SCIENTIFIC AMERICAN

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

Vol. XXIII.—No. 25. [NEW SERIES.]

NEW YORK, DECEMBER 17, 1870.

$3 per Annum. [IN ADVANCE.]

Improved Street Letter-Box for Lamp Posts.

In attaching letter-boxes to lamp posts, where they are made to surround the shaft of the post, many inconveniences are met with, and although this method of fastening is very secure, the inconveniences alluded to have rendered some method of accomplishing the same end without removing the lantern and ladder bar, and slipping the box over the shaft, very desirable. Our engravings show a method whereby the desired attachment is secured, with other improvements in letter-boxes, which not only render them tasteful in appearance, but more convenient in use.

The difficulties in slipping such boxes on the posts from the top, arise from the various sizes and styles of posts, the rusting fast of the ladder bar and other ornaments at the top of the post, the frequent attachment of awning frames, etc.

The box under consideration obviates all these difficulties. It is constructed in two hemispherical sections, A and B, Fig. 1.

One of these sections is cast with a flanged rim, as shown in the sectional drawing, Fig. 2, which overlaps the other, so that wedges cannot be introduced to separate them when they are bolted together. Each of the sections has lugs cast on its interior edge, through which square heade bolts with nuts are inserted to hold the hemispheres together.

It will be observed that these bolts are nserted from the inside, through the hand door, C, of the box—also used to extract the letters by the carriers—and the bolts are thus placed out of the reach of tampering.

The castings are made to conform to the shape of the post, and are fastened on the inside by bolts to the shaft, so that they cannot be removed by sliding them up along the post. The joints are all rendered water-tight by suitable cement, and the globular shape of the box not only enables it to shed rain in the best manner, but also to resist blows from wheels of vehicles.

The drop holes are made without movable lids, being protected by a projecting shield, as shown. This is a great convenience, as the use of one hand only is required to insert letters. The closing of an umbrella in a rain storm, or the setting down of a basket or a child in arms, in order to put a letter in the box, is thus obviated.

The spherical form of the box also facilitates the removal of the letters, as they collect together at the bottom of the box, the drop holes being so placed that the letters fall at right angles with the door on either side of the shaft, but not behind it.

Patented, through the Scientific American Patent Agency, December 6, 1870, by Albert Potts, of Philadelphia, Pa.

Fig. 1

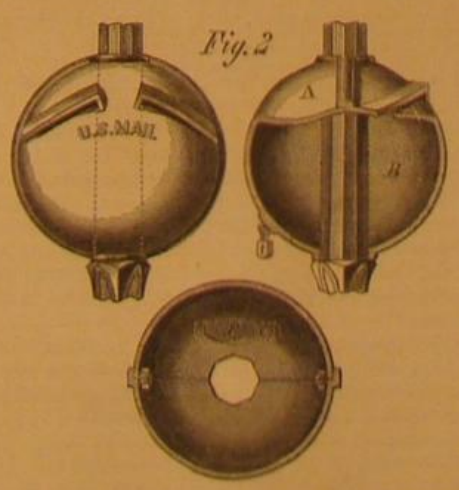
POTTS' IMPROVED STREET LETTER-BOX.

History of Carpeting.

Carpets and rugs were manufactured at a very remote period in Egypt, India, and China; but those of Persia and Turkey are the most celebrated. They were originally used for sitting and reclining upon, as may still be observed in eastern countries, where they constitute the entire furniture of the people. In Egypt they were first applied to religious purposes by the priests of Heliopolis, and were also used to garnish the palaces of the Pharaohs. It was also a custom of antiquity to place them under the couches of guests at banquets. Sardinian carpets are mentioned by Plato, the comic poet, as being disposed in this manner: "Beneath the ivory feet of purple-cushioned couches." The carpets of the Homeric age were generally white or plain cloths; but they were also sometimes produced with various colored and embroidered designs. At the supper of Iphicrates, purple carpets were spread on the floor; and at the magnificent banquet of Ptolemy Philadelphus (an account of which is given by Callixenus of Rhodes), we learn that underneath 200 golden couches "were strewed purple carpets of the finest wool, with the carpet pattern on both sides; and there were handsomely embroidered rugs, very beautifully elaborated with figures. Besides this," he adds, "thin Persian cloths covered all the center space where the guests walked, having the most accurate representations of animals embroidered on them." The Babylonians, who were very skillful in weaving cloths of divers colors, delineated upon their carpets entire groups of human figures, together with such fabulous animals as the dragon, the sphynx, and the griffin. These were numbered among the luxuries of Heliogabalus. On the tomb of Cyrus was spread a purple Babylonian carpet, and another covered the bed whereon his body was placed. These carpets were exported in considerable quantities to Greece and Rome, where they were highly esteemed. Carthage was also noted by Hermippus, Antiphanes, and others, for its magnificent carpets.

Sir J. Gardiner Wilkinson, long since dead, gives an account of an ancient carpet rug of Egyptian manufacture. "This rug," he says, "is made like many cloths of the present day, with woolen threads, on linen strings. In the center is the figure of a boy in white, with a goose above, the hieroglyphic of a 'child,' upon a green ground, around which is a border composed of red and blue lines," etc. He further informs us that there are in the Turin museum some fine specimens of worked worsted upon linen, "in which the linen threads of the weft had been picked out, and colored worsted

Fig. 2



sewed on the warp." In these two examples we have evidence of the existence, at a very early time, of a system of tapestry weaving. The ancient carpet manufacture of the Asiatic countries may resolve itself under the appellation of needle work. Of this the present system of carpet weaving in Persia and Turkey, and the tapestry manufacture of France, may be considered as fitting examples. The tapestry, as is well known, consists of woolen or other threads sewed on the strings of the warp, by means of small shuttle needles. The Persian carpet is formed by knotting into the warp tuft after tuft of woolen yarn, over each row of which a woof shot is passed, the fingers being here employed instead of the shuttle needles, as the fabric is of a coarser description. In both methods the principle is the same. Both are formed in looms of very simple construction, the warp threads are arranged in parallel order, whether upright or horizontal, and the fabric and pattern are produced by colored threads, hand-wrought upon the warp. This may be designated the hand-wrought or needle-work method, which only makes one stitch or loop at a time, in contradistinction to the machine-wrought process, the result of mechanical appliances, whereby a thousand stitches are effected at once. Herein lies the essential difference between the ancient and modern, the simple and complex carpet manufacture.

In Persia there are entire tribes and families whose only occupation is that of carpet weaving. These dispose of their productions at the bazars to native merchants, who remove them to Smyrna or Constantinople, where they meet with European purchasers. The trade in real Persian carpets is, however, very limited, owing to their small size. They are seldom larger than hearth rugs, long and narrow. Very many of them, moreover, are considerably tarnished by exposure in bazars, if they have not indeed been already used. To render them more salable they are cleaned. This is done by cropping the surface, which in some cases is shaved quite close to the knot, hence a great portion of those brought to this country have not their original richness and depth of pile. Felted carpets or *surmuds* are also made in Persia, but do not constitute an export commodity. Sir Henry Bethune, late Persian ambassador from England, had in his possession a very singular specimen of this felt carpeting, in which colored tufts of worsted had been inserted during the process of manufacture, producing a regular pattern when finished.

The greatest part of those Turkey carpets imported into England is manufactured at Ushak or Ouchak, in the province of Adin, about six days' journey from Smyrna, and rugs principally at Kulah or Koula, an adjacent village. In the province of Hoodavendigniar, Adana, and Nish, numerous households are employed in their production, as also in the districts of Bozah, the city of Aleppo, and the villages of Trebizond. Here and there throughout Caramania, such carpets are also made. The Turcomans of Tripoli, the women of Candia, and the peasantry of Tunis and Algiers, are likewise engaged in their fabrication. In none of these places, however, does any large manufactory exist; the carpets are the work of families and households. These carpets are woven in one piece, and there is this notable peculiarity in their manufacture, that the same pattern is never again exactly reproduced; no two carpets are quite alike. The patterns are very remarkable, and their origin is unknown even to Mussulmans. The Turkey carpet pattern represents inlaid jeweled work, which accords with eastern tales of jewels and diamonds. If this were rightly understood, it would prevent such speculations as those of Mr. Redgrave in his great exhibition report on designs, where he remarks that "the Turkish carpets are generally designed with a flat border of flowers of the natural size, and with a center of large forms conventionalized in some cases even to the extent of obscuring the forms, a fault to be avoided." This is doubtless a very ingenious mode of accounting for the curious forms of a Turkish carpet; but these, however fantastic, are never obscured, nor are there any flowers, flat or otherwise, in the border or elsewhere. The great beauty in these carpets lies in the equal balance of color, of dull neutral shades, somewhat somber in effect.

Generally throughout British India the carpet manufacture is carried on. At Benares and Moorshedabad are produced velvet carpets with gold embroidery. A very elaborate carpet sent from Cashmere to the great exhibition of Maharajah Goolah Singh, was composed entirely of silk, and excited great admiration. In every square foot of this carpet, we are informed, there were at least 10,000 ties or knots. Silk embroidered hookah carpets are made at Lahore, Mooltan, Khyrpoore Tanjore, and Bengal; cotton carpets, or *satrunjees*, at Rungpoor, Agra, and Sasseram; printed cotton carpets at Ahmedabad; printed floorcloth at Mooltah. Woolen carpets are far more extensively manufactured. Some come from Ellore, Mirzapoor, and Goruckpore, but the principal manufacture is at Masulipatam, 292 miles north of Madras. There the capital and enterprise of England have lent their aid to the rather tardy movements of the natives, and this article is now in

general demand. Of late years, linen warp has been introduced instead of cotton, and the fabric is thereby much improved. The design of the Indian carpets have more regularity than those of Turkey, and the colors are mostly warm negatives, enlivened with brilliant hues interspersed. For the introduction of Masulipatam carpets, as of many others into the trade, we are indebted to the firm of Watson, Bell & Co., whose Indian connection was the means of obtaining these beautiful fabrics.—*Carpet Trade.*

The Cameo-Medallion Carte-de-Visite.

The apparatus necessary for the production of cameo-medallion cartes is very simple, and comprised in the following articles:

(*a*). A four-footed metal water bath, capable of being heated by means of a spirit-lamp, into which a square porcelain dish is placed, whose overlapping sides fit over those of the water bath. This dish, which is furnished with a lip, is employed to maintain the gelatin fluid at a high temperature.

(*b*). The stamp, consisting of two square wood blocks connected together with hinges; between the blocks is fixed a brass plate also upon hinges, having in the middle an oval opening large enough to contain a bust portrait. The wood blocks open in the manner of an album, in which the brass plate, as it were, takes the place of the carte, and are, on the outside, perfectly smooth. On the inside of one of the blocks is an oval, in relief, of the exact dimensions of the opening in the metal plate; and on the other block is a corresponding hollow of oval form.

(*c*). A press which can be tightly closed by means of screws. A linen or bookbinders' press will answer the purpose well, if such can be obtained, but I have myself constructed a small wooden press expressly for the process which answers exceedingly well.

The above is all the apparatus necessary for the production of these portraits. In the first place, some pattern ovals are cut out of thick black paper, using the oval opening in the brass plate and a sharp penknife for the purpose, the cutting operation being effected at one sweep. In this way are obtained masks and small oval mats, which fit precisely into one another, and are, moreover, identical in size with the opening in the metal plate, and the relief and intaglio in the wood blocks. A print from a portrait negative, with graduated background, is then taken out of the pressure-frame, and over it is placed one of the masks, in a position most favorable to the picture; and when the same has thus been centered, the oval mat corresponding to the mask is placed upon the print, and the mask withdrawn. The print is then exposed to the sun under a glass plate, the middle being still covered with the black mat, which must not be allowed to shift from its place, and thus a darkly-tinted, or even black, margin is printed around the oval picture. The print, in this condition, is then toned, fixed and washed, and finally sized in gelatin. The latter operation is performed by the aid of some glass plates of the required size, which are carefully cleaned, as if to serve for negatives, and then rubbed over with finely-powdered stone alum (luff stone) by means of a tuft of cotton wool, the superfluous powder being afterwards removed with a soft dusting brush. These plates are coated with a four per cent normal collodion, and placed to dry in a spot free from dust. When perfectly dry, a quantity of gelatin is dissolved in hot water in a beaker, the solution being of the consistence of the collodion previously employed. This is filtered through a piece of linen into the porcelain bath, which has, in the interim, been warmed by means of the water bath, and should be maintained at an even temperature during the whole period of working.

The prints required to be gelatined are, in the first instance, trimmed to the right size by means of a cutting glass, and are then immersed bodily into the gelatin solution, so as to be fully impregnated with the same. The glass plates coated with collodion are now taken in hand; the prints laid, face downwards thereon, care being taken that all air bubbles between the paper and glass are carefully pressed out and removed; afterwards a sheet of stout white paper, somewhat bigger than the print, is cemented to the back of each photograph, a precaution for protecting the pictures in the event of their spontaneously leaving the glass on drying.

The plates are allowed to remain for ten or twelve hours (say over night) in a dry locality, and, at the end of that time, the portraits may be separated from the glass by making an incision of the film all round the paper. The superfluous paper should be trimmed off previously to the pictures being mounted upon cardboard.

After drying, the carte is put through a steel press, and is then placed in the embossing stamp to give it the desired relief.

Many of the manipulations may be slightly modified if desired. For instance, instead of cementing a piece of paper to the back of the prints, the card itself, if not very thick, may be at once attached, and the margins thereof thus gelatined, the process of rolling being in this way obviated. Some photographers add a small quantity of sugar candy to the gelatin, in order to prevent the sizing solution drying too rapidly, and to render the finished card more plastic and impressionable.

I am in possession of a large collection of these pictures, which appear as brilliant and beautiful as photographic enamels. Almost all of them have been produced by Italian firms, and by far the greater part of them have a deep-black border round the oval bust. A few of them betray a tendency to curl up at the edges, but all those which have been produced by the process I have just described have remained quite flat and even. This *modus operandi* is, moreover, to be recommended from the fact of its having been adopted by some of the first firms at Vienna, who have recently turned out some very beautiful results through its agency.—*Carl Krzicanek, in the Photographic News.*

The Toys of the Past---A Record of Departed Joys.

Itinerant toymen seem always to have dealt in a class of ware different from that sold in shops. Early in this century a Chinaman who sold a small drum, which, with peas inside, answered the purpose of a rattle, and a fish suspended at the end of a line, was as well-known a figure as the old Turk who sold rhubarb in Cheapside. There was another drum which was hung from a stick by a piece of horsehair, and when this was whirled round a rattling sound was produced, not by the drum itself, which was merely a weight, but by the friction of the horsehair against the stick. A modern and very attractive street toy was an ingenious machine, the mere movement of which causes a large flock of clay birds to flutter down a number of wires. Ten years have now elapsed since this ingenious toy was at the hight of popularity, but we do not often see it now.

The flat wooden snake, with joints of catgut, which, held by the tip of the tail, waves backwards and forwards to the terror of timid urchins, has still its place in some toy-shops; so also has the toad, whose tail, turned round, is fastened under the throat with cobbler's wax, and who leaps when the wax becomes less adhesive, though this rude method of producing spontaneous motion is driven into shade by the more perfect clockwork. But a snake made of a single spiral shaving of horn, with a solid head of the same material, which was capable of being extended to a considerable length, and which, when pressed together, was packed into a small cylindrical box, has fled beyond the limits of my observation. A fault in this mimic reptile was the ridiculously extreme delicacy of its constitution. The vertebral column, of which alone its body was composed, was always getting some unfortunate twist, and any attempt to repair the misfortune was generally followed by a compound fracture. Equally fragile were those little hollow wax dolls, which are now furnished by shops of the humblest kind, where the bottle which contains them is ranged with other bottles, scantily stocked with sugar-plums, brandy-balls, and other old-fashioned dainties. Like many specimens of the great toy, man, the little hollow doll had its social status once, though it is now in lowly places. I recollect very well the attempt of a young lady in her teens to dress such a doll. She worked with fairy fingers, but the attempt to put a sash round the waist had a result like that which is said to arise from the bite of a huge shark, and which is described in the pathetic ballad "Bryan and Pirene." Destined to perpetual destruction, the little wax doll had its avenger in the sturdy Dutch mannikin, which is utterly indestructible, save in its hair, and which, seated on a table, had a knack of bobbing forward, and assailing its proprietor with its hard, sharply pointed nose. The hollow doll's successor is the little china doll of the present day, which, always connected with a bath, seems to have been created for the purpose of perpetual ablution. Be it borne in mind that in olden times, every doll was a miniature of a grown-up person. The doll representing infancy is a modern invention, and in the French vocabulary has a name to itself, being called a "bêbè," whereas the other doll take the generic name "poupée."

The hideous demon, made of furry material, which, by means of a worm-spring within its body, jumps out of a cubical box, continues its ugly existence; but the dainty little sentinel, who lived in a cylinder, and whose worm spring was under his feet—the only veritable Jack-in-the-box—has receded. Gone, too, is the wooden apple, which, opened, revealed another apple, which, opened, revealed a third, which, opened, revealed a fourth, and so on, till we come to a tiny fruit, which contained two tiny spoons, guaranteed to be of pure silver. Both the Jack-in-the-box and the apple plunged into bad company, and that is, perhaps, the cause of their downfall. For many years they were used as prizes at the ignoble game of "cock-spy," and were set upon slim poles to be knocked down by cunning marksmen. The apple, I suspect, was of Oriental origin. At least, dainty boxes, constructed on the same principle, but made out of the choicest woods, and elaborately ornamented, are to be found in every cabinet stocked with articles of Indian vertù.—*All the Year Round.*

The West Abutment of the St. Louis Bridge.

[From the Chief Engineer's Report].

Although the bed rock at the site of this abutment is seventy-three and a half feet higher than at the east pier, the difficulties encountered in building its foundation were of a much more perplexing and tedious character than those encountered at either of the others. Its site had been for over sixty years a part of the steamboat wharf of the city, and as such had received every kind of useless material thrown overboard from the various steamers lying over it during that time.

The old sheet iron enveloping their furnaces, worn-out grate bars, old fire bricks, parts of smoke-stacks, stone-coal cinders and clinker, and every manner of things entering into the construction of a Mississippi steamer seemed to have found a resting place at this spot, and constituted a deposit averaging twelve feet in depth over the rock. During the memorable fire of 1849, when twenty-nine steamers were destroyed at the levee, the wrecks of two of them sunk upon the site of this abutment. One of these was partly covered by the hull of the other, which probably sunk immediately afterwards, The lower one was but two or three feet above the bed rock. After this terrible conflagration the city authorities determined to widen the wharf. Its front was extended to a line inclosing about one half of these two wrecks, by filling in with stone and rubbish from the city.

During this extension several other vessels were burnt at the wharf, and the wreck of one of these also sunk upon the site of the abutment. The coffer dam, constructed to inclose the site, had to be put down through these three wrecks, the hulk of either of which was not probably less than four hundred tuns measurement. Their bottom planking was all of oak, three or four inches in thickness. To drive the sheet piling down through these hulks, an oak beam six by ten inches square, armed with a huge steel chisel, was first driven down as far as a steam pile driver could force it. It was then withdrawn, and a sheet pile, five by ten inches square, was driven down in its place.

The coffer dam was formed of two courses of sheet piling, six feet apart, which were filled in between with clay. When this was completed, the water pumped out, and the excavation prosecuted within it, the discovery was made that from one third to one half of the length of each of these three steamboat hulks was inclosed within the dam, and that some of the sheet piling had not been driven through the lower one, owing to the great resistance of the hulk and the mass above it.

Before the space between the lower wreck and the bed rock could be made secure on the inner side of the dam the water came through and flooded the inclosure. A stream from a powerful Gwynne pump, having an eight-inch diameter of jet, was then directed against the material deposited over these wrecks on the outer side of the dam, where the water was fifteen feet deep, and enough of the deposit was washed away to enable another course of sheet piling to be driven down six feet beyond the dam, through all of the wrecks to the rock. After this, that part of the wrecks inclosed between this last course of piling and the dam was removed by a diver and the space filled in with clay, and the inclosure again pumped out. This portion of the dam, about fifty feet in length, was by this construction made double. As the excavation within progressed it revealed the fact that another portion of the dam had been built and made water tight through and over a water wheel of one of the wrecks. The crank of an engine of seven feet stroke attached to the head of the shaft of the wheel was just within the inclosure, while the flanges, arms, and braces of the wheel were within the walls formed by the sheet piling.

From the inclosure within the dam were taken parts of several old and burnt steamboat engines, the iron parts of some of which had to be cut off at the dam. Four wrecks of barges, some of them in use doubtless before the era of steam, were also found within it; likewise several oak sawlogs, some anchors, chains, and a great variety of smaller articles lost or thrown overboard from the river craft, or dumped in from the city.

This incongruous deposit made it exceedingly difficult to maintain the integrity of the dam, which at times had to resist a pressure of thirty feet of water. Frequent floodings consequently occurred, which delayed and increased the cost of the work. These difficulties were, however, finally overcome, and the bed rock within was at last exposed to view.

On the 25th day of February, 1868, after thoroughly testing the solidity of the rock by drilling, the first stone of the bridge was laid in this abutment fifty-five feet below high water mark, about four months after commencing the construction of the dam.

Chilblains and Chapped Hands.

The returning cold, damp weather brings in its train the seasonable series of complaints, such as chilblains, chapped hands and lips, etc. These appear to be most prevalent just now, amongst those exposed to the inclemency of changeable weather, who possess a fair complexion, delicate skin, and other constitutional predispositions. To those especially liable to these tiresome and painful affections, we recommend as a preventive wearing kid skin gloves lined with wool, which not only keep out the cold, but absorb any moisture that may be upon the hands; and to rub over the hands before washing a small quantity of glycerin, which should be allowed to dry or become absorbed to a partial extent. When chilblains do manifest themselves, the best remedy not only for preventing them ulcerating, but overcoming the tingling, itching pain, and stimulating the circulation of the part to healthy action, is the liniment of belladonna (two drachms), the liniment of aconite (one drachm), carbolic acid (ten drops), to collodion flexile (one ounce), painted with a camel's-hair pencil over their surface. When the chilblains vesicate, ulcerate, or slough, it is better to omit the aconite, and apply the other components of the liniment without it. The collodion flexile forms a coating or protecting film, which excludes the air, whilst the sedative liniments allay the irritation, generally of no trivial nature. For chapped hands, we advise the free use of glycerin and good olive oil in the proportion of two parts of the former to four of the latter; after this has been well rubbed into the hands and allowed to remain for a little time, and the hands subsequently washed with Castile soap and tepid water, we recommend the belladonna and collodion flexile to be painted, and the protective film allowed to permanently remain. These complaints not unfrequently invade persons of languid circulation and relaxed habit, who should be put on a generous regimen and treated with ferruginous tonics. Obstinate cases are occasionally met with, which no local application will remedy, until some disordered state of system is removed, or the general condition of the patient's health improved. Chapped lips are also benefited by the stimulating form of application we advocate, but the aconite must not be allowed to get on the lips, or a disagreeable tingling results.—*London Medical Journal.*

Labor and Wealth in the United States.

Henry Ward Beecher says: One of the greatest causes of thanksgiving is that labor whistles and sings in our territories. Elsewhere it is mourning its own death. The prodigious facilities for acquiring wealth in America are just beginning to be perceived. The wealth is here, easy to be developed, concentrated, and administered. The being "worth a million" won't make a man eligible to the class of rich men much longer. Some think wealth dangerous. Wealth is power, and that is always dangerous, but no nation ever rose from a barbarous state without it. Missionary preaching is of no use if it does not show the heathen how to make money. No poor man can be much in a poor community, although among nabobs his intellect may compensate for lack of worldly goods. But riches must be somewhere. The dangers of wealth here are less than we fear. Organized wealth oppresses the community, but will yet prove itself a benefactor. It tends to despotism because of its nascent state. It is not necessary that the wealth which owns the market should also own civility, or should control courts and legislatures. But we must consider the hygienic qualities of wealth. It is the almoner of employment, of comfort, of enjoyment. Money is vivifying industry to the very bottom of the community. Riches are the poor man's providence, and on the whole, are in subordination to intelligence and domestic virtue. How to use money is an art. Many can make money, who haven't the slightest idea of spending it correctly, while many more can spend that don't know how to make; but, as a general thing, money earned wisely is expended discreetly. Men live here in better constructed houses—which require more ingenuity to keep constructed—than anywhere else. The money-producing force of America is more than double the average money-producing force of any other nation. There are 25,000 land-owners in Great Britain. Here land is so cheap that scarcely an inhabitant but owns his plot, whether little or big. I know farmers I should hate to meet in argument unless I were on their side, while many hammer away at the anvil all day and read scientific and historical works all the evening. Men who deride money are almost invariably minus the article themselves, and, if they will only consider, will find that the universal diffusion of wealth is one of America's greatest blessings. Get rich! Pay anything for it but yourself, your honor, love, sympathy, faith in man, and faith in God. Wealth here is public spirit. Architecture is its adopted child. Cornell, Vassar, Cooper, and hundreds of others, are significant American names, and the time approaches when wealth shall be symbolic of every public improvement. Wealth has its evils and temptations, but to-day is something for which we, as a nation, may thank God, and pray that the time may not be far removed when the streets of gold spoken of in Scripture may be here on earth.

Progress in Japan.

"Great Japan, ruled by our wise Emperors, is superior to all other countries in the world." So says the Japanese patriot and philosopher, Kato Lukeichi; and certainly the most recent accounts we have of the proceedings of these orientals, places them in strong contrast with the "Western barbarians." In Japan, bridges are being built; in France, they are being blown up. In Japanese waters, numerous fixed and floating lights and buoys are being provided for the guidance of the navigation; in the Baltic, they are being removed and taken up. In the one quarter of the world the desire is that the safety of the ships may be secured; in the other, that they may be destroyed. The municipal council of Osaka is carrying out an efficient system of paving and drainage; is macadamizing their suburban roads, and adorning the city by planting 500 or 600 trees. On the other hand, the drainage of the Western continent is blocked and corrupted by the corpses of men and the carcasses of horses, and Paris, the fairest city of the West, is being made a great pest and charnel house, and the vernal beauties of the environs have been stamped out, and they have been changed into a hideous wilderness. The princes of Japan are fitting up improved machinery at their coal mines, and building cotton mills; the princes of Prussia are "assisting" in the destruction of grand and venerable cathedrals, splendid libraries, and the most beautiful works of nature and art, and are making "requisitions" for bread and wine to a ruined and starving population. The disastrous doings of the Westerns in prosecuting the art of war we know of but too well, from the harrowing details with which our daily papers are filled; of the more humane and creditable performances of the orientals, in prosecuting the arts of peace, we are informed by her Majesty's consuls at the Japanese ports open to foreign commerce. These reports have been published quite recently. The foreign trade done at these ports—Karrawaga, Hiogo, and Osaka, Nagasaki, Haokdati, and Niigata—may, according to Sir Henry Parkes, be taken at ten millions sterling, of which above half is in British hands. It gave employment, in 1869, to 1,043,405 tuns of foreign shipping, 398,264 tuns of which were British. The returns of shipping are exclusive of native junks and river boats. At some of the ports, the large proportion of the trade conducted by British ships is very remarkable, the proportion being greater than that done by the foreign vessels of all other nations together. The foreign commerce of Japan, considering area and population, is growing, it appears, more rapidly and satisfactorily than even that of China. The total imports, in 1869, were of the value of 17,356,932 dols., and the exports 11,475,645 dols.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections for October, 1870:

During the month 522 visits of inspection were made and 920 boilers examined—702 externally and 234 internally, while 136 were tested by hydraulic pressure. Number of defects in all discovered, 418—number of dangerous defects, 44, which in detail are as follows:

Furnaces out of shape, 12—1 dangerous; fractures in all, 13—5 dangerous; burned plates, 22—2 dangerous; blistered plates, 51—8 dangerous; cases of sediment and deposit, 72—5 dangerous; cases of incrustation and scale, 50—4 dangerous; cases of external corrosion, 22—4 dangerous; cases of internal corrosion, 15—1 dangerous; cases of internal grooving, 5; water gages out of order, 4—2 dangerous; safety valves overloaded 20—2 dangerous; pressure gages out of order, 74, varying from −10 to +20; boilers without gages, 2—1 dangerous; cases of deficiency of water, 8—2 dangerous; broken braces and stays, 12; boilers condemned, 6—6 dangerous. Two cases have been found where there were stopcocks between the safety valve and boiler. They were both removed before the boilers could be accepted by this Company. Several mud drums have been found in bad condition. These drums are usually bricked in, and cannot be thoroughly examined unless the brick work is removed. They corrode rapidly, and should be examined at least once a year.

As will be seen there have been 11 explosions during the month, by which 9 persons were killed, and many wounded. Several of these explosions were of new boilers. Many people think that when they have put new boilers in their works, they are perfectly safe. Such, however, seems not to be the fact. One of the most terrific explosions which has occurred within the year, was of a new boiler. From subsequent examination, a fracture was discovered in one of the flues, which was regarded as the cause of the accident. From unequal expansion and contraction, resulting from urging the fires injudiciously, the fracture came, and so far as could be ascertained, the flue collapsed, and an explosion followed. The six boilers condemned have been replaced by new ones.

PERPETUAL MOTION.

NUMBER III.

The two self-movers, which it has been claimed were really such, were the inventions of the Marquis of Worcester, author of the "Century of Inventions," and Jean Ernest Elie-Bessler Orffyre, or Orphyrreus, who is usually named Orffyreus in English and German works. The latter was born in 1680, near Zittau, in the department of Alsace, France, and early studied theology and medicine, but his erratic genius was only to be satisfied by engaging himself in the pursuit of a variety of the mechanical arts and painting. He asserts that it was during his search for whatever might prove curious and valuable that he discovered perpetual motion, and between the years 1712 and 1719, made two machines on his system; one he desired to exhibit publicly, but broke it up rather than submit to the payment of the license or tax required by the Government of Cassel; the other he destroyed after its having been unfavorably reported on by M.'S Gravesande. He published, in German and Latin, a book or pamphlet entitled "*Le Mouvement Perpétuel Triomphant*," quarto, dated Cassel, 1719. Other accounts differ respecting the breaking of the second machine; and, on insufficient authority, Mr. Partington styles him a "German mechanic." Dr. William Kenrick, among his miscellaneous works, wrote "An Account of the Automaton, or Perpetual Motion of Orffyreus, with additional remarks," in editions dated 1770 and 1771. Orffyreus died in November, 1745.

The following is a description of the Marquis of Worcester's wheel, described in the 56th article of the "Century of Inventions," as "An Advantageous Change of Centers."

"To prouide and make that all y^e^ weights of y^e^ defcending syde of a wheele shal be perpetually further from y^e^ center, then thofe of y^e^ mounting syde, and yett equal in number and heft of ye one syde as y^e^ other. A most incredible thing if not seene, butt tryed before y^e^ late King of happy and glorious memorye in y^e^ Tower by my directions, two Extraordinary Embaffadors accompanying his Ma^tie^ and y^e^ D. of Richmond, D. Hamilton, and most part of y^e^ Court attending him. The wheele was 14 foote ouer, and 40 weights of 50 p^d^ apiece; S Wm. Belford, then Lieu^t^ of y^e^ Tower, and yet liuing can justify it with seuerall others; they all saw that noe sooner these great weights passed y^e^ Diameter Line of y^e^ vpper syde but they hung a foote further from y^e^ center, nor no sooner passed the Diameter line of the lower syde, butt they hung a foote nearer; bee pleased to judge y^e^ consequence."

Of the inventions of these two men Dircks says:

"The only appeal that can be made in apology for the pursuit of perpetual motion, is derivable from the results represented to have been obtained by the Marquis of Worcester in one instance, and by Orffyreus in another. All the circumstances relating to their singular inventions excite our curiosity, raise our skepticism, and induce us to pause in our decision. Let us first consider the inventors personally; and, secondly, their inventions and the circumstances attending their exhibition. The two men were of very different character and position in life. The first noble by birth, of ancient lineage, loyal to the extent of sacrificing his property in support of the cause of Charles I., and evidencing by his prayers, his truly religious sentiments. About or before 1648 (as the King died 1649), he exhibited his wheel, or perpetual motion, in the Tower, before his Majesty, two extraordinary Ambassadors, the Duke of Richmond, Duke Hamilton, most part of the Court, and Sir William Belford, Lord Lieutenant of the Tower. We have to consider the upright character of the Marquis, his having invented the steam engine, his worthiness in all respects, and the circumstances here detailed, and then ask ourselves: Little as Science favors any belief in such an invention, can we see any reasonable grounds for error in this great experiment, or believe that a person so distinguished, and so much to be admired in all other respects, could thus boldly and recklessly deceive himself, his noble company, and the public taking ten years or upwards to elaborate and record a gross falsehood? It seems incredible, and true respect for the Marquis' memory will go far to maintain doubts respecting the infallibility of all mathematical demonstrations adverse to the possibility of a self-motive power. Secondly:

"Orffyreus was of humble origin, had versatile talents, and fickle, discontented, unsettled, irregular, and eccentric. He was ambitious, boasting, and the very man to raise up enemies. Between 1712 and 1718 he made and destroyed in succession four wheels or machines. He had learnt the art of clock-making, and several mechanical arts, and is supposed to have constructed or put these wheels together himself. He had a princely patron, who wished to obtain practical results from the invention for manufacturing and other operations. A misunderstanding ensues; and from that time to his death, in 1745—at least twenty-eight years—the subject lies dormant, and the invention dies with him. This last fact, coupled with the wheel having raised so great a weight as 70 lbs., makes a doubtful case still more doubtful; and particularly when, about the same time, Geiser imposed on the German public with a mere piece of clockwork, as a true perpetual motion.

"The Marquis of Worcester's wheel was fourteen feet in diameter; it was rotated by the action of forty 50-lb. weights —2,000 lbs—an enormous weight, requiring some very laborious operations of the carpenter to erect a sufficiently strong framework. Its completion must have taken some time, and led to frequent visits from the noble inventor, as well as experiments to test its correct working, before offering a practical demonstration before majesty.

"Orffyreus' fourth or last wheel, at Hesse Cassel, was twelve feet in diameter, fourteen inches broad, made of light oak framing, and covered with oil cloth. It would revolve either way, and this alone casts a shade of doubt on there being any deception in practice with it. But, strange to say, it had power enough to raise 70 lbs. to a considerable hight. Its operations were seen and attested by so many, that these broad facts rest not alone on the inventor's authority. It was so ingeniously made, that M. Gravesande wrote to Sir Isaac Newton on the subject; and his letter and mathematical reasonings, in reference to the matter, appear in his works, edited by Professor Lalande, 1774."

The following is the letter written by Professor 'S. Gravesande to Sir Isaac Newton, in regard to the wheel of Orffyreus.

SIR,—Doctor Desaguliers has doubtless shown you the letter that Baron Fischer wrote to him some time ago, about the wheel of Orfyreus, which the inventor affirms to be a perpetual motion. The landgrave, who is a lover of the sciences and fine arts, and neglects no opportunity to encourage the several discoveries and improvements that are presented him, was desirous of having this machine made known to the world, for the sake of public utility. To this end he engaged me to examine it; wishing that, if it should be found to answer the pretensions of the inventor, it might be made known to persons of greater abilities, who might deduce from it those services which are naturally to be expected from so singular an invention. You will not be displeased, I presume, with a circumstantial account of this examination; I transmit you, therefore, a detail of the most particular circumstances observable on an exterior view of a machine, concerning which the sentiments of most people are greatly divided, while almost all the mathematicians are against it. The majority maintain the impossibility of a perpetual motion, and hence it is that so little attention hath been paid to Orfyreus and his invention.

For my part, however, though I confess my abilities inferior to those of many who have given their demonstrations of this impossibility; yet I will communicate to you the real sentiments with which I entered on the examination of this machine. It is now more than seven years since I conceived I discovered the paralogism of those demonstrations, in that, though true in themselves, they were not applicable to all possible machines, and have ever since remained perfectly persuaded, it might be demonstrated that a perpetual motion involved no contradiction; it appearing to me that Leibnitz was wrong in laying down the impossibility of the perpetual motion as an axiom. Notwithstanding this persuasion, however, I was far from believing Orfyreus capable of making such a discovery, looking upon it as an invention not to be made (if ever) till after many other previous discoveries. But since I have examined the machine, it is impossible for me to express my surprise.

The inventor has a turn for mechanics, but is far from being a profound mathematician, and yet his machine hath something in it prodigiously astonishing, even though it should be an imposition. The following is a description of the external parts of the machine, the inside of which the inventor will not permit to be seen, lest any one should rob him of him of his secret. It is a hollow wheel, or kind of drum, about fourteen inches thick and twelve feet diameter; being very light, as it consists of several cross pieces of wood framed together; the whole of which is covered over with canvas to prevent the inside from being seen. Through the center of this wheel or drum runs an axis of about six inches diameter, terminated at both ends by iron axes of about three quarters of an inch diameter upon which the machine turns. I have examined these axes, and am firmly persuaded that nothing from without the wheel in the least contributes to its motion. When I turned it but gently, it always stood still as soon as I took away my hand; but when I gave it any tolerable degree of velocity, I was always obliged to stop it again by force; for when I let it go, it acquired in two or three turns its greatest velocity, after which it revolved for twenty-five or twenty-six times in a minute. This motion it preserved some time ago for two months, in an apartment of the castle, the doors and windows of which were locked and sealed, so that there was no possibility of fraud. At the expiration of that term indeed his serene highness ordered the apartment to be opened, and the machine to be stopped, lest, as it was only a model, the parts might suffer by so much agitation. The landgrave being himself present on my examination of this machine, I took the liberty to ask him, as he had seen the inside of it, whether, after being in motion for a certain time, no alteration was made in the component parts; or whether none of those parts might be suspected of concealing some fraud; on which his serene highness assured me to the contrary, and that the machine was very simple.

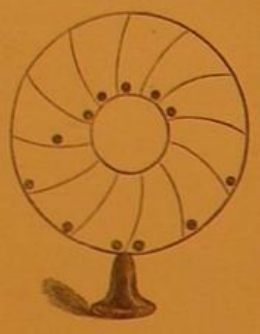
You see, Sir, I have not had any absolute demonstration,

that the principle of motion which is certainly within the wheel, is really a principle of perpetual motion; but at the same time it cannot be denied that I have received very good reasons to think so, which is a strong presumption in favor of the inventor. The landgrave hath made Orfyreus a very handsome present, to be let into the secret of the machine, under an engagement, nevertheless, not to discover, or to make any use of it, before the inventor may procure a sufficient reward for making his discovery public.

I am very sensible, Sir, that it is in England only the arts and sciences are so generally cultivated as to afford any prospect of the inventor's acquiring a reward adequate to this discovery. He requires nothing more than the assurance of having it paid him in case his machine is found to be really a perpetual motion; and as he desires nothing more than this assurance till the construction of the machine be displayed and fairly examined, it cannot be expected he should submit to such examination before such assurance be given him. Now, Sir, as it would conduce to public utility, as well as to the advancement of science, to discover the reality or the fraud of this invention, I conceive the relation of the above circumstances could not fail of being acceptable.

Partington, in his "Manual of Natural Philosophy," endeavors to interpret the somewhat enigmatical specification of the Marquis of Worcester by the following diagram, which it is self-evident almost at a glance can have no movement except that derived from external forces.

FIG. 5.



Making a long jump from the remote to the near, we shall next present an illustration of a perpetual motion machine, invented by Horace Wickham, Jr., of Chicago, Ill., and on which a patent was obtained July 26, 1870. Mr. Wickham will thank us for placing him in such honorable company as the Marquis of Worcester, and our readers will perhaps be glad to see the form and essence of a machine, which Western journals have greatly lauded as most wonderfully ingenious, etc., though if they can see how it generates any motive power, their mental vision will be superior to ours.

A is the bed or table upon which the standards for supporting different parts of the machine are secured. B B are the standards for supporting rocking beam, C. This rocking beam is pivoted at the center to the standards by the ring, D, and set screws. These centers have points like lathe centers. The other parts of the machine consist of a governor, fly wheel, etc.

C is the rocking beam, constructed in two parts and secured together by the bands, E. The rocking beam consists of two tubes; the upper one is made straight, and the lower one in the form of a W. These tubes are connected together at their ends in such a manner as to allow the ball used to pass from the lower tube to the upper one, by means of hinged inclined run-ways, F, and valve, G, and from the upper one to the lower, inside of the band, E", by the opening therein. The inclined run-way, C, is hinged at one end to the upper tube, F", at the bottom of its opening or exit, inside of the band, E', while the other end rests on the valve, C'.

This valve has attached on its under side, a pin which projects down through a hole in the band, E, a sufficient distance, so that, when the pin strikes the standard, H, secured to the bed or table, as the rocking beam oscillates it will raise the valve a short distance above the upper tube. The valve is made to incline toward the opening in the upper tube, so that the ball, when raised on the valve, will roll into the same, by means of the hinged inclined run-way, F. I is a ball, which runs in the upper and lower tubes; this ball is charged with a necessary amount of quicksilver, for giving more weight to the same, and also for giving a much quicker momentum to the ball. This ball is to be used in the rocking beam for the purpose of unbalancing, and also to exert the pressure of its specific gravity on the same at whatever point or position it may be in, and in so doing it assists in oscillating it.

The pitman, J, connects the crank shaft with the oscillating beam. The rocking beam is provided, on the opposite end to which the pitman is attached, with a rod, on which is placed an adjustable weight, which is secured at any desired point by means of a set screw. This weight is for the purpose of counterbalancing the adjustable band provided with a rod to which the pitman is attached, and also the pitman, for the purpose of regulating the motion of the machine, and is operated through the medium of a gear wheel on the crank shaft, and other suitable gearing. The governor is constructed in the usual manner, excepting in using the cut-off valve, as in steam engines, which is dispensed with, and an automatic break is used and operated by means of the rise and fall of the governor balls. The automatic break consists of an elastic band, one end of which passes up through a hole in the guide rod projecting from the standard that supports the governor, and is connected to an arm projecting toward and partly around the upright shaft of the governor.

The tension of the band is regulated by nuts and screw-thread on the end of the band. The other end of the band passes under a wheel on the shaft, K, and is secured to a projecting arm on the standard that supports the governor. The crank shaft is counterbalanced.

I do not wish to confine myself to the precise construction of the rocking beam, as shown and described, as I intend using, in lieu thereof, wires, or rods, arranged in the form and shape of the rocking beam described, with mounted weights arranged to roll on them, which, in connection with the other parts of the machine, will accomplish the same result.

