "something more than mortal," let me say that he cannot be compared with my pileated woodpecker; for *he* is the very essence of cunning and craft in his maneuvers. I have sometimes spent an entire afternoon in trying to get near enough to one to observe his habits, and at dusk found myself as far away from the object of my pursuit as when I started. But rather than weary you with a detailed description of my long crawls on hands and knees through mud and water, with repeated failures, let me put before you the bird himself, clinging to the side of the decayed trunk of a tree a few yards in advance, and entirely unconscious that my untiring efforts to reach this coveted spot have at last been crowned with success.

There he is, hammering away as though his life depended on his getting that one grub. Suddenly he stops, turns his ear to the tree, and listens attentively for the sound of his prey crawling through the wood; soon he hears him, and uttering a low, guttural cluck of satisfaction, he proceeds with his work of excavation. All at once he stops, throws his head back from the tree, and gives utterance to a long, loud, piercing call, similar to that of Colaptes auratas, but in a much stronger and louder tone, best represented by the syllables "Wa-wa-wa-wa-wa-wa-wa-wa-wa," very rapidly and loudly repeated, and then pursues his work again. I have heard his call answered by a distant one, sometimes continuing it for two or three minutes, it evidently being a source of communication between the two, for several times on this occasion I have seen one that was near me suddenly leave his position and fly away in the direction of the call. Their hammering is unlike that of the smaller species of woodpeckers, for instead of the rattle of P. pubescens, for instance, it is a steady thump, thump, thump, and may be heard a long distance. When pecking on a decayed trunk, it is hollow and muffled; but when on the live tree, it is more sharp and loud. Strange as it may appear to some, I was misled several times on my trip into believing that a woodsman was near by chopping, when in reality it was only one of these forest birds at work on some hard stump or limb.

But to return to the one in front of me: He has tired of his present location, so off he flies to another. How heavily he flies, and with what a rushing noise! Another quarter hour's careful crawl, and I am near enough to watch him again. At first he does not find a place suitable for his work, but runs up the tree, then drops down, swings himself around, first to one side, then to another, when all at once he commences work, and I know that he has found the spot where he will make a meal. How the chips fly! big ones, too, and the ground is soon covered with evidences of prowess. The slight noise I make startles him, and in an instant he is off for safer quarters. Notice when alarmed how swiftly he flies, and after the usual woodpecker fashion. Soon I hear him at work where he has alighted, and after careful maneuvering, again obtain a position near enough to observe him. This time he is on a log, and, from his manner, evidently has found a rich harvest there. How hard he hammers away! One would think that he would knock himself to pieces instead of the log; but should you dissect his head, you would find it supplied with muscles that are very strong and hard, and admirably adapted to just such work. He pauses occasionally in his work to give utterance to his call, and how it does ring through the silent woods, silent save what bird life there is in it!

At my right stands an old dead tree, with a large excavation in it that some brother woodpecker has made. Examining it, I find it measures over two feet long, about eight inches wide, and six inches deep, in a tree scarcely one foot in diameter. On another near by is more of the same work—a ring extending half way around it, two inches wide and three deep, and the ground under it covered with chips. This bird does not depend entirely upon what he is able to find within the tree he pecks at; but I find him on a small knoll covered with decaying leaves, where he is alternately pecking and scratching for the grub or worm he first listened for, and then commences his work to get him. Occasionally he pauses to listen as he turns his ear to the ground, the same as when on the tree, only to renew his pecking and scratching; but I judge his success in finding food rather poor, for he soon flies to a tree, and is hard at work again there.

Moving on cautiously, I come upon a company of six of these birds all hard at work, but from their maneuvering conclude that the mating season is at hand; for suddenly one leaves his perch and darts at another, and away the pair go through the woods, with loud screams, rapid flight, sharp turns, and loud whirring noise, but are back again soon, and renew their work as hard as ever for insects, only to repeat the same maneuver again and again, until the pair goes chirping away together, leading me to believe that each has found a mate, and the selection of some hollow tree for its nest will soon follow. This "hollow" is usually at a great height in some almost inaccessible tree, standing in the loneliest and thickest part of the swamp. I am told that the breeding season commences before long, in which case I hope to be successful in finding the much coveted nest and eggs. On dissecting the stomachs of a number of these birds, I find the food to consist of grubs, insects, larvæ, small beetles, etc., and in one case I found *two immense* caterpillars in the stomach of one bird, besides thousands and thousands of the above mentioned lepidoptera.

Description.—Male: 18 inches in length, 28½ inches in extent. Iris yellow. Upper mandible plumbeous blue; lower mandible the same, but lighter at base. Tarsus black. Toes and claws black. Top of head, including the whole crest, scarlet; a long cheek patch of scarlet. General color dull black; a large space at the base of wing quills white, more or less tinged with sulphur yellow; the feathers of the sides and belly often edged with dull white, and sometimes some of the primaries and tail feathers are tipped with the same; a long white stripe from nostrils extending along sides of the head and neck, spreading on sides of breast; also tinged more or less with sulphur yellow, ending in a large patch of white under the wings, decidedly tinged with the same color. Nasal feathers white. Female differing from the male in having the forehead for about an inch a yellowish brown color instead of scarlet, but the whole crest extending from between and back of the eyes is bright scarlet, and in my specimens the crest is handsomer than that of the males. It also lacks the red cheek patch; in other respects she is similar to the male. E. M. H.

Palatka, Fla., Jan., 1885.

THE HYPNOSCOPE.

Sir William Thomson, in a lecture to the Midland Institute delivered some months ago, on the Six Gateways of Knowledge, pointed to the possibility of a

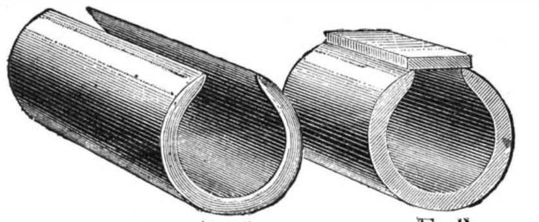


Fig. 1 Fig. 2

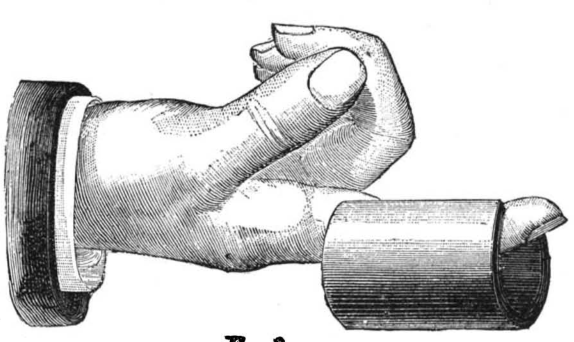


Fig. 3

THE HYPNOSCOPE.

