SCIENTIFIC AMERICAN

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

Vol. XXIV.—No. 9. [NEW SERIES.] NEW YORK, FEBRUARY 25, 1871. $3 per Annum. [IN ADVANCE.]

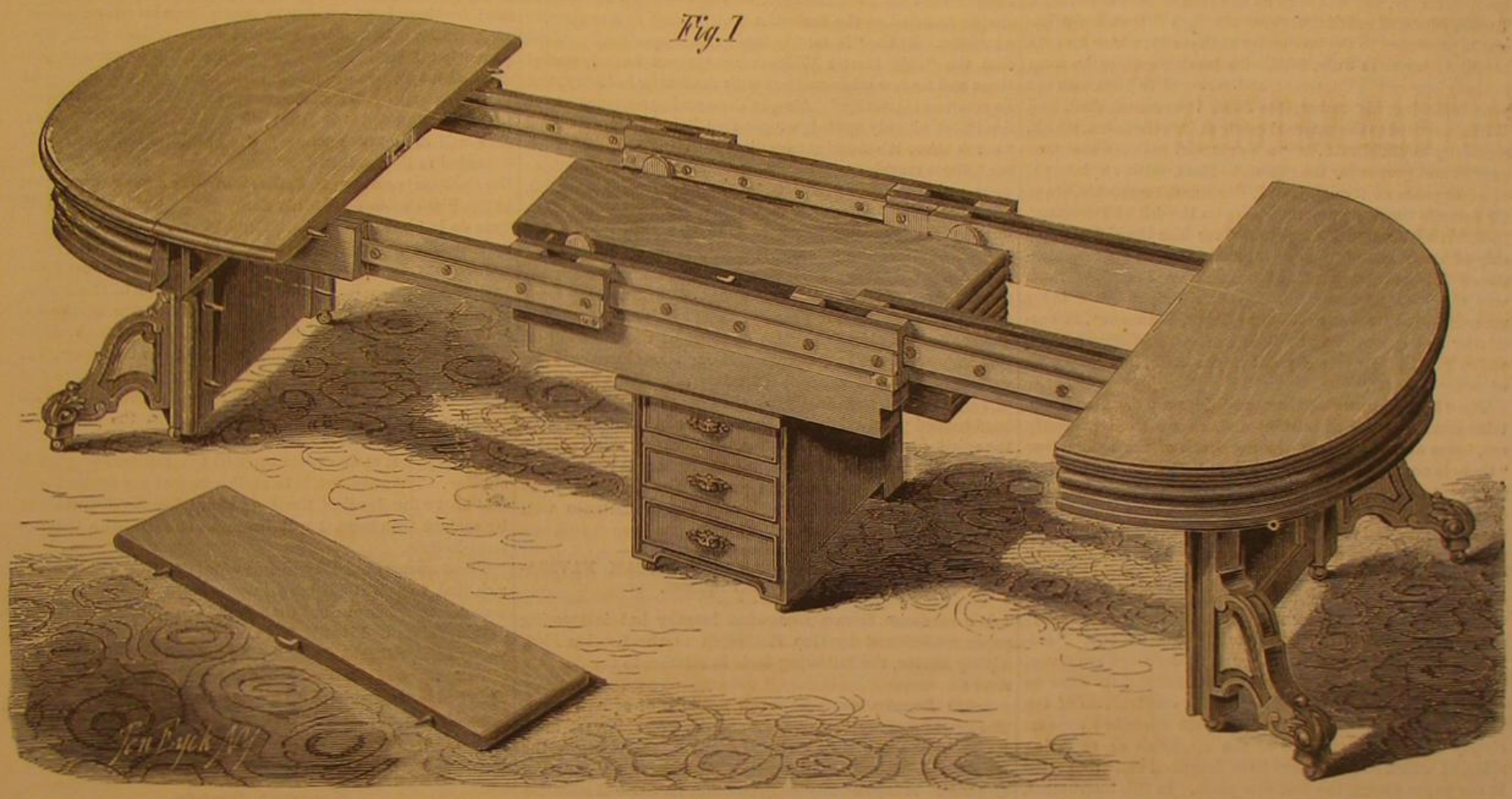
Improved Extension Table.

Our engravings give an excellent idea of the form and appearance of an improved extension table, which combines a convenient receptacle for table covers, napkins, and other table articles, and a space for storing the sections of the top, with other improvements mentioned below. The whole forms one of the most neat, compact, and convenient extension tables we have ever seen.

The tongues and grooves of the extension rails are formed of metal plates, rebated or set out from the rail by intervening strips so as to form the proper tongues and grooves. The forming of the grooves and tongues thus of metallic plates allows the rails to slide freely, the shrinking, swelling, or warping of the rails not interfering with their working. By this arrangement also, the space usually taken up by the rails is so much reduced that ample room is obtained for storing the sections of the top, or "filling."

The pieces of the filling do not differ materially from those of ordinary extension tables, except that they are hinged as shown in the engraving, in order that they may be folded for more convenient storage under the table top, in the space allotted to them, and also that the method of doweling them together is somewhat changed and improved.

Fig. 1



LENZ'S IMPROVED EXTENSION TABLE.

Fig. 2

The holes for the dowel pins are elongated, so that a hook attached to one side of the middle of each section may engage with a slotted metallic plate recessed into the juxtaposed section to which it is doweled. The sections are thus not only doweled but hooked *together*, which holds them much more firmly than in the old method of doweling alone.

The storing of the sections in the manner described is a very great convenience, obviating the necessity of a separate receptacle for them, and their carriage to and fro when required for use.

A set of drawers is also provided, as shown for the reception of napkins, table-covers, rings, etc., the bureau being placed in the center and forming the pedestal or support for the middle set of rails, and being entirely out of the way and nearly concealed from view when the table is extended. Four legs form the corners of the bureau, as shown, the case being built up between the legs. For drawers, doors and shelves may be substituted. The legs of the table, including those of the bureau, are furnished with casters in the ordinary manner.

This table is covered by three patents, obtained through the Scientific American Patent Agency, bearing dates respectively September 7, 1869, and March 15, 1870, and (reissued) May 3, 1870. Specimens of the table may be seen at J. G. Reitner's furniture store, corner Navy and Fulton streets, Brooklyn; N. Y., and a model is exhibited by Rudolph Lenz) 85 Duane street, New York. Correspondence concerning the purchase of rights should be addressed to Charles P. Lenz, patentee, Poughkeepsie, N. Y.