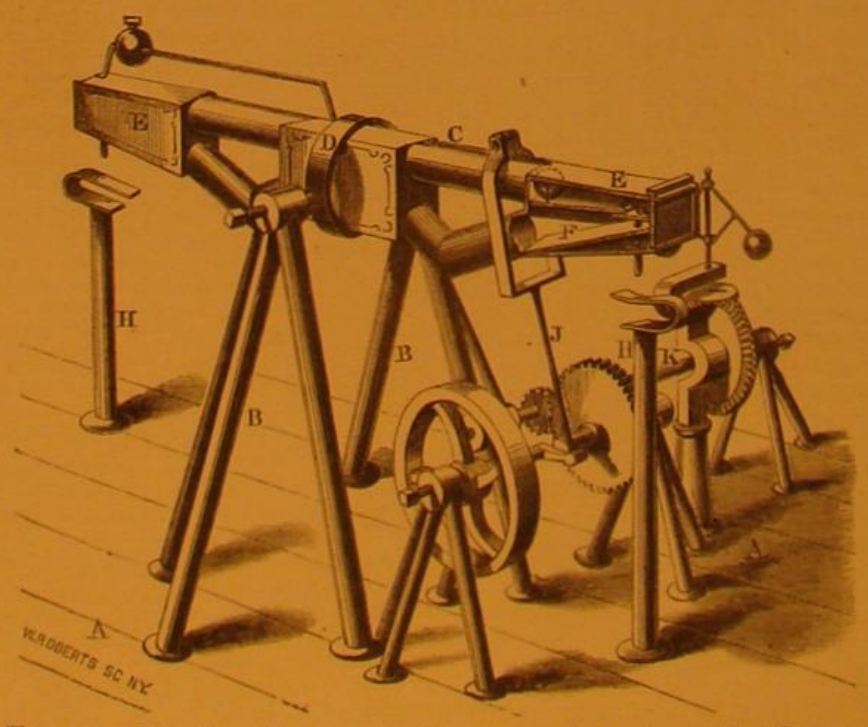
The lower tube can be made semicircular in form and shape instead of the form and shape of a W. Any number of rocking beams may be used, and more than one ball can be used in the rocking beam, by having inclined run-ways and valves on each end of said beam; the rocking beam so arranged that the balls drop from one tube to the other at the center of the of the beam, and rolling alternately from the center to the ends of the beam.

The rocking beam is oscillated by any power operating alternately on each end of the same, and which transmits motion to the other parts of the machine through the medium of the pitman and crank shaft, and for applying power to any other machine a pitman is secured on the opposite side of the rocking beam to which the pitman, J, is attached, or, instead thereof, pulleys, and endless belts on the shaft, K, or the crank shaft.

The spokes of the fly wheel are charged with quicksilver, for the purpose of giving weight to the same at any desired point, as it passes from the center to the circumference of the wheel.

It is claimed that this machine has run seven months without stopping, independent of any external force, which we do not believe, and we think our readers, after reading the above description of it, abstracted from the specification on file in the Patent Office, will concur with us in our belief.

FIG. 6.

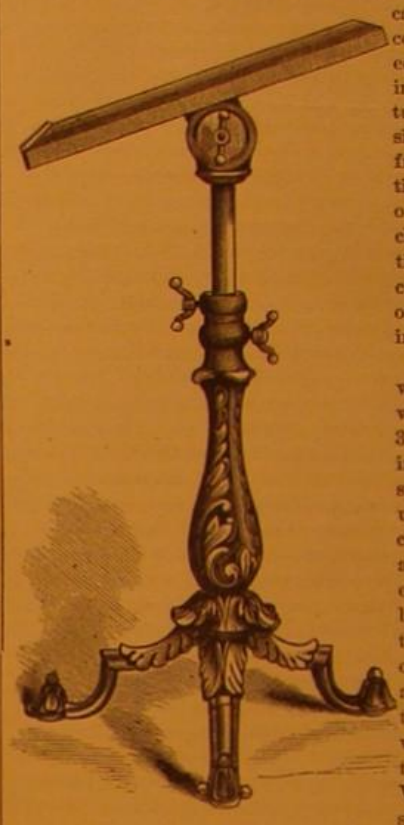


Wire Rope Bridges.

At a recent meeting of the Institution of Mechanical Engineers, held at Birmingham, a paper was read entitled "Description of a Wire-Rope Bridge, at Landore Steel Works, for conveying Materials across a Navigable Stream," by Mr. William Hackney, of Swansea, England. This bridge has been erected as an inexpensive means of removing the spoil from excavations made in carrying out an extension of the Landore Siemens Steel Works, near Swansea, and depositing it on the low marshy ground at the other side of a navigable stream, which runs by the side of the works; and it was a necessary condition that any structure thrown across the stream should be arranged so as not to interfere with the passage of vessels. The bridge is constructed of a pair of steel wire ropes, stretched alongside each other across the stream, and sloping downwards from the higher bank on which the works are situated, to the lower ground on the opposite side, where the spoil is deposited. On each rope travels a runner, or small carriage mounted on a pair of grooved wheels, from which the trucks are suspended by chains; and the two runners are connected together by an endless wire cord passing round a pulley on each bank, so that the loaded truck running down from the higher bank on one of the ropes draws up an empty truck from the lower bank on the other rope, the inclination of the ropes being sufficient for this purpose; the speed is regulated, if necessary, by a brake upon the cord pulley. The ropes are strained over abutments on either bank, and attached by chains to anchorages in the ground; and in order to admit of the passage of vessels in the stream, the abutment on the upper bank is constructed of a timber framing mounted on wheels, which can be run forwards through a sufficient distance to allow of the wire ropes being lowered to the bottom of the bed of the stream, so that the whole bridge is then completely out of the way of passing vessels. For raising the bridge again, the movable abutment is drawn backwards by a hand-winch, until the ropes are hauled up nearly tight; the hauling chains are then hooked to the anchorages by screw couplings, by which the ropes are finally tightened up, and the hand-winch is thus relieved from all strain during the working of the bridge. In this way the bridge is raised into its working position in the course of a few minutes by a couple of men at the upper end. Owing to the curve in which the wire ropes hang, their inclination is steepest close to the upper bank, thus retarding the speed of both trucks as they approach the landings on either bank, and serving generally to stop them without the use of the brake. This bridge has now been in constant use for several months, and has proved very satisfactory for the special purpose for which it was designed.

ADJUSTABLE STAND FOR DRAFTSMEN.

We herewith illustrate a stand which meets a want long felt by draftsmen and artisans. It consists of a table which can be readily and conveniently adjusted to any hight and inclination, easily turned to bring either side of the work in front, and, at the same time, be substantial, ornamental, and cheap: It is made entirely of iron, except the top, which is of wood, 20 by 22 inches.



The stand complete weighs 55 lbs., and will support a board 3 by 4 feet without inconvenience. The spindle which slides up and down in the column can be raised and lowered with ease, and held firmly by the set-screw on the right. The screw on the left immediately above passes through the collar which turns on the top of the column. When this screw is set up, and the others turned back, the top of the stand can be easily turned as the convenience of the workman requires. By means of the hand nut immediately under the board, the work is set at any inclination. It is but a minute's work to adjust it for standing or sitting, which is very desirable for the comfort of artists. It is mounted on casters, and its tasteful appearance makes it equally desirable in the office, counting-room, library, or sitting room.

Manufactured only at the Washburn Machine Shop connected with the Free Institute of Industrial Science, Worcester, Mass. Address, for further information, M. P. Higgins, superintendent.

Repairing the French Atlantic Cable.

The steamship *Robert Lowe*, belonging to the Anglo-American and French-Atlantic Telegraph Companies, returned to the Thames a short time since, after repairing the American section of the French-Atlantic cable. This work was not done by Captain Blacklock without experiencing several difficulties. The exact position of the cable was not accurately marked on the chart, because the faulty portion had been laid in a thick fog. After dragging for it for some time, it was however hooked, and found to be in good electrical condition to St. Pierre; the fault was shown by the electrical tests to be twenty-five miles off, in the direction of Duxbury Beach. The St. Pierre end was buoyed, and then Captain Blacklock proceeded to wind in the cable with the picking-up machinery. After about twenty miles had been brought on board, a ship's anchor came up attached to the cable, and to free it from the anchor the cable had to be cut.

The picking-up was then proceeded with, and at last the fault was reached. At the faulty part the cable had been wilfully damaged and hacked, probably by some captain who had hooked it with his anchor, and had damaged it in freeing his ship. At the time the fault was reached, the barometer fell, and it was plain that a storm was at hand. The end of the cable was therefore buoyed, and soon the storm was felt in all its force. One of the boats was swept away, and the men on the deck were frequently up to their waists in water. It was some days before the weather moderated sufficiently to permit the cable repairing operations to be resumed. The buoy could not be seen, but the cable was grappled once more, the splice made, the cable on board paid out, and the St. Pierre section reached. Then another splice was made, and the loop of the repaired cable dropped overboard.

CAPT. ROWETT, at the late meeting of the British Association, read a paper on Ocean Telegraph Cables, the object of which was to show the superiority of hemp over metallic cables. He contended that hemp cables were much lighter, and extremely enduring when submerged, and iron cables were quickly corroded by the action of the sea water. Various specimens of submerged cable were exhibited by the author, in support of his views.

Improvement in Bridle Bits.

This invention consists in making the cheek pieces by which the bit is hung to the cheek straps, independent of the bit, to a certain extent, so that the latter may be rotated in the horse's mouth to bring the curb chain to bear upon the jaw without moving the cheek pieces. Also in placing small metal rollers on the bit, to prevent the horse from seizing the bit in his teeth.

A in the engraving represents the bit, and B the small metal rollers. The side pieces, C, have square holes in them by which they are fastened upon the ends of the bit. The extremities of the bit outside the square shoulders, are cylindrical, and upon these cylindrical portions are loosely placed the lower ends of the cheek pieces, D, where they are retained by nuts, spaces wider than the cheek pieces being left between the nuts and side pieces by means of which the bit and side pieces are allowed to freely rotate.

The spaces are partially closed by flanges projecting from the side pieces and inclosing the lower ends of the cheek pieces, with the exception of a recess in which the side pieces rotate. This arrangement enables the rider to tighten the curb, without interfering with the cheek pieces

The bit is more particularly designed for cavalry use, and is the invention of Col. Thomas B. Hunt, Quartermasters' Department, Austin, Texas.

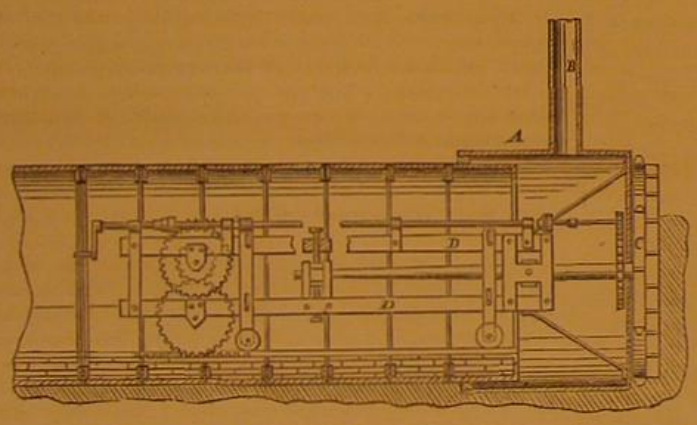
Patented in France through the Office of the Scientific American.

Important Patent Decision.

In the United States Circuit Court, Judge Blatchford has granted an injunction in the important suit of Isaac P. Frank against Charles F. Jacobson and Charles E. Mabie (known as the United States Refractor Company), in which great interests are involved, restraining the defendants from infringing on the plaintiff's patent for glass-lined reflectors, such as are used for lighting stores, churches, theaters, and public buildings generally.

TUNNEL EXCAVATOR.

Our engraving illustrates an appliance for excavating tunnels, patented by Theodore A. Fisher and Anson F. Fisher, of Beardstown, Ill. It consists of a sliding coffer, A, provided with an excavating disk, C, supported by a car, D, arranged on a suitable way in a cast-iron tube. By means of suitable gear the excavating disk is kept advanced to its work. Those familiar with the excavation of the tunnels by the use of coffers, will need no further description to understand the general principle of the device, which is designed to lay submarine tunnels, the cast-iron tubing to be laid in sections as the work proceeds. Air is supplied to the coffer through the tube, B.



Manufacture of Champagne.

As the greater part of the champagne country has been overrun by the German army and the exportation of genuine wine can hardly take place for sometime to come, the artificial production of this beverage is likely to receive a new impulse. For those who prefer to manufacture their own champagne we append a number of approved recipes:

8 Parts of the best West India sugar are to be dissolved in 4 quarts of distilled water, and boiled, and while still hot, 2 quarts of rectified spirits added. This affords what is called champagne liquor to serve as stock in the manufacture.

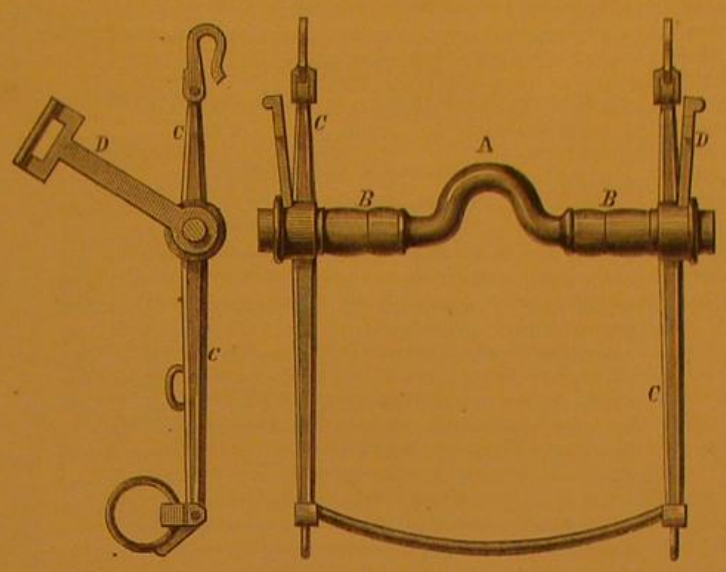
To prepare the Roedern brand with green seal and bronze cap, take one portion of the above liquor, 1 anker white wine, 1 bottle cognac, and 4 drops of the oil of wine beer dissolved in cognac.

For Heidsick, 1 portion liquor, 1 anker white wine, and ½ quart cognac.

Other varieties are prepared in a similar way, the chief difficulty being to provide the proper bottle, sealing-wax, and labels. In default of white wine, cider is found to answer every purpose, and glycerin can be substituted for sugar.

Plaster Casts of Natural History Objects.

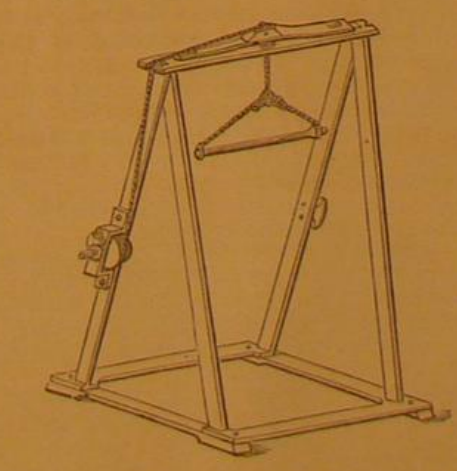
At a recent meeting of the Manchester Philosophical Society, Mr. Boyd Dawkins, F. R. S., exhibited a number of casts in plaster of Paris, of various objects of natural history, and explained the process by which any one can make them for himself. The material of the mold is artists' modeling wax, which is a composition akin to that which is used by dentists. And as it becomes soft and plastic by the application of heat, though in a cold state it is perfectly rigid, it may be applied to the most delicate object without injury. As it takes the most minute markings and striations of the original to which it is applied, the microscopic structure of the surface of the original is faithfully reproduced in the cast. The method is briefly this: 1. Cover the object to be cast with a thin powder of steatite, or French chalk, which prevents the adhesion of the wax. 2. After the wax has become soft, either from immersion in warm water or from exposure to the direct heat of the fire, apply it to the original, being careful to press it into the little cavities. Then carefully cut off the edges of the wax all round, if the under cutting of the object necessitates the mold being in two or more pieces, and let the wax cool with the object in it, until it be sufficiently hard to bear the repetition of the operation on the uncovered portion of the object. The steatite prevents the one piece of the mold sticking to the other. The original ought to be taken out of the mold before the latter becomes perfectly cold and rigid, as in that case it is very difficult to extract. 3. Then pour in plaster of Paris, after having wetted the molds to prevent bubbles of air lurking in the small interstices, and if the molds be in two pieces it is generally convenient to fill them with plaster separately before putting them together. 4. Then dry the plaster casts, either wholly or partially. 5. Paint the casts in water colors, which must be fainter than those of the original, because the next process adds to their intensity. The delicate shades of color in the original will be marked in the cast by the different quantity of the same color which is taken up by the different textures of the cast. 6. After drying the cast, steep it in hard paraffine. The ordinary paraffine candles, which can be obtained from any grocer, will serve the purpose. 7. Cool and polish the cast by hand, with steatite. The result of this process is far better than that obtained by any other. The whole operation is very simple, and promises to afford a means of comparison of natural historys pecimens in different countries, which has long been felt to be a scientific need. Casts of type specimens may be multiplied to any extent, at a small cost of time and money, and are as good as the original for purposes of comparison, and almost as hard as any fossil. Mr. Dawkins has employed it for copying flint implements, fossils, and bones and teeth, which can scarcely be distinguished from the originals.



HUNT'S BRIDLE BIT.

EXERCISING APPARATUS.

A portable apparatus for gymnasiums and private use, and which combines the horizontal bar with the swing, is shown in the accompanying engraving. It is the invention of Geo. W. S. Hall, of Baltimore, Md. On the upright of the frame is a device for taking up or letting out the rope, which latter passes over a pulley hung in the middle of a spring, and descends to support the bar, as shown in the engraving. The whole can be taken in pieces for transportation, and easily set up for use when wanted. The utility of apparatus of this kind to those leading sedentary lives, has not been hitherto properly appreciated by the American public, but we are glad to say that the disorders which our general lack of proper muscular exercise has entailed upon a large class of our population are gradually teaching us its value.



SIEMENS' PYROMETER.

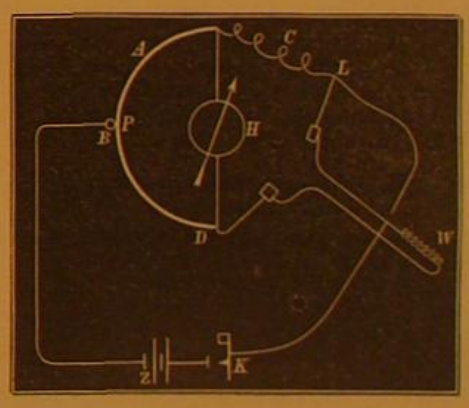
[Condensed from The Mechanics' Magazine.]

This instrument can be used to indicate high temperatures, such as those met with in blast furnaces; it can also be used to measure moderate temperatures, but its chief feature is that the indicating part of the apparatus may be several yards, or miles even, away from the place of which the temperature has to be ascertained. Hence it was used by Dr. Carpenter to learn the temperature of the deeper portions of the Atlantic, and it enables ironmasters and colliery proprietors to see in the office of the works the temperature of their pits or furnaces which are at a distance from the place of observation.

The principle of the instrument is simple. When a plati-num or iron wire rises in temperature it offers more resistance than before to the passage of a current of electricity. Hence the variations in the conductivity of the wire serve to indicate the variations in temperature, which variations may be read off by means of suitable galvanometric appliances.

The apparatus for indicating high temperatures, such as those of furnaces, consists in a coil of fine platinum wire wound round a cylindrical clay pipe, which pipe is about 3in. long by ½in. in diameter. The wire lies in a spiral groove made upon the surface of the clay cylinder; this grooving prevents the convolutions of the platinum wire from touching each other, in consequence of which the electrical current must pass along the whole length of the wire, or about three yards. The exact length through which it must pass is regulated by a small platinum adjusting clamp, the position of which may be shifted. In this way all the instruments made by Mr. Siemens are adjusted to give the same indications. The ends of the fine wire which measures the temperature are connected with two thick platinum wires, each about 18in. long; as the further ends of these thick wires are at a tolerable distance from the source of heat when the instrument is in use, they in their turn are connected with thick copper conducting wires. All these wires are protected by clay pipes. The whole of this arrangement is placed in a protecting tube of iron about 4ft. long. The platinum spiral pyrometer is then in the closed end of the tube; the other end of the tube has a wooden cap on which two brass terminal screws are fixed, and these screws are connected with the conducting wires to and from the spiral.

When temperatures above the melting point of iron have



to be measured, the end of the tube which is subjected to the heat must be made of platinum. In some instances, where moderate furnace temperatures have to be measured, the end of the tube may be made of copper. The metal is very thick at a point some few inches nearer the cold end of the pipe than the platinum spiral, in order that the cooler part of the outer pipe may not draw off the heat by conduction too rapidly, and thus affect the reliability of the indications. The short clay cylinder carrying the platinum spiral has a projection at each end, which prevents any part of the spiral touching the sides of the iron pipe, and thus interfering with the accuracy of the indications by increasing the electrical conductivity of the whole arrangement.

When the end of the great metallic pipe is pushed into a furnace, the temperature of the platinum spiral rises and its electrical conductivity consequently decreases; the decrease in conductivity is measured by electrical appliances, and thus the temperature of the furnace is read off.

Conducting wires are connected with the terminal screws at the cold end of the iron pipe, and thus the hot spiral becomes a part of the electrical circuit. The change in the electrical resistance is then measured by apparatus, the principle of which may be explained by the aid of the accompanying diagram.

The current goes from the zinc pole of the battery, Z, to the movable contact wheel, B, which wheel may be moved to any part of the arc, A D, which is a very fine platinum wire fixed round the edge of a disk of ebonite. When the little wheel is in the position shown in the diagram, the current enters the platinum wire at P, and splits into two parts, one portion of the current going to A, and the other to D. Midway between A and D, the galvanometer, H, is fixed. From the two ends of the platinum wire, A D, the current passes on one side into the constant resistance, C, and at the same time into the galvanometer; on the other side it passes to the other terminal of the same galvanometer, and at the same

time to one of the leading wires of the platinum spiral pyrometer, W. The current passes through the platinum spiral as well as through the constant resistance, C, and the two branches meet at the point, L, in order to return to the other pole of the battery. K is a "key" for making contact with the battery. As long as the electrical force at A and D is equal, the galvanometer needle will be at rest, but when it is unequal the needle is deflected. The balance may be restored and the needle brought back to zero by shifting the wheel, B; hence, when the electrical balance of forces is disturbed by the heating of the spiral, W, it may be restored by shifting the wheel, B, consequently the temperature is read off by noting the position of the wheel, B, upon the graduated arc, A D.

The plan of action is to expose the platinum spiral to the temperature to be be examined, and to connect the leading wires with the terminals; then the astatic needle of the galvanometer has to be adjusted, so that it points to the zero of its small scale. When the contact key, K, is pressed down, the needle is deflected, and the movable contact wheel, B, is shifted until equilibrium is obtained. After this, a reading of the large scale on the arc, A D, is taken, and a calculated table attached to the instrument gives the real degrees in Centigrades of the heat of the platinum spiral in the furnace. Many of the instruments are made to register temperatures up to 1,000° Centigrade, and some have been made to register 2,000°, but in these instances, the end of the large tube was made of platinum.

For ordinary temperatures, or temperatures much below a red heat, a fine insulated iron wire, several miles in length is used, and it is inclosed in a hermetically closed tube, that it may be removed from the influences of moisture and rusting. Such thermometers are found to be very sensitive, and to give very accurate readings.

Some of these pyrometers are now in use in the Imperial Ironworks in Russia; they are also used for blast furnaces, and in gas works, for the temperature at which coal is distilled much influences the quality of the gas. Some of the instruments for testing low temperatures have gone to Turin for experimental purposes.

DR. DOREMUS ON THE TRIUMPHS OF SCIENCE.

THE LENS AND THE PRISM.

The first of a course of four lectures at the Hall of the Young Men's Christian Association, on "The Triumphs of Science," was delivered on the evening of December 1st by Professor Doremus.

The lecturer in opening his address alluded in strong terms to the feeble interest manifested by the wealthy citizens of New York in regard to scientific education and the want of pecuniary aid felt by colleges and scientific institutions in general, and made an earnest appeal to all public scientific lecturers to urge the claims of these institutions with greater confidence and energy as opportunity shall offer.

He then announced the subject of the lecture for the evening as the Lens and the Prism, as through these simple yet powerful instruments a very large proportion of "the triumphs of science" have been achieved.

He first briefly sketched the history of the development of knowledge with regard to celestial objects. Strange to say, although we had such perfect records of the workings of the human mind in other fields, we did not know the authors of some of the grandest achievements in connection with astronomy. Naturally, we should conclude, the first object of attention would be the sun, and the second the moon. These were evidently the means of indicating to us the hours of the day. "To every nation, tongue, and clime, each in its meridian, the eternal sun strikes twelve at noon, and the glorious stars, far up in the everlasting belfry of the sky, chime twelve at midnight." As a time measurer the sun was the first object of attention. It was then probably observed that the shadow of the sun lengthened and shortened, and thus we had two periods of the year—the period of the longest and the shortest day. Next came the observation of the moon, and then of the stars—their movements, magnitude, and grouping, especially those constellations through which the sun and moon passed.

The Professor then detailed the various discoveries made by Pythagoras, Copernicus, Galileo, and Kepler, saying in regard to the latter that astronomers of all lands had agreed in awarding him the proud and well-earned title of law-giver of the heavens. His discovery of the elliptical movement of the planets was one of the greatest achievements of science. In regard to Galileo the lecturer said: "Let us not forget the painful termination of his splendid career, and the extraordinary and infernal vice of the human brain to humiliate this great champion of truth, who, though assured of the reality of the revolution of the earth, was obliged, upon his knees, and with his hand upon the sacred Scriptures, to swear the earth did not move. I have never seen a more infernal vice in history."

The lecturer then advanced to the discoveries of Arago, and Leverrier, and gave several instances of the marvelous accuracy with which mathematics had been applied to astronomy. In 1846 Leverrier predicted the locality where the new planet that had been previously observed, and had then disappeared, ought to shine, and his friend in Berlin examined the firmament on the night announced, and lo! there the new world was found. Dr. Doremus concluded this portion of his lecture by showing how vividly the discovery that our whole solar system revolved round a sun (which some had supposed to be Hercules), which again in its turn, with its attendant systems, rotated round yet another central sun, impressed us with a sense of the boundlessness of the universe

His remarks on the prism consisted chiefly of a clear and interesting explanation of spectrum analysis. He said that probably the prism would prove even more fertile as a means of discovery than the lens. Several new metals had already been discovered by its aid, and we had now something like proof as to the real nature of the sun, which probably consisted of metals in a highly incandescent state.

The lecture was illustrated by many brilliant and interesting experiments. He gave among others the well-known experiment of a body of oil suspended in a globe of alcohol and water, which, upon being moved upon an axis, gradually threw off bodies of eccentric forms. The motions of the universe and the results of spectrum analysis were displayed by the aid of a series of dissolving views, which were of a highly entertaining and instructive character.

Correspondence.

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

Automatic Telegraphy.

Messrs. Editors:—In your issue of November 5th, is an article upon the subject of "Automatic Telegraphy," by George B. Prescott, Esq., in which occurs this passage:

"In order to attain the exceptionally high rate of speed which has been experimentally obtained upon the Automatic line recently constructed between New York and Washington, the Company put up a steel and copper wire for which they paid more than three times the cost of a good iron wire, suitable for the use of the systems in general use. It is evident, therefore, that even the claim for greater economy in the construction of their lines, which has been so frequently made by the advocates of that system, is not well founded."

Let us see if this be so. The National Company, referred to by Mr. Prescott, have used the American compound telegraph wire, in the construction of their line to Washington. This wire is composed of 80 pounds of steel and 80 pounds of copper to the mile, its total weight per mile is therefore 160 pounds, but its conducting power is equal to that of an iron wire weighing 630 pounds per mile, and its cost per mile was $82. It is erected on an average of about 15 poles per mile, and is insulated by the Brooks insulator.

We will suppose that the posts cost, all set, on an average, $3 each, also that it cost $3 per mile for stringing the wire, and that the insulators cost 38 cents each.

These are among the principal items which go to make up the cost of a line of telegraph. Let us see how they sum up:

1.	Cost per mile of 15 posts set	$45·00
2.	" " " " 15 insulators	5·70
3.	" " " " wire	82·00
4.	" " " " stringing	3·00
	Total	$135·70

or less than one-half of Mr. Prescott's estimated cost of an ordinary line, call it $150·00 per mile, which will cover the cost of such materials and equipments over most of the length of such a line. Of course the expense of poles suitable for use in large cities, and the cost of setting them in cities would be consideraby above these figures, still the average cost will be less than Mr. Prescott's estimate for an "ordinary line suitable for the systems in ordinary use."

Don't they get the worth of their money?

The line is280 miles in length instead of 228, simply because they were obliged to go upon highways and byways, and it was under great difficulties that they secured a location at all.

Mr. Prescott admits (which is true) that they have attained a speed of 250 words per minute over the 280 miles of compound wire line, and he remarks (which is also true) "that the speed of automatic transmitting varies inversely as the square of the length of the line."

Suppose then that this line could be shortened to 250 miles by going alongside of the railroad for most of the distance, its speed then would be increased in the proportion of the square of 280 — 78,400 to the square of 250 — 62,500, or $\frac{78400}{62500}$ — 1·25, an increase of twenty-five per cent, thus making 1·25 × 250 — 312 words per minute.

Mr. Prescott also admits that 100 words per minute were all he could obtain over 250 miles of No. 8 iron wire, in a series of carefully conducted experiments.

If now, with this superior compound wire, the National Company can transmit automatically three times as fast as upon a No. 8 iron wire for the same distance, are they not fully justified in paying three times as much for it? but is $82 three times as much as the cost of a No. 8 iron wire?

We must take into account also that this new compound wire can be put upon 15 poles per mile, and withstand the storms quite as well and better than the Western Union Company's wires do with 38 poles per mile.

Now when we realize that insulation improves inversely as the square root of the number of insulators, we see that the gain in insulation, by using 15 instead of 38 insulators per mile is $\sqrt{\frac{38}{15}}$ — 1·59, nearly 60 per cent, let alone the saving in cost of construction and maintenance, and by doubling the conductivity only one half of the battery is necessary. The conductivity of this compound wire per pound per mile, is three times that of an iron wire.

Again, since it is admited that the Phelps printer can transmit only about 50 or 60 words per minute, while it will be seen from the above that an automatic system can transmit five or six times as many, now why not employ some kind of an automatic system to transmit the messages, and employ the Phelps, House, or some other printer, to simply copy them, as I suggested to Mr. Craig and Mr. Little last summer, and to several other friends nearly two years since.

Boston, Mass. Moses G. Farmer.

The Man who Built the Telegraph.

Messrs. Editors:—On page 326, Nov. 19 issue of your paper, is an editorial notice of a late meeting of the Western Union Telegraph Company, which is headed "Honors to the Inventor of Telegraphy," containing an abstract from the very appropriate remarks of its President, Mr. William Orton, in which abstract, by an error of one letter (e), the meaning of the President in one sentence is entirely changed. It occurs in the eighth line of the second paragraph, in the word "men," which should have been "man," or as follows: "In the same presence sit to-day, in the annual services of the largest telegraphic organization in the world, the man who made its existence possible, and the man (men) who made it."

Now to whom did Mr. Orton refer as "the man who made it?"

Aside from Professor Morse and one other gentleman, there were none present who contributed either in making the telegraph, or by money for its development, or as an investment in its stocks, for years after its introduction into general use and its necessity as a business agent became apparent and generally acknowledged. By reading the above sentence as corrected and as pronounced by President Orton, it will be seen that it refers to Professor Morse as the man who invented the telegraph, and to Hon. Ezra Cornell, of Ithaca, as "the man who made it." It was Mr. Cornell who took the entire management of building the first line in this country, from Washington to Baltimore, to its completion, and put it into successful operation, after the Professors Morse and Gale, Doctor Fisher, and Messrs. Vail and Smith, had expended twenty-three thousand dollars of the Congressional appropriation of thirty thousand dollars, and broken down at the Relay House ten miles from Baltimore in the winter of 1843 and 4, in their fruitless attempts to insulate the wires so as to make them work, inclosed in leaden tubes beneath the surface of the earth. As this allusion of President Orton is the first public recognition, small though it may be, of the important services of Mr. Cornell in rescuing the telegraph from the wreck of the failure which had been made by its inventors in their efforts to build their first line, which has ever come under the notice of the writer, he deems it but just and proper that this correction should be made, and asks its insertion in your columns. Horace L. Emery.

Albany, Dec. 5, 1870.

Spiritualism and Science.

Messrs. Editors:—In your last issue appeared an article entitled "Spiritualism aad Science," which is a sort of review of a work by Dr. Hammond. I have not seen Dr. Hammond's work, but from the extracts which you give and the remarks you make—with all due respect to the learned doctor—I must say that he has not only been a partial but a prejudiced observer. My own experience teaches me this. He has endeavored, as many other scientific men have already done, to reconcile the observed facts with scientific laws, has failed, and therefore denounces them as hallucinations.

I do not intend to speak of spiritual visions, communications, and so forth, since these may readily be pronounced impositions, and attributed to diseased conditions of the brain; but it is to table movings and such manifestations, which Dr. Hammond states to be "due to hallucination, legerdemain, or actual fraud," that I intend to call your attention.

He also states that equally wonderful tricks can be performed by any professor of natural magic. Without denying the latter assertion, allow me to add that all such tricks can be detected by a thorough investigation, but I defy any man to detect the least deception in the phenomenon of table tipping. I have seen the experiments performed in private parlors, and under circumstances when I knew there could have been no deception; in fact, have myself been violently thrown to the floor, as a number of ladies and gentlemen who were present can testify, while attempting to prevent a table which was under this influence from moving.

The evidence which can be brought forward to support the existence of this occult science is too weighty to be overthrown by ridicule.

In conclusion let me state that I am not a spiritualist, nor am I in any way connected with any spiritual circle. I have studied the subject with an unprejudiced mind, and am convinced that there is a mystery about it which ought to be solved, and which lies within the scope of science to investigate.

I am aware that these things are in opposition to gravity; I am also aware that by writing this I expose myself to the ridicule of the greater part of the scientific world; but as I have devoted my life to the study of science and truth, I have seen these things and know them to be facts. I hope in this way to call the attention of scientific men to these things, which seem fatal to all the laws of nature. I hope to see them fairly investigated; discarded if they are deceptions, and if not attributed to some mysterious power beyond our ken. R. H.

Ithaca, N.Y.

Sanity vs. Insanity.

Messrs. Editors:—Over twenty-one years a regular reader of the Scientific American, I hope the Editors will allow me to be of age, and in sound mind, when I add, that I have every copy well bound, and not a number missing, and prize them next to the Year Book of "Scientific" (Annual) Discovery.

Having dabbled a little with the microscopic, magnetical, and electrical experiments, collected all sorts of weeds, and "livin'" things, and curious about spontaneous generation, surrounding ether, the egg-development, and all that sort of thing—and occasionally written articles for horticultural journals, folks here in this benighted quarter give me credit for

being a man of science; but, alas! although I have not only read Faraday, Huxley, Owen, and a host of other authors, and been put to heavy expense, as the shelves of my library will testify, to learn something, I have concluded, according to your judgment on these point, that I must be a dyspeptic reader, unable to *digest* what I have read. In your article on "Spiritualism and Science" (p. 360, current volume), you truly say spiritulism s a "subject that scientific men dislike to approach," and you might as well have given the subject a wide berth, and been silent—for your language is too strong—besides it is not true what you say—and your own instincts ought to teach you—when the "rush-light" of science fails to illuminate the chasm yet existing between mind and matter—body and soul—unless you consider the soul of man a myth.

I may say, in order to define my position, that, contrary to to my wishes, I have been chosen as an elder in the Presbyterian Church, I trust, owing to a consistent Christian walk and conversation. I dislike cant or a display of piety. Scientists and spiritualists both reject the atonement and sovereignty of Christ, and deny the necessity of faith in Him, and repudiate the entire Gospel scheme, which I do not.

So coupled, you are nearer akin to the spiritualist's belief than I am. You say "The whole business of spiritualism has been the source of much mischief, and has brought insanity into many a family. OUR readers ought to know, that no man of science, no sane man of intelligence, has any faith in it. Before the light of science the whole thing is shown to be an imposition. 'But,' as Dr. Hammond says, 'Spiritualism is a religion.'" No doubt meaning just as much so as Presbyterians, Lutherans, Episcopalians, etc. Like in early gospel times, Paul had Sadducees and Pharisees to deal with. The Gospel of Christ differed from both.

But "facts are stubborn things;" and what a man, who is thoroughly posted in legerdemain or the hocus-pocus of scientific contrivances, of a cool judgment, and deliberate habit of investigation, sees in his own private dwelling—under full light—with no one present capable to mesmerize him, or possible opportunity of being misled—what such a man sees under such circumstances, require some other mode of explanation than the fancies of the hypochondriac, or that of hysteria, catalepsy, and ecstasy; that is, tables moved without any visible contact or invisible contrivance. I am very curious to read and add to my library, with other sapient authors, the small monogram entitled "The Physics and Physiology of Spiritualism," by William A. Hammond, M.D. If you had mentioned the price and place, I would order a copy at once.

But, my dear sirs, the animus of your remarks do not only bear on "Modern Spiritualism," but all that is not material. You say the consciousness of this great truth (Materialism) weighs like a nightmare upon many of the best minds of these days. These "best minds" watch the progress of "Materialism" in such fear and powerless anger as a savage feels "during an eclipse." "They are alarmed lest man's moral nature be debased by the increase of wisdom."

You altogether mistake at least one class of devout Christians, who take as great pains to increase their wisdom as you could possibly wish. Have you not discovered that there are things beyond the scalpel and analysis of matter to which names are given, that by no means explain these phenomena?

Now tell me, logically, why a common magnet will cause a needle to leap up to it, and will not disturb a pin? They are all inert metallic matter. To call it gravitation or attraction, mind you, will by no means explain it. If you will demonstrate this simple fact, then will I agree that you can explain the difference why a divine influx from the Author of our being can impress some minds, so that faith in a future state of existence is inspired as to lead him joyfully to anticipate that endless state of existence, built up of imperishable refined matter, unalloyed by the crudities of earthly ponderable elements. That mind, on the other hand, who sees that, scientifically, he is continually throwing off matter, which is again absorbed by vegetation, and again received into his physical organism, and all that, until he finally finds the machine worn out and himself "gone to grass"—what a pity—this aspiring mind of man, emblematic of its great author, to lose all individuality, and the substance turn to dust or into the herbage for the ox!

You know the celebrated chemist, Dr. Dalton, who thought the red gown in which he was installed as a Doctor of Civil Law, at Oxford, was a blue one; he was color-blind, could not tell when his blue stockings were exchanged for red ones; they simply seemed a little dirty, to his eye. I might learn some useful lessons in chemistry from such a man, but I would decline his instructions or judgment to discriminate in colors for me. The illustration respecting the introduction of the stereoscope to the *savants* of France (SCI. AMER. p. 322, current volume) is a very apt illustration. Another man's defects in his mental organization, or physical defects, cannot annul the legitimate functions of a proper development, and the cap of a hypochondriac fits one rather than the other.

I am now over sixty-two years of age. I have much to learn yet, no doubt, so have you, my worthy friends. Our mental organisms differ. I can truly believe that "angels could roll the rock from the sepulcher," or give to John a "revelation on the Isle of Patmos," and matters of that kind. Of course, to you such notions are hallucinations. But this so-called hallucination is so indelibly fixed that it makes me a happy, patient, cheerful old man. God be praised! The closet affords such *ecstatic* enjoyment, that the "poor rooters," however profound in a knowledge of organized matter, know nothing of it. The "Lord pity them!" and touch their latent functions, if not wholly dried up in their—heads, I suppose it ought to be, or—hearts, I shall not quarrel about the locality, it is the instinctive feeling that we are not Godless nor soulless creatures, place it where you please.

But all this by no means hinders me from such profound studies as geology, astronomy, and natural and mental philosophy; every fact revealed by these researches I duly appreciate. I do not shrink from perusing an author because he is styled an infidel, because I want to know how or whence he draws his knowledge. I am by no means a timorous Christian. Such is my confidence in Him in whom I believe, that if you were to tell me (beg pardon for mentioning such a personage to scientific ears) that the devil himself was in my back room, and desired an interview with me, I would deliberately "interview him," as politicians say. I hold that "truth is mighty and must prevail," because God is the author of truth, as the devil is said to be the father of lies. But, until this matter is settled what truth is, I beg you will be a little more modest, and not so hurt the feelings of well-disposed searchers after truth, as to consider those who, perhaps, have a "convolution" in their brain, which may be lacking in your own, through which they have a different experience, and come to different conclusions on matters of faith and spirit; allow them to be rational—please do.

Lancaster, Pa. JACOB STAUFFER.

Popular Errors Regarding the Watch.

MESSRS. EDITORS:—Most people suppose the regulator is put in the watch for the use of the watchmaker, when, the fact is, it is principally for the convenience of the owner. The watchmaker does not absolutely need it, some fine watches being entirely without one. It is well known that every individual watch has its own whims and caprices of action—an individuality by which it differs from another of precisely the same construction; some persons have gone so far as to assert that a watch partakes of the character of the wearer, that there is a kind of assimilation between the two; there is no doubt, however, but that the action of the watch is materially and sensibly affected by the habits of the wearer, which fact brings us face to face with the subject of regulation, which should be done entirely by the user of the watch.

This is quite contrary to the general opinion, which is, that it is especially the business of the watchmaker. A customer rushes panting into the shop, exclaiming, "Mr. Pivot, my watch is away behind time—I missed the train by the confounded thing being five minutes too slow this morning, and ever since you have had it, it goes too slow. Now I want you to keep it here till it is right," and he lays it down on the counter with a whack sufficiently hard to do it injury, and with an air which plainly says he is much offended, either with the negligence or want of skill of Mr. Pivot.

"Hold on! hold on!" shouts the watchmaker, as the indignant man is slamming the door after him, "How long is it since I set it?"

"I can't tell; it must have been ten or fifteen days—you ought to know—don't you remember—it was the day you mended my wife's gold spectacles."

"Now, my dear sir," says Mr. Pivot, "do be reasonable; don't you know that I can't exactly regulate your watch hanging here? Neither can I regulate it in your pocket unless I know how long it has been running since last set, so as to know its rate of going. You say ten or fifteen days, which is it? If ten days, it is half a minute per day; if fifteen days, it is only one third of a minute per day. Now how can I move the regulator intelligently on such uncertainty? or how can you expect me to remember when I set it, or when your wife's glasses were mended? for as soon as your watch was out of my hands some other one was in, and in the ten or fifteen days since I moved your regulator I have done the same thing to a hundred others; now don't you see what impossibilities you require of me?"