magnetic sense, which might give a sensation of magnetism quite different from the sensations of heat, force, and so on. Soon afterward Professor W. F. Barrett recounted some experiments which came under his notice, and which tended to prove that certain persons were capable of feeling the presence of magnetism as developed by the core of a powerful electro-magnet. Dr. J. Ochorowicz has investigated the subject still further, and observed that all persons sensitive to the magnet are hypnotizable in a corresponding degree. In studying the matter he uses an instrument termed a hypnoscope, which is simply a tubular magnet slit up the side, the edges of the slit forming the poles, which are preserved by an oblong armature. Such an apparatus need only be 3 or 4 centimeters in diameter, and 5 or 6 centimeters long; weighing 150 to 200 grammes. Made of Alvar steel, it is very strongly magnetic, and will sustain twenty-five times its own weight. Figs. 1 and 2 show the magnet without and with its armature, and Fig. 3 illustrates the way in which it is used. After the armature is drawn off, the index finger of the person to be tested is thrust into the tube of the hypnoscope in such a way that the latter hangs from the finger by its poles, which are connected through the finger. After two minutes the magnet is drawn off, and the finger examined. Dr. Ochorowicz states, of a hundred persons chosen at hazard, and examined in this way, seventy will observe no change, but thirty will experience changes of two sorts, subjective and objective. For example, 20 per cent. declare they feel a pricking sensation as of needles entering the skin; 17 per cent., a cold air or a sensation of heat and dryness. These two sensations may coexist, one being felt in the right arm, and the other in the left. The cold air resembles that felt in front of an electrostatic machine. Some 8 per cent. of the total will probably feel disagreeable sensations, and a smaller number of sensations of swelling, heaviness of the hand, and irresistible attraction. The objective changes are either involuntary, insensibility (anæsthesia), paralysis, contraction of the muscles. These changes disappear after a few minutes by light friction, but without that will last several minutes, or even hours. Subjects of this class can be hypnotized in a single séance. Whether these effects are really magnetic, Dr. Ochorowicz considers doubtful. Magnetism, he thinks, does not explain all. It is only the substratum of another action so feeble from a physical point of view that it is not discoverable by our instruments of research. What this other action is, whether a new force or a new manifestation of force, he does not in the present state of our knowledge venture to say.

Gaseous Fuel and Smoke Prevention.

Under the title of "The Smoke Nuisance in Towns, and its Prevention," Herr R. Weinlig read a paper, at Magdeburg, last September, of which an interesting summary lately appeared in *Engineering*.

The whole question, says our contemporary, is treated in detail. Some statistics are given to show the enormous increase in the quantity of coal produced during late years; England being stated to have doubled and Germany to have quadrupled their output in the last 24 years. In dealing with the subject of smoke prevention, the author stated his opinion that very decided legislative interference is necessary; but he does not consider that this can be extended to domestic fires, though their importance as large contributors to the evils upon which he dwells cannot be denied or underrated. He considers that the one great cure for smoke from this source will be found in the introduction of gas firing, gas being supplied cheaply from central stations. This will certainly come to pass in due time, as it is well known that a suitable gas can be produced at a price of 3 to 5 pfennige per cubic meter (about 20 to 35 cents a thousand feet); and at such a price, firing with gas is fully as cheap as firing with coal.

Tests made by Dr. Fischer, of Hanover, show that in the ordinary domestic stoves in use not more than 20 per cent of the fuel consumed is really utilized for warming the rooms; whereas, with stoves burning gas, 80 per cent and more of the possible effect is obtained. In a certain sugar manufactory at Elsdorf, no steam engines have been used for several years. Gas is made at a cost of about 20 cents per thousand feet, and is used for lighting and for driving gas engines. At the iron works of Herren Schultz, Knaudt & Co., in Essen, water gas is made at a cost of about 8 to 16 cents a thousand feet, and serves both for fires and for lighting. For the latter purpose a ring is fixed over the burners, having rods or pencils of magnesia attached. These are made glowing hot by the non-luminous gas flame, and emit an excellent light.

These and other examples prove that cheap gas production is not any longer a mere experiment, and that we may reasonably hope to see its universal introduction. But we shall never be free from the smoke nuisance till we have no more burning of coal direct in grates. The use of gas, which has already done so much in some directions, will probably gradually do the rest. Large works of all kinds will more and more take to producing gas and using it for all purposes. Smaller works and private houses will, in due course, have gas supplied to them at such a price as shall render it cheaper than solid fuel under any conditions. Domestic heating and cooking appliances for use with gas have made enormous advances of late, chiefly by the untiring ingenuity and invention of Mr. T. Fletcher, of Warrington. It remains only to "educate" the public and the gas companies a little further, and some day we shall have cheap gas laid on everywhere, and our descendants will hardly realize that we once had loads of dirty coal shot into our houses, endured no end of dust and dirt inside, and poisoned the air outside. If ever the difficulties are practically solved which at present prevent the introduction of electric lighting into our houses, then, when the gas companies find their present occupation gone, they will turn all the sooner to the other great field that awaits them; and so all the sooner will our smoke nuisance disappear by a much more satisfactory method than government interference and compulsion.

ENGINEERING INVENTIONS.

A car coupling has been patented by Mr. John G. Ogden, of No. 46 Jackson Street, Chicago, Ill. The 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 car truck has been patented by Mr. Charles E. Candee, of New York city. The principal feature of the invention lies in the equalizing bars, which are fitted to swing so as to allow lateral motion of the truck frame independently of the wheels and axles, together with boxes of novel construction, and holders for the supporting springs, by which the springs are held upright in any position of the truck.

A car coupling has been patented by Mr. Frank D. Root, of Cortland, Ill. A drawhead is held in hangers, and has at its rear end a neck passed through the rear hanger, a large nut being screwed on the end of the neck; a spring is held in the transverse cavity in the free end of the drawhead, the spring acting on a tongue on the inner end of a coupling hook, pivoted in the outer end of the drawhead, the coupling hook being connected by a chain with a plate having a quadrant edge, and the plate secured on the lower end of a vertical shaft on the platform.

AGRICULTURAL INVENTIONS.

A side hill sulky plow has been patented by Mr. Addison D. Sewell, of Colton, Washington Ter. It is made with two plows rigidly connected in reversed positions, and pivoted to a plow beam having a locking mechanism, there being a spiral spring on the beam, and a foot lever connected with the beam and the locking sleeve, whereby the plows will be locked automatically and can be readily released, with other novel features.

MISCELLANEOUS INVENTIONS.

A machine for threading screws, bolts, and nuts, has been patented by Mr. Edmond P. Baville, of Brussels, Belgium. It is for threading screws in general, and especially screw bolts, and has for its object to impart to the manufacture greater rapidity, considerable economy, and greater accuracy. The universal adjustable cutting tool consists of a mere piece of flat steel bar, in one side of which are triangular or rectangular grooves, that may be cut on a planing machine, according to the thread to be made, this cutting tool allowing the pitch of the screw being varied at will; by means of its peculiar adjustment in the screw stock, this tool also cuts the thread on the cylindrical surface of the rod or stem without compressing the latter or squeezing it between the tools, the tool cutting as well at the heel as at the top of the thread. With the machine as preferably constructed, with four die stocks and four taps, it is said that eight to nine thousand bolts can be made in a day of ten hours.

A neck yoke clamp has been patented by Mr. Elihu Wolf, of North Vernon, Ind. This invention covers a novel construction and arrangement of parts constituting a clamp for holding a neck yoke on the end of a pole in such a manner that it can easily swing vertically and laterally on the end of the pole.

A fence wire strainer has been patented by Mr. Sydney W. Fulton, of West Taieri, near Dunedin, New Zealand. The invention consists of a ring or frame carrying two pairs of clamping jaws, and a wire straining shaft or roll disposed on side of the line of the jaws, with certain novel details of construction.

A tricycle has been patented by Mr. Carl G. E. Hennig, of Paterson, N. J. Combined with four pairs of treadles are two rocking arms, connected to the cranks of the axle by rods, two pairs of said treadles being connected to the axle, and the two other pairs of said treadles being connected to a tube arranged upon the axle, with other novel features.

An improvement in the construction of buildings has been patented by Mr. Richard S. Pearsall, of Sea Cliff, N. Y. This invention covers a special manner of construction, especially in the joining and mortising of the stuff, whereby a house may be made very strong and tight, and so that it can be easily, quickly, and cheaply built.

An automatic weighing scale has been patented by Mr. Henry C. Keeler, of Ogden, Utah Ter. This invention relates to scales having a revolving dial and a stationary pointer, so the record of the weight may always be seen at one place through a small glazed opening, instead of having to follow the pointer around its range, and covers several novel features of construction and arrangement.