Preservation of Phosphorus.

Unless phosphorus be carefully preserved in the dark, it becomes coated with a film of suboxide, and in a few months loses its characteristic transparency. Dr. Siewert, of Halle, suggests a method by which the sticks can be kept, even in the light, without undergoing deterioration. For this purpose, he takes advantage of the well-known property of phosphorus to reduce some metals from their solutions. The sticks of phosphorus are put into a cold saturated solution of the sulphate of copper. Presently they become coated with a deposit of metallic copper, and in this state resemble copper rods. They can now be removed to a bottle containing water, and will keep for years. When a stick is wanted for any purpose, on removing the metallic film, and scraping off a black deposit underneath it, the phosphorus will be found to have retained its translucency, as if it had been freshly cast.

Lapland Glue.

The bows of the Laplanders are composed of two pieces of wood glued together; one of them of birch, which is flexible, and the other of the fir of the marshes, which is stiff, in order that the bow, when bent, may not break; and when unbent, it may not bend. When these two pieces are bent, all the points of contact endeavor to disunite themselves; and to prevent this, the Laplanders employ the following cement. *They* take the skins of the largest perches (it is probable that eel skins would answer the same purpose) and In this state, they employ them for gluing together the two pieces of their bows, which they strongly compress, and tie up until the glue is well dried. These pieces never afterwards separate.

ELASTIC METALLIC ROCKING CHAIR.

Our engraving illustrates a rocking chair, the frame of which is made entirely of elastic metallic straps, bent in the

form shown, and upholstered either in the way indicated or in any other appropriate manner. The construction of this chair, while it does not interfere with its comfort as a rocker, adds to it the pleasure of a spring seat. As will be seen, it is of a form easily manufactured, and if properly made, should prove much more durable than a wooden chair. It is the invention of Hermann Berg, of Springfield, Mass.

It is believed that the principal preservative substance used in embalming the mummies of Egypt was carbolic acid in the crude state

POETRY AND PATENTS.

It is well said that extremes often meet, although we do not often find them united in one and the same person. In a mind which is susceptible of all the higher flights of poetical imagination, we should hardly expect to find associated ideas of a mechanical nature. In other words, we should not look for an inventor in the person of a poet, especially in one whose poetry possesses a singular sweetness, combined with elevation of sentiment and grace of expression. But we often find that which we do not look for, and thus it happened that in a visit to the Patent Office library last week we found a recently printed copy of a translation from a patent granted in the reign of King Charles II. It bears date the 29th of September, 1626, and was granted to one "Master William Drummond, of Hathorneden," the subject matter being the construction of machines, weapons, and engines of war for attack or defense by land or sea. Before, however, entering upon a description of the inventions, some of which are very interesting, we will offer a few brief remarks concerning the inventor. This personage, then, was none other than William Drummond, of Hawthornden, the well known poet, who achieved considerable celebrity in his day. He was descended from a very ancient and noble Scottish family, and was born on the 13th of December, 1585. He was educated in Edinburgh, at the High School, and afterwards proceeded to the university of that city, where he took his M. A. degree in July, 1605. On leaving college he went to study law on the Continent, and returned in 1609. In the year following, his father, Sir John Drummond, died, and William retired to the paternal estate at Hawthornden, which, according to Ruddiman, is "a sweet and solitary seat, and very fit and proper for the muses." Here, with an interval of eight years of foreign travel, Drummond spent his life in his favorite literary pursuits, dying on the 4th of December, 1649. His literary celebrity gained for him the close friendship of many men of eminence, among whom may be mentioned Michael Drayton and "Rare Ben Jonson." Such was the man of whom Her Majesty's Patent Office bears record that he "spent much time, labor, and money, in contriving and constructing machines of many different sorts, which may be of use and profit to the State, in affairs both of peace and war."

The "letter" in which these machines are described, contains several points of interest, and, as we shall presently see, bears ample testimony to the truth of the axiom that "there is no new thing under the sun." There are no less than sixteen inventions notified, although only fifteen are described. The first of these is an instrument for cavalry use, by which it is said that one man can be rendered as available in battle as five or six men with the ordinary weapons. The instrument is stated to be also extremely suitable for foot soldiery, and, from its effect being at once terrible and rapid, the inventor calls it a "thundering staff," adding that some call it "box pistoll," "musket box," "carrabin," or "box-dragoun." Although no drawings are given, the descriptions are, for the most part, sufficiently clear to enable us to realize approximately the construction of the various weapons. Hence, the one just described appears clearly to be the prototype of the magazine or repeating rifles, of which so many have been described and illustrated in our pages during the last few years. In this instrument, then, we recognize the first attempt to afford the soldier the means of keeping up a rapid and continuous fire; the idea, however, waited for full practical development until the time of the late American war. The second invention is termed a shooting spear, with which a foot soldier, besides doing his own duty, could fill the place of five or six musketeers. This would appear to be a gun with a blade answering to the bayonet at the end of it. The third machine is very special in its way, being described as made of "musket barrels fastened together, by the aid of which any soldier may be considered able to fill the place of a hundred musqueteers. This machine may, from its effect, be called a lightning chariot, in the vulgar tongue, fyerie waggon." There can be no mistake as to the identity of this instrument with the machine guns and mitrailleurs of the present day. It was evidently a group of gun barrels fastened together and arranged for rapid firing, the whole being borne on a carriage. The fourth invention is an engine of war of similar character to the previous one, and is for use either by land or sea. It was to fire five balls in the same as it then took to fire one, and it was called "open ordinance." So far as this description goes, we see no reason why Master William Drummond should not be credited with the invention of breech-loading ordnance. The remainder of Drummond's inventions relating to the art of war include mortars for defending walls or ships, movable towers, and a ship which was to enter any ports, no matter how well they were barricaded or defended, and which could destroy ships by fire or forcibly capture them. This ship was to be immense and of terrible effect, and was to be called *Leviathan*. It is not possible, from the meager description before us, to say whether this vessel was in any sort a prototype of the "Great Eastern," or whether she was a huge sea torpedo. Following these warlike inventions come others relating to the arts of peace. These include an instrument for measuring the force of the wind; a light, rapid-moving boat; an instrument "by which the distance of a voyage may be exactly calculated, and the different longitudes of places, either at sea or on the nearest shore, determined." Then we have a distilling apparatus for use at sea, to provide ships with fresh water, made from salt water at a very small expense; burning glasses for setting objects on fire either by land or sea; telescopic glasses; and finally, that *pons asinorum* of ancients and moderns, perpetual motion. Amongst these latter inventions will be noticed one for ascertaining longitude. This is a point of interest, inasmuch as it is apparently the first recorded suggestion of a means for discovering the longitude of ships at sea. It was not until 1674 that a Frenchman named St. Pierre proposed to Charles II. a method of doing this. On the proposal being submitted to a committee of astronomers, Flamsteed, who was one of the committee, drew attention to the incorrectness of the lunar tables, by which the position of the moon among the fixed stars was to be calculated. Charles was struck by the deficiency, and immediately founded the Observatory at Greenwich, giving Flamsteed the title of astronomer royal, with a salary of £100 per annum. Previously to this, it does not appear that any attempt at determining the longitude of a ship while at sea had ever been made.