"Yes; I see how it is, but never thought of it before."

"I knew it," continues Mr. Pivot," and that's the reason I have given you such a plain talking to, and now take your watch, put it in your pocket, and make a memorandum of the date on which it was set; then when you have ascertained its rate of going, move the regulator yourself; the amount of movement it will require to affect it a certain quantity you will soon learn, and as that amount differs in every watch, it becomes necessary to know it in order to regulate it with the greatest nicety, this particular knowledge of every watch, no watchmaker can have. But should you prefer he should move it, never ask him to do it until you can tell him how much it gains or loses in a given time, for it is only troubling him and yourself needlessly, and he will be just as likely to keep your watch perpetually wrong as to ever get it right; that is why I say to you so bluntly, but honestly, if your sight be good and your hand steady, regulate it yourself, but be especially careful to avoid attempting to make your watch agree with every clock you chance to look at, or every watch the owner says will not vary a minute in a year."

Cleveland, O. R. COWLES.

Explanation Wanted.

MESSRS. EDITORS:—A short time since I was walking along the bank of the Morris and Essex canal in this city, when passing a telegraph pole, I was attracted by a queer buzzing noise which came from it. Pressing my ear close against the side, I could hear the sound very distinctly. It seemed to come in little pulsations like a battery. I then went to several other poles, at each of which I heard the same curious noise, though in some it was very faint; while at the first one I stopped at, it was so loud that, by listening acutely, I could hear it at a distance of five feet. By laying the hand on the pole the vibrations could be distinctly felt.

Perhaps some of your many readers can suggest an explanation. F. P. DODGE.

Jersey City, N. J.

Grindstones by the Ransome Process.

MESSRS. EDITORS:—In your issue of the 12th Nov., I notice under the heading of "Artificial Stone" an article by J. E. E. upon grindstones manufactured under the Ransome patents.

J. E. E. represents that though those experimented upon proved fully up to his expectations as a trial; some being "superior stones hard clear through, and doing excellent service," yet others lacked uniformity in hardness; containing spots where the sand had never united.

The tenor of his article is, that if these stones could be produced free from soft spots and of uniform hardness they would far surpass the natural stones in effective working.

My present object is to draw attention to the fact that stones can be, and are produced by the Ransome process free from soft spots, and of uniform hardness, and that, as he anticipates, they far surpass the natural stones in effective work.

The defects alluded to are not—as one would gather from his letter—inherent to the manufacture, but arise from ignorance of its details, or from want of due attention thereto.

The soft spots are occasioned by the imperfect admixture of the materials, and the want of uniformity is due either to the same cause, coupled with imperfect pressing, or to the latter point alone.

The Ransome process, when its details are thoroughly mastered, and correctly carried out, is certain in its effect, and invariably produces the expected results.

San Francisco, Cal. E. L. RANSOME.

The Thermantidote Again.

MESSRS. EDITORS:—I beg to make a few observations with respect to Thermantidote's letter, which appears in the SCIENTIFIC AMERICAN of the 26th ult.

"Thermantidote" appears to have a pretty correct idea of the details of the machine, the appellation of which he has used as his *nom de plume*. The construction of it is precisely similar to that of a fanning mill. The object is the same in both—viz., to produce a strong current of air. In the thermantidote this current is driven through a grass mat, which is kept saturated with water. By this means a great degree of evaporation is caused. Your correspondent is no doubt aware that a lowering of the temperature of the air is a result of evaporation. For the purpose of cooling a room the thermantidote is placed in a doorway with the back part directed inwards.

A common plan to cool houses in India is to open the doors in that side of the house on which the wind blows, and to hang up grass mats saturated with water in the doorways. The natural wind blowing through the mats produces evaporation. The degree of evaporation obtained in this manner is not, as may easily be conceived, equal to that attained by the thermantidote.

It may appear strange, but it is nevertheless true, that by the use of such appliances the warmer the air on the outside of the house the cooler it becomes in the inside of it. The reason is simply the increased evaporation.

I may add that the mat to which I have referred is called in India a "kuskus tatty," tatty being the Hindoostanee for mat, and kuskus that for the aromatic grass of which it is made. DEESA.

London, Canada.

Atmospheric Pressure.

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN of November 12, page 314, you notice approvingly the statement of a correspondent, A. M. T., that the entire weight of the atmosphere is not sustained by the earth, but is only equal to, or in the ratio of a column of air, one square inch of base, and extending to the outside limit of the atmosphere.

It is singular that, before coming to this conclusion, some disposition of the left out portion should not have been made. The relative amount of this neglected portion would vary with the hight assigned to the atmosphere; but instead of the inch parallelopiped, if we substitute the frustrum of the sector of a sphere, the interior end resting on the said square inch, and the exterior forming part of the atmospheric limit, whether of 10 or 1,000 miles in light, we should have a correct view of the case, and the entire pressure on the earth.

Pittsburgh, Pa. F. W. B.

Ivy Poisoning.

MESSRS. EDITORS:—I send you a prescription which I am satisfied, from ten years' experience, is the very best remedy for ivy poisoning. It is simply to bathe the parts affected freely with *spirit of niter*. If the blisters be broken, so as to allow the niter to penetrate the cuticle, more than a single application is rarely necessary, and even where it is only applied to the surface of the skin three or four times during the day, there is rarely a trace of the poison left the next morning. Having often, previous to the discovery of this antidote, been rendered helpless and blind by ivy poison, I know its worth to those effected thereby.

Port Jefferson, N. Y. H. MARKHAM.

Smoky Chimneys.

MESSRS. EDITORS:—I have had some experience similar to Y.'s (page 340 current volume of your paper) with smoky chimneys, and remedied them by the same means.

I think many flues are built too large, especially in cases where they are intended for stoves, as an ordinary stove cannot heat the whole volume of air, and by this means create a draft.

A stove flue ought to be very little larger in area than the pipe that goes into it—where the flue is perpendicular—where bends occur the area should be increased. A.

Freeport, Pa.

Improved Mode of Graining Wood.

The object of the improvement herein described, and of which our engraving gives a good representation, is to facilitate and cheapen the process of graining, so that instead of, as now, requiring for its adequate performance skill acquired by long practice, it may be performed by the comparatively inexperienced more rapidly than it can be done by the most skillful under the old process.

Hitherto the operation of graining has been tedious, laborious, and expensive. It is claimed, however, for this method that at least four times as much work can be performed by its use as could be done heretofore, while the quality of the work is fully equal to the best hand graining.

The operation is performed by the aid of stencil plates, shown at the right hand lower corner of the engraving. The engraving also shows the method of applying the plates, as described below.

These plates can be cut in any desired style of graining from natural woods, by taking off the exact pattern of the grain on tracing paper, transferring the same to the plate, and cutting the plate after the pattern thus traced. All the woods now used on account of their beautiful pattern of graining may be thus copied by the use of the plates. The whole is finished in quantity by the use of the steel fine comb, the teeth of which are covered with graining cloth, and then drawn over the plate several times while the latter is held by one hand firmly against the door or wainscot to be grained. Various portions of the plate may be used at intervals, to make variety of pattern, so that with one panel plate a number of doors may be made entirely different from each other. All the designs in the various plates are made to match each other at any section, and the entire plates also match, so that endless variety of pattern may be secured. Thus tame repetition is avoided.

A full set of stencil plates for this purpose numbers ten or more in making the various patterns and to perform graining in any place large or small.

The stencil plates are made of brass, steel, or other suitable metal. In these plates the desired pattern is cut, and the surface is indented or covered with a series of small bosses, formed by indentations on the opposite side, so that when placed on the surface, and the plates are wiped or brushed, as hereinafter described, those portions of the paint not desired to be removed shall remain undisturbed for subsequent treatment.

CALLOW'S METHOD OF GRAINING WITH STENCIL PLATES.

These plates are held stationary during the operation by small steel pins at the corners. The operation is as follows: The desired graining color is first rubbed in. Then the proper plates are applied, and held by the pins, as above specified. The plate is then rubbed over with a rubber cloth, or other suitable pad, which penetrating the openings in the plate and removes the graining color lying underneath the cut pattern. The plate being then removed, the work is completed with the ordinary graining tools.

The inventor of this method informs us that he took the first premium at the Northern Ohio Fair, both for superiority of work and for the method of performing it.

Patented, through the Scientific American Patent Agency, July 5, 1870, by John J. Callow, of Cleveland, Ohio.

Improved Flexible Joint for Water Mains.

The accompanying engraving shows a flexible joint used in laying 789 feet of 10-in. cast-iron pipe, which has just been completed and laid on the bottom of the eastern branch of the Ohio River, at Wheeling, West Virginia.

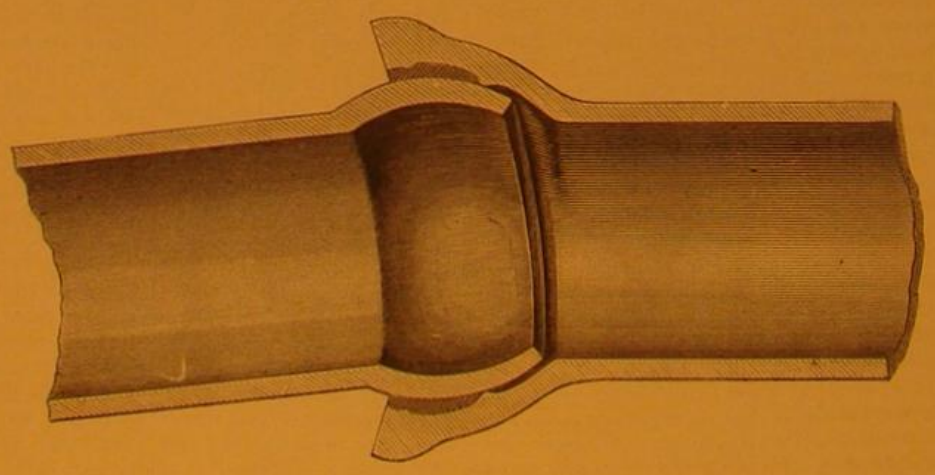
This joint was patented, through the Scientific American Patent Agency, March 15 and May 31, 1870, by Mr. Robert B. Coar, of the Jersey City Water Works, and is very simple in construction, employing neither bolts nor loose parts.

The spigot, or ball, is made of the exact size to enter the faucet or bell, the space for lead packing being formed when the center of the spigot passes through the mouth of the bell, and of a wedge shape which, when packed, cannot be drawn out or displaced.

This joint was run and calked in the ordinary manner to compensate for the shrinkage of the lead. The spigot being turned to the radius of a true circle will adjust itself to any unevenness. There was no difficulty in laying the pipe, although the current in the river was four miles per hour.

Each joint was made separately, inspected, and passed from the boat into the river to adjust itself on the bottom. When laid, the pipe was tested under a head of 200 feet by the Superintendent and Committee on Water Works of the city, and proved satisfactory in every respect.

In pipes of large diameter, Mr. Coar has provision for an inside joint by which a double joint can be made on all pipe under water. The laying of conduit pipe in this manner dispenses with viaducts in crossing rivers, and does not interfere with their navigation, which must be a great saving to water companies and corporations, who are obliged to cross streams and rivers in carrying out their plans of distribution. The principle may be extended to pipes of any diameter designed to be used as tunnels as well as water mains. Address for further information Robert B. Coar, Jersey City Water Works, Jersey City, N. J.



COAR'S FLEXIBLE JOINT FOR WATER MAINS.

Cyclones.

John M. Crady, Curator of the Museum of the College of Charleston, S. C., writes to *Nature* as follows:

Cyclones are commonly regarded as exceptional phenomena of the atmospheric circulation; and we see in text-books statements as to the seasons of the year at which they are most apt to occur, descriptions of the premonitory signs which herald their approach, and directions to aid ships in avoiding the most dangerous portion of the storm field. In short, each cyclone is regarded as an exceptional fact, an isolated burst of fury from the old storm-god, Hurakan.

The writer has lived all his life on the great highway of cyclones, at Charleston, S. C.; and from the observations of many years, has been led to conclude that this commonly-received view embraces only those cyclones which, on account of their rotatory violence, really do threaten destruction on land and sea; and that consequently it overlooks a most important series of phenomena, which, though they do not so forcibly arrest attention, are even perhaps more significant in a scientific point of view. Though destructive cyclones or hurricanes are fortunately rare, cyclones or grand rotary movements of the atmosphere are, at least on certain portions of the earth's surface, of every-day occurrence. In Charleston, Savannah, and along the coast of South Carolina generally, the writer knows from experience that very few, if any, changes of wind are to be observed, but such as are due to the cyclone which happens just then to be passing on its northward journey; and even the apparent exceptions are probably not difficult of explanation.

There is, in short, an atmospheric "Gulf Stream," whose course, beginning somewhere eastward of the Caribbean Sea, is nearly the same as that of the oceanic "Gulf Stream," and this atmospheric stream is composed of an endless succession of cyclones chasing each other ceaselessly up towards the polar regions, along the track recognized as that of great hurricanes.

These cyclones vary within very wide limits, both as to velocity of rotation and velocity of translation, as well as in diameter, and all the characters usually ascribed to such atmospheric movements. Many of them exhibit no wind stronger than a pleasant breeze in any part of their field; and a few have so gentle a motion, at least in some parts of their circuit, as will not agitate an ordinary vane; a few are almost wholly without clouds, and very many wholly without rain or lightning. Their effect upon the barometer, when appreciable, must generally be very slight; but in temperature they are usually divided into a warm and a cool semicircle by a line which, in Charleston, lies about S.W. and N.E.

Observations of the winds, during a voyage in a sailing vessel from Charleston to Liverpool, along the course of the Gulf Stream, has satisfied the writer that the stream continues unbroken between these two points, and this conclusion was strengthened by repeating these observations between Liverpool and New York. In the former voyage, hardly one of the cyclones which passed over gave more than a stiff breeze, while in the latter, from Cape Clear to Sandy Hook, every cyclone was a storm, and one of them was reported by the captain, on his arrival, as a "hurricane."

The causes of this aerial current, and its connection with the circulation of the whole terrestrial atmosphere, it is not the writer's purpose at present to discuss, though he considers the discussion one of almost cosmical importance. But the existence of such a stream is a fact of practical commercial value, in fixing the natural highways for sailing vessels between Liverpool and the Atlantic and Gulf ports of the Southern States. Obviously the short route from Northern Europe to those ports will be that southward along the coast of Europe until reaching the trade winds, then westward to strike the cyclone current in the neighborhood of the West Indies, and then, if bound to Atlantic ports, northwestward with that current. When bound, on the contrary, from the Southern ports to Northern Europe, the short route is obviously that along the Gulf Stream, which is also that with the current of the atmospheric stream. To reverse this practice, either way, is deliberately to sail "against wind and tide," if such a stream exist.

The flow of atmospheric waves which, in a recent work, has been described as setting from the coast of America towards Europe, though the writer has not seen that work, he believes cannot be other than the flow of cyclones in that portion of the atmospheric stream lying between the vicinity of New York and the English Channel. The cyclonic character is not always distinct, and sometimes is completely masked by the great distance of the observer from the center, and the consequent apparently rectilinear course of the wind; and the chances of mistake are still further increased when the observer is moving in a course parallel to the path of the center of the cyclone.

These observation have already been brought to the notice of the Smithsonian Institution, and the writer hopes tha something will be done in America towards the comprehensive, precise, and detailed inquiry which the subject demands. But unless attention of the same kind be given in Great Britain, and in the voyages of the Atlantic steamships, the resulting information will remain incomplete.

Iron Steamboats for Rivers.

The Cincinnati *Gazette* says: "The recent launch of an iron river steamer is a notable event as one step of progress in what we believe will be a revolution in the water craft of the western rivers, which will greatly reduce the perils and the cost of transportation. Here is an iron boat, 180 feet long, 42 feet wide in the hull, 6½ feet deep, with an iron shell varying from three-eighths to five-eighths in thickness, according to the need, much stronger both in the shell and in the frame than a wooden hull, divided into eight water-tight compartments, with forty feet of the deck of iron, which draws, as launched, but fourteen inches. Such a boat is almost proof against sinking. One, and even two, of her sections may be pierced, and she will still float. Her compartments will greatly reduce the risk of the cargo by fire. There is no reason why she may not last forty years. And by the use of homogeneous steel in the place of iron, by an increase of about fifty per cent in the cost of the plates, a boat may be made of double the strength in the same weight. Iron steamboats and iron barges will carry the trade of these rivers. A new boat will be a thing to outlive the builder, instead of going out in seven or eight years. This city has taken the lead in this revolution, and will hold it. Give us a free river and the upper town will before long ring with the clatter of the hammers riveting the sides of iron boats for this and the Mississippi rivers. And in such extensions of the uses of iron, instead of in monopoly prices which dwarf its uses, will be found the sure foundation of the iron production."

AN ELASTIC PREPARATION OF GLUE.—Dr. Sonnenschein reports (*Polytechniches Journal*) that when a thick solution of glue is mixed with tungstate of soda and hydrochloric acid, there is precipitated a compound of tungstic acid and glue, which, at from 30° to 40° C., is sufficiently elastic to admit of being drawn out into very thin sheets. On cooling it becomes solid and brittle, but when heated, it again becomes soft and plastic. It appears that this material has been successfully employed instead of albumen in calico-printing, in order to fix the aniline colors upon cotton; it is also used in tanning, but the leather becomes as hard and stiff as a plank of wood. It is recommended as a lute or cement.

Scientific American,

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW (PARK BUILDING), NEW YORK.

O. D. MUNN. S. H. WALES. A. E. BEACH.

☞ "The American News Co.," Agents, 121 Nassau street, New York.

☞ "The New York News Co.," 8 Spruce street, New York.

☞ Messrs. Sampson, Low, Son & Marston, Crown Building, 185 Fleet street, Trubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

☞ A. Asher & Co., 20 Unter den Linden, Berlin, Prussia, are Agents for the German States.

VOL. XXIII., NO. 25 . . [NEW SERIES.] *Twenty-fifth Year.*

NEW YORK, SATURDAY, DECEMBER 17, 1870.

Contents:

(Illustrated articles are marked with an asterisk.)

ILLINOIS AND ST. LOUIS BRIDGE COMPANY---REPORT OF CAPT. JAMES B. EADS, CHIEF ENGINEER.

The St. Louis bridge, and the great suspension bridge over East River, between New York and Brooklyn, are the two greatest engineering works of the kind now in progress in this country, if not in the world. Both are demonstrating the value of the caisson as an appliance for constructing heavy masonry under water. The former, however, is attended with peculiar difficulties, resulting from the great depth of the abutments, the successful overcoming of which will establish the fame of Capt. Eads as one of the most accomplished engineers of the age.

This gentleman has forwarded to us advance sheets of his report, dated October 1, 1870, from which we shall endeavor to present in the present brief review, and in future extracts, as full as our page space will permit, the more important facts and statements of interest.

The masonry of the west abutment has been carried up from the bed rock of the river to 31 feet above low water. It now contains 6,380 cubic yards of masonry. When completed it will be 115 feet high above the bed rock, and will contain 11,860 cubic yards.

Greater difficulties were encountered in the construction of this pier than in either of the others, owing to the fact that the river at this point had been made the receptacle of every kind of useless material, old sheet-iron, furnace grate-bars, fire-bricks, etc., and two wrecks of vessels had also been sunk on the site of the abutment. More particular mention of these will be found in an extract from the report printed in another column.

The caisson for the east pier was launched October 18, 1869, and on the 25th of October, the first stone was laid upon it. No accident occurred in sinking it, and it reached and rested upon the bed rock on the 28th February, 1870. The bed-rock under this pier is 128 feet below high-water mark. During low water, the depth of sand resting on the bed rock at the site of this pier is 80 feet, at high water it scours down somewhat.

During the sinking of the caisson, the walls at one time sprung a leak, so that the men had to be signaled up. This occurred during extraordinarily high water, and work was suspended till the water subsided.

When the pier had descended 66 feet a telegraphic instrument was placed in the air chamber, and wires led to the office of the Superintendent of construction, and also to the office of the Chief Engineer. The moral effect of the knowledge that means of communicating with the upper world was constantly at hand, is said to have been very salutary on the workmen in the air chamber. The greatest pressure marked by the gages was fifty-two pounds.

Particular attention has been paid to the effect of this great pressure upon the health of the workmen. Capt. Eads' observations on this point are so valuable that we shall publish them in full in a future issue. Suffice it for the present to say that though twelve deaths occurred, one half the men constantly employed from the beginning to the end of the work escaped injury or inconvenience.

Our space is, however, entirely too limited to give anything like an adequate review of this able report. Our extracts from it, one of which will be found in another column, and others which will be found in future issues, will give a better idea of the magnitude of the work, and the ingenious and scientific methods adopted for its accomplishment than a column review could do.

The document is singularly free from any affectation of scientific display, and written in a plain, practical, and common-sense style from beginning to end. It is too full of facts for condensation, and we should be glad had we space to publish it in full, instead of confining ourselves to extracts.

EXPLOSIONS FROM HYDRAULIC PRESSURE.

The very limited compressibility of water and its consequent limited expansion when released from pressure, have led most people to believe that in making hydraulic tests, or in urging the cylinders of hydrostatic presses to their utmost power of endurance, no danger is to be apprehended from explosions. It is reasoned that the smallest rupture of the cylinders would so relieve the pressure that its force would instantaneously be reduced far below that of any expanding gas, and, therefore, that the bursting of a press cylinder could result in nothing more serious than the cost of repairing the damage to the machine.

That this fact does not secure immunity from accident is proved by a casualty which occurred during the testing of a cylinder in Manchester, England, resulting in the death of the man who was performing the test.

The cylinder, which was of steel, was subjected to a pressure of 7,000 lbs. per square inch. It burst under this pressure, fragments of the metal flying off with great force, wounding and killing the person above alluded to.

At the inquest Mr. Ommaney one of the firm owning the works in which the accident occurred, assigned the destructive velocity imparted to the fragments, to the elasticity of the steel.

Had the material of which the cylinder was composed been cast iron, the pieces of iron would have been forced out, and simply have dropped on to the floor, and the water would have flowed out in the usual way, as in a similar case which occurred at their works some time ago. He considered that the damage done was wholly due to the elasticity of the steel, which would be greatly expanded by the water, and when the bolts were displaced it would, as a natural consequence, contract so suddenly as to send the water out with a tremendous force. During the inquest a question was mooted as to whether there was any air left in the cylinder when it was filled, but all the witnesses agreed that such precautions had been taken as to make this absolutely impossible.

A writer in a Manchester paper discussing this accident maintains that the cylinder must have contained air, and such is our opinion. The elasticity of the cylinder does not, to our mind, afford a satisfactory explanation of the accident. The writer referred to argues that in testing such a cylinder (or any other apparatus) as that now under consideration, by means of water pressure, no danger would arise from the fastenings giving way or the metal of the cylinder being ruptured; while, on the other hand, should the vessel contain air, or partly water and air, then the danger is infinitely greater, since the confined air in virtue of its elastic force behaves just as steam of equal pressure would under similar circumstances. The public have read enough of late about boiler explosions to realize the danger attending the use of steam of, say, 50lb. to 100lb., when generated in vessels not sufficiently strong to withstand such a pressure, and yet few can believe that in the case before us a similar force, but exceeding 7,000lb. per square inch, was applied without sufficient precautions being taken to prevent accident. The air in the cylinder should have been completely expelled or displaced by the water before the pressure was applied. Had this been done there would have been no explosion, though the bolts should be too weak to stand the heavy strain upon them. The ram was "hurled a distance of 10 or 12 yards, while the cylinder recoiled about 7ft." Now this is all that any practical man requires to know in order to explain the cause of the accident; and yet, strange to say, the inquest passed without a single ray of light being thrown on the matter. The danger of allowing air to remain in the cylinder during a test has been well recognized, yet it seems that in this case it was overlooked, though the firm in whose works the accident occurred is composed of engineers of established reputation.

The accuracy of the gage used on the occasion is also questioned, and there is little doubt that the gages employed in such tests are often so inaccurate as to be unreliable in their indications of high pressures.

ARTESIAN WELLS.

Some of our readers will remember the article of Professor David Christy, published on page 54, Vol. XVI., SCIENTIFIC AMERICAN, on the subject of artesian wells. His investigations of large areas over the West and South, led him to discredit the common theory, that wells of this character can be obtained anywhere by boring deep enough in the earth's crust. His generalizations were controverted in our columns by several writers.

In addition to the facts then presented, Professor Christy now calls our attention to the late results of the attempts in St. Louis, Mo., to obtain a supply of water for the Insane Asylum at that city. The boring extended to a depth of 3,843½ feet without success. No water flows from it at the surface. The attempt has been a failure, and it has been abandoned. Thus the views of Prof. Christy, step by step, are being sustained. A year previous to the work being discontinued upon the boring at the State House, Columbus, Ohio, he predicted its failure in a lengthened essay. The failure of that enterprise proved the soundness of his deductions made from a knowledge of the geology of the surrounding country. The failure at St. Louis now confirms his views. The boring at Columbus was discontinued at the depth of 2,774½ feet.

The Professor calls our attention to this subject, on account of the views of Mr. Greeley presented at the monthly meeting of the New York Historical Society, a few evenings since, in an address relating to "The American Desert," occupying the country between the base of the Rocky Mountains and the Missouri River. This territory, he said, embraced an area of 400,000 square miles; and that "all this tract needed to make it one of the most productive portions of the continent, was water, which, in his opinion, could be readily furnished by artesian wells and other modern methods of irrigation."

Before emigration sets in to that section of country, it will be necessary to test the question whether a subterranean supply of water exists in it, which will rise to the surface. The experiment of the Government exploring party, a few years since, in boring for water, proved a failure, though conducted under the direction of a geologist.

SCIENTIFIC ADMINISTRATION.

The great want in the conduct of the affairs of our Government is scientific administration.

The number of men who have been appointed to office in the United States at any time during the last thirty years on account of any fitness for the positions is lamentably small. The question of fitness is discarded at once, and political considerations are made to outweigh knowledge. So common has it become to appoint men notoriously ignorant of the first principles of government or of political economy, that an education is looked upon as a defect in a man's training for political promotion and the number of persons who think it worth while to seek a liberal education is actually less at the present time than it was thirty years ago, although the population has vastly increased. It is in view of this startling statement of facts that many of our most enlightened citizens have formed a social science association for the discussion of the best way of remedying the evil. They call loudly for a reform in the civil service, and demand that appointments shall be made after competitive examinations and on grounds of fitness, rather than of political affinities.

It will probably require years to break up the present system, but that it ought to be destroyed, no man of intelligence will hesitate to affirm. But it is not alone in the administration of the affairs of the Government that a reform is needed. We could point out quite as urgent a necessity for a radical change in the conduct of private business, as can be found in the more conspicuous mistakes of office-holders. There are many large manufacturing establishments where scientific knowledge is sadly wanting. When we see "Positively no admittance" over the door, we conclude that somebody is afraid to have his ignorance exposed. Wise men know that the chances are altogether in favor of the workmen in every establishment gaining quite as much knowledge from casual visitors as they can themselves impart. We have heard a scientific friend relate how he was denied admission to an establishment in this city where the success of the works depended upon accurate knowledge, on the plea that the processes employed were secret. Subsequent inquiry revealed the fact that no one of any scientific knowledge was employed on the premises, and the fear of having this omission divulged to the stockholders was the occasion of the "No admittance."

Professor Liebig tells a story about a chemical factory he visited in Scotland. The proprietor politely showed the eminent chemist through an establishment for making Prussian blue. The noise of the machinery was so great as to preclude conversation, and the iron scrapers in a revolving mill rubbed so hard against the sides of the hopper as to wear out the shafting in a few months. After the party had returned to the open air, Liebig inquired why it was that the friction was allowed to destroy the scrapers.

"That is precisely the secret of my success," said the proprietor; "I find the more noise the machine makes, the finer is the quality of my product."

The manufacturer actually introduced iron into the prussiate of potash at the expense of his machinery, and he was not a little astonished when Liebig advised him to throw in the iron in the form of scraps and thus accomplish the same results.

This is a fair illustration of the way many capitalists have of avoiding the expense of employing scientific experts—they prefer to grind up their own machinery to asking a few questions for which they will be compelled to pay.

It is impossible to get on in the government, in the shop, in the factory, in the camp, or on the farm without scientific administration. No one who reads aright the lessons of modern times can deny this fact. The whole world is reading this lesson in the conduct of the affairs of Prussia, and in the great success of that nation. Fifty years ago the German nation was overrun by foreign troops, their villages were burned, their crops destroyed, their cities laid under heavy contributions. They were helpless and divided in council, and wholly unprepared for the shock. As soon as the notes of war ceased and the smoke had cleared from the political horizon, the leading statesman of the day began to inquire into the cause of the humiliating condition of affairs. The great minister, Von Stein, the Bismark of those days, was not slow to detect the utter want of scientific administration in all of the affairs of State as well as in the management of trades and manufactures. His remedy was thorough and complete—his reforms laid the foundation of the future grandeur of the German nation. Under his direction the public schools were re-

modeled and new universities founded. Men were prepared for every department by previous study and careful training. There were schools for forestry, schools for intercommunication, schools for diplomacy, for trades, for mines, for teachers, for soldiers, for professions, for everything that modern civilization required. The highest places in the gift of the Government were open to competition to the lowest citizen, and any man of sufficient talent could aspire to become the rector of the university or the minister of state, and in many instances the highest places were filled with men of the humblest origin.

The first fruits of the seeds sown by Von Stein were a crop of men fully competent to fill every position of responsibility in the nation, and year after year thousands of able men have been at work raising the standard of knowledge and proficiency in every department until we come down to modern times and find a nation thoroughly drilled on every side, with the best scholers, the best soldiers, the best mechanics, the best citizens, the best officers of civil and military affairs; in fact, a nation maintaining a thorough system of scientific administration down to the most minute detail of public and private affairs.

Those who are intimately acquainted with the industries of Germany are aware that such establishments as the iron founderies of Krupp, the salts works of Grueneberg, the ultramarine factories of Nuremberg, and the great woolen and cotton mills scattered over the land, are conducted with the same precision of scientific administration as has been so conspicuous in everything relating to the Prussian armies. In this we have the secrets of success, and a lesson for our careful study and imitation. Scientific administration is what we need in public and private affairs, and we would do well to study the signs of the times and profit by its lesson.

THE GREAT BRITISH PROBLEM.

How to diffuse intelligence over a thousand leagues of ocean is the difficult problem which Hazel has to grapple with in the story of "Foul Play." But this problem was actually solved by the reverend jack-at-all-trades, and hence was certainly not so profound as the one which has so long perplexed the entire English nation, and which may be put as follows: "How to diffuse intelligence from the inside of an English railway coach to the guard at the end of the train."

The cord and bell with which every American is familiar would not answer the purpose of frisky John Bull, who could not refrain from pulling it every now and then, and the method of locking passengers up by themselves renders the execution of such a feeble joke peculiarly easy to young and mischievous Britons.

Many and diverse plans have been suggested by which the removal of the difficulties attending such communication has been sought, but it is a harder knot to untie than communication between England and France across the Straits of Dover, and still remains, like the perpetual motion, something which attracts the minds of inventors only to disappoint their hopes.

The American system of admitting a considerable number of passengers to a single car does not find favor in the eyes of Englishmen. The thing is too democratic, too leveling, to suit their taste. And though it would put an end to the practical jokes of bell pulling and cushion cutting, which seem the idiosyncrasy of youthful and sportive "Bulls," it is, for the reasons stated, a thing not to be thought of.

The peculiar features of the English passenger system have recently been brought out in a strong light by a fight which occurred in a first-class railway carriage between Carlisle and Penrith; one Thomas Bell, a calico printer, and James Quirey, a linen manufacturer, being the combatants. The *Electric Telegraph and Railway Review* thus describes the "mill" and its origin:

"Mr. Bell and Mr. Quirey were the sole occupants of a compartment in a first-class carriage. Immediately after the train left the Carlisle station on its southward journey it seems that Mr. Bell accused Mr. Quirey of having stolen his ticket. This the latter protested he had not done, but notwithstanding all the protestations of innocence, Mr. Bell, in an excited manner, rushed at his fellow-traveler, seized him by the throat with one hand, and, with the thumb and finger of the other hand thrust up his nostrils, dragged him violently backwards and forwards in the carriage until Mr. Quirey's face was sadly cut and bruised. In the course of the encounter Mr. Quirey's collar was torn from his neck, and thrown, saturated with blood, on the carpet, while the windows of the compartment were completely smashed. Passengers in the adjoining compartments heard the cries for help, but, as it unfortunately happened, the passengers' signal was not workable, and Mr. Quirey had to struggle against the violent assaults of his excited adversary, who threatened to kill him, for nearly half an hour, the time occupied in traveling between Carlisle and Penrith, a distance of eighteen miles. On pulling up at Penrith station Mr. Quirey alighted, bruised, bleeding, and much exhausted. Mr. Bell still charged his fellow traveler with having committed a robbery, and on both men being searched the ticket was found on the person of Bell himself. Mr. Quirey then preferred a charge of assault against his assailant, who was taken by the police and locked up in Penrith police station. About six o'clock in the morning a policeman who was on duty at the station looked into the prisoner's cell and found him hanging over the side of his bed with a deep gash in his throat, which had been inflicted with a penknife left in his possession. He was still sensible, but in a very exhausted state through loss of blood.

"On being interrogated by Superintendent Fowler the prisoner replied, 'I would rather suffer death in this way than that I should have been covered with such disgrace.' A medical man speedily dressed the wound, which was a dangerous one. On being brought before the magistrates the prisoner was sadly cast down. He was charged with the assault and also with committing suicide. He had apologized to Mr. Quirey, and offered to pay any amount to himself or to any infirmary if he would withdraw from the case; but this Mr. Quirey declined to do, remarking that it was his duty to the public to prosecute, and the prisoner was committed for trial on both charges, bail being accepted for his appearance."

Truly it would seem that the pugnacity of John Bull is scarcely inferior to his sense of humor.

The journal from which we gather the above statement suggests the electric telegraph as a means for conveying intelligence to the conductor. This might be better than an atmospheric railway, but have our English cousins ever thought of a flying machine for this purpose? If not, we throw out the hint as one that may lead to something.

THE FOREMANIZING PROCESS FOR PRESERVING TIMBER, THE VICTIMS OF ITS POISONOUS EFFECTS, AND THE SUITS AT LAW WHICH HAVE BEEN INSTITUTED TO RECOVER DAMAGES.

The use of the Foremanizing process by the St. Louis, Vandalia, Terre Haute, and Indianapolis Railroad in the preparation of timber for the erection of their depot at St. Louis, the poisoning of a large number of workmen employed on the work, and the death of four or five of the victims, are facts which have been already laid before our readers.

The process which has resulted in such a lamentable disaster is the invention of Mr. B. S. Foreman, of Morrison, Ill. The compound used to preserve the timber from decay consists of the following substances, in the proportions named: one ounce of corrosive sublimate, six ounces of arsenic, and sixteen ounces of common salt.

The directions given for the preparation of the timber are given in a pamphlet kindly sent us by a St. Louis correspondent, the pamphlet being published by B. S. Foreman & Son, of Morrison, Ill. The formula is as follows: "Take the lumber while still green, and pile one layer on the ground, packing close; over this layer sprinkle evenly the dry powder, in the ratio of twenty pounds of powder to every thousand feet of lumber. Lay another layer in the same manner, sprinkle powder in the same proportion, and continue the operation until the amount desired is prepared. Allow this to remain close packed until fermentation has taken place, when the lumber will be fully Foremanized, and from thenceforth free from shrinkage and practically seasoned. N. B.—To induce fermentation of timber a temperature of 45° F. is indispensable."

The effects of working timber prepared in this way were precisely what any one well versed in the nature of the poisonous materials employed would have expected. The men were attacked with blisters and sores. *Œdema arsenicalis* and symptoms imperfectly described as resembling those of venereal disease (the latter undoubtedly the result of exposure by sitting upon the poisoned timber) mingled with the well-known symptoms of poisoning by corrosive sublimate were among the effects of the poisoning.

A *post mortem* examination of one of the diseased workmen revealed the following facts: The stomach was found to be fearfully ulcerated, while the lungs and liver were nearly destroyed by abcesses, the right lung being one mass of corruption. The testimony showed that last spring the deceased had been engaged at work on the Vandalia railroad depot in East St. Louis, the timbers of which had been sprinkled with a white poisonous powder to render them non-combustible, the process being known as Foremanizing; that deceased inhaled this powder, and shortly broke out with ulcerous sores and blisters; experienced great difficulty in breathing; was taken with a chronic and painful diarrhea, and that he gradually became weak and emaciated, and died as before stated. The examining physicians testified that the condition of Smith's body pointed unmistakably to arsenic as the cause of death. The jury then unanimously rendered a verdict that Smith "came to his death by inhaling a poisonous composition used in building the freight depot of the Vandalia Railroad Company, at East St. Louis, Illinois, he being employed by the company as a laborer." Many of the surviving workmen are said to be permanently injured.

Eleven suits have been brought against the railroad company, laying damages at $25,000 each. The declaration of the parties asserts that the railroad company was bound to furnish them good timber to work with, but that instead they were compelled to work upon timber which had been sprinkled with a poisonous powder. This substance they inhaled, absorbed, and otherwise took into their systems, thereby being injured in body to the amount for which the suits are brought.

The case is a somewhat peculiar one, and as it could only have originated either in willful rashness or in culpable ignorance of the usual effects of well-known poisonous substances, we think the plaintiffs are fully entitled to recover the damages for which they sue.

SCIENTIFIC INTELLIGENCE.

IRON BLUE WITHOUT CYANIDES.

A beautiful blue color can be prepared from iron without the aid of ferro-cyanide of potassium. Make a saturated solution of sulphate of iron (green vitriol) in water; convert ¼ of this into the sulphate of the peroxide of iron by means of sulphuric and nitric acids, and then add the remaining ¾ to the original liquid. Concentrated sulphuric acid, cautiously poured in, to prevent too great heat, will occasion the formation of a blue precipitate, which is, however, soluble in water, but if it be separated from the liquid and rubbed with phosphate of soda, a beautiful blue phosphate of iron is obtained which will resist the action of water, and can be used as a paint.

The mixed hydrates of oxide and peroxide of iron are deprived of water, and prevented from forming higher oxides, by the acids and phosphate. The reaction works well in a small way, and it remains to be seen how far it is capable of application on a large scale. If we can prepare a substitute for Prussian blue without the use of poisonous cyanides it will be a real benefit to calico printers and color manufacturers.

CHLORATE OF BARYTA.

For experiments on explosive mixtures and on chloric acid, a very convenient salt is the chlorate of baryta. This can now be obtained, according to Brandau, in a very simple manner. Commercial crystallized sulphate of alumina, sulphuric acid, and chromate of potash in the ratio of one molecule of each of the two former to two of the latter, are cautiously mixed with water to the consistence of a thin paste, and warmed over a water bath, allowed to cool, and treated with alcohol in excess. Upon filtering and neutralizing with hydrate of baryta, precipitates of sulphate of baryta and hydrate of alumina are formed and barium chlorate remains in solution. The alcohol is distilled off, and on evaporation crystals of pure chlorate of barium are formed. Care must be taken not to pour sulphuric acid upon the chlorate of potash alone, but to use the mixture of acid with the aluminum salt. The chlorate of baryta has no uses at present in the arts, but chloric acid, on account of its powerfully oxidizing properties is capable of extensive application, and the new salt of baryta, above described, may be the means of affording it readily and economically.

NEW USE OF TUNGSTATE OF SODA.

Professor Sonnenschein, of Berlin, has found that when glue in thick solution is mixed with tungstate of soda, and hydrochloric acid is added, then is thrown down a compound of tungstic acid and glue, which, at from 86° to 104° F. is so elastic as to admit of being drawn out into very thin sheets. On cooling this mass becomes solid and brittle, but, on being heated, it becomes again soft and plastic.

This material has been employed as a substitute for albumen in fixing aniline colors in calico printing, and it has been tried in tanning, but produces very hard and stiff leather. As the tungstic acid renders fabrics incombustible, its use in combination with glue in calico printing would be a valuable feature. How far it is applicable in the manufacture of paper and as a substitute for albumen in photography, remains to be seen.

The tungstic glue may also have an application in the manufacture of billiard-balls, buttons, knife handles, and in general as a substitute for india-rubber. It is recommended as a lute and cement.

ADULTERATIONS OF COMMERCIAL ARTICLES.

Some calico of English manufacture was recently analyzed by a Swiss chemist and found to contain 25 per cent of the weight of the fiber of foreign substances, 5 per cent of which consisted of mineral matter. The calico was sold at a price below the value of the yarn it was made of.

A sample of starch intended for calico dressing was found to be adulterated with 16 per cent of gypsum. Some black silk in France was weighted with chemicals that proved to be spontaneously combustible, and nearly set fire to a warehouse in Paris. Paper is also notoriously loaded down with chalk, barytes, or clay, and to make the matter still more complicated, it is found that all of these articles are themselves adulterated, so that the microscope reveals adulterations of adulterations in commercial matters just as it does of parasites living on other parasites, down to the lowest order of living beings. Little fleas have other fleas to bite 'em, and so on *ad infinitum*.

Explosive Power of Nitro-Glycerin.

We condense from the *American Chemist* the following upon the above subject:

A measure containing one cubic foot will hold 796 ounces of blasting powder, and 997·1 ounces of water; or, in other words, the specific gravity of blasting powder, as it is used, is about 0·8. This, of course, takes in the interstices, which are filled with air, but as we do not use the powder in a solid lump, this is, for practical purposes, the specific gravity of blasting powder. Now the specific gravity of nitro-glycerin is 1·6. Therefore, bulk for bulk, if the explosive power were the same in a given mass, as prepared for blasting, the nitro-glycerin would have twice the power.

In reality the following are the volumes of gas generated by each respectively in explosion:

One volume of powder which is considered as most effective, produces:

Carbonic acid gas	221·4 vols.
Nitrogen	74·6 vols.
Therefore one volume becomes	296·0 vols.

Of another kind of powder, which explodes with the gases at a lower temperature, one volume produces:

Carbonic oxide	391 vols.
Nitrogen	66 vols.
One volume becomes	457 vols.

One volume of nitro-glycerin produces:

Carbonic acid gas	469 vols.
Water at 100° C.	554 vols.
Oxygen	39 vols.
Nitrogen	236 vols.
One volume becomes	1,298 vols.

These volumes are given at the temperature 0 deg. C.; at the temperature of explosion, they will be about five times greater, or about 10,607 times the original volume of the explosive, or about ten times as large a production of mixed gases for the nitro-glycerin as for the gunpowder which produces mixed gases in largest amount.

Still thirteen times is claimed by the advocates of nitro-glycerin. If this is so, the discrepancy between the temperature of the explosion must be greater than here assumed.

Cements.

From the Journal of Chemistry.