A lifting device has been patented by Mr. Eugene Paul, of Norwich, N. Y. It may be made of wood or metal, and is for lifting heavy articles, such as logs, for sawing or loading, and combines, with legs and a center piece, a lifting lever held by links on the center piece and carrying a shackle, through which a toothed lifting bar passes, which latter also passes through a shackle on the top of the center piece.

A combined desk pad, portfolio, and calendar has been patented by Mr. William R. Cole, of Pottsville, Pa. The calendar is fixed to the head or top of the pad, and has a roller indicating the months and days of the month, and another indicating the days of the week, the days showing through slots in the calendar case, and the portfolio being fixed to the back of the pad.

Improved suspenders form the subject of a patent issued to Mr. Frank E. Flagg, of New York city. The end of the shoulder strap has a cap with a tubular socket to receive a rubber rod, upon which is a regulator to which the suspender ends are attached, and which is made with a tubular aperture smaller than the rod, whereby the rod is securely connected with the shoulder strap, and the regulator can be readily adjusted and held in place.

A measuring, sacking, and registering attachment for grain separators has been patented by Mr. James Forrest, of Grand Forks, Dakota Ter. This invention consists in a peculiar construction and combination of parts to facilitate the work for which it is designed, and so the grain will all the time be covered during its passage from the discharge spout of the separator to the sacks, and thus kept clear from chaff, dust, straw, etc.

A shirt and necktie fastener has been patented by Mr. Sigmund Fechheimer, of New York city. By this improved device the shirt, scarf, or necktie, and fastener, are all combined and connected to make of the whole one article, dispensing with studs or buttons for closing the shirt in front, and the device at the same time serving to form an ornamental clasp for the ends of the tie or scarf at the neck, or other points down the bosom of the shirt.

A handle for pot and other covers has been patented by Mr. George E. Palmer, of Horseheads, N. Y. This invention relates to ring or loop-shaped handles, and covers a novel construction and means of attaching it to the cover; it may be held in its place without solder, and when attached and in use will always occupy an upright position, thereby keeping comparatively cool when applied as a handle to a stove or other pot cover.

A street lamp has been patented by Mr. George Schuette, of Manitowoc, Wis. The invention covers an elevator contrivance within a hollow lamp post for suspending an oil lamp, and arrangement for lowering the lamp to an opening in the side of the post for filling and trimming the lamp without climbing, all contrived for great convenience in the care taking, for protection from snow and ice, and from wanton abuse.

A two wheeled vehicle has been patented by Messrs. Ruben F. Taliaferro and Edward P. Mitchell, of Hueneme, Cal. Spring holders, clipped or otherwise, are secured upon the axle, and to these holders, at their rear ends, are pivoted the inner ends of bars secured to the under side of the shafts and extending backward beneath the axle, with other novel features, for so attaching the shafts that they can be raised or lowered, and the axle with the springs kept plumb.

A fire escape has been patented by Mr. Lewis B. McDonald, of Little Rock, Ark. This invention combines, with a bifurcated L-shaped rod pivoted to the floor and window sill, a rope pulley or drum pivoted between and in the prongs of the rod, with other special features, to enable the safe descent of a person escaping from a burning building, and to cause the automatic recoiling of the rope to permit the descent of another person.

A damper has been patented by Messrs. David Manuel, of Hyde Park, and George H. Burrows, of Boston, Mass. This invention covers two disks, flat at their central portion and concavo-convex at their outer portions, with openings through the outer portions, so an annular chamber can be formed between them, and the openings will alternate with each other, so that the ascending air and products of combustion may be sufficiently retarded to insure perfect combustion.

A water closet valve has been patented by Mr. Hermann C. Apel, of Milwaukee, Wis. Combined with a piston working in a cylinder and forming a valve is a lever for pressing down the piston, and an inlet for admitting water into the bottom of the cylinder to raise the piston valve, which is fitted in an inner cylinder with its seat depending in an outer cylinder, the seat being slightly elevated above the upper end of the inner cylinder, with other novel features.

An axle box and skein has been patented by Messrs. Lawrence Bimel and William Bimel, of St. Mary's, O. This invention relates to thimble skeins employed in connection with wooden axles of wagons and other vehicles, insuring the continuous oiling of the axle for a long time, and permitting of the ready application of a fresh supply of oil without removing the wheel from the axle, the bearing of the axle being protected at both ends from sand and mud, so that it will run with the minimum of wear.

A boot or shoe ventilator has been patented by Mr. Adoniram J. Trask, of Nobleborough, Me. A flexible bulb in a cavity at the heel is combined with an insole which has an aperture above and in line with the bulb, whereby the latter communicates by a tube with the inside of the boot or shoe, and by a second tube with the external air, the tubes having valves, so the bulb is alternately compressed and expanded, and air is forced into the shoe by the action of walking.

A steam radiator forms the subject of two patents issued to Messrs. Juan B. Arci and John Chapman, of Brooklyn, N. Y. These inventions relate to radiators where circulating pipes are used, communicating at their ends with upper and lower chambers, and embrace such construction of the chambers and tubes that the latter are adapted to reach through the chambers, to receive nuts or caps at their outer ends, and so the tubes and chambers may be joined together, forming the radiator complete without any extra fitting of the parts.

NEW BOOKS AND PUBLICATIONS.

PICTURESQUE CALIFORNIA HOMES. S. & J. O. Hewson, architects, San Francisco, Cal.

This is a series of some forty folio plates representing both the elevation and plans of dwelling houses erected on the Pacific coast, costing from $700 to $15,000. Not only the dimensions of the different houses are given, but the size of each room, hall, and closet, and also detail drawings of the ornamental woodwork specified in the agreement. Forms of builder's contract, with full specifications, covering all work from the foundation walls to the speaking tubes, electric bells, and gas fittings, accompany the plates. To persons about to build in the country, this series of plates will be found useful.

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) L. C. L.—Turtles are shipped from Cuba and Florida to New York by steamers. Will stand a voyage of a week or ten days. Require no attendance. Tie the flippers together, and lay on their backs. They are sent by rail in the same manner. Oysters are shipped from New York to Europe, and to all the neighboring States, by rail and boat. If for a short trip, say of less than two days, can be shoveled into perforated barrels and closed with bagging or in boxes with bagging for cover. If for distant places, pack them belly down and cover as above, which insures proper handling.

(2) R. K. T. writes: I would like to put reading matter on one side of a knife blade so it will not rub off. Could it be done with a rubber stamp, using an acid for ink? I am now making the blades of hot rolled steel, but would use cold rolled with a bright finish if the letters could be put on that finish to stay. A. Mark the blade with a rubber stamp and ink made by rubbing into a paste with a muller and stone, flower sulphur with linseed oil and a little vermilion for color. Make it as thick as printer's ink. Stamp the blades, and lay aside to dry. When the stamp wears off, the blade will be found marked by the sulphur.

(3) S. B. G.—Small toy balloons for use without gas are usually made of tissue paper with paste. The cutting of the shapes is an easy matter, which you should be able to study out yourself. Fire is the usual means for inflating with hot air. A hoop of fine wire at the mouth of the balloon to keep it from collapsing, with a small piece of sponge tied within the hoop with fine wire, is all that is required until ready for use; then saturate the sponge with a little alcohol or a mixture of alcohol and resin, and set it on fire; at the same time the balloon must be held up and spread out, so as not to take fire. A little practice will enable you to accomplish this.