It will thus be seen that there are several sound practical ideas embodied in this singular patent, and such as are very rarely, if ever, found associated with the Muses. That these inventions were not the mere offspring of a poetical idealism, which transformed the ordinary appliances of warfare and science into fantastic shapes, and gave to them multiple forms, seems clear from other portions of the document. There is evidently something more here than would result from a poetic mind simply investing ordinary matter-of-fact objects with its own imagery, or conjuring up forms and shapes founded on the basis of a reality, such as a cannon or a musket. In the "letter" before us, it is specifically stated that the "said Master William Drummond hath invented these and no few other matters with exceeding industry, and no common ingenuity." Also, in the opening sentence of the document already quoted, we see that Drummond expended "much time, labor and money, in contriving and constructing" these machines. These facts formed the considerations upon which the patent for twenty-one years was granted, although it was stipulated that the inventor should reduce one or more of the machines to practice within three years from the date of the patent. It is thus probable that he had previously only made models of his inventions; we are not aware, however, of any record of any of them having been subsequently reduced to practice. The specification is interesting as containing the germs of some of the most important improvements in gunnery that our times have seen; as embodying the first suggestion for determining the longitude of ships at sea, and finally as showing that the genius of hard-headed practical invention can sometimes co-exist with the spirit of tender and imaginative poetry. The contrast between the two conditions of mind necessary to the successful development of either the poet or the inventor, is so great as to render an instance of their co-existence well worthy of notice.—*Mechanics' Magazine.*

FACTS ABOUT THE RIVER AMAZON.—STEAM NAVIGATION AND RAILROADS.

We condense, from a somewhat lengthy but interesting paper, contributed by Geo. E. Church to the London *Fortnightly Review*, the following facts in relation to the Amazon river:

South America contains seven millions of square miles. The Amazon river drains over one third of this vast area. Its basin is more than twice the size of the valley of the Mississippi. It would hold forty-nine countries the size of England. It is generally supposed that its tropical situation bespeaks diseases of various types. On the contrary, its general health is far superior to that of its North American rival, while some of its districts, especially those of Bolivia and Matto-grosso, are blessed with the same delightful temperature which characterizes the table-lands of Mexico. The principal reason for this general health is that constant sea-breezes blow up the valley. Dry when they leave the coast of Africa, they become saturated in their ocean transit westward. They distribute their moisture, ever on a decreasing scale, from the mouth of the river upwards, until, entirely drained, they sweep across the Pacific coast range of the Cordillera of the Andes, to parch the shores of Peru.

Only by floating upon the majestic tide of the Amazon does one get an idea of its mass of waters. The Mississippi river poured into it near its mouth would not raise it six inches. In Bolivia, on the Beni branch of its Madeira affluent, two thousand miles from its outlet, it is one hundred and seventy feet deep. It presents still more astonishing soundings the same distance up the main stream. With its branches, it offers not less than fifteen thousand miles of waters suitable for steamboat navigation. The Bolivian affluents of its main branch alone count three thousand miles of river navigation. One half of this is suitable for steamers drawing six feet of water, and the other half for craft drawing three feet.

There is but one obstacle between the Atlantic Ocean and the heart of Bolivia, *viâ* the Amazon river; this is the line of rapids of the Madeira, at the northeast angle of Bolivia. They are rocky obstructions, found at intervals in the river, and are eighteen in number. They have a total fall of $228\frac{4}{10}$ feet, with a length of broken water of 64,505 feet. The total fall in the navigable stretches between them is $43\frac{3}{10}$ feet. This makes a total from the upper rapid of Guajará-merim to the lower, called San Antonio, of $272\frac{7}{10}$ feet. The total length of river between these two points is $229\frac{3}{10}$ miles, of which 217 miles are of clear channel, perfectly navigable, with a depth of water from 10 to 120 feet in the dry season.

It was in 1853 that the first steamers commenced running on the Amazon river. The year previous to this, the imports and exports were but £413,926 sterling. The effect of steam was similar, to some extent, to the resultant in the Plata valley. The difference was that the Brazilian valley had not the same temperature nor the same population as the Plata had. The fault was that no effort was then made to reach the real populated section of the Amazon basin—Bolivia. Had this been done at that date, we should now see a commerce, entering and clearing at Pará, far in excess of any figures shown at the ports of Buenos Ayres and Montevideo The borders of the Amazon would have presented along their whole extent little ports and towns, the centers of commerce, and of efforts to bring the adjacent lands into use, and thus furnish outlets for the over-crowded States of Europe. But 1870 promises to commence what should have been done in 1853.

On the lower Amazon there are now running sixteen steamers, and their number is being rapidly increased from the United States. The present ones are mostly of English construction, and appear to be unsuited to the commerce, so much so that most of the new ones lately sent out are of the Mississippi river pattern, flat bottom, and affording great facility for ventilation. There are two now nearly finished in the United States for the Bolivian rivers, above the rapids. They belong to the National Bolivian Navigation Company, lately chartered by the Congress of the United States. This company is the owner of concessions of great value from the Government of Bolivia.