A CEMENT WITHSTANDING WATER, ACIDS, OILS, ETC.—Simple shellac, made up into sticks of the size of a lead pencil, is commonly sold for such cement. The objects to be cemented are first warmed till they melt the shellac brought in contact with them. This is very good to cement broken glass, porcelain, etc., especially as the objects are again ready for use immediately when cold; but it is not adapted for flexible objects, as it cracks, and also will not withstand heat or alcohol.

A CEMENT WITHSTANDING HEAT AND ALCOHOL.—Take the best kind of glue; pour on an equal quantity of water; let it soak over night; next morning melt it over a gentle heat, and add fine Paris white, or white lead; mix well, and add a little acetic acid, carbolic acid, oil of cloves, or any other ethereal oil, to prevent putrefaction. This cement is also adapted for flexible objects, like leather. It will not withstand boiling water well, as this softens the glue.

A CEMENT WITHSTANDING HEAT AND MOISTURE.—Pure white lead, or zinc white, ground in oil, and used very thick, is an excellent cement for mending broken crockery ware; but it takes a very long time to harden. It is well to put the mended object in some store-room, and not to look after it for several weeks, or even months. It will then be found so firmly united that, if ever again broken, it will not part on the line of the former fracture.

COATING FOR OUTSIDE WALLS.—The following coating for rough brick walls is used by the U. S. Government for painting light-houses, and it effectually prevents moisture from striking through: Take of fresh Rosendale cement three parts, and of clean, fine sand one part; mix with fresh water thoroughly. This gives a gray or granite color, dark or light, according to the color of the cement. If brick color is desired, add enough Venetian red to the mixture to produce the color. If a very light color is desired, lime may be used with the cement and sand. Care must be taken to have all the ingredients well mixed together. In applying the wash the wall must be wet with clean fresh water; then follow immediately with the cement wash. This prevents the bricks from absorbing the water from the wash too rapidly, and gives time for the cement to set. The wash must be well stirred during the application. The mixture is to be made as thick as can be applied conveniently with a white-wash brush. It is admirably suited for brick-work, fences, etc., but it cannot be used to advantage over paint or white-wash.

The Phenomena of Earthquakes.

In earthquakes, says the *People's Magazine*, we see the conservative agency of fire called in to counteract the destructive agency of water. Wind and rain, heat and cold, are continually at work rending in pieces and grinding down the solid rock; the disintegrated portions of the rock form the soil of the lowlands, and this in its turn is eaten away by running streams, swept down by heavy rains, to be carried by the rivers and deposited in the sea. It is thus that the shallows and great river deltas are formed; and the materials so brought down are gradually, by the action of the waves, distributed over the bed of the ocean. This action, if suffered to continue without interruption, would in time level the highest mountain ranges; and in the place of a varied surface of land and water there would be a uniform shallow sea covering the whole earth. Here the working of fire steps in to counteract the destructive agency of water. It acts suddenly and with terrific force, and therefore it is more noted and more feared than the work which is done so silently and slowly, yet so irresistibly, by the gentle flow of rivers. Of one thing we are sure, that they are caused by the internal heat of the earth. They usually occur in volcanic regions; they are frequently accompanied by volcanic eruptions; during their continuance flames are said to burst from the earth, springs of boiling water rise from the soil, and new volcanoes have been raised as their result. We know that at a comparatively small depth below the surface of the globe there is a temperature very far exceeding anything which we experience at the surface. Whether we accept the hypothesis of a vast central fire, or consider that this heat is generated by chemical action or by electric currents, we know that there are stored up beneath our feet vast reservoirs of heat. What gases are stored under pressure in the cavities of the earth we know not. But we know that the increased expansive force of an elastic fluid under a comparatively small increase of temperature would be sufficient to rend asunder the solid rock and produce the effects we see. Perhaps a fissure so opened may admit water to the heated nucleus, there to be instantly converted into steam with vast increase of volume. This exerting enormous pressure against the rocky walls of the cavity in which it is formed causes a wave of compression in the zone of the rock immediately surrounding it, and this wave is propagated onward through the rock, just as a wave travels through water. The confined fluid strikes the walls of its prison chamber a fierce blow, and this causes a shudder to run through the earth, which passes along the surface as a shock, whose intensity is the only measure we have of the forces causing it.

THE FIRE IN THE EAST RIVER BRIDGE (BROOKLYN) CAISSON.—The fire which recently took place in the East River Brooklyn Caisson, although at the time of its occurrence the dailies succeeded in making quite a sensation out of it, proves to have been nothing serious. The only damage worthy of notice was the delay consequent upon the flooding found necessary to extinguish the fire.

SENATE Committee on Patents: Mr. Willey, Chairman, and Messrs. Ferry, Carpenter, Windom, and Hamilton.

How to Remit with Safety.

Drafts on New York, postal orders, checks on country banks, or money by express, are the safest means of remitting. Registered letters are the next safest. Every postmaster is required to register a letter when requested, on the payment of a slight additional fee. Small remittances carefully folded up in the letter or prospectus, and inclosed in a well-sealed envelope, will come safely nine hundred and ninety-nine times in a thousand. Subscribers should be careful to give the name of the State, as well as that of the Post-office, in their address, when remitting.

Subscribers wishing their paper sent to a new address should never forget to state at what Postoffice they now receive it.

Persons sending money sometimes omit to sign their letters. Such omissions are annoying to us, and unfortunate for the sender.

Address all communications relative to subscriptions' patent business, or articles for publication, to Munn & Co., 37 Park Row, New York city.

Vulcanized and Carbolized Rubber Hose.

We have been shown specimens of carbolized rubber goods manufactured by the Gutta-Percha and Rubber Manufacturing Co., Nos. 9 and 11, Park Place, N. Y., under patent dated February 15, 1870, which in a comparison with another piece made in the same manner and of the same materials, but not carbolized, and stated to have been used under the same circumstances for the same length of time, shows that the carbolic acid exerts a remarkable preservative action not only on the layers of cloth, but seemingly on the rubber also. The uncarbolized rubber and cloth were in a rotten and damaged condition, while the carbolized was apparently as strong and sound as when new. The antiseptic and preservative qualities of carbolic acid have long been well recognized, and it would seem that the use of it in the manufacture of rubber goods is one of its most recent but valuable applications.

Postage.

The postage on the SCIENTIFIC AMERICAN by mail, within the United States, is five cents a quarter, payable at the office where received.

The postage to Canada is required to be pre-paid by the publishers.

Twenty-five cents in addition to the subscription price should be sent with each name by all Canadians.

IMPROVEMENT IN IRON.—An English journal says that at a recent meeting of ironmasters in Birmingham, specimens were shown of purified iron and improved steel manufactured by Sherman's process, as it is called, after the name of the American inventor. Some samples of the steel tested at Chatham dockyard bore a tensile strain of seventy tuns to the square inch, and were at the same time more ductile than any other specimens of the same strength. Common English rough iron by Sherman's method of treatment can be converted into bar steel equal in quality to the best Swedish; so tough and strong that a bar a half-inch square bore a strain of fifty-four tuns to the square inch. The process by which these results are produced is as yet a secret; but we believe that the conversion takes place while the iron is in the puddling furnace.

MANY beneficial uses have been found for carbolic acid, and naturalists now find that by washing out with it the inside of birds which they have not immediate time to skin and stuff, the birds may be kept a week or more in a sound and flexible condition. During the prevalence of the kine pest, carbolic acid was largely used as a disinfectant; and farmers have discovered that the "ticks," which infest sheep and lambs can be killed by dipping the animals in a bath of the acid diluted with water. Great care should be observed not to make the solution too strong, as there is danger that the animals might be killed off along with the tick.

PATENTS.—During the year ending September 30, 1870, there were filled in the Patent Office 19,411 applications for patents, 3,374 caveats, and 160 applications for the extension of patents; 13,622 patents, including reissues and designs, were issued, 11,094 tended, and 1,089 allowed, but not issued by reason of the non-payment of the final fees. The receipts of the office during the fiscal year were $13,630,429 in excess of its expenditures.

IN accordance with a long established rule, all subscriptions terminating with this volume will be discontinued at that time. We trust that all our subscribers will not only renew, but that they may find it convenient to induce some of their neighbors to become subscribers. We intend to give our readers full measure and running over, in return for their subscriptions.

AGENTS throughout the United States are urged to canvass their districts, and to facilitate them in their good work we will, on application, supply specimen numbers to show to manufacturers, mechanics, inventors, and all who are at all interested in the spread of popular science.

MONEY.—In order to guard against the possibility of loss through the mails, we advise our subscribers to send their money either in postal money-orders, bank checks, or drafts.

SUBSCRIBERS who wish to have their volumes bound can send them to this office. The charge for binding is $1·50 per volume. The amount should be remitted in advance, and the volumes will be sent as soon as they are bound.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,593.—CENTRIFUGAL MACHINES.—D. McC. Weston, Boston, Mass. Sept. 23, 1870.

2,744.—IMPROVEMENT APPLICABLE TO STOCKS OF MUSKETS.—R. J. Gatling, Indianapolis, Ind. October 2, 1870.

2,782.—MANUFACTURE OF SALT AND THE APPARATUS EMPLOYED THEREIN.—J. R. Buchanan, New York city. October 18, 1870.

2,786.—SPIRAL PUMPS.—T. S. Blair, Pittsburgh, Pa. October 22, 1870.

2,790.—PREPARATION OF INDIA-RUBBER AND GUTTA-PERCHA COMPOUNDS FOR COATING WOODEN AND METAL SURFACES, AND THE PRODUCTION OF HARD RUBBER.——. Chapman, New York city. October 22, 1870.

2,795.—MODE OF TRAINING HOPS, THE SOCKETS FOR THE POLES OR POSTS OF SAME, AND OTHER POSTS, APPLICABLE ALSO FOR THE BORING OF WATER.—E. Blythe, Rochester, N. Y. October 13, 1870.

2,755.—CONSTRUCTION OF ILLUMINATING AND VENTILATING ROOFS AND GRATINGS OR PLATES, PARTS OF WHICH ARE APPLICABLE TO ORDINARY FOOTWAYS AND CARRIAGE WAYS.—Theodore Hyatt, New York city. October 20, 1870.

2,769.—CONSTRUCTION OF BRIDGES.—C. S. Smith, C. H. Latrobe, and F. H. Smith, Baltimore, Md. October 20, 1870.

2,778.—IMPROVEMENT IN AND ADDITIONS TO SKATES.—A. E. Clarke, Montreal, Canada. October 21, 1870.

AUTOMATIC LUBRICATORS.—E. von Jelnsen, San Francisco, Cal. [October 24, 1870.

2,805.—HORSESHOES.—Ebenezer Cate, Woburn, Mass. October 24, 1870.

2,862.—LOOMS FOR WEAVING.—Enoch P. Terrel, West Liberty, Ohio. Oct. 31, 1870.

2,866.—MANUFACTURE OF ACIDS AND ALKALINE SALTS.—H. M. Baker, Williamsburgh, N. Y. October 31, 1870.

2,876.—IMPROVEMENTS APPLICABLE TO SAFES, VAULTS, AND OTHER STRUCTURES FOR CONTAINING VALUABLE PROPERTY, AND IN ALARM APPARATUS OR TELEGRAPHS CONNECTED THEREWITH.—E. Holmes, Brooklyn, N. Y., and H. C. Boome, Jersey, N. J. November 1, 1870.

2,880.—APPARATUS FOR PRODUCING AND APPLYING MOTIVE POWER.—J. M. Carce, W. B. Barfield, and James McEwen, Franklin, Tenn. November 2, 1870.

NEW BOOKS AND PUBLICATIONS.

THE PRINCIPLES OF MECHANISM AND MACHINERY OF TRANSMISSION. Comprising the Principles of Mechanism, Wheels, and Pulleys, Strength and Proportions of Shafts, Couplings for Shafts, and Engaging and Disengaging Gear. By William Fairbairn, Esq., C.E., LL.D., F.R.S., F.G.S., Corresponding Member of the National Institute of France, and of the Royal Academy of Turin; Chevalier of the Legion of Honor, etc. Philadelphia: Henry Carey Baird, Industrial Publisher, 406 Walnut street. Price, by mail, free of postage, $2·50.

From the imposing array of scientific honors appended to the author's name, our readers might be led to suppose that this work was written for others than practical mechanics, but no greater mistake could be made than such a supposition. Mr. Fairbairn, though eminently scientific, is one of the most practical of men, and he knows to a nicety the wants of practical men. This book is written in the plainest and most concise style, and may be read with profit by those to whom algebra and geometry are unsealed mysteries. There are a few algebraic formulæ in the book, but the larger portion is written in plain English. The work treats of a great variety of subjects included in the general classification given in the title, and ought to be in every mechanic's library.

THE ATTITUDE OF SCIENTIFIC INVESTIGATION TOWARD DIVINE REVELATION. An Essay Read before the Associate Alumni of the General Theological Seminary of the Protestant Episcopal Church at their Annual Meeting in the Chapel of the Seminary, New York, St. John Baptist's Day, June 24, A.D., 1870. By the Rev. Richard Whittingham, Rector of St. John's Church, New Haven, Conn.

This is an effort to show that the asserted antagonism of science with orthodox theology is a real one, and that so-called science is full of contradictions. Professor Huxley is made the object of direct attack, and his "Lay Sermons" are denounced as calculated to poison the minds of thousands who them. It must be conceded that in that part of his argument based upon the contradictions of science, the author makes some strong hits.

CATALOGUE OF PRACTICAL AND SCIENTIFIC BOOKS Published by Henry Carey Baird, 406 Walnut street, Philadelphia, Pa. Sent free to any address.

This catalogue comprises the most complete list of industrial publications on all subjects pertaining to the arts and manufactures, published in this country. To mechanics, engineers, and manufacturers, no matter in what department, it offers works of sterling value expressly prepared to suit their practical needs. Young mechanics seeking for guides in their various callings will do well to send for this catalogue.

A TEXT-BOOK OF ELEMENTARY CHEMISTRY, THEORETICAL AND INORGANIC. By George F. Barker, M.D., Professor of Physiological Chemistry in Yale College. 12mo, pp. 342. New Haven: Charles C. Chatfield & Co.

In nothing is the great change that has taken place in the nomenclature of chemistry and in the symbolic language of the science more conspicuously shown than in some of our recent text-books. Professor Barker has prepared a remarkably accurate book founded on the most advanced theories and doctrines of chemistry, and no teacher who desires to keep abreast of the times can afford to be without it.

THE RIGHTS OF AMERICAN PRODUCERS AND THE WRONGS OF BRITISH FREE TRADE REVENUE REFORM. By Henry Carey Baird. Philadelphia: Collins, Printer, 705 Jayne street.

¶ This is the title of a strong argument from the trenchant pen of an able writer upon a subject in which every American citizen is interested. It is a small pamphlet, printed, we believe, for gratuitous circulation.

LAY SERMONS, ADDRESSES, AND REVIEWS. By Thomas Henry Huxley. 8vo., pp. 378. New York: D. Appleton & Co. 1870.

The Messrs. Appletons have reprinted on very poor paper and in inferior style, the famous lectures delivered before popular audiences in England by Professor Huxley. Few books of greater importance have appeared within a long period. The topics discussed relate to the origin of life, scientific education, and the most advanced theories of the new school of thinkers in England. However slow many readers may be to accept the reasoning of the writer, every one must be swift to acknowledge that the subject is handled in faultless language and the most captivating style.

THE AMERICAN JOURNAL OF ARTS AND SCIENCE. New Haven, Conn.: B. Silliman and James B. Dana.

The November issue contains a number of very exhaustive scientific articles. Examination of the Bessemer Flame," by Prof. J. M. Silliman; "Electrical Conductivities," by Alfred M. Mayer; "Northern Drift of the Pacific Slope," by Robert Brown; "Influence of Temperature on the Electricity of Certain Metals;" "Willet on the Georgia Meteoric Stone," and "Hovey on Hailstorm of June, 1870," are leading and able papers.

WE are in receipt of THE WORKSHOP, for September, a German publication devoted to progress of the useful arts, and republished in English, and also in German, French, and Italian, by E. Steiger, 22 and 24 Frankfort street, New York. As usual it contains a large number of original and beautiful designs, adapted to the wants of manufacturers in various departments where ornamental designs are requisite. It contains also an interesting essay on Chandeliers, illustrated with many engravings, and other minor articles of practical interest.

QUERIES.

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

1.—PAINT FOR STEAM PIPES.—What paint can I use for steam pipes that will give them a brilliant red, vermilion, or white, and not discolor by heat?—J. McB.

2.—COLORLESS DRYER.—How can I make a colorless dryer to be used in fine, delicate colored paints, for drying quickly, so they will not scale and crack when dry? The dryer should be of the consistency of good linseed oil, and dry paints in five to six hours.—C. R. P.

3.—BOILER CAPACITY.—I am running an engine (common slide valve), size, 12 inches by 18 inches, cylinder; 150 revolutions per minute; boiler pressure, 70 pounds; steam pipe, short and well covered; taking steam from a locomotive boiler containing 300 square feet heating surface; boiler well covered by a thick jacket, and a ¾ inch blower pipe, besides the exhaust, running into the smoke stack. Fuel, wood; feed-water, hot. I cannot make steam fast enough to keep my pressure up to 70 pounds. I want more boiler power, and am offered two cylinder boilers 30 inches in diameter and 40 feet long, and I am told they will supply me with sufficient steam. Query: Will two cylinder boilers 30 inches in diameter and 40 feet long make sufficient steam, with wood for fuel, to run an engine (common slide valve), with 12 by 18 cylinder, 150 revolutions per minute, requiring 70 pounds steam to do the work?—W. V. B.

4.—HEATING SURFACE OF TUBES.—In counting the heating surface of tubular boilers, is it most proper to calculate the internal or external circumference of the tubes? I should like to know the opinion of your correspondents in regard to this.—W. V. B.

5.—TO KEEP POLISHED BRASS FROM TARNISHING.—I should like information on the best methods of keeping polished brass from tarnishing. What have the readers of the SCIENTIFIC AMERICAN found best for this purpose?—O. F.

6.—SOLDERING STEEL.—I wish a recipe for a flux that may be used to solder steel, and will not cause polished metal to rust.—H. W. M.

7.—CEMENT.—What is the best cement for laying stone in cold weather where it is exposed to the action of frost and water?—B. F.

8.—TO PURIFY BLACK OIL.—How can I purify oil that has been used on shafting, so as to fit it for re-use on the same?—A. C.

Answers to Correspondents.

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

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

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

SCATTERING SHOT GUN.—J. G. T., of Texas, has a shot gun which scatters too much, for which he seeks a remedy. Being well posted in gun matters, I can give him some ideas. The only remedy known to gun-smiths is by choke-boring, that is, boring from the breech of the gun, and so as to have a gradual taper towards the muzzle. This method of boring greatly improves the shooting qualities of the gun, as the charge concentrates at the muzzle. I have bored some guns so much for this purpose, that the diameter of the bore at the breech was one eighth of an inch larger than at the muzzle, before they would shoot well. All of the pigeon-shooting clubs have their guns bored in this manner. Large shot are more apt to scatter than fine, but this depends on the bore of the gun. A large-bored gun does not shoot fine shot so well as medium. A small-bored gun throws fine shot with greater force than a large-bored one. As a general thing, a small-bored gun is not adapted to large shot, as it does not chamber them well. The length of gun also depends on the size of bore—28 or 30 inches for a gun of from 10 to 14 gage; 30 to 34, of guns from 8 to 10; 26 to 28, guns of 15 to 18 gage.—C. W. L., of Mass.

DRILLING SMALL HOLES IN BRASS PLATE.—G. F. may perform the nice job he has undertaken, in the following manner: Fasten the piece to be drilled to a face plate that runs perfectly true, so that the center of the proposed hole is exactly in the center line of the lathe. First run through on the center a twist drill, smaller than the desired hole. Then make from Stubs wire, the size of the hole desired, a half round drill, and having bored out the hole with a small boring tool or graver just so the half-round drill will enter, feed through on the center, and the drill will go through perfectly straight, and make a perfect hole.—T. G. C., of Vt.

BULLET MOLDS.—The hollow hemispheres J. B. C. inquires about, are made with reamers, called by gunsmiths cherries, which can be bought of any gun-furnishing establishment. Fit both parts of the mold and rivet them; then drill a hole in them as as large as the shank of the cherry. Put in the cherry, and hold the molds in the vise; tighten as fast as you ream, and use plenty of oil, and while finishing keep the cherry very clean.

DRILLING SMALL HOLES IN BRASS PLATE.—G. F. should lay out the holes to be drilled in the brass plate as accurate as possible, and mark deep with a center punch (which should be turned). Send for a Morse twist drill, the proper size, as short as possible, and go through the work. Have the drill run perfectly true and rapid, feed slow, and he will do a good job.—H. W., of N. Y.

FEED ROLLS ON DOUBLE BEATER SCUTCHER.—"Workman's" feed rolls are not near enough to the knives of the beater. If distant over one fourth of an inch, the tendency is to clog, which, of course causes the cotton to be unevenly distributed.—C. M., of Mass.

TURNING ZINC SHAFTS.—In answer to G. D. B., I would say that zinc shafts can be turned in a lathe. I have turned ¾ and ⅝ inch with a very fine diamond-point tool. Set the tool as high as it will cut nicely.—O. F., of Pa.

H. L C., of Mich.—Bodies are classed with reference to their power to let heat pass through them without becoming heated themselves, and the reverse, as "*diathermanous*" and "*athermanous;*" the former term being applied to those which allow heat to pass freely without becoming heated themselves, and the latter term to bodies of the opposite character. A beam of solar light and heat in passing through water imparts a portion of its heat to the water, as ascertained not only by the increase of temperature in the water, but in the diminished heat of the beam after its passage. Therefore water is not a diathermanous body. You will find this subject fully treated in "Silliman's Physics."

N. L., B., of Ill.—This correspondent with others is puzzled to see what supports the atmosphere, if it is not wholly supported by the earth. The subject has no practical importance, and we do not wish to burden our columns with a protracted discussion of it.

W. McL., of N. Y.—With reference to the use of the Brazilian pebble, we have never heard from any reliable source that it was injurious to the eye. Oculists have recommended it, but it may be that some new facts have been brought to light. You had better consult with Dr. Agnew, or some other well known oculist.

B. C., of N. H.—Steam boilers vary in evaporative capacity from say five to ten pounds of water to a pound of coal. It is a good boiler that will evaporate eight pounds of water per pound of coal. The actual horse power developed by the evaporation depends upon the engine which consumes the steam. It is a first-class engine that will run on three pounds of coal per horse power per hour with a good boiler, though still greater economy with the very best engines is attained.

H. W., of N. Y.—Have you not mistaken the drift of L. V.'s query? It is not a straight cylinder he wishes to bore, but a bent cylinder, a segment of a hollow cylindrical ring, part of a circular hollow ring, we suppose.

J. R. T., of Cuba.—We do not know how many of Fowler's steam plows have been introduced into this country. There may be two or three, but they are not much used here.

J. M., of Canada.—We do not think you can get an electro-magnetic machine such as you want in this country.

T. W. T., of ——.—The theory of an all permeating, all pervading ether, supposes this substance to be so highly attenuated as to show no sensible ponderability, that it possesses a higher degree of elasticity

than any known substance, that it permeates the molecular spaces of all bodies, solid, liquid or gaseous, and fills the interplanetary regions.

H. F. H., of Md.—Solder for fruit cans is made of half tin and half lead. It is the common tin solder.

C. H. C., of Ill.—A mortise made in green wood will become smaller as the wood shrinks in drying.

S. P., of Wis.—We shall drop the subject of "Balancing Cylinders" for the present.

G. W. P., of L. I.—Your idea is not new. Fell's railroad over the Alps has a center rail with two friction wheels that grip its sides.

J. S., of N. Y.—In the absence of skill on your part, printed directions can be of no value. You had better go to a good watchmaker.

Recent American and Foreign Patents.

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

CAST-IRON PLOW.—John K. Odell and William S. Little, Deckertown, N. J. This invention has for its object to improve the construction of cast-iron plows, so as to make them simpler in construction, stronger and better in operation, and more convenient in manufacture than when made in the ordinary manner.

COMBINED HAND SEED-DRILL AND CULTIVATOR.—Samuel D. Lucas, Winterpock, Va.—This invention has for its object to furnish a simple and convenient hand machine, which shall be so constructed that it may be readily adjusted for planting various kinds of seeds, that require to be planted in drills or rows, and for cultivating the plants when required.

SHIFTING SHOVEL PLOW.—Adam Snyder, Packard, Ohio.—This invention has for its object to furnish an improved shovel plow, which shall be so constructed that the shovel may be set square with the line of draft, or inclined to one or the other side, as may be desired.

SCRUBBING BRUSH.—Ralph Rockwell and Z. B. Custer, Petroleum Center, Pa.—This invention relates to the manner of securing the bristle stock of a scrubbing brush to the base board bearing the rubber strip that operates as a dryer, and in the manner of pivoting the handle to said base board, whereby the stock is prevented from lateral movement or displacement, and the handle may be inclined in either direction, to enable the operator to work the brush with either the rubber or dryer in front.

BOILER FOR PREPARING PAPER PULP.—Lorenzo Dean, Fort Edward, N. Y.—This invention has for its object to improve the construction of the boilers ordinarily used for reducing paper stock, so as to make them more convenient and effective in operation, and enabling the stock, when reduced, to be washed and bleached without removing it from the boiler in which it has been reduced.

SAWING MACHINE.—Daniel Heller, Milton Center, Ohio.—This invention has for its object to furnish an improved machine for operating a "cross cut" or other wood saw, which shall be simple in construction and effective in operation, enabling one man to do more work than two with the ordinary saw, and with greater ease.

PREPARING STRAW, ETC., FOR THE MANUFACTURE OF PAPER.—Lorenzo Dean, Fort Edward, N. Y.—This invention has for its object to furnish an improvement in preparing straw and other fibrous material for the manufacture of paper, by means of which the labor and expense will be greatly diminished, and the material, when reduced, will produce a much better stock.

SETTING TIRES ON WHEELS.—A. O. Wheeler, St. Augustine, Ill.—This invention relates to a new and useful improvement in mode of setting or tightening and loosening the tires of carriage or other wheels, and consists in increasing the diameter of the whee or expanding the felly by means of a tapering screw, operating in a divided nut.

LUBRICATOR.—Samuel S. Vollum and William H. Green, New York city.—This invention relates to a new and useful improvement in a device for conveying oil or other lubricating material to the arms of carriage axles, or to journals, boxes, or bearings.

BEVELING THE EDGES OF CIRCULAR PLATES OF METAL.—William H. Singer, Pittsburgh, Pa.—This invention is an improvement for which a patent was issued to the same party Nov. 30th, 1869, and consists in providing a mechanism for holding the circular blank on which a beveled edge is to be produced, without enlarging the central hole through which the stepped vertical holding pin passes, and whereby the whole of that part of the blank to be beveled is introduced between the rolls at once.

PACKING BOX FOR ROTARY STEAM CYLINDERS.—S. Deacon and J. Russel, Lawrence, Mass.—This invention relates to a new packing box for revolving steam cylinders, and consists in the arrangement of a nut that serves to clamp the packing between two cones, and which, instead of working on a screw thread is moved longitudinally by contact with a fixed cam.

HORSE POWER.—Lorenzo P. Teed, Mechanicsburgh, Pa.—This invention has for its object to furnish an improved horse power, which shall be so constructed and arranged that it may be firmly secured in place, and securely held while at work, being secured and adjusted conveniently and quickly, and without removing it from the wagon.

COFFEE STEAMER.—Louis Hildenbrand, Michigan City, Ind.—This invention relates to an apparatus for rapidly extracting the aromatic ingredients from coffee-beans by means of steam created by the heat of a stove or other heater, with an object of utilizing the full virtue of the beans, and consequently economizing coffee and producing a beverage superior to that made by the means heretofore in use.

PROCESS OF SACCHARIFYING MASH.—Charles H. Frings, Centreton, Mo.—The object of this invention is to produce a perfect saccharifying of mash without waste of malt. For this object a small quantity of muriatic acid and phosphoric acid is added to the water used for converting the grain into mash; corn, rye, barley, wheat, or other grain being used.

MACHINE FOR POLISHING COFFEE-BEANS.—Charles C. Warren and James B. Baldy, Toledo, Ohio.—The object of this invention is to construct a machine, whereby coffee can be rapidly cleaned and polished in bags; and the invention consists in the employment of two or more rollers, of which the outer surfaces are employed for revolving the filled bags.

STREET LETTER-BOX.—Albert Potts, Philadelphia, Pa.—The object of this invention is to so construct letter-boxes which are to be applied to lamp-posts, pillars, or other similar supports, that can be readily fitted on, firmly retained, safely closed, and conveniently used. See an illustrated description of this invention in another column.

DOOR SPRING.—William H. Stafford, New York city.—This invention relates to a new spring of very simple construction for holding doors shut, and is applicable to all kinds of doors, whether they are hinged to swing to one or both sides.

MACHINE FOR POINTING NAILS.—Harry A. Wills, Vergennes, Vt.—This invention relates to a new machine for pointing the ends of nails used for horse shoes and other purposes. The invention consists in a new spiral feeding apparatus for conveying the nail blanks to the pointing mechanism. The invention consists also in a new arrangement of gaging, clamping, and pointing mechanism.

Official List of Patents.

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FOR THE WEEK ENDING DEC. 6, 1870.

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109,793.—KNITTING MACHINE AND NEEDLES.—A. W. Allen, Indianpolis, Ind.

109,794.—CLOTH-WINDING MECHANISM FOR LOOMS.—W. A Arnold, Rockport, Mass.

109,795.—LUBRICATOR.—C. D. Austin, Newcastle-on-Tyne, England.

109,796.—VALVE COCK.—Robert Berryman, Boston, Mass.

109,797.—CAR COUPLING.—Henry Blanchard, Jr., Boston Mass.

109,798.—BELT FASTENER.—S. S. Bolton, Big Rapids, Mich.

109,799.—BEDSTEAD JOINT.—L. G. Bradford (assignor to himself and N. H. Morton), Plymouth, Mass.

109,800.—CURTAIN FIXTURE.—J. G. Brothwell (assignor to Turner, Seymour & Judds), Wolcottville, Conn.

109,801.—SASH LOCK.—E. L. Brown, Norwich, N. Y.

109,802.—APPARATUS FOR EVAPORATING BRINE AND OTHER LIQUIDS.—James Buchanan, Detroit, Mich.

109,803.—BRICK MACHINE.—Cyrus Chambers, Jr., Philadelphia, Pa.

109,804.—COTTON BALE TIE.—William Chambers, New Orleans, La.

109,805.—TINSMITH'S FURNACE.—Michael Conner, Plymouth Mich.

109,806.—CIRCULAR SAW JOINTER.—E. H. Corbin, Winchester, Ind.

109,807.—STEAM GENERATOR.—L. R. Cornell, Flatbush N. Y.

109,808.—RAILWAY RECLINING CHAIR.—J. P. Curry, New York city.

109,809.—NUT LOCK.—M. A. Cushing and O. R. Glover, Ottawa, Ill. Antedated November 26, 1870.

109,810.—WASHING MACHINE.—Henry Dickinson, Marlborough, Conn.

109,811.—REFRIGERATOR.—H. F. Eberts, Detroit, Mich., assignor to himself, D. Y. Howell, Toledo, Ohio, and T. S. Sprague, Detroit, Mich.

109,812.—CULTIVATOR.—Abraham Eshleman, Martinsville, Pa.

109,813.—BARREL SAFETY VALVE OR VENT.—B. F. Evans, Newburyport, Mass.

109,814.—HAND STAMP.—D. W. Fish, Brooklyn, N. Y.

109,815.—PERPETUAL BRICK-BURNING KILN.—William Gilbert, Detroit, Mich.

109,816.—SEWING MACHINE FOR MAKING PUFFINGS.—E. D Gird, Syracuse, N. Y. Antedated November 25, 1870.

109,817.—WAGON TONGUE SUPPORT.—A. F. Gue, Eastmanville, Mich.

109,818.—SHUTTER FASTENER.—Theodore Hare and James Wood, Norristown, Pa.

109,819.—SNOW PLOW.—C. F. Hornbeck and W. J. Carns, Slaterville, N. Y.

109,820.—DEVICE FOR FREEZING FISH, MEATS, ETC.—D. Y. Howell, Toledo, Ohio, assignor to himself, T. S. Sprague, and H. F. Eberts, Detroit, Mich.

109,821.—BOX FOR PACKING FRUIT, PROVISIONS, ETC.—G. M. Huston, Putnam, Ohio.

109,822.—FEED CUTTER.—William Hutchins (assignor to himself and G. G. Hutchins), Paw Paw, Mich.

109,823.—HEAD REST FOR CAR SEATS.—E. M. Judd, New Haven, Conn.

109,824.—JELLY GLASS.—W. M. Kirchner, Pittsburgh, Pa.

109,825.—TOOL FOR FORMING SCREW THREADS ON GLASS JARS.—W. M. Kirchner, Pittsburgh, Pa.

109,826.—HAIR-SPRING OF WATCHES, ETC.—Calvin Kline, Brooklyn, N. Y., assignor to himself and G. E. Hart, Newark, N. J.

109,827.—POCKET BOOK.—Julius Lehman, New York city.

109,828.—SEWING MACHINE.—T. A. Macaulay, Northampton, Mass.

109,829.—STEAM BOILER.—W. B. Mack (assignor to D. B. Duffield), Detroit, Mich.

109,830.—CAR COUPLING.—Stephen Mahurin, Liberty, assignor to himself, J. W. Singleton, and W. A. Richardson), Quincy, Ill.

109,831.—SAUSAGE STUFFER.—Jacob Mickley and J. E. Hartman, Cashtown, Pa.

109,832.—WAGON BRAKE.—Jacob Mickley and J. E. Hartman, Cashtown, Pa.

106,833.—VARNISH FOR PHOTOGRAPHIC NEGATIVES.—J. W Morgenecier, Sheboygan, Wis.

109,834.—DOOR LATCH.—W. T. Munger (assignor to P. & F. Corbin), New Britain, Conn.

109,835.—TREADLE FOR SEWING MACHINES.—Alfred Nielson, Brooklyn, N. Y.

109,836.—WASHING MACHINE.—L. B. Osgood, Shelby, Mich.

109,837.—CORN PLANTER.—George Paddington, Waubeck, Iowa.

109,838.—STOVE-PIPE THIMBLE.—J. D. Pierce and J. B. Smith, Milwaukee, Wis.

109,839.—GRAIN SEPARATOR.—Hiram Raymond, Tecumseh Mich.

109,840.—WASHING MACHINE.—John G. Raymond, Rondout, N. Y.

109,841.—BURR MILL.—S. G. Rollins (assignor to Wigg, Rollins & Co.), Boston, Mass. Antedated November 26, 1870.

109,842.—CARRIAGE AXLE AND AXLE YOKE.—Samuel Rowell, Amesbury, Mass.

109,843.—WAGON BRAKE.—George W. Sanborn, Gilmanton, N. H.

109,844.—MACHINE FOR STAMPING, PRESSING, AND POINTING HORSESHOE NAILS.—Frederick Sandham, Montreal, Canada.

109,845.—LAST FOR BOOTS AND SHOES.—Samuel W. Shorey Chicago, Ill. Antedated November 26, 1870.

109,846.—SHAFT COUPLING.—William Smeed, Rochester assignor to himself and Glen & Hall Manufacturing Company, Brighton N. Y.

109,847.—Milking Stool.—George Smith, Syracuse, N. Y.
109,848.—Apparatus for the Manufacture of Gas from Hydrocarbons.—James H. Smith, Newark, Ohio.
109,849.—Buckle.—G. E. Stedman, Boston, Mass.
109,850.—Pile for Beams.—Joseph Stokes, Trenton, N. J.
109,851.—Machine for Countersinking the Holes in Butt Hinges.—Lucius P. Summers (assignor to P. & F. Corbin), New Britain, Conn.
109,852.—Bed Bottom.—Charles Valkmar, New York city.
109,853.—Suspender.—Joseph Warren Wattles, Canton, Mass.
109,854.—Machine for Trussing Barrels.—Peter Welch, St. Louis, Mo.
109,855.—Spring Hinge.—Wm. Wells, Cleveland, assignor to himself and John Wriglesworth, Mentor, Ohio.
109,856.—Lantern.—H. J. White, Boston, Mass.
109,857.—Process of Separating the Hair from the Warp in Hair Cloth.—David Whitley, Providence, R. I.
109,858.—Wire Fence.—Bartholemew Wilson and F. P. Grimes, Dayton, Ohio.
109,859.—Tree Protector.—B. L. Alley, Salem, and T. W. Shapleigh, Cambridgeport, Mass.
109,860.—Clothes Dryer.—Charles R. Anderson St. Louis, Mo.
109,861.—Corpse Preserver.—R. C. Andrus, Poughkeepsie, N. Y. Antedated December 3, 1870.
109,862.—Drain Tile Machine.—H. F. Baker, Centerville, Ind.
109,863.—Hay Tedder.—Orville A. Benton, Amenia, N. Y.
109,864.—Attaching Lamp-Founts to Brackets, Chandeliers, etc.—George Bohner, Chicago, Ill.
109,865.—Apparatus for Cleaning and Polishing Coffee.—J. H. Brookmire, St. Louis, Mo.
109,866.—Friction Roller.—William Brown, Portsmouth, England.
109,867.—Ice Ax and Pick.—John N. Bunnell, Unionville, Conn. Antedated November 25, 1870.
109,868.—Combined Rule, Bevel, Square, and Divider.—George G. Burgess, Grafton, Ohio. Antedated November 26, 1870.
109,869.—Insect Destroyer.—Thomas Byrne, New York city, and Deidrich Strunk, Lavaca county, assignors to themselves and J. J. Schott, Lavaca county, Texas.
109,870.—Journal Lubricator.—J. A. Cowles, Chicago, Ill. Antedated November 30, 1870.
109,871.—Buckle.—L. D. Cowles, Romeo, Mich.
109,872.—Seasoning and Preserving Wood.—Charles M. Cresson, Philadelphia, Pa., assignor to American Wood Protection Company.
109,873.—Seasoning and Preserving Wood.—Charles M. Cresson, Philadelphia, Pa., assignor to American Wood Protection Company.
109,874.—Treating and Recovering the Liquids used in Seasoning and Preserving Wood.—Charles M. Cresson, Philadelphia, Pa., assignor to American Wood Protection Company.
109,875.—Bread Pan.—William H. Daggett, South Vineland, N. J.
109,876.—Folding Chair.—Isaac N. Dann assignor to the New Haven Folding-Chair Company), New Haven, Conn.
109,877.—Locomotive Head Light.—S. M. Davies, Chicago, Ill. Antedated November 23, 1870.
09,878.—Rotary Engine.—William A. Davis, Salem, Ohio.
109,879.—Insulator for Telegraph Wires.—Manuel De Montufar, New York city.
109,880.—Casting T's for Oil Wells.—Julius Dickey, Titusville, Pa.
109,881.—Process for making Concave Circular Saws.—Thomas S. Disston (assignor to himself and Henry Disston & Son), Philadelphia, Pa.
109,882.—Post-Marking, Stamp-Canceling Machine.—Charles E. Donnellan (assignor to himself and McCord & Wheatley, Indianapolis, Ind.
109,883.—Steam-Boiler.—George S. Dubois, Jersey City, N. J.
109,884.—Harness-operating Mechanism for Looms.—John C. Duckworth, Pittsfield, Mass.
109,885.—Water-Wheel.—William H. Elmer, Berlin, Wis. Antedated November 26, 1870.
109,886.—Iron Culvert.—Moody G. Freeman, Wenona, Ill.
109,887.—Saccharifying Mash for Grain.—Charles H. Frings (assignor to himself and Charles Braches), Centreton, Mo.
109,888.—Bee-Hive.—James W. Gladding, Normal, Ill.
109,889.—Spring Bed-Bottom.—Charles Glenn, Allegheny City, Pa.
109,890.—Breech-loading Fire-Arm.—Charles Green, Rochester, N. Y., assignor to Charles Parker, Meriden, Conn.
109,891.—Water-Wheel.—Mahlon Gregg, Rochester, N. Y.
109,892.—Window-Frame.—William H. Griffin, Springfield, Mass.
109,893.—Cotton-Plow.—Thomas Guice, Mount Andrew, Ala.
109,894.—Mold and Cone for Metallic Castings.—William Hainsworth, Allegheny, Pa.
109,895.—Medical Compound.—Orrin F. Harris, Norwich, Conn.
109,896.—Pump.—William Hartley, Durand, Ill.
109,897.—Cotton-Press.—William Haynie, Memphis, Tenn.
109,898.—Collar for Circular Saws.—James B. Heald, Milford, N. H.
109,899.—Canal Lock.—George Heath, Annapolis, Md.
109,900—Sawing-Machine.—Daniel Heller, Milton Center, Ohio.
109,901.—Coffee-Pot.—Louis Hildenbrand, Michigan City, Ind.
109,902.—Faucet.—Jacob Hills, Haydensville, Mass.
109,903.—Machine for Beating and Cleaning Hair.—George P. Halloway and William J. Huey, Portland, Ind. Antedated November 28, 1870.
109,904.—Direct-acting Steam-Engine.—William Davis Hooker, San Francisco, Cal.
109,905.—Hay-Press.—Henry C. Hunt, Indianapolis, Ind.
109,906.—Stop-Valve.—Charles Emery Hutson, Commerce, Mo.
109,907.—Tire for Traction-Engines.—Oliver Hyde, Oakland, Cal.
109,908.—Lubricator for Steam-Engines.—Francis Jackson, Wigan, assignor to William Prosser, Manchester, England.
109,909.—Base-burning Fire-place Heater.—Julius Jaeger, Tompkinsville, N. Y.
109,910.—Sawing-Machine.—Per Johnson, Columbia, Cal.
109,911.—Wind-Wheel.—John H. Kimble, Samuel Kimble, and George W. Kimble, Fox Lake, Wis.
109,912.—Lathe.—Samuel U. King, Windsor, Vt.
109,913.—Wrench.—Christian Knisely, Chicago, Ill.
109,914.—Revolving Fire-Arm.—Charles J. Linberg and William J. Phillips, St. Louis, Mo.
109,915.—Miter-Box.—Charles F. Linscott, Chicago, Ill.
109,916.—Combined Hand Seed-Drill and Cultivator.—Samuel D. Lucas, Winterpock, Va.
109,917.—Putting up Pomatum.—Elard Ludde, New York city.
109,918.—Ironing Table.—James H. Mallory, La Porte, Ind.
109,919.—Churn.—Chelton Matheny, Greensburg, Ind.
109,920.—Flock-Machine.—William McAllister, Lawrence, Mass.
109,921.—Piano Action.—Frazee B. McGregor, Pontiac, Mich.
109,922.—Padlock.—William McIntyre, New York city.
109,923.—Corn-Planter.—Noah Mendenhall, Greensburg, Ind.
109,924.—Washing-Machine.—Samuel S. Middlekauff, Hagerstown, Md.
109,925.—Water-Wheel.—Mordecai Millard, Franklin, Ohio. Antedated Nov. 26, 1870.
109,926.—Turbine Water-Wheel.—Ransom Monroe, Hendrick's Creek, Pa.
109,927.—Thill-Coupling.—Francis B. Morse (assignor to himself and H. D. Smith & Co.), Plantsville, Conn.
109,928.—Apparatus for Dressing and Furrowing Millstones.—James Lee Norton, London, England.
109,929.—Cast-Iron Plow.—John K. Odell and William S. Little (assignors to G. W. Coe), Deckertown, N. J.
109,930.—Coupling for Earth-Boring Augers.—Thomas Orchard, Lincoln, Cal.
109,931.—Metallic Cartridge.—William I. Page, East Boston, Mass. Antedated Nov. 26, 1870.
109,932.—Car-Coupling.—Jay R. Palmer (assignor to himself and James H. Hatch), Mariposa, Cal.
109,933.—Shoe-Lacing Hook.—Alphonso Patten (assignor to himself and Robert W. Rumery), Biddeford, Me.
109,934.—Corn-Plow.—Elwood Phillips, Centreville, Ind.
109,935.—Skate.—Alfred C. Platt, Sandusky, Ohio.
109,936.—Corn-Planter.—Henry G. Porter, Hopkinton, Iowa.
109,937.—Halter.—Robert Porter, Ottumwa, Iowa.
109,938.—Washing Machine.—Samuel Post and Henry D. Martin, Ypsilanti, Mich.
109,939.—Letter Box.—Albert Potts, Philadelphia, Pa.
109,940.—Coke Furnace.—Thomas Price, Steubenville, assignor to himself and James Cruthers, West Newton, Ohio.
109,941.—Buckle.—Francis Puetz, Buffalo, N. Y.
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109,946.—Scrubbing Brush.—Ralph Rockwell and Zora B. Custer, Petroleum Centre, Pa.
109,947.—Skirt.—Hugo Schultz, Paris, France.
109,948.—Apparatus for Pitching and Coating Barrels, Casks, etc.—Louis Schulze, Baltimore, Md.
109,948.—Wrench.—Eliphalet S. Scripture, Brooklyn, E. D. N. Y. Antedated Nov. 25, 1870.
109,950.—Elevator and Distributer.—Thomas Shanks, Baltimore, Md.
109,951.—Direct-Acting Engine.—Sydney F. Shelbourne, New York, and Charles E. Emery, Brooklyn, E. D. Antedated Nov. 28, 1870.
109,952.—Pocket Alarm.—Calvin W. Simonds (assignor to Hollis Towne), Boscawen, N. H.
109,953.—Beveling the Edges of Circular Plates of Metal.—William H. Singer, Pittsburgh, Pa.
109,954.—Alarm Lock.—Thomas P. Sink, Fairton, N. J.
109,955.—Pump.—John P. Sivertson, Chicago, Ill.
109,956.—Wagon for Loading Timber.—Jacob Skeen, Mound City, Ill.
109,957.—Sleigh Brake.—Henry W. Smith, Rainsburg, Pa.
109,958.—Corkscrew.—John A. Smith, Brooklyn, N. Y.
109,959.—Combined High and Low Water Indicator.—Levi F. Smith, Philadelphia, Pa.
109,960.—Shifting Shovel Plow.—Adam Snyder, Packard, Ohio.
109,961.—Box for Packing Bottles.—Joseph Jones Solomon, Philadelphia, Pa.
109,962.—Door Spring.—William H. Stafford, New York city.
109,963.—Direct-acting Engine.—William J. Stevens, New York city.
109,964.—Draw Handle.—Caspar A. Stock, New York city.
109,965.—End-Gate for Wagons.—Roderick F. Stocking and Calvin P. Greene, Lawn Ridge, Ill.
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109,967.—Horse Power.—Lorenzo P. Teed, Mechanicsburg, Pa.
109,968.—Stove Grate.—John Merritt Thatcher, Bergen, N. J.
109,969.—Coal Screen.—Edward Thomas, Shickshinny, Pa.
109,970.—Burglar Alarm.—James Harry Thorp, New York city.
109,971.—Alarm Attachment.—James H. Thorp, New York city.
109,972.—Water Wheel.—Josiah Turner and Stephen Woodward, Sunapee, N. H.
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109,986.—Beehive.—R. A. Williams, Colusa, Cal.
109,987.—Machine for Pointing Nails.—H. A. Wills (assignor to National Horse-Nail Co.), Vergennes, Vt.
109,988.—Hoisting Machine.—Nicolaus Wonlarlarsky, St. Petersburgh, Russia.
109,989.—Watch Case.—A. A. Wood, Charlotte, Mich.
109,990.—Compound for Treating Malt Liquors.—Wm. Zinsser, New York city.
109,991.—Manufacture of Sugar or Sirup from Sweet Potatoes.—Charles Delamarre (assignor to himself, John A. Thurber and Robert R. Benson), New Orleans, La.
109,992.—Aquatic Toy.—A. W. Hart (assignor to himself and W. M. Tileston), Washington, D. C.