(4) P. J. C. writes: A floor for a skating rink was deadened by a mixture of lime, earth, and saw dust, in the proportion of 1, 1, and 6, respectively. About one-sixth of it was covered by the first layer of the floor, and the mixture under this had lain over night before being put in place. The remainder was put in as fast as it was mixed. The night after it was put in, the building burned down. Granting that one-quarter of the lime was not slaked, could it have set fire to the building? A. You fail to tell us whether the lime, earth, and saw dust was mixed with water. If the lime was slaked by wetting with water, and then mixed with the other materials, there is no reason to believe that the fire was caused by the slaking of the lime. If, on the contrary, the lime was mixed with the other materials dry, and any of the mass left in a heap or even spread between flooring, spontaneous combustion might result from the air-slaking of the lime in contact with saw dust. Damp saw dust alone in a mass of no more than a cubic foot is liable to spontaneous combustion. We have experienced this phenomenon in a drawer of saw dust use for drying jewelry after washing.

(5) S. E. S.—Your description will answer for a boiler to carry 60 pounds steam. Should be tested with 125 pounds pressure. Steam has been used at 500 pounds pressure in an engine, and 1,000 pounds pressure in a steam gun. Such high pressures are generally impracticable. The steam is too hot for packings and lubrication.

(6) N. L. S.—Do you know of a wet process for the development of solar prints? A. The print is exposed in the solar camera until it assumes a lilac hue, which will be a few minutes at most. The image at this time will be just visible. The paper is now taken out and immersed in the following developing bath devised by Carey Lea:

Gallic acid	6 grs.
Acetate of lead	3 grs.
Rain water	40 oz.

which is prepared as follows: Dissolve a drachm of gallic acid in four drachms of alcohol, and a drachm of acetate of lead in 12½ ounces of water. Take a drachm of the alcohol solution and 12½ drachms of the solution of acetate; add these to 100 ounces of water, and then drop in just enough glacial acetic acid to redissolve the slight precipitate of acetate of lead that falls. Several prints may be immersed in the bath at a time. Five or six minutes is required for development, which occurs in the dark room, and it must be stopped when prints appear perfect. Overprinting is not necessary, as the fixing bath improves the detail. After washing, the prints are immersed in a hypo bath.

Water	20 oz.
Hyposulphite soda	6 oz.

Four minutes is sufficient for fixing; the prints are then thoroughly washed in running water; their color is reddish, but on drying changes to a beautiful deep brown.

(7) L. W. S. & S.—The liquid in hand grenades for extinguishing fires consists of sodium chloride, ammonium chloride, and hydrochloric acid dissolved in water, with the addition of potassium carbonate and subsequently sodium bicarbonate, and last of all a little free crystallized tartaric acid is added. The object of such a mixture is the generation of carbonic acid at the time of the fire, so that if you can arrange to have a solution of some carbonates, sodium or potassium, so placed that in the event of fire a free acid of some character can be brought in contact with the liquid, thereby generating the carbonic acid gas, your purpose will be accomplished.

(8) C. H. writes: I wish to know the proportions and manner of mixing lard and creamery butter to make "butterine" (not oleo). I wish to make some for experiment. A. We understand the manufacture of butterine to be similar to that of oleomargarine, and therefore refer you to illustrated articles on this subject in Nos. 48 and 49 of the SCIENTIFIC AMERICAN SUPPLEMENT. 2. Can the iron parts of furnace registers be japanned and dried enough in a common stove oven so as not to smell a long time after putting in their place in the house floor? A. The heat required for japanning is not very great. A common black japan may be made by painting a piece of work with drying oil and putting the work into a stove not too hot, but of such a degree as will change the oil black without burning it, gradually raising the heat to about 350° Fah., and keeping it up for a long time. This process requires no polishing.

(9) M. E. and H. G.—The best practice for laying up a boiler for winter is to thoroughly clean it outside and inside, by taking out all mud and scale; then fill up the boiler, and put from one-half to 1 gallon kerosene oil inside. Get up 10 or 15 pounds steam, draw the fires, and, if a locomotive or upright, blow out the entire contents. If set in brick, wait until the brick work cools enough to do no damage. Clean the flues and scrape all soot and ashes from the shell and smoke box, close every opening to boiler, and shut damper. To keep an engine that is idle, thoroughly oil with mixture of oil and tallow.

(10) G. K. G. asks for a recipe for genuine Haarlem oil. A. Take of

Balsam of sulphur	3 pints.
Barbados petroleum	1 "
Oil of amber (crude)	1½ "
Linseed oil	4 "
Oil of turpentine	8 "

Mix.

(11) J. M. F. wants to get a formula for making a cheap baking powder. A. Take of

Tartaric acid	15 oz.
Sodium bicarbonate	16 "
Starch	16 "
Ammonium carbonate	2 "

Powder the articles separately (with the exception of ammon. carb.) and dry each thoroughly, then rub through a fine sieve until a uniform mixture is obtained, the ammonium carb. being reduced to a fine powder immediately before adding. The ammonium may also be left out, but its use favors the production of a finer and whiter bread than can be obtained without it.

(12) H. M. U. asks: How can sheets of iron and steel in a red hot condition be rolled together and not stick? What is the powder or liquid that will prevent adhesion? A. Use powdered plumbago.

(13) News asks us to publish some good recipe for making liquid glue. A. Ordinary glue 5 pounds is dissolved in water, contained in a vessel which may be heated by means of a water bath, care being taken to stir from time to time. When all the glue is melted, 1 pound of commercial nitric acid is gradually added in small quantities. This addition creates an effervescence and a disengagement of red nitrous fumes. When all the acid has been passed in, the vessel is withdrawn from the fire, and the contents left to cool. This glue may be kept for a long time even in uncorked vessels.

(14) C. G. C.—Your ring should first be coated with graphite for copper plating. Shellac would appear to be the proper article to make your wood floor adhere together, but we do not believe you can form it into any composition in which the wood will not be burnt out at 1,000° of heat.

(15) D. L. R. D. writes: I have broken the amber stem of a pipe that I value on account of its associations, and would rather repair it than replace it by a new piece if possible. Will you kindly let me know the receipt for a cement that will stand the heat, if there is one? A. Smear the parts which are to be united with linseed oil, hold the oiled part carefully over a small charcoal fire, a hot cinder, or a gaslight, being careful to cover up all the rest of the object loosely with paper; when the oiled parts have begun to feel the heat, so as to be sticky, punch or press them together, and hold them so until nearly cold; only that part where the edges are to be united must be warmed, and even that with care, lest the form or polish of the other parts should be disturbed; the part joined generally requires a little repolishing.

(16) T. H. L.—Perhaps the following will answer for the cement you want: Guttapercha, 1 pound; India rubber, 4 ounces; pitch, 2 ounces; shellac, 1 ounce; linseed oil, 2 ounces; melted together. This cement hardens on keeping, and needs remelting before application.

(17) W. E. A.—Irrigation has become a saving means to prosperity in many parts of the Pacific coast. We recommend you by all means to make your location a study as to the ways and means for irrigation. Building dams or embankments, cutting canals and ditches, anything to hold the water back, and at last to pump water with wind mills. We cannot give specific details of what you should do in your particular case, from want of exact knowledge of the lay of the land and the facilities at hand for constructing the most economical works, but we recommend you to examine the irrigating works in your neighborhood, and also consult with an engineer making this branch a specialty.

(18) J. S. C. asks: How can a gun barrel be blued—not browned? A. Polish the barrel; heat it in a tray, or box of sand, so that it may be heated its entire length evenly. When the blue comes, cool it in water. 2. Is a breech loading rifle using a cartridge with paper patched ball as accurate, on general principles, as a muzzle loader with cloth patched ball? A. Yes; more so.

(19) S. B. H.—There is nothing that you can add to lamp oil to make it less explosive. The explosive qualities of the oil are due to the volatile products of the petroleum. These can be distilled off. The best plan is to buy a higher grade oil.