Three great efforts are now making to reach this inexhaustible treasure house of old Spain—the new Bolivia. On the south, the energy of the Argentine Republic is brought to the problem, and will accomplish all that nature will permit; for there is no country in South America whose people are carrying it to a more splendid destiny than this. The Argentine Central Railway has been pushed forward to Cordoba, about 250 miles distant from the port of Rosario, on the Parana river. The steady earnestness of its contractors promises to extend it to Jujuy, 585 miles north of Cordoba. This will draw much trade from Southern Bolivia; and if extended to the northeast, around the spurs of the Andes, to the Bolivian province of Tarija, will give a great commerce to the Plata valley. Already many of the products of Santa Cruz de la Sierra and of Tarija find their outlets by carts and on muleback over this route.

Peru, having at Tacna, Arica, and Arequipa, tasted of the vast riches which lie upon the eastern slope of the Andes, appears determined to retain a little of it, even at the expense of a railway from the coast of the Pacific to the Lake of Titicaca. This road is finished as far as Arequipa, 117 miles distant from the port of Islay, on the Pacific; 220 miles more, making in all 337 miles, will complete the work. This is under contract. Certainly, the wealth in the northwest corner alone of Bolivia must be astonishing; for Peru is trying to reach it at an expenditure of ten millions of pounds sterling. The road, too, is to scale a pass of the Andes 14,600 feet above the level of the sea; and, when it reaches Puno, its eastern terminus, it will be separated by Lake Titicaca from Bolivia.

These efforts are bold and full of merit. The country is so rich that they will all reap large returns; but it is by the way of the Amazon river that Bolivia looks for her greatest development; and it will be in connection with the Amazon valley of Brazil that she will receive it.

The subject is full of interest for Europe and America. This sudden launching into notice of a country hitherto prevented from participating in the general progress of the world, is of considerable moment to commerce and civilization.

Kerosene Frauds.

W. J. Martin, Professor of Chemistry at Davidson College, N. C., writes to the *American Chemist* as follows: "I have been making some experiments on the photometric and economical value of the different kinds of *burners* for kerosene lamps, with a view to publishing the results in a local paper for the information of our people. During the progress of the experiments, I have been led incidentally to test the flashing and burning points of a number of samples of oil which came into my hands, and one specimen examined today is so remarkable that I send you an account of it, to be used as you think fit. This kerosene was bought of Trimble & Barrick, Philadelphia, and is marked on one head of the barrel, "*Brilliant Refined Burning Oil. Philadelphia A. F. Beam;*" and on the other head, "M. Evans, State Inspector. Approved. Fire test, 110°. November 26, 1870." (The first initial of the inspector's name I could not decipher.) Now this oil, heated over the water bath, with the thermometer bulb three quarters of an inch below the surface, starting at 50°, and heated to 110° in fifteen minutes, flashed freely at 60°, took fire and continued to burn at 70°; and at 75° the flame would descend and ignite the mass with the light one inch above the surface. With the State Inspector's brand of approval at a fire test of 110°, for the oil to take fire at 70° seems to me an intolerable outrage, which I would gladly be instrumental in exposing and punishing. The degrees are, of course, Fahrenheit."

Whereupon the editor of the *Chemist* remarks: "It is possible that at the time Prof. Martin obtained his sample, the barrel did not contain the oil which the State Inspector approved."

Then why, asks the SCIENTIFIC AMERICAN, was the article sold or offered for sale? If dangerous oils like this can be peddled throughout the country, what is the use of inspection?

DEEP MINES.—The copper mine near Lake Superior was long supposed to be the deepest mine in the United States, being 1,300 feet in depth. But the Amador Quartz Mining Company, of Sutter Creek, Cal., has penetrated 1,350 feet "into the bowels of the earth, without let or hindrance." The Brazilian gold mine, owned by an English company, has been abandoned. The shaft was badly timbered, and water came in too fast to make it profitable in working. It was 1,890 feet deep.

THE ANCIENT BREWERS OF NEW YORK.

From the first number of a new publication called the *Brewers' Gazette, Distillers' Journal, and Malt and Hop Trades Review*, published by Curson & Mundy, 195 Fulton street, New York, we extract the following sketch of the early brewers of New York, which is full of interesting historical facts:

Several of the brewers in New Amsterdam were men of considerable note, and filled some of the highest civic offices in the community. Their establishments were chiefly situated in the vicinity of the Fort, within which the first was built. The street occupied by them was, from that circumstance, called the "Brouwer Straat," or the Brewers' street," and corresponded with the present Stone street, between Broad and Whitehall. It was one of the first streets occupied in the future commercial capital, and received its present name from being the first paved with stones, which was done by an ordinance made in the year 1657. One of the principal brewers in this locality was Isaac De Foreest, who came to the country in 1636, and in 1645 received a grant upon the above street, then one of the best in town. He was also the owner of a farm at Harlem, and of the "Old Kirk" or church on Pearl street, and for many years a magistrate. In acknowledgment of his services in improving the town, and in public office, he was privileged with "the great citizenship."

Jacob Wolfertsen Van Couwenhoven erected a large stone brewery on the north side of the same street, on land granted him also in 1645, at the corner of Stone and Broad streets. He was not successful in business, and entailed mortgages upon his property, of which, however, he held possession until his death in 1670. The same premises were occupied as a brewery subsequently by John Van Couwenhoven.

Peter, a younger brother of Jacob, just referred to, was also a prominent person at that day, and carried on business as a brewer and trader. He was six years a "schepen" of the city. He was unpopular, both with the English after they came in possession and with his Dutch neighbors. Having been arraigned on a charge of extortion, he refused to give bail, and was imprisoned and fined. He left the city, and resided awhile at Elizabethtown, New Jersey, of which he was one of the earliest settlers; but in 1665 was still a resident of the city, at the northwest corner of Pearl and Whitehall streets. His brewery at the head of the present Broad street became, in 1670, the property of Isaac Van Vleck, who, for the remainder of his life there, conducted a prosperous business in brewing. He was several years an alderman, and died in 1695.

The Bayards, also, Nicholas and Balthazar, step sons of Governor Stuyvesant, were among the most conspicuous and opulent citizens at that time. They were both engaged in the manufacture of beer. An extensive district of the city, long afterwards, and, to old residents of New York, still known as the "Bayard farm," was the property of their wealthy descendants. It extended along each side of Broadway, north of Canal street, for the distance of many blocks, and from the Bowery to beyond McDougal street, on the west side of the city.