REISSUES.

4,192.—Manufacture of Plated Metal Bracket.—John Barclay, Bergen, N. J.—Patent No. 94,064, dated August 24, 1869.
4,193.—Sleeping Collar.—Levi Dederick, New York city.—Patent No. 103,026, dated May 17, 1870.
4,194.—Harvester Rake.—H. H. Scoville, Oakland, Cal., assignor of one half interest to J. A. Scoville.—Patent No. 23,613, dated April 12, 1859.
4,195.—Treenail.—N. L. Tomlinson, Mystic Bridge, Conn.—Patent No. 78,554, dated June 2, 1868.

DESIGNS.

4,501.—Lamp Chimney Cleaner.—Emeline T. Annis, Mount Morris, N. Y.
4,502.—Drawer Pull.—Nelson Merriam, West Meriden, Conn.

TRADE-MARKS.

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EXTENSIONS.

Edge Keys.—G. C. Todd, of Lynn, Mass.—Letters Patent No. 16,128, dated Nov. 25, 1856.
Method of Clamping Cutters in the Cutter Heads for Planing Machines.—J. P. Grosvenor, of Lowell, Mass.—Letters Patent No. 16,144, dated December 2, 1856.

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

Vol. XXIII.—No. 26. [NEW SERIES.] NEW YORK, DECEMBER 24, 1870. $3 per Annum [IN ADVANCE.]

Improved Independent Shuttle-motion Loom.

The advantages gained by making the motion of the shuttle independent of the velocity of the other parts of power looms, have already been fully set forth in these columns. These advantages are so manifest that inventors have for years sought to secure such a motion, and several have been illustrated in this journal within the past two years. We have now to add another, which secures the desired result in a very simple manner, combining several important features which are set forth below.

Fig. 1 is a perspective view of the loom with the improved shuttle-motion attachment, the details of which will be understood by referring to Fig. 2 in connection with the following description.

Power is communicated to the loom through the pulley, A, and shaft, B. The shaft, B, has formed thereon double cranks, which, through the medium of the connecting rods, C, give the required oscillation to the lay.

Through the medium of suitable gearing, D, rotation is imparted to the shaft, E. This shaft carries two cams, F, each of which has a hinged segment, G, which allows the motion of the primary shaft, B, and the shaft, E, to be performed in either direction without affecting the operation of the loom, and also permits the lay to be pushed back by the hand of the attendant at any portion of the revolution, without necessitating any re-adjustment of parts in starting the loom.

The cams, F, operate oscillating levers, H, pivoted at I, and having friction rollers pivoted to the ends which engage with the cams. The operation of the cams is to alternately thrust the back ends of the levers, H, inward at each revolution of the shaft, E. This alternately forces the opposite ends of the levers, H, outwards, against the lower ends of the vertical oscillating levers, J, against which the ends of the levers, H, press, but with which there is no positive connection by pivots or links attaching the two sets of levers to each other.

The forcing out of the lower ends of the levers, J, in the manner described, causes them to alternately stretch the coiled springs, K, the inner ends of which are respectively linked to the tops of the levers, J, and the other ends of which are attached to the undersides of the lay beam, as shown.

Each of the levers, J, is attached by a leather cord, L, leading from its upper end to the picker, M, situated at the end of the lay race, R, opposite the lever. Other cords, N, lead from the pickers over pulleys, O, down to double pulleys, P, attached to the frame of the loom, as shown, upon which the cords, N, wind, as other cords, T, are unwound by the inward motion of the lower ends of the levers, J, to which they are attached.

The action of the movement is as follows: The revolution of the shaft, E, forces inwards one of the oscillating levers, H, thereby forcing outward the bottom of one of the levers, J, and forcing in its top so as to put tension in the spring to which it is attached. The opposite spring, being in this part of the movement released from tension, recoils, and drawing outward the top of the lever to which it is attached, and drawing inward the bottom of the same lever, imparts rotation to the double pulley, P, by unwinding the cord, T, which rotation winds upon the pulley the cord, N, and draws back the picker, M, to the rear end of the shuttle box, ready to make its stroke the moment the spring to which it is attached by the cord, L, is released by the let-off portion of the cam, F.

This simultaneous action of the movement at the opposite ends of the lay is alternated at each revolution of the shaft, E, so that while one spring is under stretch the other is making its recoil, and not only making the stroke of the picker at the other end of the lay, but also drawing back the picker which made the last stroke ready for the next alternate stroke, and so on.

If a thread break, the motion of the shuttle, S, may be instantly stopped by dogs, Q, which, by the use of the foot may be thrown into position to engage with the lower end of either of the levers, J, so as to prevent the recoil of the spring to which the lever is attached, and consequently the throw of the shuttle.

The advantages of an independent shuttle motion were specifically given in our article descriptive of Stever's Independent Shuttle-motion Loom, published on page 335, current volume, of the SCIENTIFIC AMERICAN.

It is claimed, however, that this loom gains an important advantage by dispensing with the semicircular picker-staff motion, and that the shuttle is on this account not nearly so likely to be knocked off the lay-race. It is also claimed that this movement is simpler and cheaper than any which has preceded it, while it fully attains all the other advantages secured in other independent shuttle movements.

The velocity of the throw of the shuttle is the same whether the picks be rapid or slow, and great rapidity is attainable. We are told that looms with this motion attached are now successfully run at a speed of 200 picks per minute without danger of too great strain upon the thread.

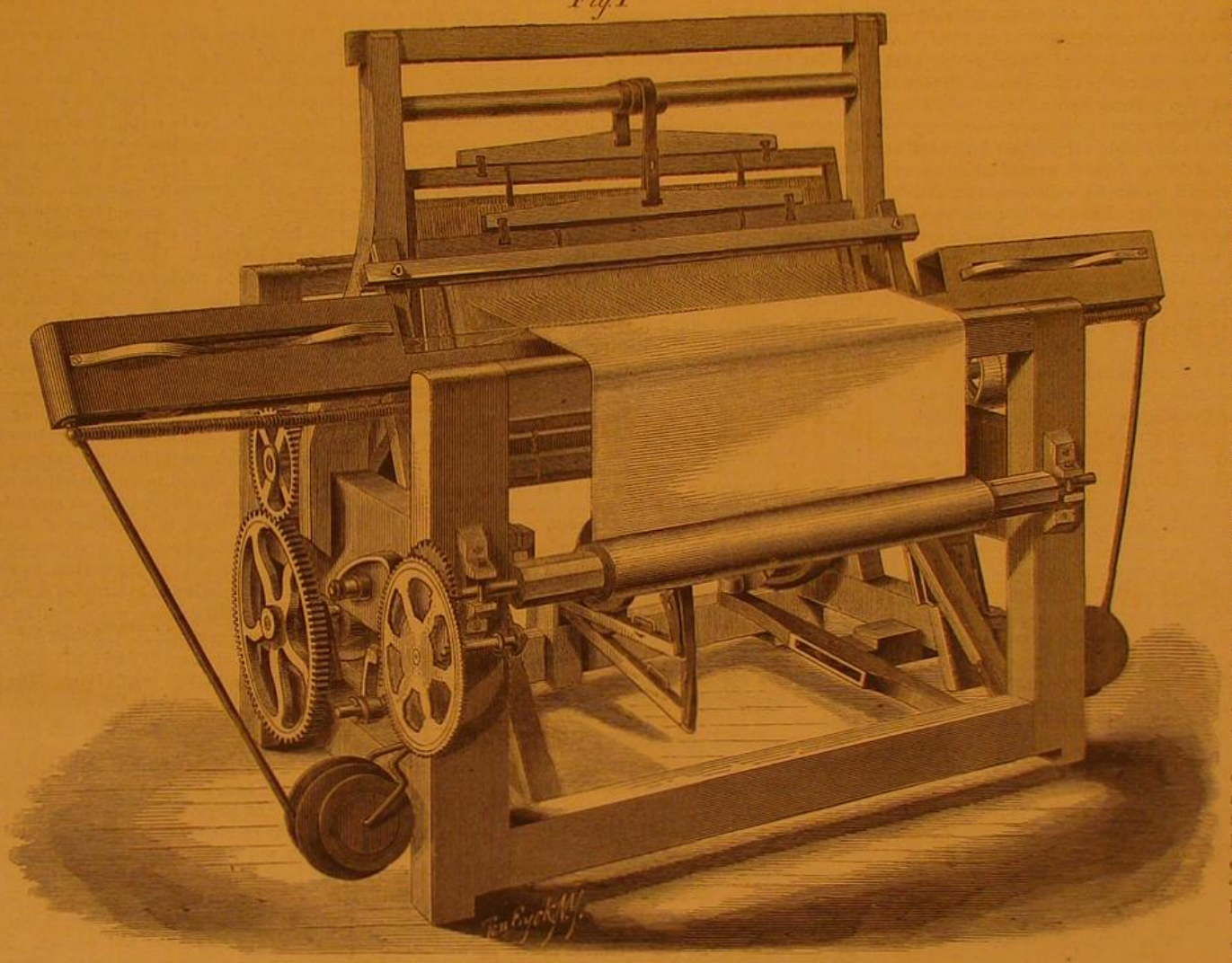
The movement can be attached at a cost of about $3·50 to any power loom in market except the Lyall "Positive Motion Loom."

The springs may be adjusted to different tensions to suit the character of the textures to be woven. Thus a uniformity in textures unattainable on the old looms, is always secured.

The pickers being self-sustaining and having a downward tendency in their movement, always maintain an upright position and always strike the shuttle at right angles directly in the line of their motion, giving greater stability of movement and allowing a high speed without danger of breakage. The reversibility of the cams without interfering with the operation of the pickers, secures the advantage that in stopping the loom to mend a thread of the warp, the lay may be moved back while the mending is done, and if the pitmans or connecting rods, C, are on the dead center, it is not necessary, as in old looms, to move the power wheel by hand to get the pitmans off the center. The work proceeds from the point at which it stopped, when the loom is again started.

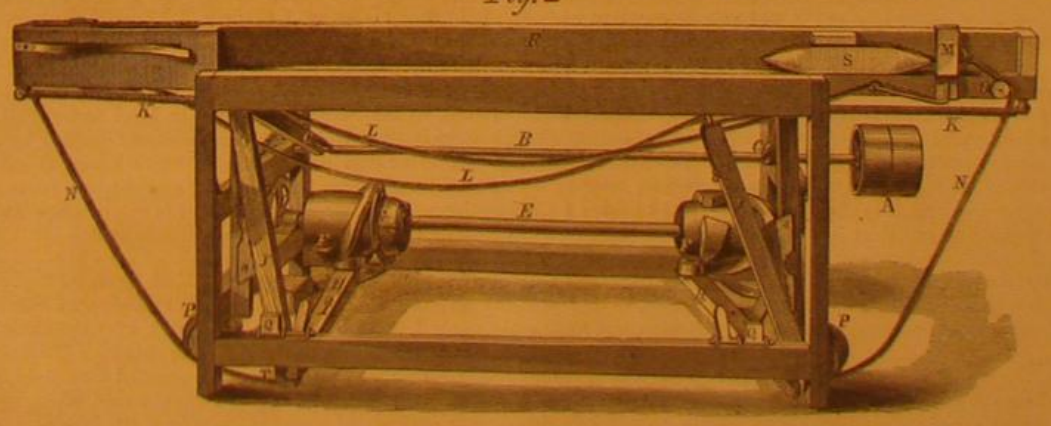
All the machinery is attached to the loom itself—no part to the floor; and the heavy surging motion of old looms is avoided, as well as much of their noise. Patented Dec. 13, 1870, by E. P. Terrel. Patents have also been applied for in all the foreign countries. For further information in reference to the sale of the patent for the United States, address F. M. Hamilton, West Liberty, Logan Co., Ohio, or Alexander A. C. Klaucke, Box 48 Washington, D. C.

Fig. 1



TERREL'S INDEPENDENT SHUTTLE-MOTION LOOM.

Fig. 2



PROGRESS OF FOREIGN INVENTION.

There seems to be considerable activity in invention abroad. The stimulating effect of the war on military invention seems, however, to be gradually subsiding. Among the chemical patents issued we notice a new process, patented in England, for making

ILLUMINATING GAS FROM TAR.

To prepare the material for this purpose the acid tar is placed in a suitable vessel (by preference lined with lead) and boiled up with open steam. The condensed water from the steam combines with the acid and sinks to the bottom and is drawn off. The alkaline tar is then run in, and the whole of the tars again boiled up. In this way any acid that may be present is neutralized, and leaves the tars in a purified state floating on the surface of the solution of salts, alkali, and other matters (the alkali may be recovered by evaporation). The purified tar can now be used for gas making by mixing it with small coal, or by running it into the retorts after the charge of coal has been introduced, but it does not do so well to run it into the retorts in this state, as it is apt to choke up the running-in pipe with carbonaceous matter.

Interesting to nautical men is a newly patented

STEERING GEAR,

which is an ingenious application of hydraulic pressure to move the rudder. The rudder head is provided with a strong tiller, which is actuated by means of a pair of hydraulic rams placed horizontally on each side of the tiller athwart the ship. These rams are connected together at their inner ends, between which they carry a block or bush, which works on the turned cylindrical end of the tiller, and which permits the tiller to slide radially. These hydraulic cylinders have branches attached to their outer ends, to which strong hydraulic pipes terminate in a slide valve chest having three ports—namely, one of the end ports, communicating with one of the above named hydraulic cylinders, which the inventor calls the port cylinder; the other extreme part with the other or starboard cylinder, and between these two ports the exhaust port is laid.

Of higher scientific interest is an

ASTRONOMICAL INSTRUMENT

called the "Heliade," by means of which the true time at any portion of the day may be discovered, as well as the latitude, longitude, and meridian line of the place where the instrument may be. It consists of a rectangular box hung so as to turn on two pins, and the axis of which passes through the center of the volume of the box in the direction of its length. The axis of the two standards is perpendicular to the base, which pivots horizontally on a support, whose legs are composed of screws, by means of which the base may be maintained in a perfectly horizontal position, which forms an essential condition for the exactitude of the observations. This true horizontal position is ascertained by means of two water levels fixed at right angles on the base. A screw nut serves to arrest the pivoting movement when the box is in the desired position. Inside the box are two hollow demi-cylinders with their concave parts standing back to back at the center of the volume of the box. Their bases form exact half circles. These demi-cylinders are graduated in their concave part by means of lines parallel with the hemicycle of the base, and of others perpendicular to the first, and parallel with the generating line of the cylinder. This instrument resembles in its general features the heliorama, recently illustrated and described in this journal. It is the invention of F. M. Pannerat, of Paris, France.

The question of the disposal of sewage is now attracting the attention of the most able chemists as well as engineers throughout the civilized world. Among others, C. M. Tessie du Motay, the discoverer of the process for making oxygen, so often referred to in these columns, has devised and patented a process for

TREATING EXCREMENTS

which may prove valuable. The chief objection to it will probably be the cost, though as some of the substances employed are useful as fertilizers, they may perhaps add enough to the value of the matters treated to in a measure compensate for their use. Taking human or animal excrement the inventor disinfects it by one of the metallic salts or antiseptic agents which are now employed, when it contains ammonia in the state of sulphur hydrates or sulphurets, or sulphureted hydrogen in the free state. After this operation he adds to the mixture of solids with liquids or separately or united in one and the same liquor, soluble phosphate, acid, or neutral magnesian salts, fluosilicic acid, or even soluble fluosilicates, alkaline tenons or metallic, such as fluosilicates of lime, of magnesia, of alumina, of iron, and the like. When the reagents separately or collectively employed have reacted upon the soluble portion of the excremental matters in such a manner as to form a combination with them, the inventor adds, in order to cause them to pass from the acid into the neutral or alkaline state, either lime or carbonate of lime or magnesia or carbonate of magnesia. If after this treatment the excrement still gives off sulphohydric odors, a metallic salt should be added in order to complete its disinfection.

Among the curiosities of the patent announcements, we find one completed for a

PERPETUAL MOTION,

the invention of R. M. Marchant, of Torrington Square, London. The inventor compresses by stages the air, steam, or gas to be used as a motive power by means of pumps, a separate pump and chamber being provided for each stage, and the pumps being constructed in such manner as to prevent leakage by the provision that the air charge shall in every pump or chamber be passed, by the law of gravity, through the water in such pump or chamber to a higher level, so that all pressure tending to leakage shall as far as practicable be exercised by water on the joints, with which joints the air is precluded from coming in contact by the difference of its gravity. This meager description hardly indicates where the self-motive power is to come from, but those who are sufficiently versed in the attempts made to secure perpetual motion by the use of fluids of different densities will see in this device a familiar principle which has always failed to secure the desired result. A more complete description would therefore only show in a clearer light the folly of the inventor.

Mr. E. Weare, of Stonehouse, England, has patented a method of

UTILIZING WASTE THREAD

in the manufacture of textile fabrics. He accomplishes the end sought by returning the waste threads to the condensing carding engines by means of mechanism, the greater part of which is attached to one of the scribblers, by preference to the last. Over the end of the carding engine, rollers are fixed, over which rollers the waste thread from one side of the engine is conducted to the other side, and the threads from the two sides of the engine thus brought side by side. The waste threads are taken up by or coiled upon, a roller or spool driven by any convenient gearing from the carding engine or otherwise; and the said roller or spool, when filled with the waste threads, is conveyed to the scribbler (the axis of the roller or spool placed in suitable supports), and made to bear or rest on a second roller or drum, which has a slow, uniform rotary motion communicated to it, whereby the waste threads are uniformly delivered into the sliver as it comes off the scribbler. The sliver passes to the condensing carding engine in the usual way.

PENTAGRAPHIC EMBROIDERY

is a name applied to an ingenious method of performing ornamental needlework, invented by Mr. Billwiller, of St. Gall, England. A number of jointed frames are employed, each carrying tambouring or sewing apparatus. They are so arranged and connected together that the needles they carry may be made to traverse in any direction over the surfaces of the fabrics to be embroidered, and that the movements of the several needles shall be simultaneous and similar. The needle frames are also connected with a pentagraph having a tracing point capable of being led by the workman over the lines of a pattern which it is desired to copy, and when this is done the needles will each travel in and work along a path similar to that passed over by the tracing point. Thus each needle will produce embroidery resembling the pattern, but not necessarily of the same size; usually it is preferred that the pattern should be on a larger scale than the work produced by its means.

Professor Helmholtz on Faraday.

Preface to the German Edition of "Faraday as a Discoverer." Translated by Prof. Tyndall.

The name of Faraday is one to be held in reverence by all natural philosophers. Many times in London, in connection with lectures which I delivered at the Royal Institution, I had myself the privilege of his obliging help and the pleasure of his amiable society. The perfect simplicity, modesty, and undimmed purity of his character gave to him a fascination which I have never experienced in any other man. I had therefore a duty of gratitude to fulfill towards him.

But apart from this, and apart from that friendship for Faraday's younger associate and successor, the author of this book, which induced me to undertake the task, I believed that I should render a service to German readers by facilitating, as far as in me lay, an insight into the action and character of a mind so richly and peculiarly endowed, and so entirely the product of natural growth.

It is, moreover, by no means for the philosopher only that such an insight possesses interest. His interest, certainly, is the most immediate, for it has hardly been the lot of any single man to make a series of discoveries so great and so pregnant with the weightiest consequences as those of Faraday. Most of them burst upon the world as surprises, the products, apparently, of an inconceivable instinct; and Faraday himself, even subsequently, was hardly able to describe in clear terms, the intellectual combinations which led to them. These discoveries, moreover, were all of a kind calculated to influence in the profoundest manner our notions of the nature of force. In the presence of Faraday's magneto-electric and diamagnetic discoveries more particularly, it was impossible for the old notions of forces acting at a distance to maintain themselves without submitting to essential expansions and alterations. The clearer expression of these changes is at the present hour the object of physical science.

In what way such extraordinary results were achieved is naturally a question of the first interest to the investigator who strives after similar though more modest ends. But Faraday's development appears to me to possess no small human interest in relation to many theoretic questions of psychology, and to the art of education. The external conditions under which he cultivated those striking capacities which excite our wonder were the simplest that can be imagined. He was completely self-taught; brought up in humble circumstances, having received no more than the commonest instruction, and having been only favored by fortune in the circumstance that when he was a poor apprentice to a bookbinder, he found, at the right time, a helper in Humphry Davy, who recognized his peculiar gifts, and procured for him the possibility, though in a subordinate position, of working in the direction towards which his genius impelled him.

And throughout his whole life and labors the advantages and disadvantages of such a mode of development reveal themselves in simpler and larger traits than in the case of most other similar celebrated names. The principal advantage rose undoubtedly from the fact that his intellect was not too soon subjected to theoretic fetters, but enjoyed its freedom in the presence of natural phenomena; and that instead of book learning, he permitted the fulness of nature herself to operate upon his open mind. The disadvantages are, perhaps, of a subordinate kind; but they reveal themselves in quite as unmistakable a manner when he strives to give expression to his ideas, and to supply, by all kinds of sensuous imagery, the want of mathematical culture. This is manifestly the way in which he alighted upon his lines of force, his ray vibrations, and other notions, which bewildered the investigators of his time, and the truer and clearer meaning of which has been in part made out by mathematical theory since Faraday himself ceased from his labors.

And still, in this unlearned son of a smith, who held fast throughout his life the pious creed of his fathers, ran a vein of philosophy which gave him the right to be ranked among the foremost of those engaged in the general intellectual travail of our age. That, as Tyndall informs us, he retained the term "natural philosophy," usual in England to express physical science, and the name "philosopher" for the cultivator of that science—lies essentially in the nature of his work. After the science of our age, in its laudable efforts to make human knowledge a true image of the actual universe, had shattered many an old metaphysical idol, it halted amid the transmitted forms of physical ideas regarding matter, force, atoms, and imponderables. These names were even converted into new metaphysical shibboleths by those who thought themselves most advanced in the way of enlightenment.

It was these ideas that Faraday sought in his riper labors to purify from everything theoretical which was not the true and immediate expression of the facts. More especially he opposed the action of forces at a distance, the assumption of two electric fluids and of two magnetic fluids, and, in like manner, all hypotheses which contradicted the law of the conservation of force, of which he had an early presage, though he singularly misapprehended its mathematical expression. And in these precise directions he exercised, in the first place, the most unmistakable influence on the physicists of England. The mathematicians among them, especially, labor to render theories of phenomena the pure and true expression of the laws of fact, to the exclusion of all arbitrary theoretic devices. In this way Faraday's ideas, though in a modified form, often reveal themselves with their true significance assigned to them.

Responsibility for Detention of Advertised Trains and for Accidents.

The English courts hold the railway companies to a pretty strict rule in regard to their relations with the public convenience and the public safety. A case of long standing has recently been tried in the Court of Exchequer, the result of which is a case in point. A season-ticket holder found the advertised train not going to start, in consequence of the fireman having neglected to keep up steam, and ordered a special train. The bill for this was about two hundred dollars. The sharp passenger paid it, and then brought an action for the recovery of the money and some fifty dollars additional for his own loss of two hour's time. The judge expressed himself "astonished" that the company had resisted such a claim, and the jury gave the plaintiff a verdict for all he asked.

If we should import a little English law or an English judge or two, it might prove of advantage to the American public. In England likewise accidents to persons or property, from the carelessness or neglect of railway officials or employés, are punished by heavy pecuniary assessments under the head of damages. Verdicts to the amount of thirty or forty thousand dollars for personal injury have been recovered, and we read of one case where the jury rendered a verdict of over fifty thousand dollars. These heavy verdicts, however, do not seem to prevent disasters. In the Board of Trade Returns for Great Britain, for 1868, it is stated that nine railways in England and Wales paid for compensation for accidents on their roads the sum of $2,103,855, of which $1,407,940 were for injuries to persons, and $695,915 were for damages to goods. The compensation for accidents in 1869, it is anticipated, will amount to a larger sum than that above stated.

The English managers are much in favor of settling claims for damages by arbitration instead of trusting the matter to a jury, and in this we think they are wise; and we believe likewise it is better for both parties. Arbitration simplifies the whole proceeding, saves time and expense, and, if the arbitrators deal fairly with the facts of a case submitted to them, justice will not be so likely to be delayed or defeated by merely legal technicalities. Another very sensible decision was recently decided by an English court, to this effect, that a railway company is not responsible for the loss of articles from a passenger's portmanteau, which had been left by the owner in one carriage while he traveled in another, his own negligence having made the loss possible.—*Railway Times.*

A New Mode of Evolving Light.—Mr. Andrew Pritchard writes to *Nature* as follows: "A singular phenomenon of the evolution of light has been recently observed by me. By tearing sharply a piece of twilled calico into strips in a room well guarded from light, a perceptible luminosity was clearly distinguishable, which appeared at its maximum at the final parting of the fabric. This phenomenon is exceedingly well marked in dry, new calico, and appears to me due to the dressing, as after being washed no light is evolved. Whether attributable to electricity, phosphorescence, or fluorescence, I leave for further investigation. The light appears similar to that produced on breaking a lump of sugar in the dark. So far as I can ascertain, the phenomenon of light being evolved on tearing a fabric is new."

Effects of Compressed Air on the Men Employed in the Caisson of the East Pier of the St. Louis Bridge.

[From the Report of the Chief Engineer, Capt. James B. Eads.]

The first symptom manifesting itself, caused by the pressure of the air, is painfulness in one or both ears. The eustachian tubes extending from the back of the mouth to the bony cavities over which the drums of the ears are distended, are so minute as not to allow the compressed air to pass rapidly through them to these cavities, and when the pressure is increased rapidly the external pressure on the drums causes pain. These tubes constitute a provision of nature to relieve the ears of such barometric changes as occur in the atmosphere in which we live. The act of swallowing facilitates the passage of the air through them and thus equalizes the pressure on both sides of the drums, and prevents the pain.

The pressure may be admitted into the air lock so rapidly that this natural remedy will not in all cases relieve it. By closing the nostrils between the thumb and fingers, shutting the lips tightly, and inflating the cheeks, the eustachian tubes are opened, and the pressure on the inner and outer surfaces of the tympanum is equalized, and the pain prevented. This method must be used and repeated from time to time as the pressure is let on, if it be increased rapidly. No inconvenience is felt by the reaction when the pressure is let off, as the compressed air within the drums has a tendency to open the tubes, and thus facilitates its escape through them; whereas increasing the pressure has the effect of collapsing them, and therefore makes it more difficult to admit the compressed air within the cavities of the ears. It frequently occurs, however, from some abnormal condition of these tubes, as when inflamed by a cold in the head, that neither of these remedies will relieve the pain. To continue the admission of compressed air into the lock, under such circumstances, would intensify the suffering, and possibly rupture the tympanum; therefore the lock tenders were particularly instructed to shut off the compressed air at the moment any one in the lock experienced pain about the ears; and then, if it could not be relieved by the above means, the lock was opened and the person was not permitted to go through into the air chamber. Sometimes fifteen minutes were occupied in passing persons through the first time, after which they usually had no further trouble from this cause.

The fact that the depth penetrated by the air chamber was considerably greater than that hitherto reached in any similar work, left me without any benefit from the experience of others in either guarding against any injurious effects of this great pressure upon the workmen and engineers subjected to it, or of availing myself of any known specific for relieving those affected by it.

When the depth of sixty feet had been attained some few of the workmen were affected by a muscular paralysis of the lower limbs. This was rarely accompanied with pain, and usually passed off in the course of a day or two. As the penetration of the pier progressed the paralysis became more difficult to subdue. In some cases the arms were involved, and in a few cases the sphyncter muscles and bowels. The patients also suffered much pain in the joints when the symptoms were severe. An average of at least nine out of ten of those affected suffered no pain whatever, but soon recovered, and generally returned to the work.

The duration of the watches in the air chamber was gradually shortened from four hours to three, and then to two, and finally to one hour.

The use of galvanic bands or armor seemed, in the opinion of the Superintendent of Construction, the foremen of the chamber, and the men, to give remarkable immunity from these attacks. They were all ultimately provided with them. These bands were made of alternate scales of zinc and silver, and were worn around the wrists, arms, ankles, and waist, and also under the soles of the feet. Sufficient moisture and acidity were supplied by the perspiration to establish galvanic action in the armor, and as the opinion of those most accustomed to the chamber was almost unanimous in favor of this remedy, I am very much inclined to believe it valuable.

Immediately on the manifestation of greater severity in the symptoms, a hospital boat was fitted up at the pier, and one of the ablest physicians in the city (Dr. A. Jaminet) was engaged to attend those affected, and also to institute such sanitary measures as his judgment should dictate. A careful examination of the health and bodily condition of every workman was daily made, and none were permitted to engage in the work without the approval of Dr. Jaminet. Those most severely affected were sent to the city hospital and had the benefit of the advice and treatment of its resident physician, Prof. E. A. Clark.

The total number of men employed in the air chamber of this pier was 352. Of this number about thirty were seriously affected. Notwithstanding the care and skill with which those most severely attacked were treated, twelve of the cases proved fatal. Each one of these, without exception I believe, was made the subject of careful inquest by the coroner, aided by an autopsy conducted usually by some of our most skillful surgeons and physicians.

Whilst the exciting cause in all of these cases was doubtless the exposure of the system to the pressure of the condensed air of the chamber, the habits and condition of several of those who died were, at the time they went to work, such as would have excluded them from it if subjected to the examination of Dr. Jaminet, and the verdict in about one half of the cases gave a totally different cause for the death of the patient. Nearly or quite all of these deaths happened to men unaccustomed to the work; several of them to men who had worked but one watch of two hours. In contrast to this is the fact that quite a large number of the men (certainly one half of those constantly employed) commenced with the work at its inception and remained throughout its continuance entirely without injury or inconvenience.

The gentlemen composing the engineer corps of the bridge all visited the air chamber, some of them quite often, either in the discharge of their professional duties, or from motives of curiosity, and none of them suffered any injury whatever.

Much diversity of opinion was expressed by the medical gentlemen who investigated the symptoms and held autopsies of the deceased. Some of these gentlemen maintained that a slower transition from the abnormal to the natural pressure would have been less injurious; others claimed, on the contrary, that it was from the too rapid application of pressure in passing from the natural into the compressed air. The fact that the air lock tenders were in no case affected, although subjected many times during a watch of two hours in the air lock to rapidly alternating conditions of the atmosphere, at one moment in its normal state in the lock, and five minutes later exerting a pressure of fifty pounds per square inch upon every part of the body, would seem to prove both of these theories unsound, and lead us to believe that in the length of time to which the human system is subjected to this extraordinary pressure exists the real source of danger, and not from any rapid alternations of pressure to which it is exposed.

After the caisson reached the rock, I have frequently, when passing through the air lock, admitted the compressed air into it so quickly that none but those well accustomed to it could relieve the pressure upon their ears, and yet I felt no ill effects whatever from this rapidly increased pressure; and in going out I have let the pressure off so fast that the temperature in the lock has fallen thirty-two degrees (F.) in consequence. These transitions occupied but three or four minutes.

The fact that the air chamber was briefly visited by thousands of persons, including many delicate ladies, even after it had reached the bed rock, some remaining as long as an hour in it without any of them experiencing the slightest ill effects from the pressure, and the fact that no cases of any importance whatever occurred among the workman after the watches were reduced to one hour, satisfies me that this is the true cause of the paralysis, and that by lessening still more the duration of the watches, a depth considerably greater can be reached without injury to the workmen. Too long a continuance in the air chamber was almost invariably followed by symptoms of exhaustion and paralysis. Dr. Jaminet, on one occasion, remained in two and three quarter hours when the depth was over ninety feet, and was dangerously attacked soon after reaching home.

Hoosac Tunnel---Trial of Dualin.

EAST END.

About fifteen hundred pounds of dualin in cartridges ready for use, reached here from Neponset ten days since, being the sixth attempt to supersede nitro-glycerin. The inventor of this compound arrived on the 28th ult., for the purpose of superintending its application in person. As this parcel had been specially prepared for the purpose, guided by the results of five previous experiments at various points of the tunnel, "great expectations" were raised, as to the results. One of the slopes then being operated upon by nitro-glycerin and having a burden of eight feet, which was being thrown down every blast, bottoming every hole, was offered for the experiment. Similar charges of dualin were substituted for nitro-glycerin; the dualin was utterly unable to move the rock—the inventor asserting that this failure arose from the cold weather having affected the compound, the charges were thereupon warmed, but with no better result. Some charges were now inserted in holes having a burden of two feet, instead of eight; these removed the rock, but as powder would have done the same work, this was not deemed a seccess. Meanwhile some 400 pounds of dualin were teamed to the central shaft, but as the results of three days' blasting at the east end were reported of "no account" this has not been used. We believe the results now attained with nitro-glycerin at the east end, and above described, viz.: Taking out the roof full width of the tunnel with a single series of seven drill holes having an eight-feet burden, and bottoming every hole, indicates admirable direction of the work, and argues well for the speedy completion of the tunnel. Progress during November, 133 feet.

WEST END.

Well No. 4. Messrs. Hocking & Holbrook have commenced using nitro-glycerin in their sub-contract, for the purpose of removing the rock preparatory to putting in the brick arch at that point; their first blast of nitro-glycerin in five holes, was tried on Monday with satisfactory results, and hereafter they intend to substitute it for powder, except in trimming. It seems to produce less jar, and it is anticipated will be less injurious to the brick work that is completed, than blasts with powder—besides expediting the work and saving money. Sixty-three feet of brick arch were completed during the month ending November 30.

WEST SHAFT.

The progress of the heading at this end, we understand, during the month of November, has nearly equaled that attained at the east end. When it is remembered previous to the present contract 40 feet was more than average at this point, the progress, 130 feet during the past month, is very satisfactory.

CENTRAL SHAFT.

The advance made in the two heading just opened during November was 76 feet. Considering that this rock has to be twice handled, and then lifted over 1,000 feet to the surface; such progress by hand drilling is very extraordinary work, but as Mr. Walter Shanley has been on the ground during the month, all the time, this may afford the clue how it is the headings are being driven at such a rate, by handdrilling.

It will be observed that with the most strenuous efforts at hand drilling the progress was not one third of that accomplished at the east end where the Burleigh compressed air drills are used.

Photographs of Arctic Scenery.

One of the most interesting and instructive entertainments of the season was given at the Somerville Art Gallery last week by Mr. Bradford. It is known that Mr. Bradford and Dr. Hayes revisited the polar regions in the summer of 1869, and that they brought back with them several hundred photographs and sketches of a region hitherto unknown to the world except by description. The photographs have been copied upon glass for exhibition with the magic lantern on a canvas 20 feet square. The pictures are remarkable for their sharpness and definition, and afford a better idea of that wonderful region than it would be possible to obtain without personal inspection. The interest of the occasion was greatly enhanced by the explanations made by Dr. Hayes, who courteously gave an account of the adventures of the party, with the necessary statistical and scientific information in reference to the size of the icebergs and the geological character of the rocks. We understood Dr. Hayes to say that there was enough ice in one of the floating masses so truthfully delineated upon the canvas, if brought to the New York market and sold at the price we are accustomed to pay, to bring in enough money to pay off our national debt and leave a balance in the treasury. This startling statement affords the best idea of the enormous weight of these icebergs, and we can better understand, after viewing them, how readily they can grind out valleys, and change the whole contour of the bed of the ocean in which they float. At the close of the exhibition Dr. Barnard, of Columbia College, made some eloquent remarks on the educational value of such studies and urged upon the Board of Education the importance of affording an opportunity to our school children of seeing representations of this entertaining and instructive character.

Mr. Bradford then invited the company to partake of some ices evidently not of arctic manufacture, and of edibles very different from the pemmican and blubber with which his traveling companions were obliged to be content in their northern journey. The entertainment was one to be remembered by all who had the pleasure of being present.

New Projection of the Earth.

G. R. Nash, C. E., of North Adams, Mass, has calculated and constructed a new system of projections, which he designates "The Conoidal," on which linear position, area, angles, and distance, are in harmony, as also "form" when sectional maps are used. It seems to us better adapted for general purposes than any of the projections now used.

On 'Mercator's" projection, the young student of geography is at once misled respecting the comparative sizes, positions, and forms of countries, islands, seas, etc., resulting from its variable scale, and many persons carry these early impressions through life. "Mercator's" is a special projection for the use of mariners, and not suited for general purposes. The "Spherical" has three disadvantages: One that it is not a delineation of the earth's surface on one representation; another, that parallels of latitude are not parallel; and thirdly, it embraces more area than really exists. The new projection corrects these disqualifications in both projections, besides possessing other favorable features, and is, therefore, we believe, eminently qualified to be the basis for the future construction of maps, charts, and atlases. A great advantage is also apparent in the lines at right angles with each other, dividing the chart into squares, as any person can see at once the distances north and south, east and west of the equator, or prime meridian, or other points, thereby greatly assisting in teaching sizes and areas.

Charts showing only small subdivisions on this projection are necessarily very correct, and can be constructed with any meridian as a "prime."

We have seen a drawing on this projection, which represents the first map of an atlas. It is proposed next in order to project the New World, then the Old World, then each continent with its sectional maps, which arrangement would gradually reduce any distortion produced on a chart showing the whole surface of the earth.

Lamy's Thermometer.

The pyrometer invented by Lamy is founded upon the dissociation of carbonic acid from calc spar in a porcelain tube, and an arrangement for reading the amount of gas thus expelled. He has since extended his experiments upon other salts and finds the double compound of ammonia chloride of calcium to be admirably adapted to the accurate determination of slight variations in temperature. This is in consequence of the ease with which the ammonia vapor can be expelled, and the variations in its tension under different degrees of heat. Lamy incloses about a gramme of the ammonia chloride of calcium (made by passing ammonia gas over dry chloride of calcium) in a flat copper box of the size of a five franc piece, with a tube 4 or 5 mm. wide and 150 millimeters long. This tube is attached to a leaden tube of 1·51 mm. diameter and of any required length, on the end of which is placed the manometer for reading the force of expansion of the gas. For lower temperatures a column of quicksilver will answer every purpose. As long tubes can be used this form of thermometer is admirably adapted for determining the temperature of wells and caves into which it can readily be sunk.