(20) T. H. writes: Do you consider paraffine a good antidote to prevent the disintegration of building stones in this climate, or do you know of any better? A. The corrosive gases contained in city air attack the building stones, many of which are of inferior quality, especially the sandstones, as brown stone. Coating them with paraffine prevents all access of the air to the stone, and therefore arrests any corrosive action. The subject of the preservation of building stones is a new one, and at present it is not easy to say what is the best preventive. Our buildings are not made to last, or else they would be constructed from better material.

(21) H. S. H.—We are now beginning the 1885th year of the Christian era. In regard to the exact date of the birth of Christ, the best church historians agree in placing that event in the year 4 B.C.

(22) W. B. G. asks: 1. What is the chief cause of Asiatic cholera? A. The present theory in regard to the cholera is that it is caused by a germ. It is therefore a zymotic epidemic. 2. What preventive can be used? A. Quarantine and sanitary precautions are the best preventives. 3. What remedy can be used? A. There are various medicines known as cholera mixtures. The so-called Sun cholera mixture consists of equal parts tincture of Cayenne, tincture of opium, tincture of rhubarb, essence of peppermint, and spirits of camphor; mix well. Dose, 15 to 30 drops in a wineglass of water. 4. Is it confined to any particular climate? A. It is generally confined to the warmer climates, including the temperate zones during summer. 5. Does it reach the lower class more easily than the higher? A. Owing to the lack of suitable sanitary conditions, the lower classes are generally attacked sooner than the higher. See articles on cholera on page 88 and page 89 of SCIENTIFIC AMERICAN for August 9, 1884.

(23) C. E. R.—An approximate method of estimating the contents of a cask is by determining the bung diameter and also the end diameter, adding them together and dividing by two, and then applying the rule of the cylinder, which is as follows: Square the radius, which will be the factor obtained (that is, the average diameter of the cask), and multiply by 3·14159 (or approximately 3⅐); this gives the area, which then multiply by the length of the cylinder, and the result will be the cubical contents of the cask.

(24) W. F. T.—For paste shoe blacking mix one part of ivory black, ½ treacle, ¼ sweet oil, then add ¼ oil of vitriol and ⅛ hydrochloric acid. Dilute each ingredient with three times its weight of water before mixing. For liquid polish take 2 lb. of ivory black in fine powder, treacle 1½ pounds, ¾ pint of sperm oil. Rub the black well together, add the treacle, and mix. Another recipe is 4 ounces of ivory black, 3 ounces coarse sugar, a tablespoonful of sweet oil, and 1 pint weak beer. Mix them gradually together until cold.

(25) A. W. L. asks: How many cubic feet of air gas is made in winter from one gallon of 88° and 90° gasoline, in a Springfield gas machine, and how many cubic feet of ordinary city coal gas would it take to give the same amount of light as this one gallon of gasoline gives? A. Professor A. A. Hays, in his report on the Springfield gas machine, gives the following: The richest gas at 60° requires 6 to 7 ounces of gasoline for the production of a hundred cubic feet; this is about seven-tenths of a gallon, and seven-tenths of the price of one gallon of gasoline will be the cost of the material for 100 cubic feet of such gas. In quality it generally burns with an intensity equal to an 18 candle city gas. In comparison with city gas, the value of the latter depends entirely upon its intensity, an element which varies according to several circumstances.

(26) H. B. L. asks how to extract coloring matter (lampblack) from grease? A. By melting the grease, and then filtering it through cloth or paper. It will probably be necessary to use a hot water filter to prevent its solidifying during filtration.

(27) C. S.—Gas is not literally in coal, but the coal is almost solidified gas; that is to say, the distillation of coal yields gas.

(28) W. O. C. asks: 1. What do you recommend for softening and whitening the hands? A. Use a solution of one part glycerine in seventeen parts distilled water. 2. Also for removing warts and moles? A. Warts may be removed by the application of lunar caustic, nitric acid, or aromatic vinegar. Croton oil, under the form of pomade or ointment, and tartar emetic, under the form of plaster or paste, have been successfully employed in the removal of moles, etc. Such operations should only be performed under the direction of a physician or some one competent to direct their application.

(29) A. L. T. asks: Is there any composition used in ornamenting picture frames better than equal parts of glue, whiting, and linseed oil? A. The following might be better for some purposes: Mix 14 lb. of glue, 7 lb. resin, ½ lb. pitch, 2½ pints linseed oil, 5 pints of water, more or less according to the quantity required. Boil the whole together, stirring well until dissolved; add as much whiting as will render it of a hard consistency, then press it into mould, which has previously been oiled with sweet oil.

(30) F. H. asks: 1. What is acetate of soda? 1. Sodium acetate is a salt consisting of soda and acetic acid, the acid of vinegar. 2. What is the common name? A. It has no common name. 3. By using it as a heater, is it put dry in the holder? If not, what else, and the proportion of each? A. In using it as a heater, sufficient water is added to dissolve it at a boiling heat, then as it solidifies it gives off a great amount of heat. 4. Will it not eat through tinned iron (common tin)? A. It is not specially considered as a corrosive compound. 5. Should it be partially filled, and how far filled? A. It is safe to fill the vessel two-thirds full. 6. Must it be hermetically sealed? A. It should be hermetically sealed. 7. Will frost hurt it or burst the holder, like water? A. Frost does not affect it. 8. Is it poisonous or dangerous to handle? A. No. 9. Where can it be got the cheapest, besides drug stores? A. From the wholesale jobbers. 10. What should be the price about by 25 or 50 lb.? A. It is quoted at from 40 cts. to 45 cts. per lb. In the quantities you mention, it is probably slightly cheaper.

(31) H. G. A. asks how to prepare academy board and canvas for painting. A. The various earths and metallic oxides tempered with the most tenacious drying oils are laid evenly over the cloth, which first, however, must be coated with size. In order to preserve the elasticity of the ground, some drying oil is generally mixed with the glue or size with which the canvas is prepared. For the same purpose beeswax, sugar, treacle, albumen, etc., have been added with various degrees of success. It is said that Titian used beeswax dissolved in oil.

(32) W. D. R. asks: 1. How to polish wood to get a good polish? A. The polishing of wood varies according to its hardness. Woods such as mahogany may be readily polished by rubbing over with linseed oil and then against a cloth dipped in fine brick dust. 2. How to polish stone such as granite, etc.? A. The polishing of stone is usually performed by rubbing the desired specimen with a piece of very fine sandstone (in the case of granite, something harder is used), rubbing backward and forward, using very fine sand and water until the slab appears equally rough and not in scratches; next use a finer stone and finer sand, then rub until smooth with fine emery powder and a piece of felt. Finish with putty powder and clean rags.

(33) W. R. T. desires to know the composition of purple colored copying leads or pencils, and also of ordinary colored writing pencils? A. Faber makes four grades as follows:

	No. 1. Very soft.	No. 2. Soft.	No. 3. Hard.	No. 4. Very hard.
Aniline	50 parts.	46 parts.	30 parts.	25 parts.
Graphite	37·5 "	34 "	30 "	25 "
Kaolin	12·5 "	24 "	40 "	50 "

For purple an aniline violet is used. For other colors various shades of aniline can be used. The cheaper qualities of colored pencils consist simply of the coloring material mixed with kaolin or clay. Receipts for colored pencils are given on page 2949 of SCIENTIFIC AMERICAN SUPPLEMENT, No. 185.