Another wealthy burgomaster, who was one of the early brewers of the rising Dutch metropolis, was Oloff Stevenson Van Cortlandt. He came to the city in 1637, on military service, which he quit the same year for a civil office as commissary of cargoes, at a salary of thirty guilders ($12) per month. He resigned his office to the company in 1648, to engage in the brewing business. His premises were on "De Brouwer straat," now Stone, adjoining those of Isaac De Foreest, where his property was one of the first class, and valued, on the final cession of the city to the English, in 1674, at $30,000. He was an influential politician, and, in 1650, the president of the citizens' representatives, called the "Nine Men," who were opposed to the administration of the last govornor, Stuyvesant, and were by him turned out of their pews in church, and their seats torn up. He had a valuable property on the west side of Broadway, adjacent to Cortlandt street, which still perpetuates his name. He held several prominent offices. His son, Stephanus, was the first native born mayor of New York, to which he was appointed at the age of thirty-four. Another son, Jacobus, was, like the last mentioned, a wealthy merchant and a mayor of the city

Jacob Kip, a son of one of the oldest settlers, in 1652 resigned the secretaryship of the city magistracy, to which he was appointed five years before, while quite a youth, on the first organization of the city, and engaged in the brewing business. He afterwards resigned it for mercantile pursuits. His property on Broad street, partly acquired in the business, and partly by marriage with the wealthy widow of Guleyn Verplank, was estimated in 1674, at $8,000. Daniel Verveelen, a brewer, who originally settled at Fort Orange, resided about this time on "De Prince straat," now Beaver, east of Broad. There are many of the name now in the State. On the same street lived also Jan Jansen Van Bresteede, a cooper, who was appointed in 1658 the marker of beer barrels, and in 1667 inspector of pipe staves. Jan Vinje is mentioned as a brewer in the town in 1653. He was one of the heirs to the property between Wall street and Maiden Lane, and extending from river to river, known as the Damen farm. In 1654, Thomas Hall, an Englishman, who had joined the New Englanders some years before in the attack upon the Dutch colony on the Delaware, where he was taken prisoner and sent to Manhattan, became the purchaser of a farm on what is now Beekman street. He there established a brewery, which, after his death, in 1670, with the farm, a large and valuable tract from Pearl street to Park Row, was purchased of his widow, by William Beekman. Beekman, who came to the province in 1647, and was the first of that name, carried on for many years the brewing business at the corner of Beekman and William streets, which conjointly still bear his name. Mr. Beekman was at an early age a schepen of the city, and held other municipal offices at different times. He was sub-director of the colony on the South river from 1658 to 1663, and after that was sheriff of Esopus. He was held in high esteem until his death in 1707, at the age of eighty-five. His property on the present Pearl street, between Franklin Square and Ann street, was in 1674 valued at $10,000. It was long known as Beekman's swamp, and is still spoken of among the leather manufacturers, to whose use it has been for a great while appropriated, as "the Swamp."

OAK GRAINING.

[Condensed from the Builder.]

There are several methods used for imitating oak, with various degrees of success. The most ancient of which we have any knowledge was done by painting the work with a graining color, and then making all the figures or markings with the end of a tallow candle; the result was that the graining color dried hard everywhere, except on those places touched by the tallow, which was then wiped off with a piece of flannel, leaving the marks of the clean ground color. Another plan was to mix a little dark color with sweet oil and beeswax, and put in with a pencil or fitch the color of the various markings, upon the bare ground color. The graining color was then mixed with beer, and spread over the work, and then flagged with a duster, or large flat tool made for the purpose. When this was dry, the marking color was washed off with turpentine. This system is in partial use even at this day.

The next great stride in oak graining seems to have been the natural out-growth from this last process, and is called "spirit-color graining." When well and properly done it is a useful and cleanly process, having this advantage over any other method, *i.e.*, that work done with it may be grained and varnished in the same day, which, under certain circumstances and for certain work, is very valuable, especially where, as in offices, etc., unnecessary interruption of business has to be avoided. This process is carried out as follows: To mix the graining color, grind a quantity of the best washed whiting in turpentine; add such a proportion of either burnt sienna, Oxford ocher, burnt umber, raw umber, or part of one and part of another, according to the color required, as will stain the whiting to the required depth of color; then add sufficient turpentine varnish to bind or fasten the color when thinned to a working consistency with turpentine, which may be best ascertained by trial before commencing any important work. The color is then spread evenly over the surface, and strippled or streaked with a duster or flat brush; it is now combed quickly (in the manner hereinafter described). If this be not done quickly, the color sets or dries, and when once set the combing cannot afterwards be done. The color dries quite dead. When it has stood a short time it may then be figured or marked, in imitation of the marks seen in the real oak, thus:—Dissolve Scotch soda in water—let it be tolerably strong—add a little burnt sienna, ground in water. Now take a flat fitch (hog-hair), dip it into the solution of soda, and thus mark out or put in any figure desirable, taking care not to use it too freely, or else it will run and make marks which are not required; it must be borne in mind that wherever the oda to :ches there will be a mark. When the work is all figured, the whole must be well washed with a sponge and plenty of clean water, which will clear off the soda, and wherever it . as touched, the graining color will be destroyed, and will wash off, leaving the figures clear and bright. The work must then be brushed over with weak beer and water, in the proportions of half beer and half wa er, and then overgrained in the usual manner. A door may thus be grained and varnished in a couple of hou:s' time. The solution of soda is sometimes dispensed with, and turpentine is used instead. The veining fitch is dipped into turps, stained so as to show the marks, which are wiped off again before they have had time to dry, using a flannel rag for that purpose. Wherever the turpentine touches the spirit color it immediately softens the turpentine varnish, which may then be wiped off, but only while it is wet; and as it of course dries very soon, the work requires to be quickly done, or else it is labor lost. This is not so cleanly in using as the soda, but good work may be done with it. The heart or sap of oak may be admirably imitated on this system, especially upon molded surfaces. The heart must be marked in with the fitch or a sable pencil and turpentine, as before described, and, while it is wet, must be brushed or softened all one way, that is, in the direction in which the sap runs—the direction of its growth. If this be done well, the light and dark edges of the sap of the real wood may be very closely imitated.