The subject is one of peculiar interest as affording more accurate methods for measuring small degrees of heat than can otherwise be obtained.

MERCURIAL PUMP WITHOUT VALVES OR STOP-COCKS.

The *Journal of the Franklin Institute* is indebted to Prof. Young, of Dartmouth College, for an account of the following ingenious arrangement, which was first suggested by Mr. C. H. Smith, of Mt. Auburn Institute, Cincinnati, Ohio, to Prof. C. O. Thompson, of Worcester, Mass., and was by the latter gentleman carried out in practice with entire success.

A glass tube, A B, of such size as may be desired, is drawn out at one end, B, and by means of a stout rubber tube is connected with a mercury reservoir, C. A rubber cork at the end, A, carries two tubes; one, D, leading from the vessel to be exhausted to the bottom of A B, the other from the top of A B to a beaker, G, containing a little mercury, the hight, F E, being about 30 inches.

When the reservoir, C, is raised, the mercury entering B C closes the lower end of the tube, D, and expels all the air contained in A B by the tube, E F, and, in fact, is allowed to fill and flow through E F for a moment. On depressing the reservoir the mercury descends in A B and leaves a vacuum into which air flows from D; E F being over 30 inches in hight, the mercury in F rises in it but no air can enter by that way. To render the joints at A tight, a little mercury is run in over the rubber cork, as was suggested by Dr. Gibbs, of Cambridge, in his modifications of Sprengel's pump.

MILKING-STOOL AND PAIL-HOLDER.

L. B. Hoit, of Cedar Falls, Iowa, has invented an improved milking-stool and pail-holder, of which the accompanying engraving is a representation.

The object of this improvement is to hold the pail near the bag of the cow, so that the milk shall not be lost by spraying, as is the case when the pail rests upon the ground, to keep the pail from being soiled on the bottom by filth, and to obviate the fatigue of holding the pail on the knees.

The stool has attached an arm with a circular frame at the end to support the pail. The weight of the milker on the stool counterbalances that of the milk-pail.

By the use of this simple article, milk is saved, and also preserved from filth, the bucket is out of the way of the cow's tail, and she cannot kick it over. At the same time much fatigue is saved to the milker.

IMPROVED MOP WRINGER.

This improvement is the invention of B. B. Choate, of Springfield, Vt., and its object is to save the hands from strain, as well as contact with filthy water in the wringing of floor mops.

A, in the accompanying engraving, represents two metallic bars, which are bent at their centers, in the line of their edges, nearly double, and then have their edges and sides curved or bent, in the manner represented in the drawing. These bars are pivoted together a short distance from their ends, and between their ends are placed the rollers C and D. The rollers have axles, which have bearings in the ends of the bars, holes being made in said bars for receiving the axles. The centers of the bars are so formed as to answer as foot pieces, upon which the operator may place his foot in bearing the rollers together. When the foot pieces at the centers of the bars are separated, the rollers, of course, separate at the same time, so that a mop may be placed between them. When the foot pieces are closed towards each other, the rollers close upon the mop, and press it as tightly as may be desirable for wringing the water, etc., from it.

The bars, A,* are spread wide enough apart at a point just above their pivots that they embrace an ordinary water or mop pail on opposite sides, and are provided with hooks catching upon the edges of the pail, so as to support the bars and keep them in position. Upon one of the shafts of the rollers is secured a crank handle for revolving or giving motion to them.

The operator stands over the bucket and operates one of the bars with his foot, while he turns the rollers with his hand by means of the crank handle. One bar will remain stationary, while the other can be raised or lowered, so as to separate or close the rollers. The mop is pressed and drawn between the rollers in the usual manner.

A NEW INK FOR PRINTERS.

In the official announcement of patents issued during the past week, published in another column, will be found that of a new printers' ink, which, while it is said that it can be furnished 33 per cent cheaper than the ordinary ink, is claimed to possess superior advantages to any hitherto used.

The patentee is Mr. Julius Kircher, a pupil of the celebrated chemist, Liebig.

The ink in question consists of 10 parts of hydrated peroxide of iron, 6 parts of hydrated protoxide of iron, and from 10 to 16 parts of varnish.

The two first-named ingredients are mixed in a moist state by stirring; 48 parts of water are then added; and the water being evaporated by boiling converts the mixture into a fine velvety black powder. This powder is washed and dried, and finally mixed with the varnish, the proportion of which varies in accordance with the desired quality of the ink.

The advantages claimed for this ink are that it never changes its color. It has no disagreeable odor; it is a fine glossy black; and, as above stated, is one third cheaper than ordinary ink.

The manufacture of this ink is shortly to be introduced into this country, the requisite machinery for the purpose being now *en route* from Europe.

We understand that the Austrian Government has adopted this ink on account of its permanent unchangeable quality for printing the Government documents.

The patent is owned jointly by L. Bamberger, J. Kircher, the inventor, and Leopold Mendelson, the originator of Mendelson's *Bank Note Reporter*, whose name appears in connection with the macaroni and vermicelli manufacture in another column.

We have before us a copy of an Austrian newspaper published at Vienna, printed with this ink, which presents an unexceptionable appearance.

Any information relative to this ink may be obtained by addressing Mr. Leopold Mendelson, 311 and 313 Avenue A, New York city.

Triumphs of Science.

The second of the course of four lectures before the Young Men's Christian Association, in this city, on the "Triumphs of Science," was delivered on the evening of December 8th.

After a few introductory remarks, Professor Doremus said there was a class of men who claimed to have discovered the distance of most of the bright orbs in the firmament, as well as the sizes and weights of many of them. Now, how was this knowledge gained? It was generally known that we could measure the distance between two objects on this globe without actual measurement, simply by watching the angles which were made between the eye and the objects themselves. The same principle was applied by the astronomer to the sun and moon and other celestial objects. Some of the stars were so distant that they could only be measured by the time taken by a ray of light to travel from them to the earth, and, even judged by this standard, were so remote that light took hundreds of years to traverse the space between them and the eye of the astronomer who was gazing at them. When the distance was known the size also could be ascertained by a calculation founded on the diameter and distance of the object, but some stars were so remote that we could not correctly estimate their diameter, though we could form some idea of their grandeur by their comparative brilliancy.

The weight was discovered by ascertaining the power of attraction possessed by the different planets. Some might say that these were mere dreams of fancy. But, in truth, astronomical calculations and measurements were the only ones entitled to absolute credit. He was ashamed to say that there was only one State in the Union that had yet been correctly laid down on the map by astronomical observations, and that State, he was, as a New Yorker, sorry to say was Massachusetts.

At present the maps of this country were very inaccurate, in spite of the delicacy of the lines that were shown as dividing our various counties and States, and they must ever be inaccurate until verified by scientific tests and measurements He ought not, however, omit to state, further, that at neither of the colleges of the city was there an observatory, or any means provided for astronomical instruction.

In view of our wealth, was not that a great opprobrium to our city? Indeed, that melancholy fact was one reason why he believed professors ought to come forward and bring under popular notice the claims of science. New York gave freely to the right and the left in aid of religion, and he thought this reproach of her illiberality to science would not long be allowed to rest upon us.

The Professor then again returned to the discoveries made by means of spectrum analyses. The most common metal in the universe seemed to be sodium, for we found it everywhere all through the starry world, in the air and in the human body. An old inscription at Memphis said that the earth below showed what the planets above were like.

Our earth was but a burned up star, and its crust but a very fragmentary part of its bulk. We all know how terrible were earthquakes or the trembling of the earth's crust under the influence of some internal agitation. By an estimate he had made a few years ago, it appeared that no less than half a million of human beings and millions of other animals had been destroyed by earthquakes and volcanoes within the last two centuries. This showed the vigor of this internal force of the earth and the terrible condition under which we were living.

Dr. Doremus then gave a number of instances of remarkable sinkings and elevations of the earth's crust, which, compared to the entire bulk of the globe, was but as one to forty. He then proceeded to show the nature of the earth's crust and to trace the various modifications to which its surface has been subjected, especially in the relative arrangement of land and water. To the eye of the geologist the earth, as it existed at present, was the product of unalterable and beneficent laws which had slowly worked out conditions of climate and even of wind currents, in exact correspondence with the needs of the animated creation.

The lecture terminated with some brilliant experiments, showing the precision of the ratio in which the elements of matter combine.

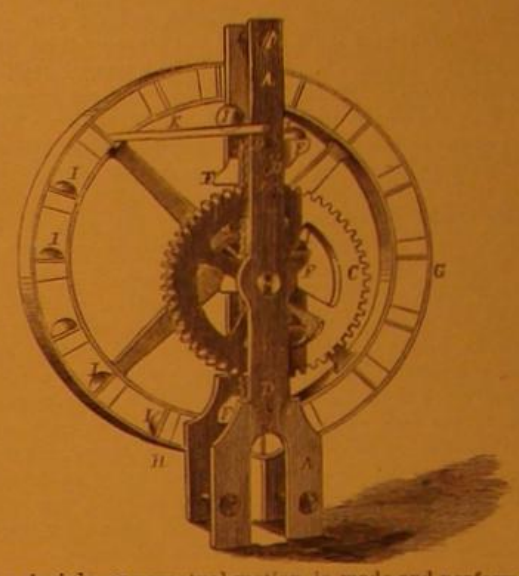
PERPETUAL MOTION.

NUMBER IV.

In 1790 one Conradus Schwiers, a Doctor of Divinity, patented a "Machine on a self-moving principle, or perpetual motion." Fig. 7 is a view of this machine, which, it will be at once seen, is an effort since often repeated, to obtain a wheel so as to keep its center of gravity from ever falling directly under the axis while revolving.. The following is the specification:

"Now know ye, that in obedience of the said letters patent, and the proviso therein contained, I, the said Conradus Schwiers, do hereby declare my said new invented self-moving principle, or perpetual motion, is made and performed in manner following, that is to say:

FIG. 7.



"Two stiles or uprights marked in the plan hereunto annexed, A, A, etc., and fastened together by the screws, 1, 2, 3, and to the base, between which stiles or uprights run the wheel, C, and the pinion, D, and the two double pinions, D, D, etc., over which double pinions run a douple chain, etc., to which chain are fixed the buckets, F, F, etc. The chain is made with joints on each side and bars running across, equal in number to the cogs of the wheel, C. Upon the same axle with the wheel, C, on the farther side of the inner stile, A, runs the wheel, G, whose diameter is full double that of the wheel, C; and the pivot of the wheel, G, runs in the back, H, as the other pivot of the same axle runs in the front stile, A. The wheel, G, is divided near the periphery into receptacles in number equal to the buckets on the chain, which receptacles are supplied with metal balls, I I, etc., from the buckets, F, F, etc., by means of the gutter, K, which balls by their weight forcing round the wheel, G, and thereby lifting up the buckets, F, F, etc., on one side as they go down on the other side, discharge themselves again at the bucket, L, where they are taken up by the buckets, F, F, etc., and discharged again at the gutter, K, and are so repeated in a constant succession as often as any receptacle is vacant in the wheel, G, at the gutter, K, for their reception, and by that means the perpetual revolution is obtained, the upper ball being at the same time discharged from one bucket when the lower ball is taken up by another." A very common principle has been worked out to uniform failure in various ways, from the earliest to the latest times. It is shown in the accompanying diagram, Fig. 8, which represents a large wheel, the circumference of which is furnished, at equal distances, with levers, each bearing at its extremity a weight, and movable on a hinge, so that in one direction they can rest upon the circumference, while on the opposite side, being carried away by the weight at the extremity, they are obliged to arrange themselves in the direction of the radius continued. This being supposed, it is evident that when the wheel turns in the direction, *a*, *b*, *c*, the weights, A, B, and C, will recede from the center; consequently, as they act with more force, they will carry the wheel towards that side; and as a new lever will be thrown out, in proportion as the wheel revolves, it thence follows, say they, that the wheel will continue to move in the same direction. But, notwithstanding the specious appearance of this reasoning, experience has proved that the machine will not go; and it may indeed be demonstrated that there is a certain position in which the center of gravity of all these weights is in the vertical plane passing through the point of suspension, and that therefore it must stop.

FIG. 8.

Fit companions to these remarkable specimens of false reasoning are the two modern devices of which we give illustrations in Figs. 9 and 10.

Fig. 9 represents a device by Charles Batcheller, of Polk Co., Iowa, on which he has taken a patent during the present year.

"My invention is designed to provide a simple balance power, that may be advantageously used in connection with any machinery where a balance wheel or fly wheel is used or may be used. By my combination of levers, weights, and gearing, I create a compound power that is perfectly balanced when at rest. Thus far it is similar to a common fly wheel. But less force is required to put my compound wheel in motion, and, after being started, it accumulates a greater power, and much more rapidly, than an ordinary balance wheel. The degree of power actually gained has not been accurately determined. In addition to the increase of power I gain an increase of speed. While my compound balance-lever power makes one revolution, the inside shafts and wheels thereto attached make two revolutions. The illustration is a perspective view of my compound balance lever mounted on a frame. A is the frame. B represents pieces forming frames, in each of which are hung three geared wheels. There are two of these frames and two sets of those geared wheels. C is a geared wheel, which can be used for communicating power. D, belt wheels, which are also used to communicate power. These can be used at the same time, one on each side; and in place of the belt wheels and belting, geared wheels may be substituted. E represents weighted levers firmly secured to the axes of the geared wheels. There are four of these weighted levers, but only three shown in the illustration. G represents geared wheels secured on the hollow shafts, H, together with the frames, B. There are two of the geared wheels, and they are so placed that they connect the two sets of wheels and weights. By this connection the balancing power is formed. The frames, B, and the wheels, G, are secured upon the hollow shafts, so that they cannot move independent of each other. Shafts are placed within the hollow shafts, H, upon which the communicating wheels, D, and the center wheels are secured, so that they can move independent of the frames B, and wheels, G. While the frames, B, make one revolution, the wheels, D, and the center wheels, make two revolutions. This is caused by the action of the weighted levers, E. Their weight, or inertia, prevents them from passing around the center of the axis of the wheels with which they are suspended in the revolving frames. The full force of this resistance, or inertia, is applied to the other wheels of each set, and by these wheels communicated to the center wheel.

"The size and weight of this compoundbalance lever power may be varied and adapted to the various uses to which it may be applied."

Fig. 10 is a device of Doctor Alois Drasch, of St. Egidi, Austria, patented in the United States, December 22, 1868.

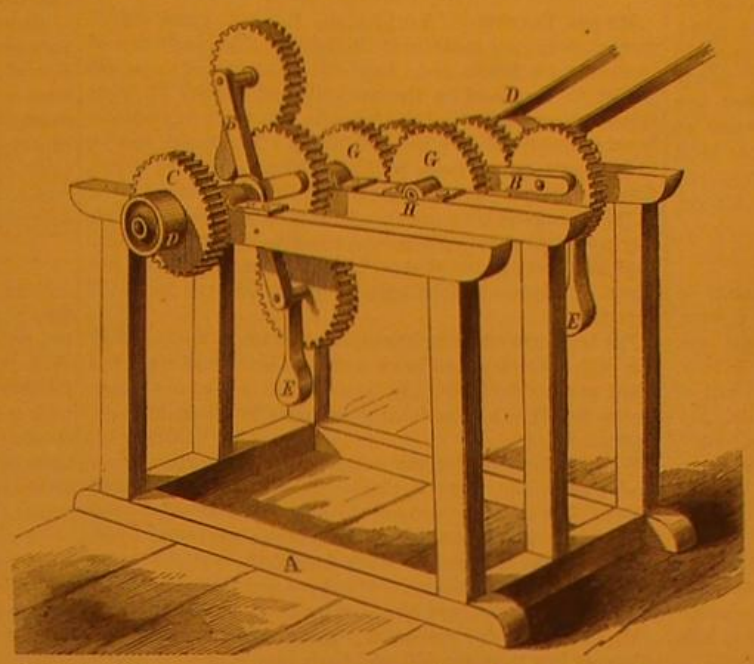
"This invention consists in the arrangement of an annular tilting tray, which forms the orbit for a revolving ball, in combination with a supporting platform, and with a lever which extends into the tray and connects with a shaft, to which motion is to be imparted, in such a manner that, by continually changing the position of the tray, the ball is caused to rotate therein without interruption, and by the action of the rotating ball on the lever the desired motion is imparted to the shaft, which connects with the working machines or mechanism to be driven. A represents a tray, which forms an annular path, or orbit, for the ball, B. This tray is made of sheet metal, or any other suitable material, and its diameter is about four times that of the ball, B. It is supported in its center by a rod, which connects, by a ball and socket joint, C, with a platform, D, so that said tray can be readily tilted in any desired direction. From the edge of the platform, D, rises a circular rim, E, which prevents the tray from being tilted any lower than desirable. The position of the tray is governed by a hand-lever, F, which enables the operator to continually tilt said tray in advance of the rotating ball, so that said ball is kept rolling on a continually changing inclined plane; and, as the ball progresses in its orbit, it bears on a lever, G, which extends from the shaft, H, into the tray, as shown in the drawing. The tray is guided in its tilting motion by an arm, I, which is firmly attached to its circumference, and catches in a loop, J, secured to the edge of the platform, D. The shaft, H, is intended to transmit the motion, imparted to it by the action of the ball, B, to the working machines, or to a mechanism of any desired construction.

"In the drawing, my motor is shown as applied for propelling a railroad car, or vehicle, and in this case the shaft, H, bears a bevel wheel, K, which gears into a similar bevel wheel, L, mounted on the axle of the car, or vehicle, so that the rotary motion imparted to the shaft, F, will be transmitted to the axle of the car, or vehicle, and the desired motion of said car, or vehicle, will be effected. It is obvious, however, that my rotary ball-motor is applicable for the purpose of driving machinery of any kind, and it is particularly valuable in localities where the erection of a steam engine, or other motor, would be difficult or impracticable."

Fly and Balance Wheels.

The fly wheel and the balance wheel, and their different uses and applications, the millwright should be familiar with. The fly wheel is used to equalize velocity; the balance to equalize weight.

FIG. 9.



When a crank is used as the medium of transmission between a rotary and reciprocating motion, in either direction, a fly wheel is generally necessary to equalize the momentum among the various situations of the crank during its revolution. The size and weight of the fly must, of course, be determined by the weight, and, more particularly, by the nature of the machinery. In many instances, this contains a sufficiency of regulating influences within itself, as the locomotive engine on a railroad, or the tread-power applied to drive a grindstone. The ordinary stationary steam engine, or a saw gate driven by gearing or by a belt, requires a fly wheel of a size and weight proportioned to the momemtum of the reciprocating movements. But a saw gate, or other reciprocating motion, taken direct from the water wheel by a crank on the same shaft, will run well enough with no other fly wheel than a balance; in fact, gates are often run in this way, without either fly or balance; but a balance should always be attached when circumstances admit of it, because, in addition to the assistance rendered by balancing the weight of the gate and pitman, another advantage is gained in the reduced strain and wear upon the binder and plumb block, by which the crank is much easier kept in its bearings. The rule among millwrights for the weight of the balance is to have its balancing power as near to that of the gate and pitman as possible; the extra weight of the saws, stirrup irons, and gages being found sufficient, with the advantage of gravity, to compensate the cut of the saws.

In computing this balancing power, regard must be had to the distance of each from the center; that is, the weight of gate, etc., must be calculated by the length of the crank from the center, while the weight of the balance must be calculated by the distance from its center of gravity to the same center, which is generally greater than the length of the crank. To make this plainer, suppose the crank to be twelve inches long, and the center of the balance eighteen inches from the center of the shaft, then every pound weight in the balance will be equal to one and a half on the crank.

For a light and swift crank motion, such as a screen or sieve in a grist mill, or the whiffers which take the rolls from a wool-carding machine at the doffer cylinder, springs are an excellent compensating medium.

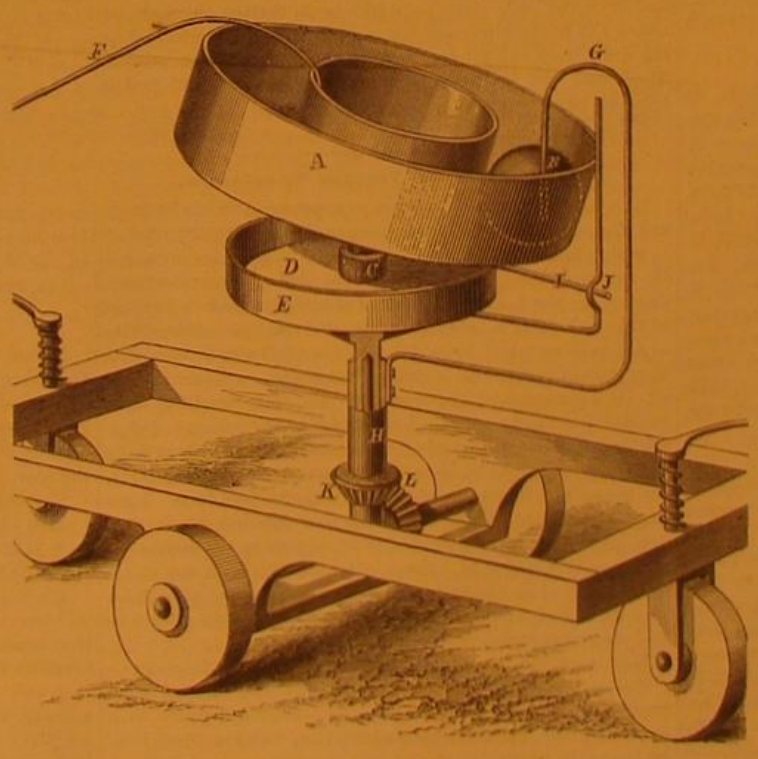
There are many circumstances in which a fly wheel may be advantageously applied in a strictly rotary machine, either when the propelling power is unsteady or disturbed by other machines, or when the power is steady and the work of resistance is unequal, as in circular saws used for cutting fire-wood, making shingles and staves, or other work where the saw is alternately cutting and running empty at short intervals. By lengthening the arbor of such saws so as to place a fly wheel upon the end, at a convenient distance and out of the way, a great improvement may be made in their working, as it tends to equalize the velocity while the saw is running idle, and giving it out again while the saw is cutting. This effects a considerable saving of power, which is stored up, as it were, in a reservoir, and given out when required, thus enabling as light motive power and light belt to carry a saw through a cut which, without a fly wheel, would check up the saw, or slip the belt, and be ticklish and troublesome to feed.

It should be remembered here that the principle of the fly wheel is sometimes misunderstood and misapplied, as well as that of the lever, and that the fly wheel can never, under any circumstances, add power, but only equalize it. A machine may, therefore, be made with too much fly wheel. An instance of this will show what we mean. A friend of ours took a fancy for turning, and employed a good machinist to construct a crank power, to be worked by hand, to drive his lathe. The workman first set up a large shaft, with a crank on one end and a fly wheel on the other. The fly wheel was heavy enough for a ten-horse power engine, and a train of cog-wheels, ingeniously contrived to gain speed by an advantageous leverage without losing power, connected this first shaft with the cone-shaft from which the lathe belt got its motion. The result was that three men sweating on the crank gave the first shaft a motion like the shaft of an overshot wheel, and drove the lathe like a buz. But the men complained that the work was too heavy, and we were consulted to see if the work could be lightened. The result was that the great generator of power, the fly wheel, with its complicated train of cogged levers, was set aside, and a light band wheel upon the crank shaft substituted, from which the cone shaft was driven direct, and one man drove the machine with perfect ease and regularity.

Now, this blunder was not made by an inferior mechanic, as the workmanship of the various parts was excellent, but was the result of mistaken theories, most likely derived from a careless perusal of books, and jumping at conclusions which he had never enjoyed the opportunity of rectifying by experience. It may further be remarked here, as a general rule, that when a fly wheel is necessary to any revolving machine, it should be either upon or as near to the last and quickest mover as possible, and never, as in the case referred to, upon the first and slowest, where its effect is only to load and lumber the machine, and increase the friction without any compensating advantage.

We shall end this subject by a remark which we forgot to make when treating upon the saw-mill crank-balance, which is, that the weight of the balance should never be more than the proportion there indicated, because the balance, though counteracted by the weight of gate and pitman, when up or down, has no compensating equivalent while acting horizontally, except the butt-end of the pitman, which leaves a great centrifugal force unbalanced, and acting alternately in both directions at each revolution, has an injurious effect upon the binder and bearings; and, further, that the balance and crank should be connected, and opposite each to the other, and not on separate parts of the shaft. A gang-shaft was broken where we were working, last winter, when no other cause could be assigned than that the balance was placed on the tail end of the shaft, which was thus, in addition to the strain of driving, made the medium of connection between the crank and balance, and it snapped off at the crank bearing.—*Craik's Practical Millwright and Miller*

FIG. 10.



Tests for Glycerin.

We translate the following tests for glycerin from the *Chemischen Central Blatt* of Oct. 5, 1870:

"Brescius recommends as a test for glycerin, which is to be used in wines, beer, etc., to heat ten or twenty drops of the same in a platina capsule. It will commence to boil, then it will burn and leave a slight trace of carbonaceous substance, which will be but small when glycerin is distilled, while glycerin not distilled will leave considerable residue. This carbonaceous substance will disappear by being heated to a red heat, without leaving a perceptible white or other residue.

By adding the same volume of concentrated sulphuric acid, drop by drop, to a pure distilled glycerin, no color will appear, even after several hours. The vessel ought to be set in ice, and the sulphuric acid must be very carefully added to prevent heating of the mixture. Glycerin not distilled will, under these circumstances, take color, if only a very light shade. Any glycerin will take a brown color, by being heated with strong sulphuric acid, and it is for this reason especially

necessary in this test to cool it off well. Pure distilled glycerin, to which are added a few drops of oxalate of ammonia, will not give, even after several hours, the slightest indications of cloudiness. Glycerin not distilled will, however, usually turn cloudy at once, or at least after a short while, if it does not form a precipitate. Pure glycerin, added to pure nitric acid, with a few drops of a solution of nitrate of silver, will not show the least cloudiness, while impure glycerin will always present a greater or lesser milky appearance. Above all it is to be observed that glycerin, even when shown in a large glass vessel, should be entirely colorless, and clear as water, and that it should not, by being warmed on the hand by rubbing, leave a fatty odor, which usually appears more prominent by adding a few drops of diluted acid, f. i. sulphuric acid.

Drying of Wood.

Dr. Hartig, of Munich, has recently made experiments on various kinds of woods. He says trees generally contain, during the winter months, about an average of 50·7 per cent of moisture; in March and April, about 46·9 per cent; in May, June, and July, about 48 per cent; while up to the end of November the quantity of moisture increases but little. Air-dried wood (timber) contains from 20 to 25 per cent of water, and never less than 10 per cent. Wood, which by being artificially dried, has been deprived of all moisture, is thereby entirely altered as regards its cohesive strength—it becomes brittle, and loses its elasticity and flexibility.

In order to dry all kinds of timber by artificial means, so as to preserve the essential physical structure, and, thereby, the good properties of the wood, the drying should be effected slowly, and the temperature to which the timber is submitted should be moderate to begin with, and care should be taken not to eliminate all the water.

The author enters into details, illustrated by engravings, on the best means of drying timber on a large scale, and states that small pieces of wood, such as are intented for joiners and furniture-makers, may be readily and efficiently dried by being placed in dry sand, and then heated to 100°. The sand acts in the manner of an absorber of the moisture, as well as a diffuser of the heat.

Improvements in the New York City Hall Park.

Our friends who have visited our office in Park Row will recollect that it fronts directly upon the City Hall Park. Should their business again call them here they will find a great and agreeable change has been made in this hitherto ugly looking plat of city property. On the lower end towards the Battery the massive and substantial U. S. P. O. building is slowly rising. On the north side of the post-office a handsome avenue has been cut through from Park Row to Broadway, and a very substantial Belgian pavement has been laid upon it. The remainder of the Park has been paved with the Scharf asphaltic pavement, which makes one of the most beautiful road surfaces we have seen, and we hope it will prove durable. The spaces between the walks and drives are handsomely laid out, and trees, fountains, and urinals of pleasing design have been placed therein. From a thing of ugliness the Park has been transformed into one of beauty, and the general appearance of the immediate vicinity is much improved thereby.

The scientific lectures before the American Institute, at the Academy of Music, are as follows: Tuesday evening, December 20, 1870, The Struggles of Science, by George B. Loring, M.D., of Salem, Mass; Tuesday evening, December 27, 1870, How We Stand and Walk, by Prof. Burt G. Wilder, of Cornell University, Ithaca, N. Y.; Friday evening, January 6, 1871, The Triumphs of Modern Surgery, by Prof. F. H. Hamilton, of Bellevue Hosp. Med. College, New York; Friday evening, January 20, 1871, On Water, by Prof. C. F. Chandler, of Columbia College, New York; Friday evening, January 27, 1871, On Tides and Tidal Currents, and their Effects upon Harbors, by J. E. Hilgard, of the U. S. Coast Survey, Washington, D. C.; Friday evening, February 3, 1871, On Light, by Henry Morton, President of Stevens Institute, Hoboken, N. J.

Since the halfpenny postal-cards have been introduced in England it appears that their anticipated advantages are not without inseparable inconveniences. Whatever is written on these cards can be read by any one through whose hands they pass, while a letter weighing half an ounce may be sent securely in an envelope, over the length and breadth of the British Isles, for a penny postage-stamp. The economizing patrons of the cards, however, in their endeavor to save a halfpenny and secure their communications from inquisitive eyes, are directing their attention to sympathetic inks; apparently forgetting that the employment of such inks entails expense and loss of time to both the sender and receiver, and completely frustrates the main object contemplated by the use of the cards—dispatch. This is not the first time in the world's history that the attempt to save a cent has resulted in losing a dollar.

Attaching Eccentrics to Shafts.—Mr. A. Stewart, of the U. P. R. R., North Platte, Nebraska, writes us that the method of attaching eccentrics, recently described and illustrated in this journal, and communicated by Mr. Egbert P. Watson, is not the invention of Mr. T. G. Gorman, as stated. Mr. Stewart says he had drawings and patterns made for the same thing while foreman of the Springfield shops in 1868, but that he does not claim the device as his invention, having seen the same twenty years previous.

More than half of education is learning *how* to learn.

Correspondence.

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

Beet-Root Culture in New Mexico.

Messrs. Editors:—I have for the last two years experimented on raising sugar beets, the genuine Silesian, from seed obtained from Silesia, and I believe that this part of the world cannot be surpassed in the quantity and quality of beets suitable for sugar. We have for more than two years seriously entertained the idea of establishing a beet-sugar factory in this territory, but times were so dull and money so scarce, that we have not yet been able to commence in earnest.

There are great inducements offered for a beet-root sugar factory in this territory. There is an enormous quantity of sugar used, and every pound of it is brought from the East; and sugar, at wholesale, sells here at $22 to $24 per sack (100 pounds).

The beets grow here in abundance, and are a never-failing crop with irrigation, and labor is cheap—we pay 50 cents and board, per day for labor. It is clear that a beet-root sugar factory would be a financial success under judicious management.

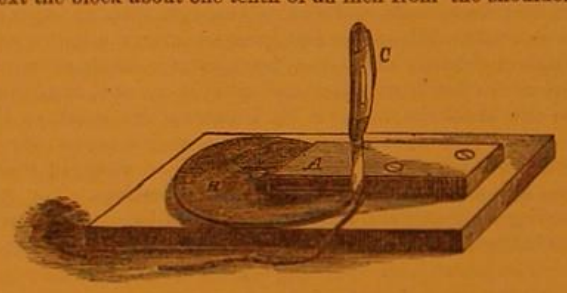
We have been stirring the matter from time to time in our local papers, and there is plenty of will, but not enough money. For instance, we here would do all as far as land and buildings are concerned—would furnish the beets, wood, coal, and even labor, if some party will furnish the capital to bring and set up the machinery. We have got splendid water power, good location, and plenty of land and wood.

We have got a fine woolen mill going, which we are just enlarging to a three-set mill, and shall have it in full operation again by next spring. Carl W. Wildenstein.

Cherry Valley P. O., New Mexico.

How to Make Leather Cord Belting.

Messrs. Editors:—A. R. K. asks in "Queries," page 346, current volume, how to make a round leather cord belt. He can make one any length by cutting a perfectly circular piece of leather, then cutting it a little way round (two or three inches) with his knife to start it. Then take a piece of wood two and a half or three inches long, and cut a step in the under side like A in the diagram, and nail it to a board, the cut side down. Then put the leather under it like B, and stick a sharp knife down on the side towards him with the edge next the block about one tenth of an inch from the shoulder,



and draw the little piece that has been started through between the knife blade and the shoulder on the block, and he can draw it all out till he comes to the center of the leather. Then soak the leather in water a few minutes, and roll it between two boards after twisting it slightly.

Utica, N. Y. S. B.

Conductivity of Various Substances.

Messrs. Editors:—I notice in your paper an article by Richard Higgs, from the *Electric Telegraph and Railway Review*, in which he starts out with what seems to me false premises. He assumes that "experiment proves that the best heat conductors are the best conductors of electricity," and in support of this he inserts a table showing the relative conductivity of different metals, "by which," he says, "it will be seen that they generally agree as to order," but glass is not once spoken of. If I understand the matter at all, glass conducts heat rapidly, but shows a decided resistance to the passage of electricity. There are a number of substances in which as wide a divergence might be shown; the muscles of a living body, for instance, conduct electricity much better than heat. I am greatly mistaken if Mr. Higgs has not selected his facts to suit his theory, instead of suiting his theory to the facts—not an unusual practice in "these latter days." I do not claim to be much of an electrician myself, however, and should be pleased to hear from you or some of your readers who may be better acquainted with the subject.

Baltimore, Md. C. E. Bentley.

Our correspondent is mistaken in supposing glass a good conductor of heat. The art of glass blowing depends in a great measure upon its nonconductivity, which enables it to be heated in particular places and to retain its heat in those places without diffusing it to parts desired to retain their form and rigidity. Let our correspondent take a small piece of glass tubing and heat a spot in it to red heat in an alcohol or glass flame. He will find that he can hold the tube in his fingers only a very short distance from the heated portion. Then let him try the same experiment with a metal rod or tube, and he will find that he is laboring under a mistake.—Eds.

Heating of Buildings.

Messrs. Editors:—Permit me to remark that the practical man among your readers would disagree with you in your article on the "Heating of Buildings," page 359, on one point in particular, viz., that steam heating is the next best to grate fires. If you reconsider this matter, you cannot but confess that this is an error, as it is well known that warming buildings with circulation of the hot water apparatus is, if not equal to grates, the next best, as the most sensitive plant will thrive when cultivated under this heat; if with steam it would die. Hot water when well applied is economical steady, and healthy. J. B. M.

Montreal, Canada.

[Steam heat, *if properly applied*, is, we still think, for ordinary purposes, next to the grate in excellence, all things considered. It is true that for green-houses hot water apparatus is preferable; but for general heating purposes, low pressure steam, with air admitted from the external atmosphere, and passed directly through the heating coils, is more easily managed, we think, and less liable to prove inefficient under the care of such persons as are usually placed in charge of such apparatus.—Eds.

Hoosac Tunnel.

Messrs. Editors:—I was forcibly struck with the difficulties the practical engineer would have in establishing a line, or two points on the supposed line, at the bottom of the central shaft of the Hoosac Tunnel, described in your journal of October 29th, and as an engineer, would not be willing to trust to its correctness; but would insist that the corporation should sink another shaft not more than 3,000 feet or less than 500 feet (as the vertical contour of the ground might dictate) distant from the center shaft, to determine my accuracy. The difficulty, as all will agree, is in dropping two perpendiculars from two points in the tangent line on the surface to the bottom of the shaft, these points being necessarily less than 35 feet apart. I am at a loss, therefore, in endeavoring to obtain any information from your "San Jose, Cal.," correspondent, in your issue of No. 24, when he generalizes "that a reliable result can only be obtained by the aid of a transit instrument, modified according to the exigencies of position and surrounding circumstances." This sentence certainly "covers the ground," if, indeed, a better transit is needed than Queen, of Philadelphia, Temple, of Boston, and a host of other makers are making every day for civil engineers. But it does not seem to me that a transit is to overcome the difficulty that will be experienced. A perfect line is supposed to exist, or else certainly the shaft is not sunk on the line. This being the case, in what way will perpendiculars be dropped by the aid of a transit? One cannot see through the telescope of the transit down the shaft, and if he could he would not depend upon (to use a field engineer's expression) its "dumping" perfectly, no matter how perfect the transit might be in its mechanism. The objective difficulty is in dropping the perpendiculars. Can this be done perfectly, and a test of its perfection established? If so, the great difficulty is overcome. If not, I cannot conceive how a "transit instrument" can overcome it. Returning, however, to the plummet, not remembering the difficulties that have been experienced with long lines, I would suppose they were either the "vibratory-oscillating" or "vibrating rotative" motions. The attraction which would bring the lines closer together at the bottom than at the top of the shaft would affect only the length of the line, not its direction; and any motion of the earth which would affect the perpendicular of the lines, not vibratory in its character, would affect each line equally, and the line at the bottom of the shaft would be parallel, if not vertically identical, and so would practically be perfect. If, however, as I suppose, the difficulty is in either of the vibrating motions, I would suppose the hanging or suspending the plummet in oil would suffice. But I would still insist on another shaft being sunk, as before stated. The subject is an interesting one to engineers, and I would (for one) like to hear the views of the profession. By the way, Messrs. Editors, will you or the writers for your "Correspondence" column, give us the history of the Mount Cenis Tunnel in this same connection?

Clarksville, Tenn., G. C. Breed.

Hoosac Tunnel.

Messrs. Editors:—Your Californian correspondent, with the titles attached of A.M. and M.D., on page 372, current volume, contends "that the plummet cannot be depended on to give a vertical line for a central shaft to the tunnel, in consequence of the earth's rotation, which causes a deviation to the west, in geometrical progression, with the depth."

The earth's rotation tends to a deviation in its own direction, or east, in the simple ratio of the depth; but the tendency to deviate, for all practical purpose, is counteracted by the earth's constant central attraction.

We can, however, suppose an extreme case, when the plummet has descended under the influence of the eastern deviation, unrestricted by the central attraction, and its descent being arrested, the string would represent the rod of a pendulum, and the plummet would vibrate till the vibration was stopped, when it would rest on the true vertical line. The length of the tunnel is not recollected, but if it were 6 miles, or 3 miles each way from the center, a rise of 6 feet at the the ends above the center would be required to meet the sphorosity of the earth. The tunnel is assumed to be straight, which would in effect be equal to a descent from each end towards the center. If the tunnel followed the arc, instead of the straight chord, its floor would be on a level throughout and vertical shafts from any part of the surface would enter it at right angles; whereas any vertical shaft to the straight tunnel would enter obliquely, except at the central point.

Pittsburgh, Pa. T. W. B.

A series of experiments made with water and benzole, water and oil of cloves, water and sulphide of carbon, has been made, and shows that two liquids, not miscible with each other when in contact, boil at a lower temperature than when the most volatile of these liquids is brought to ebullition by itself.

[For the Scientific American.]

SUCCESSFUL APPLICATION OF STEAM TO CANAL BOATS.

BY T. MAIN.

In the winter of 1867–8, the writer, after considering various methods for applying steam for towing on the canals, conceived the plan of locating an ordinary screw propeller in the center of the bow of the ordinary canal boat, in a cavity or opening (tapering in shape, and terminating about 20 feet from the bow) which is formed for that purpose, with the view of preventing any agitation of the water, of displacing it at the bow, and of replacing it at the stern of the boat; and, in order to show the indications with this method of propulsion, a working model of a boat, and a section of the canal, on a scale of ¼ inch to a foot, were constructed and tried in the spring of 1868.

Various models and experiments were tried until September, 1870, when the canal boat *Geo. Barnard* (a lake boat, 90 feet × 17 feet × 6 feet draft, and which carries 200 tuns) was procured, and steam power applied on this plan, at Nyack, for the purpose of making an actual trial on the Erie canal, to test the speed, the consumption of fuel, and to find whether there were any objections to its working when going through the locks, and running on the canal. Accordingly, on November 4th, after everything had been made ready, the *Geo. Barnard* left Nyack on a trial trip to Schenectady (on the Erie canal) and back, a distance of over three hundred miles, going with her own steam all the way.

The results of this trial prove that steam can be applied to ordinary canal boats to propel them three miles an hour, or twice the speed of the present loaded boats, without any injurious action on the canal banks whatever.

That the speed of the boat is the same on the canal as on the river.

That the boat can go through a lock in six minutes from the time the bow enters until the stern leaves it, or about one half the time a loaded horse boat takes; for, owing to the screw being in the bow, when going up the boat can be drawn against the upper gate, against the current, allowing the lower gate to be promptly closed.

That the boat will pass over the tow lines of other boats.

That it can be handled in the locks by three hands.

That a loaded boat can be run 72 miles per day, on one tun of coal, costing $5, while the towing for horse boats has cost 40 cents per mile this season, or $28·80 for 72 miles, and they take two days to go that distance, and have to pay the crew for two days instead of one.

That, if desired, this boat will tow one or more loaded boats at a moderate speed. (She towed a boat loaded with 135 tuns of cargo, at Rondout, at the rate of 2¾ miles an hour.)

That steam can be applied to any canal boat at a cost of about $600 for altering the boat, in addition to the cost of the machinery, and then she will be capable of doing twice as much business as before.

That such a boat can go on the canal, river, or lake, with her own steam, and so dispense with all charges for tunnage.

That steam can be advantageously applied to a canal boat or barge, with a smaller reduction of the carrying capacity, on this plan than on any other, as the boat can be built very full, and yet the water can flow to the screw, and go from it very readily.

That a boat carrying 200 tuns of cargo, on this plan, with a 16-horse power engine, and burning one tun of coal in twenty-four hours, will go three miles an hour, while the carrying capacity is only reduced ten tuns by the application of the machinery, and if a greater speed is desired it can be obtained by applying more power.

The steering qualities of the *Geo. Barnard*, when loaded on an even keel, are all that could be desired, and she behaved very well throughout the trip; the only thing found to be needed was a jet in the smoke pipe, so that the steam pressure could be maintained when cleaning the fire, or when the smoke pipe was lowered to go under the bridges.

The action of the engine and boiler was perfect, in fact the engine was never stopped until the destination of the boat was reached each day. The action of the screw on the trial has been found to draw a current into the opening at the bow, force it along under the bottom, and replace it at the stern, thus allowing the vessel to glide along without making any commotion in the water. The boat passed through forty-four locks on her way. She passed three loaded horse boats above Cohoes, and beat them three hours on a run of nine miles, thus showing that there is now no difficulty whatever in successfully applying steam to canal boats on the Erie, Champlain, or Hudson & Delaware canals.