(34) H. B. asks if it is necessary to use the water bath, or the kettle to be surrounded by water, in the distillation of cider, illustrated in SUPPLEMENT, No. 110? A. The use of the water bath is to prevent the temperature from increasing above 212 degrees. The same effect can be produced by using a lower temperature, and also by interposing a tin plate containing sand between the flame and the still. 2. After the cider is boiled once, should the distillate be boiled again before it is brandy? A. That depends upon its strength. If of proper strength, a second boiling can be dispensed with. 3. Could an oil stove be used to good advantage? A. The source of the heat is immaterial as long as you get it, be it from coal, oil, or gas. 4. Where there is no hydrant, how or what convenient way could be arranged for the water that is used for the condenser? A. Use any convenient reservoir of water, for instance, a pailful placed above the condenser, and of course connected with it by a rubber tube. 5. For the kettle that is called the water bath, should the rim be soldered or riveted? Could any iron kettle be used for the copper bath to set into, or should it be made of copper the same as the other? A. The variety of vessel to be used as a water bath is of no consequence, a tin pan will answer. If your still is small enough; an ordinary tin tomato can will answer for water bath.

(35) W. M. R. asks what cement to use in putting together a slate trough that will withstand cyanide of potassium, or if put together with plaster of Paris, what to use over that to make it proof? A. Coat the plaster of Paris with a good asphalt varnish; this allowed to dry thoroughly should be perfectly satisfactory.

(36) G. B. S. desires a receipt for mixing fresco paint? A. The pigments used in fresco painting are generally mineral or vitreous, finely ground, and applied with pure water. They are absorbed by the plaster, which must be in a moist condition.

(37) C. A. B. asks how to make batteries, such as sold by druggists, and worn on a silk cord around the neck? A. These batteries generally consist of plates of zinc and copper. They generate a slight current of electricity.

(38) S. McI.—Mercury will keep in iron vessels without injury to itself or the iron. The iron expands a little less than the mercury, but you could not observe the amount of expansion in a half inch tube from a ball of three inch diameter, of iron, for a change of 150 degrees in the temperature, although the difference would be enough to burst the ball if closed full of mercury. The heat required to raise steam to 1,000 pounds pressure would decompose or destroy wood fiber. Steam cannot be raised to 1,000 pounds pressure at 300 degrees temperature. The act of compression raises the temperature to its normal point. If cooled below this point, the pressure falls with the temperature.

(39) W. S. C.—Oak saw dust will not injure the boiler, but might give some trouble by getting into the water gauge and gauge cocks, or by foaming over to the cylinder. If you have oak saw dust, you may also have oak bark, which is still better. By soaking the bark in hot water and pumping the solution of tannin into the boiler, with a little soda, you will have what is sold in the market for a first class boiler cleaner. A pailful of bark extract and one pound of soda is enough for a dose once in one or two weeks, and perhaps only one a month, according to the quality of water that you use in the boiler. Blow off a little from your boiler every day, and examine the interior once in one, two, or three months, as your experience may suggest.

(40) E. M. B.—All of the explosives may be confined to the chamber in which they are exploded, *provided* the chamber is strong enough. A chamber that will withstand 40,000 lb. pressure to the square in. will do for most kinds of gunpowder. If the chamber is larger than the bulk of the charge, there will be less pressure, in the ratio of the size of the cavity to the bulk of the charge. Gunpowder engines have been invented and patented, but are a total failure in practice.

(41) E. W. G.—Various expedients are used for deadening the sound in public hall floors, such as the ordinary deafening of loose boards let in between the joists resting on wall strips nailed on the side of the beams, and plastered from 2 to 3 inches thick. Then lay a common board floor upon the beams. Upon this lay the ordinary roofing felt, and upon the felt the matched flooring. Another way is to put in two sets of beams, one for the floor and one for the ceiling—every other beam projecting several inches above, so as to allow of the ordinary plaster deafening to be attached to the floor beams only. This will allow the ceiling beams to be free from vibration.

(42) G. M. S.—The belting of an engine to a main shaft is considered a great convenience to save the high speed otherwise required of the engine. The friction is of less value than the convenience. But where it is convenient to connect to a main shaft by coupling, where the shaft is to run no faster than the proper speed of the engine, you may save 5 per cent of the power. We know of nothing better than lacing or hooks for ordinary sized belts. Very wide and thick belts are sometimes glued and riveted, but require tightening pulleys. Rubber belting under the same circumstances may be connected with rubber cement, and riveted.

(43) C. N. asks if there is an acid for testing butter and oleomargarine, and what are the results. A. There is no very simple and complete test. One proposed by Hager is as follows: A bit of wick is inserted into melted butter, lighted, and then blown out. If the butter is pure, there is little odor; but if artificial, a tallow-like smell is perceived. The general method however is by microscopical examination or by qualitative tests of the fatty acids.

(44) H. F. K. writes: I have made soap 1 part potash, 4 of grease, and would like to know how to harden it for use? A. The soda soaps are generally harder than those made with potash. For every 100 pounds of the fat, use one-eighth of caustic soda; and one-third to one-fourth of the fat can be substituted with advantage by rosin. This will harden the soap.

(45) G. W. W. writes: I have some books I want to letter with gold. Would you be kind enough to tell me how to go about it, and what kind of size is used? A. The leather or cloth is sized with albumen, and gold leaf laid on with small portion of boiled linseed oil. The lettering being fastened in an embossing press and heated, is brought with sufficient pressure on the cover to make the gold leaf adhere. The surplus gold being brushed off, leaves the impression of the die.

(46) J. H. Z. asks a recipe for a transparent paste, to paste pictures on glass. A. Gum tragacanth is much used for such purpose. A colorless cement can also be prepared by dissolving 75 parts India rubber in 60 parts chloroform, and add to the solution 15 parts of gum mastic.

(47) W. H. H. writes: In relation to the locomotive: 1. Would it not be more economical to condense the exhaust, and create an artificial blast by means of a blower? A. No. Where would you get water for condensing? 2. Where can I find a description of the most approved condenser? A. Any book on low pressure engines.

(48) F. E. W.—It is claimed that Trevithick made the first successful locomotive which was placed in actual service, in 1803, in England. The first railroad in the United States was built in 1829. The 20th day of December, 1867, was Friday.

(49) H. E. D.—A can filled with air and the vapor of gasoline is liable to explode by contact with fire or a light. It will not explode spontaneously nor by the mere heat of a hot day.

(50) V. C.—Coal tar is a good preservative for wood of any kind, and contains the antiseptic principle of creosote. If applied hot by dipping the ends of the posts in a kettle of hot tar, you will accomplish all that may be desired. The creosote costs more, and both can generally be obtained where there are gas works.

(51) D. H. E.—The great trouble with cams in stamp mills arises from bad construction, in allowing the shape of the cam to cause a concussion with the stamp catch. The point of the cam should not strike, but some part of the curve nearer the shaft should first lift the stamp. Much also depends upon the relative position of the shaft and stamp bar. A true spiral from a center is considered the best.

(52) N. A. W. asks the exact number of English feet in a nautical mile, and how it is figured. A. 6086·44 feet according to some authors, and 6085·889568 according to some other authors. A nautical mile is one-sixtieth of a degree on the equator, and is obtained by dividing the earth's circumference by 360° and then dividing the dividend so obtained by 60.

(53) A. S. G. asks a receipt for preserving the hair, and prevent it from falling out. A. The following is frequently used for strengthening the hair:

Castor oil	½ pint.
Alcohol 95 per cent	½ "
Tincture cantharides	½ oz.
Oil of bergamot	2 drachms.

Color a pale pink with alkanet root. Tincture of cantharides and glycerine mixed together is a more active compound, and is frequently used to prevent baldness.

(54) L.—A good black varnish for leather belts may be made with boiled linseed oil, litharge, and lampblack. A spirit varnish may be made with shellac varnish and lampblack.

(55) J. O. S. asks for a corn remedy. A. Corn cure. Take of—

Salicylic acid	gr. xxx.
Ext. cannabis indic	gr. x.
Collodion	℥ ss. M.