But the most important and best system of graining oak is the oil-color process. It must be understoood that oak has two distinct characteristics. The first is the grain of the wood, which is formed by the pores, and which always runs the length way of the plank, and, in fact, of the tree also, and this is fine or coarse, as the case may be; the other is technically called "the figure"—the dapple, the veining, and the lights of the oak. These markings, almost in every case, run across the grain, and, as a rule, have a silvery reflection, and stand out lighter and brighter than the grain, and sometimes they have a light silvery edge and a dark center. Of course, both the grain and the markings are different in different descriptions of oak. In the English oak the grain and the veining, or figure, are much finer and closer than in the foreign oak. The Dantzic oak, for instance, is exceedingly coarse or open in its grain or pores, and the "lights," or figure, are, as a rule, in broad or thick lumps, without much grace or beauty of form; while the figure in English oak is arranged or flows in graduated curves, having a beauty peculiarly its own. The grain and the markings require different methods of working, and there is no method yet invented which does this so effectively and so well as the oil process.

New work should be well dusted before being primed. After the first coat is dry, it should be rubbed down with sandpaper and stopped with good sound putty. Three coats should then be put on and the work sandpapered between each coat; except this be done, no good work can result. The finishing coat should be mixed with three parts of oil to one of turps. The color for light or new oak, commonly called wainscot, should be a light creamy buff, made with Oxford ocher and white, and a little vermilion or Venetian red. Some grainers like a white ground for this very light oak, but it has a rawness of look which is not at all pleasant to look upon.

For a middle shade of oak the color should be stained with Oxford ocher, Venetian red, and a little burnt umber; and for dark oak, with burnt umber, Venetian red, and a little orange chrome. These may all be modified by admixture with black, in a degree according to whether the oak when finished is to be warm or cool in tone. And here we may note that the color of the ground is of vital importance to the effect of the work when finished. Many persons don't care much about the ground color so that it is light enough, as they depend upon the glazing color to bring it up to the required shade. This we are quite certain is a mistake, for if two panels be grained, one on a white or nearly white ground, and the other on a rich colored ground, the former cannot by any amount of glazing be brought to the same richness of color as the latter; therefore it is the wisest plan to work upon ground colors which are of the same tone of color, or nearly so, as the work is intended to be finished. The contrast also between the graining color and the ground color should never be violent. When it is so, the work has a staring vulgarity about it very undesirable. The "figure" or markings stand out so prominently and so positively that all flatness and repose is destroyed. This is a very common fault with grainers, and one which should be avoided. Grainers of this class are very fond of bright chrome-yellow ground, and of glazing their work with burnt sienna, thus making it "foxy," and, as a matter of course, ugly and vulgar.

DYERS' RECIPES.

From Haserick's Secrets of Dyeing.

INDIGO BLUE TOPPED, FOR HOSIERY.—100 pounds of wool are colored with 4 pounds of Guatemala or 3 pounds of Bengal indigo, in the woad or soda vat; then boil in a kettle a few minutes 5 pounds of cudbear or 8 pounds of orchil paste; add one pound of soda, or, better, one pail of urine; then cool the dye to about 170° Fah., and enter the wool. Handle well for about twenty minutes; take it out, and cool, rinse, and dry. It is all the same if the cudbear be put in before or after the indigo. Three ounces of aniline purple dissolved in one half pint of alcohol can be used instead of the cudbear. It produces a very pretty shade, but it ought never to be used for mixed goods, which have to be bleached, as it runs into the white; also the cudbear disappears in the sulphur.

DARK BLUE FOR BROADCLOTH IN THE WOOL.—This is colored in a healthy woad vat; the first dip is handled well and slow for one hour in the net, then taken out, aired, and the vat stirred again; in two hours it can be dipped again for half an hour, and so often taken through until it has acquired the right shade. The vat ought to be strong enough in indigo to color it dark enough in three dips. About 10 pounds of good indigo is reckoned to 100 pounds of wool; clear indigo blue does not require anything more, but if taken through a warm bath containing two pounds of blue vitriol, the color stands better in fulling, and is faster; after which it is rinsed, switched, and dried. The dark blue generally found in the market is topped with 15 pounds of camwood or 20 pounds of red sanders; the latter are boiled on the colored wool, as the indigo required for such dark colors would make it very expensive.

DARK BLUE TOPPED WITH LOGWOOD.—Give it a dip first in the blue vat, then rinse: then boil the wool for one hour in a kettle containing 10 pounds of alum, 2 pounds of half refined tartar, and 1½ pounds of blue vitriol; after which take it out, cool, and make fresh water. Add from 5 to 10 pounds of logwood, according to the shade required, and the quality of the logwood; let it boil in a bag or otherwise, cool the kettle to 170° Fah., enter the wool and handle slowly; in one hour it can be cooled, rinsed, and switched for drying. This does not require any alkali in shading the wool, as the soap will do this in fulling. If cloth be colored this blue, some pearlash or urine may be used to accomplish it; but then the kettle ought to be cooled to 136° Fah. The goods require good scouring, otherwise they will crock.

INDIGO BLUE ON CLOTH, PART LOGWOOD.—100 pounds of cloth. Color the cloth first by one or more dips in the vat of indigo blue, and rinse it well; then boil it in a solution of 20 pounds of alum, 2 pounds of half refined tartar, and 5 pounds of mordant for two hours; then take it out and cool. In fresh water boil 10 pounds of good logwood for half an hour in a bag or otherwise; cool off the kettle to 170° Fah. before entering; handle well over a reel; let it boil for half an hour, then take it out, cool, and rinse. This is a very fine blue, but not so permanent for wear.

Improvement in Printers' Quoins.

This quoin, now generally used in France, is rapidly gaining favor in this country. It is really a great improvement, and we are now using it in our office with much satisfaction.

It has the advantages of durability, saving in wear and tear of chases, so often broken and sprung by the use of the old quoins, entire freedom from shrinkage, much greater rapidity in locking up forms, and greater security, as a form once locked may stand any length of time and remain as tight as when first locked.

The pressure is equalized on all parts of the chase, and thus without undue strain all the pieces in the form are securely held without the use of beveled furniture.

The pressure is obtained by means of screws, actuated by triple or quintuple worm gearing, as shown, the central worm being turned by a hand key. The pressure thus obtained is very great. Various sizes are made, adapted to all sorts of newspaper, book, and job work.

This device was patented in the United States August 10, 1869. For further particulars address, F. Dorrity, 240 East Thirty-second st., New York.