Alloys of Copper, Tin, Lead, Zinc, with Manganese.

In the year 1826 a spoon, made by Messrs. Zernecke, of Berlin, was analyzed, and the alloy was found to be composed of copper, 57·1 per cent; manganese, 19·7 per cent; zinc, 23·2 per cent. This analysis is included in a chapter on "Kuperf-mangan," by Mr. Johann Tenner, in his "Handbuch der Met-all-legirungen," published at Quedlinburg. Berthier produced a large number of alloys of manganese with various metals, and has recorded their principal properties. Although there is no published account of such experiments, Dr. Percy some years ago thoroughly investigated the nature of manganese alloys. There are also specifications of patents, one in the name of Emil Stoehr, dated 1862, the other in the name of Oscar Prieger, dated 1864, both claiming the original discovery of this class of alloy. Whilst, therefore, the alloys of copper, zinc, and other metals with manganese, have been more or less known to the metallurgist for more than forty years; whilst their valuable physical properties have been fully described; whilst, moreover, manganese in its ores almost approaches iron in its abundance and in its value, and whilst for years being suffered to escape as a waste product from almost every large alkali works, we find the metallurgist has not succeeded in reducing it to serve widely except when yoked with iron. Attention was directed to this subject by the late Mr. John Keates. To produce metallic manganese was not from the first attempted; and it is with extreme difficulty that even small quantities of this metal can be prepared. From the first it was discovered that in using any of the ores of manganese the iron and the silicon completely destroyed the value of the product. Having obtained a comparatively pure oxide of manganese, recovered from the "still-liquors," and having mixed this with oxide of copper, not metallic copper, together with wood charcoal, all finely ground and intimately mixed, the charge was put into a plumbago crucible, then heated in an air furnace at an intense heat from three to four hours. It was found when the pot was taken out that, still suspended in the charcoal, and not run down to the bottom, were innumerable fine shots of a bright white metal; these being separated by washing and placed again in the crucible and heated, fused into a prill or button covered with a layer of green vitreous slag. The process was continued, until some small ingots were produced, and on these experiments were made as to their malleability and ductility. The alloy was found to be very hard and brittle when hot, but when cold, although still hard, it rolled with ease, and was highly elastic. The proportions of the alloy were about—copper, 75 per cent; manganese, 25 per cent. When the simple alloy had been produced in sufficient quantities, compound alloys with zinc were tried in various proportions, and these again rolled with complete success. Certain mixtures of copper, zinc, and manganese possess the advantage over both German silver and yellow metal that, whereas the one will only roll cold, and the other hot, the manganese alloy rolls from hot to cold. The laboratory experiments having been completed, an air furnace was built in which a 1 cwt. plumbago crucible was used. The results were precisely the same as those obtained in the laboratory, only it was found that by stirring the charge a few minutes before the crucible was taken out of the fire, by far the greater portion of the metal that before was in small fine shot, needing very careful washing, now settled to the bottom of the pot, and could be poured out as a bar or an ingot, the slag also melting, and the unconsumed charcoal floating on the top. This experiment was continued until several hundredweights of the alloy were produced, so that it might be subjected to various tests, and also that some approximate estimate of its cost and value might be formed. As a simple alloy, in which the proportions of manganese range from 5 per cent to 30 per cent, it is both malleable and ductile, with a tenacity considerably greater than that of copper. With zinc, a compound alloy, resembling in some of its qualities German silver, is obtained. The alloy of copper and manganese combines with tin, lead, and other metals, and from these castings are made, and applied as bearings for machinery and other similar purposes. It was not the nature of the metal itself that prevented its being widely used; it was its cost. The waste of manganese is very considerable, over 10 per cent remaining unreduced, and forming a silicate; the wear and tear of the plumbago pots and the furnace incurred a large expense, and in proportion to the quantity of metal produced the fuel consumed and the labor expended were great. The work was therefore for a time arrested by an obstacle which not unfrequently bars the path of the inventor. It was, however, now simply a question of cost. The waste of manganese in alloys rich in that metal will, it is feared, always be considerable, but the value of the raw material would permit some such loss, could the other points be obtained—and these, it is believed have now been achieved. The metal has been produced by heating a mixture of carbonate of manganese with oxide of copper and charcoal in a tolerably large reverberatory furnace, and not in a small and costly pot. The fuel used has been principally the common slack or small coal of the district, and not coke. The labor has been proportionately reduced, and a series of alloys are produced that ere long promise to play no unimportant part in the arts and manufactures. It is the excellent furnace arrangements of Mr. Siemens that have assisted in overcoming the difficulties at first encountered, by affording the intense heat needed, with a non-oxidizing flame, in a quiet atmosphere.

Specimens exhibited.—(1) Manganese and copper in various proportions, from 35 per cent to 5 per cent of manganese as ingot, sheet, and wire. (2) Copper, zinc, and manganese; also in different proportions, and in a variety of applications. (3) Copper, zinc, manganese, and tin; as ingots and as bearings. (4) Copper, manganese, and tin, in several different proportions; as bars. (5) Copper, manganese, and lead.—*J. F. Allen, Esq. F. C. S. Before the British Association.*

There is an Under-Current.

It has long been known that a current is constantly flowing into the Mediterranean from the Black Sea, and from the Atlantic, besides the numerous rivers pouring in always abundantly, and the question has often been asked: How is it that the great Midland sea does not become over-full? The answer is: Because, while a surface-stream flows in through the Strait of Gibraltar, a stream deep down is constantly flowing out; and the existence of this under-current is said to have been proved by a captain, who sunk a basket of stones by a rope to a considerable depth, where, being acted upon by the strong stream, it towed the boat out against the surface-current. Nevertheless, the existence of the under-current has often been questioned. Dr. Carpenter, however, who has recently returned to England from a dredging-cruise in the Mediterranean, states that he took much pains to investigate this question, and ascertained that the outflowing under-current does really exist.

EYESIGHT AND THE MICROSCOPE.

[Condensed from an article in "Good Health," by Professor John Phin, New York.]

In using the microscope, I have found that the best system is that recommended by Dr. Carpenter. It is to alternate the use of the eyes, always keeping the unemployed eye open. But I feel confident that it is of no use to keep the unemployed eye open if it be made to stare at a dead-black surface. It is the exclusion of light from one eye, and the consequent unequal action of the visual organs, that is thus produced, that causes the mischief that we dread; and it matters not whether this unequal action be produced by covering the eye with the eyelid, or by excluding the light from it by other means—the result is the same. In making observations with the microscope, all extraneous light should be excluded from the eyes. Hence the value of a properly arranged shade. Such a shade, however, should consist of more than a mere flat sheet of pasteboard covered with velvet. It should have a perpendicular portion, rising up in front of the face, and cutting off all light except that which comes through the microscope. And now, having provided a shield of this kind, which, by the way, is easily made of pasteboard, blackened on the inside with dead-black varnish (made of alcohol, lamp-black, and a very little shellac), if we punch an inch hole at such a point that the unoccupied eye can see it in the same way that the other eye looks through the instrument, we will find that the fatigue experienced by that eye is vastly less than when it is exposed to the dead-black surface. A few trials will set at rest all questions on this head, and the change from light to darkness is easily made by simply slipping a piece of blackened paper or card over the hole.

With few exceptions, we use altogether too much light with the microscope. Where a full flood of light is passed through a transparent object, the finer points are apt to be "drowned" out entirely; and it is only by modifying the amount of light by means of the diaphragm, that we are enabled to make out the more delicate details. Hence it will be found that the use of the bull's-eye condenser, for concentrating the light on the mirror, and consequently augmenting the amount of light passing through the object, is, in general, totally unnecessary. This arrangement of the illuminating apparatus is totally different in its effects from that of the achromatic condenser, and cannot be substituted for it, as some persons seem to think.

The first requisite in the light that we use is whiteness. Hence daylight, the light from a white cloud, the artificial white cloud illuminated by daylight, the light from the old-fashioned argand lamp burning sperm oil, the modern student lamp burning kerosene oil, and its various modifications, and the argand gas-burner are good—their excellence being about in the order here laid down. Common gas-light, candles, and kerosene lamps are inferior just about in the order we have named. White light is not nearly so fatiguing to the eyes as the reddish glare from a half-smothered combustion. Hence, in all cases we must seek to have the most perfect combustion and highest possible temperature of flame in our sources of artificial light. It is true that this gives rise to great heat, but this difficulty is easily obviated by the use of a proper screen or shade, and none will be found better than the one previously described. Indeed, when working by artificial light, it will be found that the heat is one of the most efficient causes of injury to the eyes, and the screen that we have mentioned is, perhaps, quite as useful, from the fact that it cuts off heat, as from its excluding unnecessary light.

The second requisite is steadiness. Nothing is more trying to the eyes than a flickering light. Of all sources of light, the naked gas-flame is the most unsteady; and yet we have seen young men working away with it for hours. The argand gas-lamp with glass chimney is much more steady, but it is not quite as white as a well-trimmed German student-lamp, burning good kerosene oil; and as this means of illumination is the most accessible in this country, it is probably to be preferred above all others.

There are certain conditions of nearly equal importance that ought to be found in the microscope itself, and that are found in the instruments of the best foreign makers, as well as those of this country. A very trifling want of correct adjustment on the part of the microscope produces a very injurious strain. Hence the necessity of a ready means of producing a delicate and accurate adjustment of the focus of the microscope. This is totally wanting in some instruments, and within a few days we saw, in an English scientific periodical, an advertisement of a microscope which claims superiority on the ground that it does not require focusing. Such a microscope must be essentially bad, except for a very limited class of objects. All good microscopes are furnished with arrangements for focusing. A second requisite is that the instrument should be so steady that the object shall be retained in view and in focus without change. Any tremor is injurious to the eyes, and especially is this the case when that tremor produce a continual change in the relation of the object to the focus. A single hour's work with a lens held in the hand or mounted on an unsteady stand will cause more injury to the eyes than weeks of work where a first-class instrument of far higher power is used. It has always seemed to us that watchmakers, engravers, and those who use lenses, do not sufficiently appreciate this fact. They in general mount their lenses on wire stands, which tremblingly respond to every footstep that falls upon the floor, and thus cause continual demands upon the eye for re-adjustment of focus. Wherever a microscope—single or compound—is used for more than a few seconds, it ought to be mounted upon a stand so firm that all vibration, and especially all disturbance of the focusing, will be avoided.

Shaw's Cotton Seed Huller.

The proper hulling of cotton seed is a matter of much importance, in a commercial point of view. Our readers having perused the valuable articles on Cotton Seed and Cotton Seed Oil, published in this journal during the past year, will stand in little need of any argument on this point. If the seed be much broken in the hulling process, so as to approximate the quality of meal, its spoiling during exportation is almost certain. We have been shown a letter, from a London firm, attesting that a lot of seed, hulled by the machine shown in our engraving, was shipped to London from this country, not only arriving in perfect condition, but yielding 42 lbs. of oil from 165 lbs. of seed, in the samples tested, the oil being of excellent quality, not inferior to that extracted from Egyptian seed.

In an agricultural point of view, the proper and economical hulling of the seed is also of importance, since the hulls which are worthless for industrial purposes, or for feeding contain nearly all the fertilizing elements of the seed.

We are informed that since the shipment of seed to London above referred to, other lots have been sent with equal success. If these are facts, as stated, they establish the possibility of shipping hulled seed, and will undoubtedly open the door to a large foreign traffic in this article.

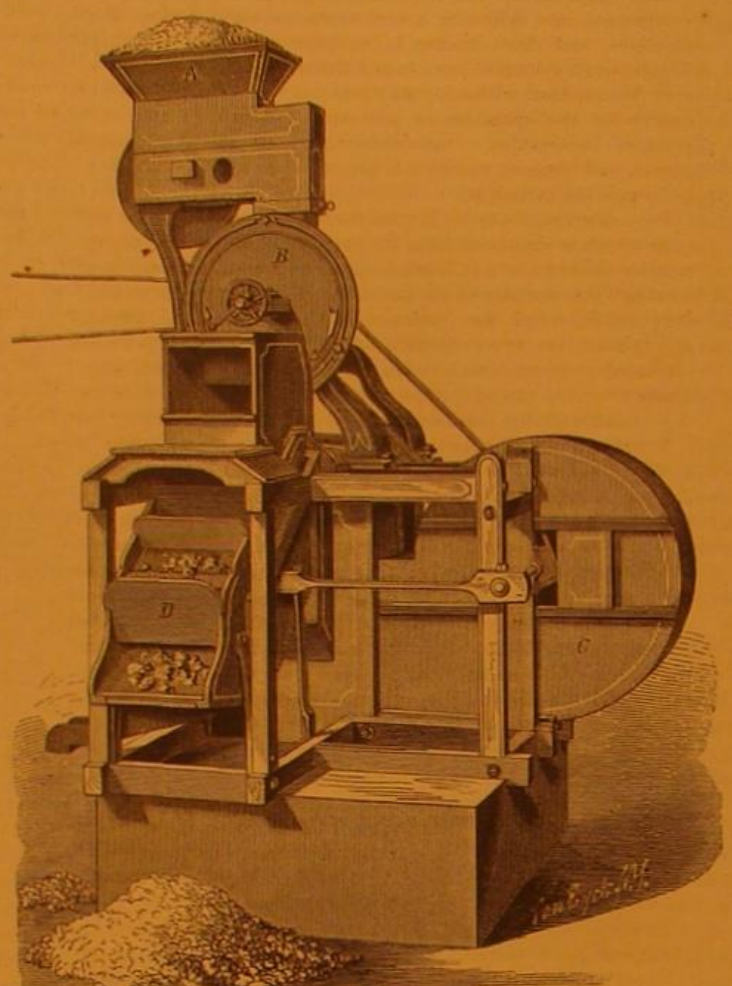
The operation of the machine is extremely simple, as is also its construction.

The seed is placed in the hopper, A. From this hopper it falls upon an endless apron, which carries it along and drops it into a vertical chute, from whence it is carried by a screw conveyer through the center openings of two revolving chilled iron plates, inclosed in the case, B, and passed through between their surfaces to be hulled. These hulling plates have a peculiar "dress," the action of which is to decorticate the kernels of the seed.

The seed, passing downward from the hulling plates, meets a blast, generated by the fan-blower, C, which blast carries up all such seed as is imperfectly hulled, together with the perfectly separated hulls, and deposits them upon the "separators," D. These separators are screens, upon which a series of fingers play, rubbing the imperfectly separated seeds and hulls, and completing the work of the hulling plates.

Very little of the seed is thus imperfectly hulled by the plates, and the passage of the same through the separators completely supplements the operation of the plates. At the same time the air blast removes all dust, and also acts to dry the hulled seed. A second separator in the opposite side of the machine from D separates the small portion of seed that may have been crushed in passing through the hulling plates, the crushed portion being used as food for cattle, while the sound and comparatively uncracked portions, constituting the greater bulk of the product, are reserved for exportation, or for home oil manufactories.

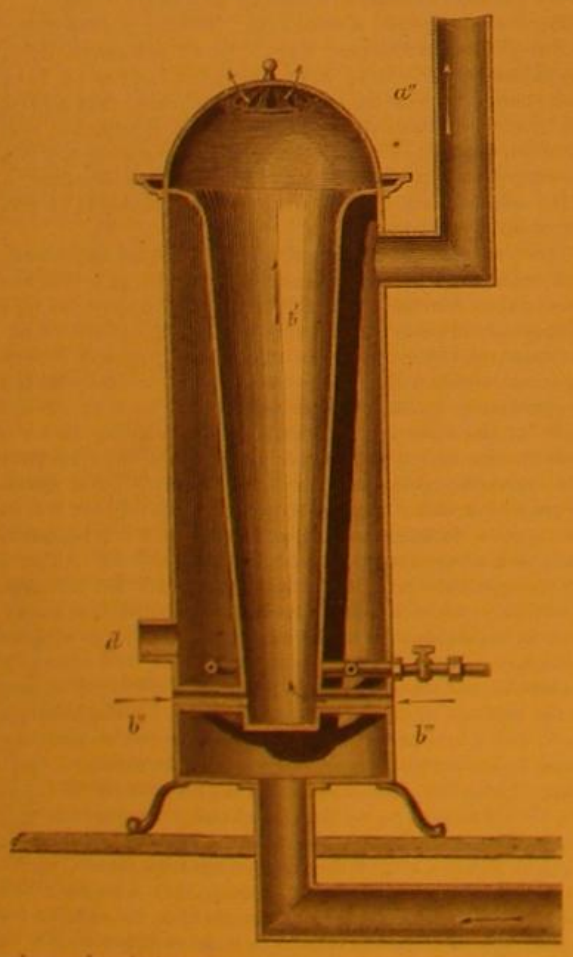
Patented Nov. 9, 1869, and June 7, 1870. For information concerning these machines address Jewell & Ehlen, 93 Liberty street, New York city.



SHAW'S COTTON SEED HULLER.

Gas Stove.

A correspondent of the *Journal of Gas-Lighting* (London)



gives a description of a gas stove, which is not open to the objections against such stoves as they are usually constructed. It may be easily made anywhere by ordinary sheet-iron workers, and as such a stove would be in many cases very desirable, we reproduce the engraving of it from the journal referred to.

a', the air-passage (2-inch tubing), passing underneath the floor to the outside of the building, and protected by an air-brick.

a'', the exit-flue. With a view to the economization of heat, this may be considered as part of the stove. As much of it as may be convenient should, therefore, be fixed in the room.

b', an air-chamber, through which the air circulates, entering below through the tubes, *b''*, *b'''*. *c*, the ring-burner.

d, a circular doorway for lighting the gas and examining the hight of the jets. This is closed by a disk of glass set in a tight-fitting ring, fastened by a bayonet-joint.

The exit-flue may extend horizontally a considerable distance—say 30 to 50 feet—if within such limits it can be conveyed into a constantly-used chimney, or, in any case, one with a good up-draft. If no chimney be available, the flue may be carried (horizontally) any reasonable distance to the outside of the building, the end being turned up in the usual manner. By a slight alteration in the fitting up—that is, by connecting the air-tubes, *b''*, *b'''*—so as to receive air from outside the house, a constant flow of fresh (warmed) air would be admitted to the room.

Rapid Telegraphing.

There was great rivalry between the Western Union and the other telegraph companies having lines between this city and Washington, D. C., as to which should transmit most rapidly the annual message of the President, delivered to the Senate and House of Representatives on December 5th. The message contained about 9,000 words, and was transmitted over 10 wires by the Western Union Company, dropping copies at Baltimore and Philadelphia in 37½ minutes, or at the average rate of 25 words per minute on each wire.

The entire message was transmitted by the Bankers and Brokers' and Franklin Companies in 70 minutes, employing two wires each. This was at the rate of 33 words per minute.

The Franklin Company used two wires until the message was completed, and a third wire for 15 minutes, the average time being 70 minutes, and the average speed 28 words per minute.

The Bankers and Brokers' Company used two wires, the average time being 70 minutes, and the average speed 35 words per minute. One of these wires averaged 39 words per minute—Mr. Benjamin Johnson sending and Mr. I. S. Fitch receiving.

The result in the strike in January last drove from the Western Union to the opposition companies, greatly to the advantage of the latter, some of the best operators formerly employed by the former. The operators of the B. & B., and Franklin lines may justly feel proud of this achievement and their substantial demonstration of superiority.—*The Telegrapher.*

The Mode of Erecting a Railway Bridge across the Ganges.

Last month a party of engineers, headed by Sir John Rennie, visited the works of Messrs. Campbell, Johnstone & Co., at Silvertown, to witness the exhibition of a new method of launching girders or bridges without scaffolding. The structure which formed the subject of the experiment was two spans, each 110 feet in length, of a bridge which is to be erected across the Ganges at Cawnpore, and which will carry on the top surface the rails of the Oude and Rohilkund railway, and below, a good and substantial roadway for bullock trains or ordinary traffic. The *bridge* is to be formed of lattice tubular girders, the hight over all being ten feet eight inches, and the bullock road nine feet wide by eight high. The bridge, when complete, will consist of 23 spans each of 110 feet in length, resting upon cylindrical piers of brickwork, and the weight of materials in each will be about 75 tuns.

The method hitherto adopted for launching girders of these dimensions has been simple haulage by means of chains and pulleys, which has been attended with great loss of power, delay, and many other inconveniences. The mode adopted and devised by Messrs. Campbell, Johnstone & Co., avoids waste of power, has nothing to do with either chains or pulleys, and depends entirely upon direct propulsion. The span having been built up on the shore, rests at each end upon a series of ten wheels, which are propelled by ten hydraulic rams, five on each side; the number may of course be diminished or increased, according to the work to be performed—and *to* these wheels, which play upon a rail beneath the bridge, there is fitted a worm and worm-wheel moved by a ratchet brace, which is set in motion by five men on each side working handles up and down, who can propel 150 tuns at the rate of nine inches in the minute, a speed which, with a slight alteration of the machinery, will be increased to a foot. In this instance a bridge 2,530 feet in length, is to cross the Ganges in 23 spans of 110 feet each. Every section (each including two spans) will be launched from the same shore, and all will be driven across by the apparatus and moved from pier to pier as required. The bridge was designed by Mr. Heppel, C. E., and has been constructed by Messrs. Campbell, Johnstone & Co., to whom belong the entire credit of devising the apparatus for the fixture of the superstructure.—*Herapath's Journal.*

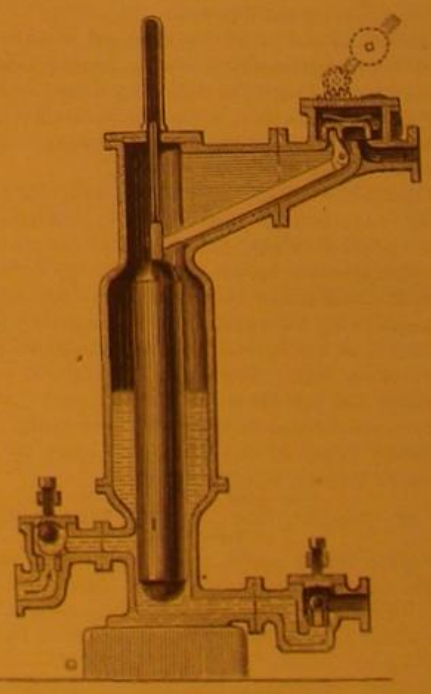
Automatic Boiler Feeder.

This new feeder is the invention of the English engineer Mr. Macabies, and is designed to maintain a constant level in steam boilers. It is composed of a cylindrical receiver furnished with two spherical valves, one slide valve, and a floating water gage.

The receiver is put in communication first with the atmosphere and the hot water of a reservoir, and then with the steam and water of the generator.

It is in reality a supply cylinder of small capacity working automatically, and having no parts liable to derangement. The work of supplying the boiler is reduced to a simple surveillance of the apparatus.

According to the *English Mechanic*, when the float is down, as in the figure, the steam in the receiver can escape by the valve at the upper right hand corner, and hot water from the proper reservoir flows in by the valve at the lower left hand side. As the receiver fills, the float rises and closes the right hand upper valve; the steam, then acting upon the water of the receiver, closes the valve which admits the supply and opens the valve upon the opposite side, which communicates with the boiler. The water, being subjected to equal pressure above and below,



flows into the boiler by virtue of its weight. The float descending with the water shuts the steam valve and the water again flows in.

Dyeing Articles made of Horn Black.—The objects made of horn, and ready for use, but not yet polished, are placed in a lye of caustic soda or potassa, and left therein until a portion of the surface has been dissolved, which may be readily detected by the somewhat fatty feeling the horn assumes when touched with the fingers. The objects are next washed in pure fresh water, and afterwards passed through Lucas' aniline black. After having been dried, the objects are washed, and, lastly, polished.

Scientific American,

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW (PARK BUILDING), NEW YORK.

O. D. MUNN. S. H. WALES. A. E. BEACH.

☞"The American News Co.," Agents, 121 Nassau street, New York.

☞"The New York News Co.," 8 Spruce street, New York.

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VOL. XXIII., NO. 26 . . [NEW SERIES.] *Twenty-fifth Year.*

NEW YORK, SATURDAY, DECEMBER 24, 1870.

Contents:

(Illustrated articles are marked with an asterisk.)

PROPRIETORS AND FOREMEN.

A mechanic writes us: "I must caution all mechanics against using their inventive genius, if they have such a boss as I have got, lest they on Saturday night get a note in their book, informing them that they are no longer wanted."

Proprietors of manufacturing establishments sometimes imagine that because they purchase the intelligent labor of their operatives, and grudgingly dole out, at the end of the week, its moderate wages, they can lay claim, or ought to lay claim, to the private brain work of the individuals so unfortunate as to be under their employ. We advise every mechanic, who has such an employer, to leave him as soon as he can find another situation, for he certainly cannot make a change for the worse.

But, while there may be *some* such employers, we are glad that our experience warrants us in saying that they are exceptional. The majority would be glad to see a talented operative working his way from the ranks, and would (so long as he does not neglect the duties for which he is paid), encourage, rather than discourage, any effort he might make to that end. Cases are not rare where young mechanics have added their inventions to the capital stock of the firms in which they were employed, and become partners. Mechanics should, however, remember that they have no right to use the time of their employers in the furtherance of their own private interests, and that they deserve not only rebuke, but discharge, should they, without the full knowledge and consent of their employers, surreptitiously make models, or drawings, instead of attending to their proper work.

In many cases, the power to employ, or discharge, is vested in a salaried foreman, possessing no direct interest in the business which he superintends. Whenever this is the case, proprietors should recollect that a foreman will "bear watching," as well as his subordinates. It is to our knowledge, not without precedent, that foremen take a leaf from the book of municipal management, and make a trade of indulgences to the workmen under them. In other words, they roll a bribe like a sweet morsel under their tongues, and the man who refuses to pay tribute finds, after a while, that he must make way for perhaps some inferior workman, having less self-respect, and more love for unrighteous mammon.

In general, we believe proprietors of large establishments are too careless of the personal welfare of their employés, and might secure better service, and advance their own interests, by seeing that justice is impartially administered by their foreman. No man ever yet lost any thing by showing his help that he had, at least, the regard for them which common humanity claims.

HOW VERMICELLI AND MACARONI ARE MADE.

Macaroni and vermicelli are articles of food originally, we believe, prepared in Genoa, in Italy. The former is a dough of wheat flour and water, made into a pipe-like form, a little larger than the barrel of a goose quill, and dried till it is hard. The latter is a simple dough of wheat flour and water, or a mixture of flour, water, eggs, sugar, and saffron, made into threads, and dried like macaroni.

Except in a few small establishments, where the work has been generally performed by hand, the manufacture of these articles has not until recently been prosecuted in this country.

The Mendelson Vermicelli and Macaroni Works is an extensive steam manufactory of macaroni and vermicelli, recently established at Nos. 311 and 313, Avenue A, in this city.

Feeling that a description of the processes employed would be of interest to our readers, we this week visited the works mentioned, and were rewarded by witnessing for the first time a very interesting series of manipulations, which, though extremely simple, require for their conduct great care, skill, and experience, to secure uniformly good results.

The first step in the manufacture of these articles, is the preparation of the dough. This is done in machines strongly resembling pug-mills for mixing clay for brickmaking. The tempering of the dough is not done by any particular formula, the variations in the quality of the flour used not permitting the use of a particular specified quantity of water. The tempering is a work of great nicety, as upon it depends the perfection of the subsequent processes.

The dough taken from the mixers is put into a press, and compressed into cylinders about seven or eight inches in diameter, and from twelve to fourteen inches in length. These dough cylinders have considerable consistency. They may be handled without detriment to their shape, which exactly fits the cylinders of powerful hydraulic presses of peculiar construction. Into these cylinders the dough is placed, and pressed through holes in former plates at the bottom of the cylinders.

For macaroni, the holes in the former plates have each a plug which is supported from the inside, and which is enough smaller than the hole to leave an annular space all around it. Through this annular space the dough issues in the form of long tubes, which are removed, cut into proper lengths, and placed on trays formed of cloth of loose texture, stretched on square frames of a convenient size for handling. These trays are placed in frames in a darkened room, where they remain till the macaroni is fully dried.

Vermicelli goes through the same operations as macaroni, until it reaches the hydraulic presses. In these presses the former plates used for vermicelli are made with concentric groups of holes, each group containing about forty-eight holes, and each hole being about one tenth of an inch in diameter. When the pressure is applied the dough issues through these holes in threads resembling catgut in appearance almost exactly. The pressure to which it is submitted causes it to become heated; and to cool it and partially dry it, a blast of cold air is made to play directly upon it, a flan blower being used for this purpose. The operation is completed by cutting the bundles of forty-eight threads into proper lengths, twisting the lengths up into graceful coils, drying, and packing.

We understand the concern is now working about twenty-five barrels of flour per day, with city orders for all they can produce.

Mr. L. Mendelson, the head of this establishment was the originator of the Mendelson Bank-Note Reporter, and is well known as one of the many German citizens who have brought with them to this country rare business talents and great commercial enterprise.

CLOSE OF VOLUME XXIII.

The never-ceasing tide of time has brought us to the close of our twenty-third volume. The six months consumed in its publication have been months of steady progress and healthy growth, and have brought us many gratifying assurances that our efforts to please our patrons are successful and duly appreciated.

The contents of the volume are, we think, unprecedentedly rich and varied, and its numerous engravings maintain the standard of high excellence we have always sustained in this department.

The correspondence contains very much instructive practical matter, and constitutes a very valuable feature of the volume.

Towards the close of the volume we started a new feature, namely, a column of queries, wherein the information desired by our readers may be made known to practical men, and practical answers received from correspondents so situated as to be in possession of the information required. We think this column will call out a vast amount of practical information which will be placed at the disposal of all our readers.

Our miscellany has comprised the most instructive and popularly written articles on theoretical and practical subjects, obtainable from the best home and foreign sources, and the editorial articles have been written with a view to suggest thought, and to indicate the general current of progress in science and the arts.

That our efforts to keep ahead of all competitors in our peculiar field have been successful is indicated by the steady and healthy growth of our subscription list, and the unmistakable signs of satisfaction gathered from our extensive correspondence.

To the press at large, and our exchanges particularly, we are indebted for many favorable notices and warm commendations. Our articles have been extensively copied and credited, both at home and abroad.

We feel that we are justified in appealing to the friends of the SCIENTIFIC AMERICAN to aid us in increasing our circulation, and feel confident that the appeal will be responded to by a large accession of new subscribers for 1871.

Meanwhile we shall continue unabated our efforts to keep in the very front rank of popular scientific publications, and shall neglect no opportunity to add to the attractions, general interest, and value of our paper.

REMOVING STREET SNOW AND ICE.

On some of our thoroughfares, where rival horse-railway companies have adjoining tracks, the efforts which they make to remove the snow is sometimes ludicrous, if not foolish. The great scraper of the Third Avenue Company, for example, will come along, sweeping the snow from its own track very nicely, but depositing it upon the track of its next neighbor, whose following machine chucks it back again where it came from. This sort of fun is sometimes kept up for a whole day; time and labor of man and beast are wasted; public travel obstructed, and the companies lose much money.

The draft of the large snow scrapers is very heavy, and quite ruinous to the health of the horses. We have seen the vapor of perspiration from some of the twelve-horse teams rise above the third-story window of our office, after the efforts of the poor animals to drag the machine.

The companies ought to join hands, and wholly remove the snow from all crowded places, either by carting or melting.

By the practice of a little common-sense and ingenuity it would be easy to clear, and keep clear the tracks throughout the whole length of every city line. The aggregate loss of the various companies from snow obstructions is enormous. On some occasions all travel is suspended, and the entire forces of men and animals, with extra laborers, are employed to dig the snow; but as it is not removed, the rails are soon again covered.

There is a grand opportunity for an ingenious person to make a fortune by the invention of an effective machine for doing the above work.

On Broadway they employ to clear the gutters, snow scrapers, consisting of planks set on edge, diagonally to the line of draft. Eight horses drag the machine along, and they succeed in throwing up a portion of the snow into a windrow, and temporarily cleaning the gutter. But the immense travel of vehicles soon rolls the snow back again.

The best method is to remove the snow altogether; and probably the best way to do that, is by the application of steam.

In London they employ old steam fire engines for this purpose. The snow is scraped up into great heaps near the sewer openings, and jets of steam are then applied, by which the mass is quickly melted, and disappears through the sewers. This is a very speedy and effective method of getting rid of street snow and ice. We hope that our city authorities will give it a thorough trial this winter.

SUCCESS AS THE MEASURE OF ABILITY.

The world usually accords the merit of ability to those who achieve success in any field of effort, and it is right. Success *is* the evidence of ability—ability to succeed—nothing more. Real mental caliber is not evidenced by success, unless that success is attained in some occupation or profession which requires great mental ability for its conduct.

A man may succeed in wearing a very small pair of boots, if his understanding is sufficiently narrow; and men succeed as often through deficiencies as through proficiencies. A man sits daily in front of the *Tribune* office in this city who makes a living by whittling with his feet. This man has no arms and has by long practice acquired the power to hold a piece of wood with the toes of one foot, while he whittles with a knife held in the toes of the other foot. It is quite doubtful, judging from the appearance of this individual, whether, had he been endowed with arms, he would have achieved either the notoriety he now enjoys, or have made half the money he now pockets from the wonder-loving groups who gather about him. Such success as he has attained has been won through virtue of his deficiencies.

We recollect reading some years ago an account of a wonderful dancer whose chief attraction was that he had but one leg. With this leg he did what single legs had been deemed incapable of doing, and though his dancing fell short of a first-class two-legged performance, yet it was really wonderful for one leg, and so one leg drew houses where probably two would have failed to please the public.

As with physical defects so with mental. The piano playing of the blind negro idiot (?) "Tom," whose performance is certainly wonderful for a blind idiot, would lose a great portion of its charm if he were once understood to be in full possession of the intellect allotted to ordinary mortals. He succeeds in making a great impression because he has, or is supposed to have, two great defects.

It often is the case, on the other hand, that men fail because they have minds too large for their business. These minds will be, *must be*, occupied with higher things than the trivial details of business, and the petty cares, to neglect which is to insure failure in most commonplace vocations.

Success, then, unless measured by the character of the field in which it is achieved, is no measure of mental or physical power. Is a man successful? In what is he successful? Is he a successful dandy like Beau Brummel; a successful knave like a modern railroad grabber well known in this metropolis; a successful dry-goods clerk; or a successful lawyer and statesman, like Clay and Webster; a successful divine, like Whately; or a successful teacher, like Arnold?

Success is, it is true, a measure of ability, but of *great* ability only when it is itself tested by the higher measure of lofty aims, wise purposes, and good deeds.

THE RELATION OF MINERALOGY TO CHEMISTRY.

It is related of the famous Abbe Hüay that while examining a fine specimen of calc spar on one occasion, he accidentally let it fall, and it broke into a hundred pieces. He was horrified at his carelessness, and, after making due apology, began to gather up the fragments. He soon observed that every piece had the same shape, and that the calc spar was made up of an infinite number of rhombic crystals. This circumstance led to the examination of many other minerals, and the result was the foundation of crystallography, and the

reference of all crystalline substances back to six primitive forms. The science of crystals soon commanded the attention of chemists, and an instrument was invented, called the goniometer, for measuring the angles, and for deciding to what class each mineral belonged.

Later researches seem to point out that there is an intimate relation existing between the crystalline form and the composition of a body, and we may some day discover the law by which we can arrive at the composition of a mineral or other salt, by measuring its angles, and without the necessity of subjecting it to analysis. But this is at present mere speculation.

The peculiar luster, cleavage, hardness, and other physical properties of minerals, have been studied, and something like an independent science has been established, founded upon these external properties. As our knowledge of chemistry has increased, and better methods of analysis have been invented, we are ceasing to lay so much stress upon the outward forms of minerals, and have commenced arranging them with reference to the bases and acids they may contain. Chemists have found that all minerals are composed of well-known elements combined according to the laws of atomic weights, and that they are in every sense chemical salts. For example, feldspar is a double silicate of potash and alumina, and can be made in the blast furnace and porcelain oven as readily as chloride of sodium or saltpeter in the laboratory. Calc spar and arragonite can be made, the one from cold, the other from hot solutions. Every year witnesses the artificial manufacture of minerals, and there is a fair prospect of our ultimately being able to make every stone there is on the earth.

The time does not appear to be very far distant when we shall make even the precious stones, the diamond, the ruby, or the emerald, as readily as we now do glass and porcelain. Professor Dana, in his unsurpassed book on mineralogy, gives the formula of all minerals so far as is known, and classifies them according to their chemical constitution, and thus virtually hands the science over to the chemist. It was not until minerals were made artificially that we were able to form a rational theory of their probable origin in the rocks. Nature's laboratory does not differ from man's inferior imitation, and as the laws of combination are constant, it is safe to infer that the same agencies were employed in producing the native minerals that we pursue in making them artificially. It is only when we treat minerals as true chemical salts that we can assign them their proper place in the universe.

In a recent German work on chemistry, by Professor Geuther, of Jena, we find a tolerably full list of chemical compounds, and among them a large number that occur native, and are known as minerals; for example, under magnesium, potassium-magnesium chloride is described as carnallite; calcium-magnesium chloride as tachhydrite; calcium-magnesium carbonate, as dolomite; calcium-magnesium silicate, as augite, and so on through a long catalogue of substances. The crystalline form, solubility, hardness, specific gravity, general properties, and formulas of all salts are given with the occasional observation that this or that compound is found in nature as a mineral, but without any break in the order of discussion on account of that fact.

In this way mineralogy becomes incorporated with chemistry, and rocks may be defined to be chemical compounds that occur ready made in nature, just as carbonaceous substances are traced back to living organisms, and are treated of under the head of organic chemistry. It would not occur to any one to bottle up gases and to regard them as entitled to found a separate science, or to speak of metals, gases, or liquids as we do of chemistry and physics. Gases are a part of chemistry, and so are metals and minerals.

We have called attention to this subject in order to afford our readers some knowledge of the great progress made in the extent of our acquaintance with the crust of the earth, and of the formation of minerals, since chemistry was impressed into the service of explaining the nature of the forces that must have been at work to produce what we see around us. It was not until the acid character of silica was made known by Berzelius that we were able to manufacture glass in a rational and scientific manner, and glass is in fact an artificial mineral very much like what we find ready made in volcanic craters.

The manufacture of porcelain, of soluble glass, of saltpeter, and of many other useful compounds, is conducted in imitation of what is going on in nature, and is now founded upon strictly scientific principles. The total number of minerals thus far described does not exceed 700, while the different salts of potash alone amount to nearly as many, so that the study of potash in all of its relations involves nearly as much labor as the examination of all the minerals that have thus far been found. It will thus appear that the relation of mineralogy to chemistry is of the most intimate character, and that minerals can only be studied philosophically when regarded as chemical salts.

Agricultural pursuits are beginning to absorb the attention and energies of the population of Colorado, which is favorable to the development of the resources of the territory. That prosperity which depends upon the hazards and uncertainties of mining is at best but spasmodic, and it is only where agriculture is made the fundamental interest that the population assumes a settled character and industry is attended by permanent rewards.

Subscribers whose term expires with the year will take note that this is the last number, and will oblige the publishers by remitting for the new year immediately.

SCIENTIFIC AMERICAN.

1871.

Special Club Premium.

A New Volume of this journal will commence on the first of January next. Any person sending us yearly clubs for ten or more copies will be entitled to receive, free of postage or express charge, one copy of the celebrated engraving, "MEN OF PROGRESS," for every ten names.

This large and splendid Steel Plate Engraving is one of the finest art works of the day, possessing a rare and peculiar value over ordinary pictures, by reason of the life-like accuracy of the personages it represents. The scene of the picture is laid in the great hall of the Patent Office, at Washington. The grouping is spirited and artistic. Among the persons represented are the following eminent inventors:

S. F. B. MORSE,.....Inventor of Electric Telegraph.
CYRUS H. McCORMICK,.....Inventor of Reaper.
THOS. BLANCHARD,.....Inventor of Lathe for Irregular Forms.
WILLIAM T. G. MORTON,.....Inventor of Chloroform.
SAMUEL COLT,.....Inventor of Revolving Fire-Arms.
CHARLES GOODYEAR,.....Inventor of Rubber Fabrics.
FREDERICK E. SICKLES,.....Inventor of Steam Cut-Off.
HENRY BURDEN,.....Inventor of Horse-Shoe Machine.
JOHN ERICSSON,.....Inventor of the first Monitor.
JAMES BOGARDUS,.....Inventor of Iron Buildings.
JOSEPH SAXTON,.....Inventor of Watch Machinery.
PETER COOPER,.....Inventor of Iron-Rolling Machinery.
JOSEPH HENRY,.....Inventor of Electro-Magnetic Machine.
ISAIAH JENNINGS,.....Inventor of Friction Matches.
RICHARD M. HOE,.....Inventor of Fast Printing-Presses

These noble men, by their own efforts, raised themselves from the depths of poverty, and by their wonderful discoveries, conferred incalculable benefits upon the human race, entitling them to rank among its greatest benefactors. It is but fitting that the remembrance of their achievements, and the honored forms of their persons, as they lived and walked among us, should be perpetuated by the highest skill of art. The picture, which is three feet long and two feet high, forms an enduring and desirable object for the adornment of the parlor. It was engraved by the celebrated John Sartain, from a large painting by Schussele, and all the portraits were taken from life. Every lover of Science and Progress should enjoy its possession. Single copies of the Engraving $9; Three copies, $25.

One copy of the Scientific American for one year, and a copy of the Engraving, will be sent to any address on receipt of $10.

MUNN & CO.,
37 Park Row, New York City.

TIMELY SUGGESTIONS.

Every Employer should present his workmen and apprentices with a subscription to the Scientific American for the coming year.

Every Mechanic and Artisan whose employer does not take the Scientific American, should solicit him to subscribe for 1871.

Now is the time for old subscribers whose subscriptions expire with the year, to renew.

Now is the time for new subscribers to send $3 and commence with the new year.

Now is the time for forming clubs for the new year.

It will pay any one to invest $3 for himself, his sons, or his workmen, for one year's subscription to the Scientific American.

It is easy for any one to get ten subscribers at $2·50 each, and for his trouble obtain the splendid large steel plate engraving worth $10.

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It is no more trouble to remit $6 for two subscribers than $3 for one.

If any mechanic whom you ask to subscribe says he cannot afford it, tell him he cannot afford not to.

If any one wishes specimens of the paper to examine before subscribing, tell him to write to the publishers and they will cheerfully mail them.

If any one wishes an illuminated Calendar for 1871, to hang in his office or shop, he can have it sent free on sending request to this office.

If handsome illuminated posters and prospectuses are wanted to assist in obtaining subscribers, send to the publishers of this paper.