2. A remedy for squeaky shoes. A. There is no satisfactory cure for a squeaky shoe. It will sometimes cure itself, from getting wet, or as it gets older and the parts better set together. The squeak generally comes from the inner sole not fitting well in its place, but may also come from the shank piece, or counter, or other parts.

(56) A. P. F. asks how opodeldoc soap is made. A. White Castile soap, cut small, 2 pounds; camphor, 5 ounces; oil of rosemary, 1 ounce; oil of origanum, 2 ounces; rectified spirit, 1 gallon; dissolve in a corked bottle by the heat of a water bath: and when considerably cool, strain, then add aqua ammonia 11 ounces; immediately put it in bottles, cork close, and tie over with bladder. It will be very fine, solid, and transparent, when cold.

(57) W. J. H. asks how to prepare the various articles for the gelatine pad, and if it is really necessary to use kaolin. A. First dissolve the glue in water, heat it, add then the glycerine. Leave the kaolin out if you prefer, or use finely powdered barium sulphate instead. 2. Also a recipe for making the purple ink used on the gelatine pad. A. Dissolve 1 part aniline blue violet in a mixture of 7 parts water and 1 part alcohol.

(58) S. P. B—Frictional electricity is frequently generated in the process of buffing. It is more common in cold clear weather than in warm damp weather. Common glue is not a very good conductor; when perfectly dry, it is a fair insulator. To line nickel plating baths, melt together 1 part pitch, 1 part resin, and 1 part plaster of Paris, perfectly dry. A good asphalt varnish, if allowed to dry properly and completely, will also stand.

(59) J. L. G. asks if there is anything that will take off the hulls in making hulls. I am using Babbitt's concentrated lye, but before the hulls come it is liable to burn. A. Your experience shows the impossibility of using too concentrated a lye. It will not injure the corn to soak it in lye, provided too strong an article is not used, but the alkali must then be removed by repeated washings, using, if necessary, a little acid; hydrochloric would answer.

(60) L. D. V. L. asks how to prepare a green coloring for ice cream. A. Green ice cream is made with pistachio nuts. These closely resemble almonds, but are sweeter, and form a green emulsion with water. The cook books will give you the proportions to use.

(61) S. D. G. asks by what process it is that by the use of sulphuric acid potatoes are hardened so they can be used for pipes. A. Boiled (dry) potato mixed with zinc chloride and barytes has been used to form an imitation alabaster. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 313.

(62) J. J. K. asks: 1. Which is the most economical in feeding a boiler—the steam pump, the power pump, or an inspirator or injector, and why? A. A power pump with a heater is cheaper than a pump alone, but not always the most desirable, on account of the occasional necessity of feeding the boiler when the machinery is not running. The injector in connection with a heater is claimed to be the most economical, because it returns all of the heat used as power to the boiler. 2. What change is produced in hardening steel, that is, in molecular arrangement? A. This is too large a subject for discussion here. You will find interesting articles on the theory of hardening steel in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 397, 375, 223, 224. 3. Is there any economy in heating the feed water when using an inspirator? A. Yes. Every degree of heat gained is economy.

(63) A. G.—We have no knowledge of paper floors for skating rinks, and believe that floors of that material, to be serviceable, would cost very high. We do not suppose there is anything better for skating rink floors than hard wood, preferably maple, well seasoned, narrow and thick strips, tightly driven together, carefully planed, and then waxed or oiled.

(64) W. W. P.—As the running parts of locomotives are balanced, and with nothing but gravity to hold them to the track, there is consequently no more pressure downward whether running or standing. The absolute traction or pull on the track is more when starting and moving slowly than when under full speed.

(65) W. H. P.—We have no knowledge of any water pitchers or urns for cooling water separate from the ice; but coils of block tin pipe placed in ice boxes, drawing water from the regular supply through the coil, are in common use. A refrigerator with a separate ice and water chamber is a subject of patent, and on the market. Any of our silversmiths would no doubt undertake to make the device in the form of pitcher or urn.

(66) F. L. B. asks: With 80 pounds pressure, 100 revolutions, and 200 horse power known, how many revolutions will 60 pounds, steam developing 135 horse power, give? A. Our computation gives 67½ revolutions, due to the other conditions you name. This is rather a crude way of deciding the fact as to whether a mill had been run to its full capacity. What speed the mill should run and what it did run should be matters of fact derived from observation.

(67) M. G. K.—The three largest equal circles that can be described in a square containing 160 acres will have a diameter of 1366·6 feet, according to our computation. A diagram and formula is too complex for Notes and Queries. Human fat resembles beef tallow. Kerosene does not pass through metal or glass, but crawls over the top by capillary attraction, and will thus accumulate on the outside of vessels so as to run down.

(68) W. A. E. asks what the preparation is made of that is put on canvas so it can be used just the same as a blackboard. A. 1 gallon 95 per cent alcohol, 1 pound shellac, 8 ounces best ivory black, 5 ounces finest flour emery, 4 ounces ultramarine blue. Make a perfect solution of the shellac in the alcohol before adding the other articles. To apply the slating, have the surface smooth and perfectly free from grease; well shake the bottle containing the preparation, and pour out a small quantity only into the dish, and apply it with a new flat varnish brush as rapidly as possible. Keep the bottle well corked, and shake it up each time before pouring out the liquid.

(69) H. W. F. says: I have had the pleasure of reading your valuable paper for the last fifteen years, and knowing your willingness to give your subscribers information, I take the liberty of asking you for the dimensions of the Washington monument that is now being completed. A. The dimensions of the Washington monument are:

Height of obelisk	500	feet.
" " pyramid top	55	"
" " total	555	"
Base, outside	50	ft. sq.
" inside	25	" "
Outside of obelisk at 500 feet is	36½ ft.	"
Inside at 150 feet is	31½	" "
Original foundation	80	" "
Sub or added foundation	146½	" "

(70) G. H. W. asks how to make a preparation that will be harmless in bleaching the human skin. A. In a general way, we should recommend that hydrogen peroxide be experimented with. A description of it and its uses will be found in SCIENTIFIC AMERICAN SUPPLEMENT, No. 339. There can be no directions given which will answer every case.

(71) M. N. B. desires an ink with which more than one copy can be obtained. A. Mix about 10 parts of jet black writing ink and 1 part of glycerine. This, if used on glazed paper, will not dry for hours, and will yield two fair, neat, dry copies by simple pressure of the hand in any good letter copy book. The writing should not be excessively fine nor the strokes uneven or heavy. To prevent setting off the leaves after copying, should be removed by blotting paper. By changing the quantity of glycerine you can get an ink which will give several copies.

(72) J. A. M.—There is no such thing as "agricultural ammonia" as distinguished from ordinary ammonia, composed of one volume of nitrogen and three of hydrogen, which condense to two volumes on combination. It is not used in agriculture except in nitrogenous manures, such as guano, fish manures, flesh, etc., and in stable manure. A teaspoonful in a quart or more of water is often used as a fertilizer for pot plants. It is also used, but not so extensively, in the salts, sulphate, and chloride of ammonia; but owing to the solubility of these salts, they are very liable to be washed out in drainage water if not promptly taken up by the plants. They should, when used, be applied as a top dressing in spring. Nitrogen is, more profitably, supplied in nitrates.

(73) H. J. D. asks (1) for a receipt for making mead. A. Mead wine consists of honey, 20 pounds; cider, 12 gallons; ferment, then add rum, ½ gallon; brandy, ½ gallon; red or white tartar dissolved, 6 ounces; bitter almonds and cloves, of each, ¼ ounce. Then cleared and bottled. 2. Also one to make a good drinking bitters to give one an appetite. A. For bitters grind to a coarse powder ½ pound cardamom seeds, ⅛ pound nutmegs, ¾ pound grains of paradise, ½ pound cinnamon, ¼ pound cloves, ¼ pound ginger, ¼ pound galanga, ¼ pound orange peel, ⅛ pound lemon peel; then macerate with 4¾ gallons 95 per cent alcohol, and add a sirup made of 4½ gallons water and 12 pounds sugar; then filter.