Benefits of Science.

The practical view of agriculture cannot be more clearly or profoundly conceived than it was by the North American chief, whose speech on the subject is reported by Crêvecœur. The chief, in recommending agriculture to his tribe, the Mississippian Indians, said: "Do you not see that the whites live on corn, but we on flesh? that the flesh requires more than thirty moons to grow, and is often scarce? that every one of the wonderful seeds which they scatter on the soil returns more than an hundred fold? that the flesh has four legs to run away, and we only two to catch it; that the seeds remain and grow where the white man sows them? that the winter, which for us is the season for laborious hunts, is to them a time of rest?

It is for those reasons that they have so many children, and live longer than we do. I say, then, to every one that hears me, before the trees above our huts shall have died of age; before the maples of the valley cease to yield us sugar, the race of the sowers of corn will have extirpated the race of flesh eaters, unless the hunters re- solve also to sow." In his difficult and laborious life of the chase, the Indian consumes in his limbs a large sum of force; but the effect produced is very trifling, and bears no proportion to the expense. Cultivation is the economy of force.

Science teaches us the simplest means of obtaining the greatest effect with the smallest expenditure of power, and, with given means, to produce a maximum of force. The unprofitable exertion of power, the waste of force in agriculture, in other branches of industry, in science, or in social economy, is characteristic of the want of true civilization.

Breaking of Car Axles.

W. Bridges Adams, in a paper published in the Journal of the Society of Arts, says that the cause of the breakage of railway axles is to be found in the fact that they are strained beyond their powers, not by the load, but by imperfect structure of the vehicle they are attached to—imperfect, possibly, originally, but commonly by violence in use. "The running is wringing the neck of the axle."

With a view to lessen lateral friction of the wheel flanges as much as possible, it has been customary to keep the axles as near as possible together. This, if the bodies be long, involves "hogging," and oscillation, with a bad distribution of the load. Other things being equal, the nearer the axles are to the wagon end, the steadier they will be; but then flange friction increases with the length of wheel base, and a remedy must be provided for this.

Supposing that a train of wagons were built perfectly true at the outset, for a straight line, the multitude of longitudinal shocks would soon set the wheels out of truth, and so the question arises, whether it be possible so to construct them, that diagonal shocks to the frame, giving a permanent set, shall not affect the true running of the wheels; and next, whether wagons may not be so constructed as to dispense with the loose coupling, which is a material source of breakage to couplings, and displacement of the wagon frames? We think it is. Desirable as it is to point out the causes of the defects, it is still more useful to point out the remedy.

Value of Patents on Small Articles.

A good illustration of the value of patents on small articles in universal demand, is found in Miles' patent double-pointed tacks, designed for putting down carpets, oilcloths, matting, etc., and for hanging curtains, etc. Two patents have been obtained upon this improvement, and although recently introduced, the manufacturers are doing a large business. The tacks are made on the principle of the staple. The edge of a carpet nailed by them may be stripped up without the least danger of tearing the fabric. They are easy to extract when driven, as they have no heads to break off. They are a decided improvement on the old style of carpet tacks, and may be found advertised in another column.

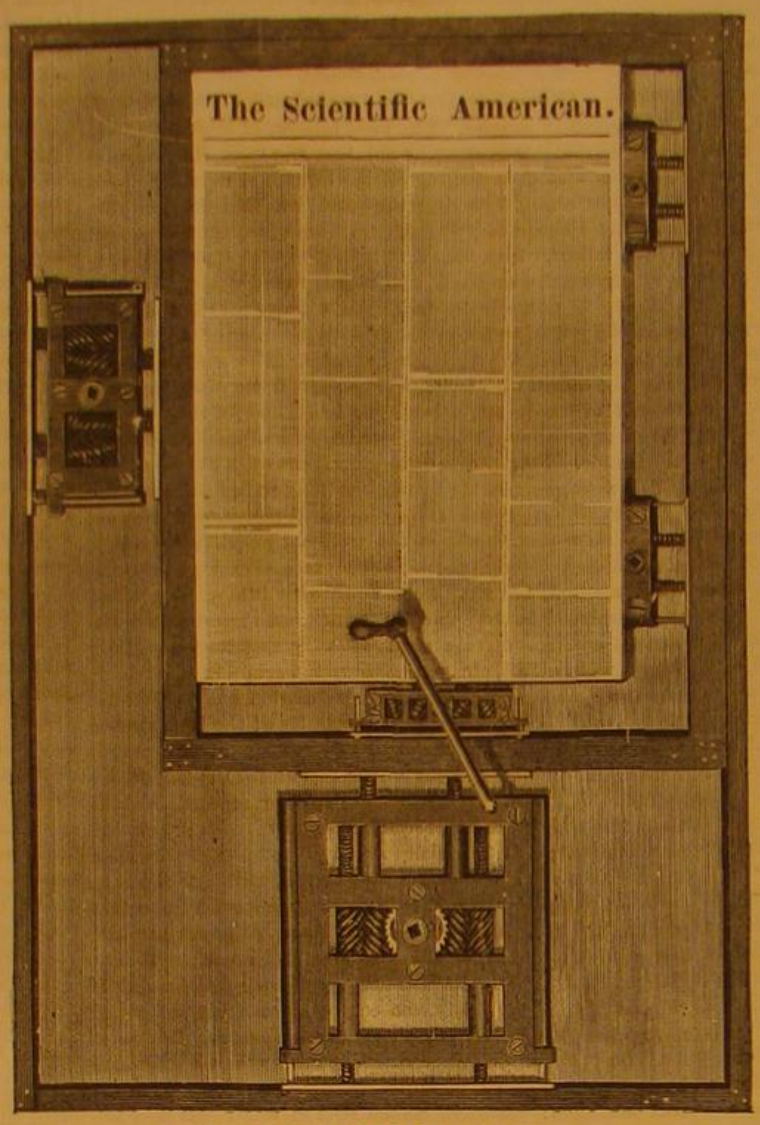
A NOBLE ACT.—Mr. A. T. Stewart, the well-known merchant of this city, is about to send 5,000 barrels of flour, on his own account, to relieve the suffering French. Mr. Stewart's example is a noble one, and will entitle him to rank as a benefactor to the suffering poor.

PYROMETER.