It is the intention of the publishers of the Scientific American to make the paper next year better and handsomer than any previous year during the last quarter century it has been published.

It is the intention of the publishers to illustrate by superb engravings all new and practical inventions and discoveries that may be developed during the year.

For terms to Clubs, see special premium notice given above

In accordance with a long established rule, all subscriptions terminating with this volume will be discontinued at that time. We trust that all our subscribers will not only renew, but that they may find it convenient to induce some of their neighbors to join them. We intend to give our readers full measure and running over, in return for their money. That the publishers may calculate the quantity of paper to print on the new volume; and that none may be disappointed by not getting back numbers, we would impress upon all the importance of renewing their subscriptions and sending new names as early as possible.

NEW BOOKS AND PUBLICATIONS.

The Cabin on the Prairie. By Rev. C. H. Pearson, Author of "Scenes in the West," etc. Illustrated. Boston: Lee & Shepard.

This is one of a series of stories called the "Frontier Series," now issuing by the above-named firm. It is a graphic picture of prairie life, full of varied stories, and to those unfamiliar with the scenes it delineates, unique incident. As a specimen of good healthy reading for youths of both sexes, it is unexcelled, while adults may peruse its instructive pages with pleasure and profit. The book is one calculated to secure a wide popularity.

Manual of Social Science: Being a Condensation of the Principles of Social Science of H. C. Carey, LL.D. By Kate McKean. Philadelphia: Henry Carey Baird, 406 Walnut street.

We shall in a future issue review his book editorially.

We are indebted to the Hon. Horace Capron, U. S. Commissioner of Agriculture for a copy of his report for 1869. It contains a large mass of carefully compiled and valuable statistics, and many important papers on various subjects relating to American agriculture.

Recent American and Foreign Patents.

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

Combined Lock and Latch.—F. M. Ranous, Yreka City, Cal.—This invention has for its object to improve the construction of an improved gate latch, patented October 26, 1869, and numbered 96,147, so as to make it more convenient in use, and more effective in operation, enabling it to be used as a lock without interfering with its operation as a latch.

Safety Valve.—J. Armstrong, Brookfield, Missouri.—This invention relates to a new and useful improvement in safety valves for locomotive and other steam boilers.

Animal Trap.—Ebenezer Oliver, New York city.—This invention has for its object to improve the construction of the wire traps, known as round or bee-hive traps, so as to make them better adapted for use.

Mode of Securing Ships' Anchors.—William Henry Barker, Windsor, Nova Scotia.—The object of this invention is the construction of some simple apparatus, by which the anchor can be hung to the catheads and instantaneously let go when necessary, and avoiding all the principal objections to any of the machinery now in use for that purpose.

Method of Coupling Pipes.—George C. Germain, Cuyahoga Falls, Ohio.—The object of this invention is to so connect gas and water pipes, made of asphaltum or other suitable material, that the joints will be entirely water or gas proof, and readily applied.

Chair.—C. R. Long, Louisville, Ky.—This invention relates to a new and useful improvement in chairs, and consists in the mode of securing the seat to the legs, whereby the ordinary upper rounds and stretchers of the chairs are dispensed with, while the seat is made detachable, and the chair strong and durable.

Water Wheel.—Daniel W. Case, Garden City, Minn.—This invention relates to improvements in water wheels, and consists in the construction and arrangement of the bearing for the shaft, and adjusting apparatus therefor in the top of the case of the wheel; also, in certain improvements in the construction and arrangement of the chutes leading the water to the wheel and the gates therefor, and also in an arrangement for discharging the water from the wheel, partly through central and partly through vertical discharges.

Cultivator.—Freeman C. Jewell, Rahway, N. J.—This invention has for its object to furnish an improved cultivator, simple in construction, easily operated, and effective in operation, and which shall be so constructed that it can be readily and quickly adjusted, as circumstances may require.

Exhaust Valve.—W. A. Carns, Malden, Mass.—The object of this invention is to prevent sparks and cinders from entering or being drawn into the cylinders of locomotive engines, when the motion is reversed.

Washing Machine.—D. C. Harlow, Hannibal, Mo.—The object of this invention is to provide a simple and cheap apparatus to be used in connection with the common wash-tub for washing clothes, and consists in revolving a spring cylinder above a concave formed of rollers.

Dressing and Furrowing Mill-stones.—James Lee Norton, London, England.—This invention has for its object improvements in apparatus for dressing and furrowing mill-stones.

Car-Coupling.—A. F. Street, Zanesville, Ohio.—This invention relates to a new and useful improvement in couplings for railroad cars, whereby strength, durability, and certainty of operation are secured.

Shovel Plow.—Isaac A. Benedict, West Springfield, Pa.—This invention relates to a new and useful improvement in winged shovel plows, and consists in attaching the wings to adjustable arms and making the wings adjustable on the arms.

Clock-Alarm.—J. H. Davis, Chillicothe, Mo.—This invention has for its object to provide means whereby alarm attachments can, whenever desired, be secured to or connected with clocks of suitable construction. At present some clocks are provided with alarm attachments and others not. Those which have no attachments cannot, at present, be changed into alarm clocks. By the aid of this invention clocks of all kinds can be readily converted into alarm clocks, without the aid of experts.

MILK CARRIER.—Lewis Morris, Havre de Grace, Md.—The object of this invention is to provide for public use a can in which milk may be transported from the farm to the city without deterioration in quality, from air or warmth, by the way. The can is constructed of material, which is a non-conductor of heat, with a lining of sheet metal, and is provided with a cover having a peculiar but simple and convenient device which admits of being sealed or locked, and also otherwise secured, without loss of time.

ANTI-FRICTION BOX FOR AXLES, SHAFTING, ETC.—William O. Reid, Vienna, N. C.—This invention consists in such an arrangement of friction balls with circumferential grooves in the internal surface of a pipe-box, that both the vertical and the longitudinal pressure (as between the axle journal and box) is received or borne by said balls, and the friction, and also the draft strain upon the team, thereby greatly lessened.

MACHINE FOR BENDING PLOW HANDLES.—Jacob Woodburn and S. F. Smith, Indianapolis, Ind.—This invention consists in an improved device for holding plow handles in the shape it is desired they shall have when attached to the plow, and in the peculiar construction of detaching parts, whereby the holding device may be quickly and easily attached to or disconnected from the machine for bending the handles. The whole apparatus is efficient without being expensive or cumbrous.

MACHINE FOR FINISHING PLOW HANDLES.—S. F. Smith, Indianapolis, Ind.—This invention consists in the arrangement of an ordinary sand polishing belt on two conical or round-faced pulleys—one larger than the other—so that said belt shall be caused to present a similar rounded surface, and in certain novel means of adjusting the tension of the belt and the angle of the smaller pulley thereto.

FAUCET.—Franz Wiesenhofer, Fremont, Ohio.—The object of this invention is to prevent flies and other insects from entering the lower ends of the hollow spigots used in certain kinds of faucets, and the consequent injury to the liquor drawn through such faucets.

BASE-BURNING STOVES.—Israel Snyder and Peter C. Garrett, Grand Rapids, Iowa.—This invention relates to improvements in base-burning stoves, and consists in making the fire-pot open at the sides from the grate up to the bottom of the reservoir with which it is connected; the said open fire-pot being used, and the draft being arranged to cause the flame and caloric currents to impinge against the outer shell of the cylinder as low down, and as directly as possible, the said arrangement provides a space between the cylinder and the fire-pot to the bottom of the stove for heating purposes.

BELT SPLICE POINT FINISHER.—John C. McLaren, Montreal, Canada.—This invention relates to an improved machine for cutting the ends of pieces of leather to be spliced for making belts, and it consists in a clamping apparatus for holding the strap and a cutter for cutting the end, both of peculiar construction, the object of which is to make a clean and smooth cut at the point reduced to a thin edge, which, as heretofore formed by the skarfing machine is left stringy and uneven.

CANCELING STAMP.—E. S. Goodman, New Orleans, La.—This invention relates to improvements in canceling stamps, and consists in providing the die with one or more plates having a number of sharp edges for cutting the articles to be stamped, and providing a thick leather bed on which the die strikes for the protection of the cutters. The said plates on which the cutters are formed, serve for guides for the ink-ribbon. The invention also comprises a novel arrangement of the type and the holding devices therefor to facilitate the changing of the type; also an arrangement of the type die for having the name and address of the inventor, maker, or other person sunk into the face alongside of the type for the date, so that an impression thereof will be given to the thing stamped at the same time.

VELOCIPEDE.—Henry A. Maltby, Brownsville, Texas.—This invention relates to improvements in velocipedes, and consists in a novel combination of foot and hand-propelling apparatus, also guiding apparatus, whereby the operators may employ both foot and hand simultaneously, and at the same time guide the machine by movements of the body actuating the guiding apparatus through the medium of the seat.

CHURN.—John W. Jordan, Lexington, Va.—This invention relates to improvements in churns, and consists in a vertically moving dasher, composed of one or more lazy-tongs frames, jointed at one end to the bottom of the churn case, and at the upper end to a vertically reciprocating rod worked by a lever or otherwise, so as to expand and contract the said frames, which have perforated boards so attached as to move up and down in the cream in a way to cause intense agitation.

WEAVING CERTAIN KINDS OF FABRICS.—Wm. Sam'l Laycock, Sheffield, England.—This improvement consists in fixing on each end of a shuttle a pair of nippers or other apparatus, one of which takes hold of the end of a single hair selected out of a bunch of hair on that side of the loom from which the shuttle commences to work. The shuttle is then driven through the shed by friction or otherwise, from under the shed, and when it reaches the opposite shuttle box it quits its hold of the hair it has drawn into the shed, and the nippers on the other side of the shuttle takes hold of another single hair selected out of a bunch from that side of the loom, so that in traversing back it deposits that hair in the shed, and the opposite nippers again seize another hair and proceed with it as before stated in the formation of the fabric.

CHAIN CLUTCH.—Hiram Pitcher, Fon du Lac, Wis.—This invention relates to a new and useful improvement in clutches for chain pulleys or wheels and windlasses, and for all purposes to which it is applicable, and it consists in a series of self-adjusting blocks, each with a recess for receiving and holding a chain, arranged in a groove around a wheel, drum, or windlass.

SPRINGS FOR CARRIAGES.—D. S. Abbott, Ischua, N. Y.—This invention relates to a new and useful improvement in springs for carriages, wagons, sulkies, and seats, and consists in a bar or spring so arranged that while the bar receives the weight or power, it is made to compress or operate upon an elastic spring, by means of which the required degree of elasticity is imparted to the carriage or wagon body or seat.

OILER FOR THE INTERIOR PARTS OF STEAM ENGINES.—Milan Hinman, West Stockbridge, Mass.—This invention has for its object to furnish an improved apparatus for introducing oil into the interior parts of an engine, oiling the throttle valve, governor valve, steam chest, cylinder, and other parts not usually oiled, preventing the wear of such parts, and which shall be simple in construction, easily applied, and effective in operation.

ANTI-FRICTION JOURNAL BOX OR BEARING.—James Wardrobe, C. D. B. Fisk, J. F. Curtis, and George Fetley, Carlin, Nevada.—This invention has for its object to furnish an improved anti-friction bearing for the journals of steam cars, horse cars, and other journals or shafts, which shall be simple in construction and effective in operation, being so constructed as to run for any required length of time without heating.

TYPE-SETTING MACHINE.—W. S. Shipley, Jersey City, N. J.—This invention relates to a new machine for setting type into rows and columns ready for the printing press, and consists chiefly in the application of an air blast whereby the types are conveyed from the receiver to the form in which they are set up. The invention consists also in the use of sectional grooved receivers for holding the type in proper position for the blast. These receivers are rotating blocks operated by means of levers or pawls from a keyboard so that each block can be turned at will to carry its type to the blast channel, which is formed by the grooves of the said blocks.

IMPROVEMENT IN THE MANUFACTURE OF ALUM AND IN OBTAINING BY SUCH MANUFACTURE PRODUCTS APPLICABLE TO CERTAIN USEFUL PURPOSES.—Peter Spence, Newton Heath, Manchester, Great Britain.—This invention consists in the use of certain compounds of alumina and phosphoric acid, particularly, or such compounds of alumina, iron, and phosphoric acid at present obtained in the island of Redondos, near Antigua, in the West Indies, and known under the name of Redondo phosphate, and of minerals of similar composition obtained in other West India islands and other places.

TOOL CHEST.—G. F. Card, Piper City, Ill.—This invention relates to improvements in tool chests, and consists in an application to the cover of a chest of a seat and clamp, such as used by leather workers, in such a way that when the cover is raised and the chest opened, the whole constitutes a seat and bench of a convenient kind for such workers, and when closed, the tools being in the same places as when the workman is at work, will be packed ready for storage or transportation.

PISTON ROD PACKING.—William Hartley, Rockford, Ill.—This invention relates to improvements in piston rod packing, and consists in an arrangement of sectional metallic rings and binding screws in a hollow cylinder attached to the piston head, through which the rod works, the said arrangement being such that the rings will be caused to bear upon the piston and against the ends of the cylinder, to which they are neatly fitted and make steam-tight joints, while allowing the piston to vibrate laterally as much as may be necessary for any inaccuracy in the working of the rod.

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109,993.—CARRIAGE SPRING.—David S. Abbott, Ischua, N. Y.
109,994.—PUMP PISTON.—J. D. Alvord (assignor to James Wilson), Bridgeport, Conn.
109,995.—HOLDER FOR SILK, ETC.—B. A. Armstrong, Jersey City, N. J., assignor to himself, J. P. Brainard, New Haven, Conn., and L. O. Smith, Philadelphia, Pa.
109,976.—SAFETY VALVE.—Jasper Armstrong, Brookfield, Mo.
109,997.—BRICK MACHINE.—J. M. Austin (assignor to Isaac Turner, Georgetown, Mo.
109,998.—CAT-HEAD ANCHOR STOPPER.—Wiliam H. Barker, Windsor, Nova Scotia.
109,999.—SHOVEL PLOW.—I. A. Benedict, West Springfield, Pa.
110,000.—LET-OFF AND TENSION MECHANISM FOR POWER-LOOMS.—E. B. Bigelow, Boston, Mass.
110,001.—CARPENTERS' VISE.—George F. Bissell, Oneonta, N. Y.
110,002.—SELF-LUBRICATING AXLE.—G. P. Blaisdell, North Easton, Mass.
110,003.—STEAM HEATER.—Edward Bourne, Pittsburgh, Pa.
110,004.—CLEANER AND GRINDER FOR CARDING MACHINES.—L. W. Boynton, Hartford, Conn.
110,005.—GAS LAMP.—J. H. Brown, New York, assignor to himself and C. E. Ball, Jamaica, N. Y.
110,006.—ADJUSTABLE SHACKLE FOR CARRIAGE SPRINGS.—John Bullard, North Hyde Park, Vt.
110,007.—TOOL-CHEST.—George F. Card, Piper City, Ill.
110,008.—EXHAUST VALVE.—William A. Carns, Malden, Mass.
110,009.—WATER WHEEL.—Daniel W. Case, Garden City, Minn.
110,010.—STAMPING MILL OR CRUSHER.—George F. Case (assignor to himself and Milan C. Bullock), Windsor, Vt.
110,011.—HAY AND COTTON PRESS—Nathan Chapman, Hopedale, Mass.
110,012.—WOVEN FRINGED FABRIC.—Peter Cocker (assignor to himself and W. I. McBride), Philadelphia, Pa.
110,013.—TABLE.—George J. Congle, Chipewa Falls, Wis.
110,014.—CORN CUTTER.—H. V. Corbett (assignor to George W. Amigh), Allendale, Mich.
110,015.—FEED REGULATOR.—Wm. T. H. Daniels, Belville, Ohio.
110,016.—ALARM ATTACHMENT FOR CLOCKS.—J. H. Davis, Chillicothe, Mo.
110,017.—COFFEE ROASTER.—Noah Davis, Boston, Mass.
110,018.—INKING APPARATUS FOR PRINTING PRESSES.—Fred. Otto Degener, Brooklyn, E. D., N. Y.
110,019.—LAND ROLLER.—George C. Dolph, West Andover, Ohio.
110,020.—HINGE.—Rudolf Drahota, Philadelphia, Pa.
110,021.—TRUMPET FOR SPINNING MACHINES.—Geo. Draper, Hopedale, Mass.
110,022.—ROTARY ENGINE.—Richard Dudgeon, New York city.
110,023.—MACHINE FOR MIXING THE MATERIALS TO FORM ARTIFICIAL STONE, ETC.—J. S. Elliott (assignor to "The Union Stone Company"), Boston, Mass.
110,024.—BREECH-LOADING FIRE-ARMS.—W. H. Elliot, New York city.
110,025.—MEDICAL COMPOUNDS AND APPARATUS FOR MAKING THE SAME.—Peter Fahrney, Chicago, Ill.
110,026.—DOOR-STOP.—Wm. H. Fahrney (assignor to himself and John Donaldson), Rockford, Ill.
110,027.—MANUFACTURE OF PAINTS.—F. W. Gerdes, Allegheny City, Pa.
110,028.—PIPE COUPLING.—G. C. Germain, Cuyahoga Falls, Ohio.
110,029.—MACHINE FOR MIXING "BATCH" FOR GLASS.—W. T. Gillinder, Philadelphia, Pa.
110,030.—MODE OF ATTACHING BOOT AND SHOE HEELS.—Benjamin Giroux, Chicago, Ill.
110,031.—HAND STAMP.—Edward S. Goodman, New Orleans, La.
110,032.—TYMPAN SHEET FOR PRINTING PRESSES.—John Gorman, Portland, Me.
110,033.—WASHING MACHINE.—Dewitt C. Harlow, Hannibal, Mo.
110,034.—DEVICE FOR DRIVING SEWING MACHINES.—A. W. Harris, Providence, R. I.
110,035.—PISTON-ROD PACKING.—William Hartley, Rockford, Ill.
110,036.—NAUTICAL ALARM.—John F. Haskins, Fitchurg, Mass.
110,037.—MODE OF ATTACHING COMPOSITION HEELS TO BOOTS AND SHOES.—C. H. Helms, Poughkeepsie, N. Y.
110,038.—CORE FOR CASTINGS.—John Herald, Unadilla, N. Y.
110,039.—CULINARY VESSEL.—R. M. Hermance, Troy, N. Y. Antedated December 1, 1870.
110,040.—LUBRICATOR.—Milan Hinman, West Stockbridge, Mass., assignor to himself and Robert M. Stone, Des Moines, Iowa.
110,041.—SEMI-ROTARY VALVE.—Josephus F. Holloway, Cleveland, Ohio.
110,042.—REFINING AND DECOLORIZING SIRUPS AND OTHER LIQUIDS, AND IN MATERIAL FOR THE SAME.—Duane Hull, Brooklyn, N. Y.
110,043.—BURGLAR-ALARM.—Marshall J. Hunt, Rising Sun, Md.
110,044.—STEAM-JET BOILER-TUBE CLEANER.—Roland C. Hussey, Milford, assignor to himself and Augustus O. Corbett, Boston, Mass.
110,045.—TUCK-CREASING ATTACHMENT FOR SEWING-MACHINES.—John C. Jenson, Chicago, Ill.
110,046.—CULTIVATOR.—Freeman C. Jewell, Rahway, N. J.
110,047.—CHURN.—John W. Jordan, Lexington, Va.
110,048.—PRINTING-INK.—Julius Kircher, Cannstadt, near Stuttgart, Wurtemburg.
110,049.—GLASSWARE AND METAL STEM-CONNECTION.—Charles Louis Knecht, St. Clair, and Thomas Adams, Stow township, Pa.
110,050.—LOOM.—William Samuel Laycock, Sheffield, England.
110,051.—BUHL-SAW.—Thomas Leavitt, Everett, assignor to "Sonnents Wood-Carving Company, Boston, Mass.
110,052.—CARTRIDGE-CAP EXTRACTOR.—John Logan and Daniel W. Eldredge, Boston, Mass.
110,053.—CHAIR.—Charles R. Long, Louisville, Ky.
110,054.—PURIFYING BENZINE.—George Lupton, Indianapolis, Ind.
110,055.—LAMP-BURNER.—George Lupton, Indianapolis, Ind. Antedated November 26, 1870.
110,056.—MOLD FOR MAKING GLASSWARE.—James B. Lyon, Pittsburgh, Pa.
110,057.—VELOCIPEDE.—Henry A. Maltby, Brownsville, Texas.
110,058.—HAIR-RESTORATIVE.—Allen C. Maxfield, Biddeford, Me.
110,059.—LIFE-RAFT.—David McFarland, New York, assignor to A. M. Ingersoll, Brooklyn, N. Y.
110,060.—BELT-SPLICE POINT-FINISHER.—John Cummings McLaren, Montreal, Canada.
110,061.—FIELD CORN-PICKING AND HUSKING-MACHINE.—George Meader and Charles Meader, Prairie Center, Ill.
110,062.—LIQUID METER.—Charles Moore (assignor to Jose F. De Navarro), New York city.
110,063.—TRUSS.—Charles Morrill, New York city.
110,064.—APPARATUS FOR DRESSING AND FURROWING MILL-STONES.—James Lee Norton, London, England.
110,065.—ANIMAL-TRAP.—Ebenezer Oliver, New York city.
110,066.—HITCHING-POST.—Wilson S. Owings, Pan Handle Postoffice, West Va.
110,067.—BOBBIN-WINDER FOR SEWING-MACHINES.—John L. Patch, Charlestown, assignor to himself and E. F. Tilden, Boston, Mass.
110,068.—ELASTIC MANE-TURNER.—Chamberlayne Phelps, Clayton, N. Y.
110,069.—CHAIN-CLUTCH.—Hiram Pitcher (assignor to himself and H. & G. O. Trowbridge), Fond Du Lac, Wis. Antedated December 9, 1870.
110,070.—DEVICE FOR ATTACHING THE SHANK TO MINERAL AND COMPOSITION BUTTONS.—Charles L. Potter, Providence, R. I.
110,071.—COMBINED LOCK AND LATCH.—Francis M. Ranous, Yreka City, Cal.
110,072.—BASKET FOR TILE-GRINDERS.—Peter C. Reniers, Pittsburg, Pa. Antedated December 10, 1870.
110,073.—DEVICE FOR TRIMMING CYLINDRICAL BRUSHES.—Arthur G. Risley, Utica, N. Y.
110,074.—LEATHER FOR NECK-YOKE FOR CARRIAGES.—Henry Sanders, Utica, N. Y.
110,075.—MACHINE FOR CUTTING CORKS.—Eilert O. Schartan, Philadelphia, Pa. Antedated December 9, 1870.
110,076.—CORK-MACHINE.—Eilert O. Schartan, Philadelphia, Pa.
110,077.—TYPE-SETTING MACHINE.—William Stephenson Shipley, Jersey City, N. J.
110,078.—SASH-LOCK.—Christian Sholl, Mount Joy, Pa.
110,079.—MORTISING-MACHINE.—William H. Sible, Harrisburg, Pa.
110,080.—PLOW-CLEVIS ATTACHMENT.—Henry C. Sieverling, Carrollton, Ill.
110,081.—PROCESS OF REMOVING EARTHY MATTERS FROM BRONZE AND OTHER CASTINGS.—Michael Smith, Somerville, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn.
110,082.—SAFETY-VALVE.—Henry F. Snyder, Williamsport, Pa.
110,083.—BASE-BURNING STOVE.—Israel Snyder and Peter C. Garrett, Cedar Rapids, Iowa.
110,084.—MANUFACTURE OF ALUM AND FERTILIZERS FROM MINERAL PHOSPHATES.—Peter Spence, Newton Heath, Manchester, Great Britain.
110,085.—HEAD-BLOCK FOR SAW-MILLS.—Franklin J. Staley (assignor to Long, Joseph & Carter), Indianapolis, Ind. Antedated December 9, 1870.
110,086.—JOURNAL-BOX.—Edward H. Stearns, Erie, Pa.
110,087.—STENCH-TRAP.—Daniel C. Stillson, Charlestown, Mass.
110,088.—CAR COUPLING.—Augustus F. Street, Zanesville, O.
110,089.—METHOD OF UNITING WOOD.—John A. Thompson, Auburn, N. Y. Antedated November 26, 1870.
110,090.—TELEGRAPHIC RELAY.—Benjamin Birdwood Toye, Toronto, Canada.
110,091.—TREE PROTECTOR.—Charles Henry Trumbull, Marion, N. Y.
110,092.—ALARM TILL.—Cyrus Tucker and William H. Tucker, Indianapolis, Ind. Antedated Dec. 9, 1870.
110,093.—RAILWAY AXLE.—James Wardrobe, Charles D. B. Fisk, John F. Curtis, and George Fetley, Carlin, Nevada.
110,094.—EXTENSION LADDER.—Thomas Watson and Charles Perry, Brooklyn, N. Y.
110,095.—DOUBLE-TREE FASTENER.—Decatur Werst (assignor to himself and Joshua Laffin), South Bend, Ind.
110,096.—BARREL.—James W. Weston, New York city.
110,097.—PATTERN FOR MEASURING AND LAYING OUT GARMENTS.—Fannie Wetmore, Chicago, Ill.
110,098.—ROLLER-SHAFT FOR WRINGERS.—Levi H. Whitney, Washington, D. C. Antedated Nov. 26, 1870.
110,099.—FAUCET.—Franz Wiesenhofer, Fremont, Ohio.
110,100.—WEIGHING WAGON.—Geo. A. Wilcox, Chicago, Ill.
110,101.—SCHOOL DESK.—Elijah Wilson, New Brighton, Pa.
110,102.—MANUFACTURE OF EMERY WHEELS.—John F. Wood (assignor to "The Union Stone Company"), Boston, Mass.
110,103.—FRICTION BLOCK FOR ATTACHING CULTIVATOR AND OTHER TEETH.—William Workman and Jason Hitchcock, Ripon, Wis.
110,104.—HEATING STOVE.—Thomas Young (assignor to Ives & Allen), Montreal, Canada.
110,105.—CHEESE PRESS.—Robert Allen, Cleveland, Ohio.
110,106.—BARREL CHAMFERING AND CROZING MACHINE.—Truman M. Annis and Thomas B. Luce, Linden, Mich.
110,107.—WAGON.—Ephraim Ball, Jr., Canton, Ohio.
110,108.—PRESERVING SWEET POTATOES.—Hedgemon T. Basye, Dyersburg, Tenn.
110,109.—MACHINE FOR TILLING OR CULTIVATING.—Henry Belmont, Romford, England.
110,110.—STEAM JET PUMP.—Albert J. Blakslee and Garner C. Williams, Du Quoin, Ill.
110,111.—MEAT AND VEGETABLE CUTTER.—George E. Bringman, Philadelphia, Pa.
110,112.—REFRIGERATOR.—Andrew J. Chase, Boston, assignor to himself and Perrin C. Drisko, Boston (Highlands), Mass.
110,113.—BRICK PRESS.—James F. Clark, Morenci, Mich.
110,114.—STEAM PIPE COUPLING FOR RAILROAD CARS.—Joseph Conner, Philadelphia, Pa.
110,115.—BUCKLE.—Eugine P. Corwin, Washington, Ill.
110,116.—BOAT DETACHING APPARATUS.—John C. Cottingham, Philadelphia, Pa.
110,117.—CAR-AXLE BOX COVER.—David Cowley, Erie, Pa.
110,118.—FURNACE FOR BURNING SHAVINGS.—Lucius Crandall, New York city.
110,119.—HEAD BLOCK.—Perley M. Cummings, Cincinnati, Ohio, assignor to himself and Joseph D. Clark, Erie, Pa.
110,120.—PIANOFORTE ACTION.—Willard G. Day, Baltimore, Md.
110,121.—ASPHALT ROAD AND PAVEMENT.—Edward J. Desmedt (assignor to Grahamite Asphalt Company), New York city.
110,122.—OAT CLEANER.—Simon Dickens, Jr., Milwaukee, Wis.
110,123.—GROOVING TOOL.—Joseph Dill, Grand Rapids, Mich.
110,124.—MACHINE FOR SEPARATING COCKLE FROM WHEAT.—William G. Douglas and Hugh Thomas Douglas, Warrenton, Va., and John Milton Reed, Omaha, Nebraska.
110,125.—COFFEE, TEA, AND SPICE CAN.—James M. Earle, Springfield, Mass.
110,126.—HOE.—James Fairley and Alfred Fairley, Birmingham, England.
110,127.—BUNG ELEVATOR.—David F. Fetter, New York city.
110,128.—CUT-OFF FOR CISTERNS.—Frank Fischer, Quincy, Ill.
110,129.—NOTES, CHECKS, ETC., TO PREVENT ALTERATION.—Charles Folsom, New York city.
110,130.—COAL BARGE.—Lawrence F. Frazee, Jersey City, N. J.
110,131.—GRAIN THRASHER AND SEPARATOR.—Henry Gill Mansfield, Ohio.

110,132.—Treadle for Sewing Machines.—James W. W. Gordon, Newport, Ky.
110,133.—Harrow.—James M. Harper, El Paso, Ill.
110,134.—Cotton Seed Huller.—Jackson Harrington (assignor to himself, Ralph Wheeler, and Jonathan Dart), New London, Conn.
110,135.—Hay Elevator and Conveyer.—T. E. Haymond, Morris, Ill.
110,136.—Well Tubing.—George W. Hemenway, Elmira, N. Y.
110,137.—Clothes Dryer.—Israel Hogeland, Indianapolis, Ind.
110,138.—Grain Binder.—A. S. Hoyt, Winona, Minn. Antedated Dec. 3, 1870.
110,139.—Farmer's Boiler.—Joseph H. Hunter, Pennington Point, Ill.
110,140.—Brake for Sewing Machines.—Jas. W. Jacob (assignor to himself and John J. O'Donnell), Jeffersonville, Ind.
110,141.—Vehicle.—John Jack, Tiskilwa, Ill.
110,142.—Harrow.—D. L. Jaques, Hudson, Mich.
110,143.—Pile for Armor Plates.—Joshua Jeavons, Sheffield, England.
110,144.—Needle Setter for Sewing Machines.—Jacob Karr, Washington, D. C.
110,145.—Clothes Dryer.—James W. Kenning, Quincy, Mich.
110,146.—Mechanism for Operating Shuttle Boxes in Looms.—L. J. Knowles, Warren, Mass.
110,147.—Side-saddle Tree.—Andrew Lawrence, Louisville, Ky.
110,148.—Cover for Tea and Coffee Cups.—Joseph Leach, New Harmony, Ind. Antedated Dec. 6, 1870.
110,149.—Cotton-renovating Machine.—J. B. Lyons, Milton, Conn.
110,150.—Spring Seat for Vehicles.—Wait Mead, Francis D. May, and R. L. Hoyt, Chestertown, N. Y.
110,151.—Gearing for Machinery.—Thos. T. Millett, Sr., Savannah, Ga.
110,152.—Milk Carrier.—Lewis Morris, Havre de Grace, assignor to himself and G. W. Baker, Aberdeen, Md.
110,153.—Wood Pavement.—William S. Morse, Washington, D. C.
110,154.—Wrought-iron Column.—John W. Murphy, Philadelphia, Pa.
110,155.—Flour Packer.—Addison H. Nordyke, Richmond, Ind.
110,156.—Lubricator.—Thomas J. Nottingham, Cincinnati, Ohio.
110,157.—Coal Grate.—Ira Packard (assignor to himself and J. W. Slaght), Lena, Ill.
110,158.—Steam Boiler.—Patrick Quinn, South Newmarket, N. H.
110,159.—Sash Balance.—Charles R. Rand, Dubuque, Iowa.
110,160.—Anti-friction Boxes for Axles.—Wm. O. Reid, Vienna, N. C.
110,161.—Compound for Bating Hides and Skins.—L. F. Robertson, New York city.
110,162.—Implement for Removing Corns, Bunions, etc.—C. L. Roorbach, St. Clair, Pa.
110,163.—Material for Bearing Surfaces in Machinery.—John Schieder, New York city.
110,164.—Straw Cutter.—V. J. Shryrock, Folsomville, Ind.
110,165.—Sand-papering Machine.—S. F. Smith (assignor to Osgood, Smith & Co.), Indianapolis, Ind.
110,166.—Self-acting Valve or Cutt-off for Liquid Cans.—H. S. Snow, West Meriden, Conn.
110,167.—Fruit and Vegetable Parer.—Henry Soggs, Columbus, Pa.
110,168.—Spoke Shave.—G. N. Stearns, Syracuse, N. Y.
110,169.—Water Wheel.—Ralph Stinson, Whitesville, Mo.
110,170.—Fence.—W. W. Sullivan, Liberty, Ind.
110,171.—Shuttle-operating Mechanism for Looms.—E. P. Terrel, West Liberty, Ind.
110,172.—India-rubber and Combination Hose.—Wm. A. Torrey, Mont Clair, N. J.
110,173.—Bridge.—Marshall Turly, Council Bluffs, Iowa. Antedated Dec. 3, 1870.
110,174.—Upholstering Spring.—H. C. Velie, Poughkeepsie, N. Y.
110,175.—Mechanical Movement.—William Walker, Odin, Ill.
110,176.—Nail Extractor.—Wesley G. Ward, Fayette, N. Y.
110,177.—Pump.—Wesley G. Ward (assignor to himself and A. M. Flickinger), Fayette, N. Y.
110,178.—Neck-tie Supporter.—Wm. A. Wicks, Baltimore, Md.
110,179.—Machine for Making Coupling Pins.—Charles H. Williams, Cleveland, Ohio.
110,180.—Mop Head.—Lewis Williams, Arlington, Vt.
110,181.—Washing Machine.—G. L. Witsil, Philadelphia, Pa.
110,182.—Pump.—H. E. Wolcott, Elbridge, N. Y., assignor of two thirds of his right to R. B. Wheeler and E. B. Hoyt.
110,183.—Wagon Brake.—Jacob Wolfla (assignor to the Union Omnibus and Wagon Manufacturing Company), Cincinnati, Ohio.
110,184.—Machine for Bending Plow Handles.—Jacob Woodburn, St. Louis, Mo., and S. F. Smith (assignors to Osgood, Smith & Co.), Indianapolis, Ind.
110,185.—Mechanical Movement.—Jacob Wolf, Burr Oak, Mich.
110,186.—Pen.—G. W. Wooley, Washington, D. C.

REISSUES.

4,196.—Tuck-creasing Device for Sewing Machines.—James Bolton, Chicago, Ill., assignor to the Singer Manufacturing Company.—Patent No. 46,871, dated March 21, 1865.
4,197.—Inkstand.—Samuel Darling, Providence, R. I.—Patent No. 51,931, dated January 9, 1866.
4,198.—Metallic Roofing.—Seymour Hughes, Hudson City, N. J.—Patent No. 103,897, dated June 7, 1870.
4,199.—Bit Stock.—L. J. Gunn and C. H. Amidon, Greenfield, Mass., assignees of A. C. Moore.—Patent No. 16,931, dated March 31, 1857.
4,200.—Gearing for Mowing Machines.—J. V. Strait, Litchfield, Ohio.—Patent No. 95,950, dated October 19, 1869.
4,201.—Furnace for Burning Bone-black and other Substances.—Adam Weber, New York city.—Patent No. 65,457, dated June 4, 1867.
4,202.—Combined India-rubber and Steel Springs.—The National Spring Company, New York city, assignees of E. T. Russell.—Patent No. 10,280, dated November 29, 1853; extended seven years.

DESIGNS.

4,503.—Frame for a Paper-bag Machine.—C. F. Annan, Boston, assignor to himself and H. S. Merrill, Cambridge, Mass.
4,504.—Base of a Hot-air Furnace.—Robert Boyd and J. C. Hart, Rochester, N. Y.
4,505.—Scythe.—C. P. Crossman, West Warren, assignor to himself, D. F. Hale, and Sidney Sanders, Chicopee, Mass.
4,506.—Broom.—R. W. English, Buffalo, N. Y.
4,507.—Carpet Pattern.—H. S. Kerr (assignor to Israel Foster), Philadelphia, Pa.
4,508 and 4,509.—Carpet Pattern.—William Mallinson, Halifax, England, assignor to W. & J. Sloane, New York city. Two patents.
4,510 and 4,511.—Coal Box.—R. W. Newbery, New York city. Two patents.
4,512 and 4,513.—Center-piece for Ceilings.—J. W. Reeves (assignor to W. H. French), Philadelphia, Pa. Two patents.
4,514.—Show Case.—R. J. Roberts, New York city.
4,515.—Cooking Stove.—J. R. Rose and E. L. Calely, Philadelphia, Pa., assignors to Armstrong Company, Port Deposit, Md.
4,516.—Bracelet.—T. I. Smith, Attleborough, Mass.
4,517.—Hoe.—B. T. Stowell, Quincy, Ill.
4,518 to 4,520.—Woven Fabric.—R. C. Taft, W. B. Weeden, and J. W. Taft, Providence, R. I. Three patents.
4,521.—Plowshare.—R. H. Taylor, Lincoln, Va.

TRADE-MARKS.

96.—Razor Strap.—B. F. Badger, Everett, Mass.
97.—Wagon Axle.—D. A. Brown & Co., Fisherville, N. H.
98.—Root and Herb Bitters.—Flint & Co., Providence, R. I.
99.—Medical Compound.—G. C. Furber, Yreka, Cal.
100.—Broom and Brush.—L. Y. Gardiner & Co., Amsterdam, N. Y.
101 to 104.—Whiskey.—W. A. Gaines & Co., Frankfort, Ky. Four Patents.
105.—Leather.—G. F. Page and C. T. Page, Franklin N. H.
106.—Cigar, Snuff, and Tobacco.—Lorin Palmer, New York city.
107.—Oil.—Charles Pratt, New York city.
108.—Cutlery.—R. J. Roberts. New York city.

EXTENSIONS.

Harvesting Machine.—W. N. Whiteley, of Springfield Ohio.—Letters Patent No. 16,131, dated November 25, 1856; reissue No. 1,288, dated June 25, 1861; reissue No. 1,614, dated February 2, 1864.—Division A.

Harvesting Machine.—W. N. Whiteley, of Springfield Ohio.—Letters Patent No. 16,131, dated November 25, 1856; reissue No. 1,288, dated June 25, 1861; reissue No. 1,615, dated February 2, 1864.—Division B.

Water Wheel.—John Tyler, of West Lebanon, N. H.—Extended by Act of Congress, Approved July 7, 1870.—Letters Patent No. 15,309, dated July 8, 1856; reissue No. 3,015, dated June 30, 1868.

Railroad Car Seat and Couch.—T. T. Woodruff, of Philadelphia, Pa.—Letters Patent No. 16,160, dated December 2, 1856.

Railroad Car Seat and Couch.—T. T. Woodruff, of Philadelphia.—Letters Patent No. 16,159, dated December 2, 1856; reissue No. 1,439, dated March 17, 1863.

Machinery for Preparing Fibrous Substances for Spinning.—James Apperly and William Clissold, of Dudbridge, England.—Letters Patent No. 18,886, dated December 2, 1857; antedated December 4, 1856.

APPLICATIONS FOR EXTENSION OF PATENTS.

Machine for Composing and Distributing Type.—William H. Houston has petitioned for an extension of the above patent. Day of hearing March 15, 1871.

Breech-loading Fire-arms.—William Cleveland Hicks, Summit, N. J.—has petitioned for an extension of the above patent. Day of hearing Feb. 22 1871.

Machines for Making Axes.—G. F. Hutchins, East Douglas, Mass., has petitioned for an extension of the above patent. Day of hearing Feb. 15 1871.

Keeper for Right and Left Hand Locks.—Calvin Adams, Pittsburgh, Pa., has petitioned for an extension of the above patent. Day of hearing Feb. 8, 1871.

Gig Mills for Napping Cloth.—Ernest Gessner, Aue, Saxony, has petitioned for an extension of the above patent. Day of hearing Feb. 8, 1871.

Answers to Correspondents.

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

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

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

G. L. B and others.—We have already published two replies to the article on spiritualism, which seem to cover all that is requisite to show the ground of diference between its believers and Dr. Hammond s hypothesis. We decline to publish more at present.

F. S. C., of Mass.—The information you seek through our columns would probably bring out a great variety of specifics, none which ought to be taken without advice. We prefer not to dabble in tha branch of science.

J. W. C., of Iowa.—We did not recommend the English system of non-examination, to be adopted in our patent office. We copied the article from the *Tribune*, and gave that journal credit for it.

H. B., of R. I.—You will find a full description of the construction of the caisson of the Brooklyn bridge in the Scientific American for July 2d, it being there port of the Engineer.

INDEX.

ILLUSTRATIONS.

MISCELLANY.

Figures preceded by a *Star* (*) refer to illustrated articles

PATENT CLAIMS.

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Sewing mach. table m'f'g's address E. L. Morgan, Rivesville, W. V.

Wanted—Shears suitable for 8-in. Train. Quote most favorable terms at once. Battelle & Co., Memphis, Tenn., Rolling Mill.

Patent Floating Bridge, Floating Lighthouse, etc. For rights to build or use address Thomas Schofield, Grass Valley, California.

I wish to correspond with some manufacturer of Spiral Springs. Louis LeMay, Whistler, Alabama.

Building Felt (no tar) for inside and out. C. J. Fay, Camden, N.J.

Craigleith Grindstones, by J. E. Mitchell, Philadelphia, Pa.

Machinists' Grindstones, by J. E. Mitchell, Philadelphia, Pa.

Cutlers' Grindstones, by J. E. Mitchell, Philadelphia, Pa.

Scale.—Allen's Patent will remove scale from steam boilers, and not injure the iron. Send for Circulars. Josiah J. Allen, Philadelphia.

Wanted—Situation as Mechanical Draftsman. Apply Box 561, Pittsburgh, Pa., G. B.

Fifteen cents for good Arithmetical Puzzle. Send by mail by J. R. Bo & Co., Philadelphia.

Molder Wanted—One who thoroughly understands pipe molding in all its branches. Murray, Moore & Co., Portsmouth, Ohio.

Screw Driver.—The entire right for sale. Patented June 22, 1869. Address Patentee, William Hofer, New Haven, Conn.

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above see Scientific American, Nov. 27th, 1869. Also, Glazier's Diamonds. John Dickinson, 64 Nassau st., N. Y.

Crampton's Imperial Laundry Soap, washes in hard or salt water, removes paint, tar, and grease spots, and, containing a large percentage of vegetable oil, is as agreeable as Castile soap for washing hands. "Grocers keep it." Office 84 Front st., New York.

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Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct.

Glynn's Anti-Incrustator for Steam Boilers—The only reliable preventive. No foaming, and does not attack metals of boilers. Price 25 cents per lb. C. D. Fredricks, 587 Broadway, New York.

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Manufacturers and Patentees.—Agencies for the Pacific Coast wanted by Nathan Joseph & Co., 619 Washington st., San Francisco, who are already acting for several firms in the United States and Europe, to whom they can give references.

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For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

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For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

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