(74) B. R. T. asks: 1. What is used to form plumbago into a paste for stove blacking so that it needs no other preparation? A. Plumbago pulverized, 1 pound; turpentine, 1 gill; water, 1 gallon; sugar, 1 ounce, constitutes the liquid black lead polish. 2. What is the best for boots and shoes to keep snow water out, and make them pliable and not injure the leather? A. Beef tallow, 4 ounces; resin, 1 ounce; beeswax, 1 ounce; melt together. Add when cold a quantity of neatsfoot oil equal to the mass. Apply with a rag, warming the boots, and rub in well with the hand.

(75) E. A. M. writes: I have a boat 36 feet long, 8 feet beam, with flat bottom and round sides and pointed bow; draws 1 foot of water without load, aside from keel. Now, is it possible to run this boat against a current running at the rate of 7 miles an hour with 30 inch screw, 4 blades, and driven by 4 horse power engine? And how far from end of boat should the wheel sit to get the best results? A. Very doubtful whether you can make headway against a seven mile current, unless the boat is of the best model. The screw should be placed close under the stern, and entirely submerged.

(76) C. W. M. asks: 1. How can I bleach shellac? I want to make a varnish as near transparent as possible. A. Dissolve the lac in a boiling lye of pearl ash or potassium hydroxide (caustic potash), filter it, and pass chlorine through the solution until all the lac is precipitated. Collect the precipitate; wash well in hot water, and finally twist into sticks and throw them into cold water to harden. 2. How can I mix the aniline dyes, either soluble in water or alcohol, with an oil varnish? A. Use aniline dyes soluble in alcohol; and having made an alcoholic solution of them, they should readily mix with any varnish.

(77) T. P. L. asks how and what the laundries use to stiffen collars, cuffs, etc. A. Melt 2½ pounds of the very best paraffine wax over a slow fire. When liquefied, remove from the fire, and stir in 100 drops oil of citronella. Have a number of round new pie tins, clean and nice; place them on a level table and coat them slightly with sweet oil, and pour about 6 tablespoonfuls of the mixture into each tin. The pan may be floated in water to cool the contents sufficiently to permit the mixture to be cut or stamped out with a tin cutter into small cakes about the size of a peppermint lozenge. Two of these cakes added to each pint of starch will cause the smoothing iron to impart the finest possible finish to muslin or linen, besides perfuming the clothes in first class style.

(78) V. C. T. writes: I am troubled with dandruff in my whiskers, and am rapidly losing them; have tried tonics, washings, oil, without any success. Can you recommend anything? A. A serviceable application is two drachms of borax dissolved in a pint of camphor water, washing with this lotion once or twice a week; or much benefit may also be derived by washing with tepid water, agitated with a piece of quillar bark until a strong lather is produced; or with water containing salt of tartar in the proportion of two drachms of the salt to a pint of tepid water. See also Dr. J. V. Shoemaker's paper on "The Hair, its Use and its Care," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 388.

(79) H. C. asks: 1. Will a continuous coil boiler containing 75 feet of 1¼ inch pipe, heated by a blast spraying kerosene oil, generate sufficient steam at 100 pounds pressure to run a 2 inch by 3 inch engine at 500 revolutions per minute? If not, how many feet of pipe will it require? A. You have enough fire surface, but your boilers are not arranged for the greatest effect. If you could divide your pipe so as to make a shorter circulation, with two or more sections, you would have a better effect. It will require double the amount of pipe for the work required. 2. Which is better—to feed coil from the bottom, keeping it half full of water, or to feed from the top, allowing all the water to evaporate into steam? A. Feed at bottom. 3. Will steam, at the temperature consequent to 150 pounds per square inch pressure, injure Babbitt metal valves and fittings? A. Babbitt metal is too soft or tender for valves or fittings. Better use the regular trade stock for such work.

(80) W. X. H. asks how many horse power a 6 inch leather belt (single) will transmit running over 20 inch pulley at 80 revolutions per minute. A. 3½ horse power.

(81) H. M.—The best way of finishing floors is described in SCIENTIFIC AMERICAN, November 17, 1883. An oiled floor is generally considered more durable than carpet. Oiled floors are not generally washed, but are wiped up with coarse woolen cloths, or else washed with turpentine. It is always possible to oil a floor, but it must first go through a preliminary preparation. Floors are generally oiled first, and then polished. They require constant attention, and for a stone floor we think you would find it exceedingly difficult to keep it in proper condition. For an office it is well adapted, and when protected by rugs a very pleasant and cleanly flooring.

(82) J. J. K.—Water will filter through bricks, provided you make the filter well or cavity in proportion to the quantity of water to be drawn. Such a filter box two feet square in a cistern might do for the use of a small family, but its capacity would largely depend on the water pressure.

(83) A. H. P. writes: I wish to apply paraffine wax to a wood surface. Is there any way of dissolving it so that it may be applied with a brush, same as paint, and that when dry will have a smooth waxed surface? A. Paraffine may be dissolved in coal tar benzol, and then applied with a brush. The solution will be rather dilute, and several coats will be necessary before the proper thickness of surface is obtained. As a general thing, it is best to use melted paraffine. 2. Can you tell me a cheap way of preparing a wood stain from red sanders? A. An imitation rosewood is made by mixing ¾ pound of potash in 1 gallon of hot water, and ¼ pound of red sanders wood is added thereto; when the color of the wood is extracted, 2½ pounds of gum shellac are added and dissolved over a quick fire; the mixture is then ready to be used on a groundwork made with logwood stain.

(84) B. F. G. writes: After boiling the bones preparatory to grinding them, I find a good deal of grease, but it is very dirty, and I wish to know if there is any way of clarifying or bleaching it, at a small cost, so as to make it marketable? A. Melt the grease with a small quantity of saltpeter; then add sufficient sulphuric acid to decompose the saltpeter. The mass, after the scum is removed, becomes a light yellow color, and is completely deprived of all offensive smell and animal impurities. The grease thus obtained can be used to advantage in making soap.

(85) W. M. C. writes: I am making a medical coil similar to that described in Sprague's latest edition. 1. What is the object in having the pasteboard tube tapering? A. In a small coil, tapering the tube would make but little difference. In a large coil, it is of some advantage, as it allows part of a secondary wire to be nearer the primary wire than it could be if the tube were as thick as is necessary to prevent the secondary current from leaping to the primary coil. 2. Does it not require more insulation between its several layers of wire than a coating of paraffine, also between the primary and secondary coils? A. If the wire is well covered, a coating of paraffine is sufficient. 3. Does it require a condenser? A. No condenser is required for a medical coil. 4. How many pounds of No. 18, 22, and 26 wire respectively will it require? A. It depends upon the size of your coil; you will not need more than two or three ounces of No. 18 wire, and but little more of the other sizes. 5. If the tube is tapering, how can a brass tube be made to fit in it tightly? A. The taper of the tube should be all upon the outside.

(86) J. B. P. writes: In our work at this place, we use to a large extent the common Faber pencil, for ciphering and memo. writing. Do you know of any wash or other substance by which the sheets can be covered, so as to prevent the figures and writing from erasure, or blurring? A. To a solution of collodion of the consistency used by photographers, add two per cent of stearine. This solution is then spread over the paper in a similar way as in photography. It dries in from 10 to 20 minutes and thoroughly protects the pencil marks. This solution is used to preserve pencil and India ink sketches.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted,

January 20, 1885,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

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