The pyrometer, or "heat measurer," is an instrument for indicating temperatures by the expansion of metals.

While, for many purposes, the mercurial thermometer is undoubtedly useful and indispensable, still, where such an instrument is subject to careless handling, or when, from the nature of things, the indications should be clearly read, and also when temperatures above 500 degrees are to be measured, it is evident that some other arrangement must be adopted.

Advantage being taken of the uniform expansion and contraction of metals, from heat and cold, an instrument is here



DORRITY'S PATENT QUOIN.

shown, in which the longitudinal and differential expansion of two metal tubes is, by suitable mechanism, made to register, in degrees of any desired scale, on a dial similar to a steam gage. This pyrometer consists of a seamless drawn brass tube, inclosing a turned iron tube, and both are screwed into a socket at the bottom. The upper end of the iron tube is closed by a rod screwed into its bore, while the brass tube is secured to the case of the instrument. The iron tube being open throughout, and both tubes being in close contact, it follows that when they are immersed in the fluid, gas, or molten metal to be tested, the brass tube expands more than the iron, and carries it down with it, as they are united at their lower ends. This motion, which is uniform, is, by means of a toothed bell-crank sector within the case, and a small pinion on the pointer shaft, greatly multiplied, moving the pointer around the dial in any desired ratio to the motion of the inner tube.

This arrangement of the metals is claimed to insure their becoming uniformly heated, as it is highly important that both tubes should acquire the temperature of the substances tested as speedily as possible.

For showing the temperature of oil stills, gas retorts, steam digesters of all kinds, india-rubber vulcanizers, vats of hot liquids (as in dye works, breweries, etc.), as well as for superheated steam, this pyrometer will be found convenient, as it is not easily damaged (being all of metal) and its indications are as easily read as those of a steam gage.

In cases where the tubes cannot be inserted, for want of room, they may be enclosed within a larger one, the end of which is screwed into the vessel containing the substance to be tested.

This pyrometer is used as a steam gage by attaching th tubes to the back, instead of to the bottom, of the case, and screwing the instrument into the head of the boiler, the dial being then vertical. The expansion of the tubes will thus always show the true pressure in the boiler, the dial being in that case graduated in pounds.

These pyrometers are graduated, after the tubes have been thoroughly annealed, by placing each instrument in a freezing mixture, then in boiling water, and lastly in high pressure of steam, from which points the length of the degree is determined.

They are manufactured in several styles, with tubes at the back or bottom of the case, and of any length between one and four feet, as may be desired.

Application has been made for a patent on this improvement, and the instruments are manufactured by the inventor, Henry W. Bulkley, mechanical engineer, 98 Liberty street, New York, who may be addressed for further information.

Exploding Charges by Electricity.

Franklin, in 1751, and Priestly, in 1761, suggested the possibility of applying the electric spark for the ignition of gunpowder charges; but electricity was not practically applied until about thirty years ago, by the French military engineers, since which its use has become general. It was employed to ignite the great blasts that destroyed the Round Cliff at Dover, and to remove the wreck of the Royal George, and has been largely used in heavy blasting with powder and nitro-glycerine in California, and for exploding torpedoes under water.

The variety of contrivances is very great. Many exploders have been devised to act either by heating a piece of thin wire, introduced in the circuit ofa battery and placed in the charge, or by the passage of a spark produced by an electromagnetic machine, or Ritchie coil, through a sensitive explosive compound, thus causing alocal explosion sufficient to ignite the whole charge.

Among those who have given great attention to this subject, Baron Von Ebner, of the Austrian military engineers, and Mr. Abel, of the British war department, who has devised one of the best exploders known, may be specially mentioned. A spark generated by revolving magnets is made to pass through a mixture of subphosphide and subsulphide of copper and chlorate of potash—materials of high conducting power and extremely sensitive to the spark. One of the great difficulties in the way of making such exploders is the liabilityof the materials to be merely thrown aside, and not exploded, by the passage of the spark.

In the United States, inventors have been active in devising different forms of apparatus for igniting explosives. They all depend upon either the direct passage of a spark or the heating up of an imperfect conductor, immersed in an explosive mixture. This mixture and the arrangement of wires are inclosed in a small cartridge of paper or wood, which can be readily placed in the midst of the powder, in the hole to be exploded. Mr. Stowell patented, in 1862, a peculiar form of cartridge, containing the ends of the conducting wires and a strip of platina. Beardslee, in 1863 patented a very simple mode of making an imperfect conductor between the ends of two wires, by drawing a pencil mark of graphite upon the surface of a piece of dry wood. Mowbray, in July, 1869, patented an improved electrical fuse for exploding charges of nitro-glycerin. It consists of a small cartridge of powder, in the top of which is placed a small quantity of a composition, like that used by Mr. Abel, made of sulphide of copper, 9 parts; subphosphide of copper, 2 parts; chlorate of potash, 3 parts; the whole intimately mixed. The ends of the wires are immersed in this mixture. It is designed especially to be inserted in cans of nitro-glycerin, to be exploded in oil wells.

The dealers in the new explosive compounds, such as nitro glycerin, dynamite, and dualin, furnish exploders especially designed for the several preparations. These various exploders may be fired either by the voltaic current, or by a spark from a suitable electrical machine, or the Page coil.—*Mining Machinery.*

THE AMERICAN BIRD TRADE.—The bird trade in America seems to be in a flourishing condition. Over 40,000 canaries are brought in every year, and probably 10,000 more are raised in this country for the purpose of sale. The number of bulfinches, goldfinches, thrushes, robins, and larks annually imported rise as high as 500 or 600 for each variety. There are fully 3,000 Java sparrows brought to the United States by vessels from that region, and fully as many parrots are yearly sold in this city alone. Waxbills and other minute varieties are scarce, and seldom arrive in quantities of more than 100 or 200 each year. Parroquets and love birds from Australia follow parrots in their relative importance. In native birds there is no reliable data to go upon. It is roughly estimated that about 10,000 mocking birds find their way from the wild nest to the cage each succeeding year.

RHEEA FIBER.—Notwithstanding the report that a number of machines for clearing rheea fiber had been sent in to the Indian Government in reply to the announcement published last year, none would seem to have been successful, from the fact of the time for competing for the prize of £5,000 having been extended for another year.

PERPETUAL MOTION.

NUMBER XI.

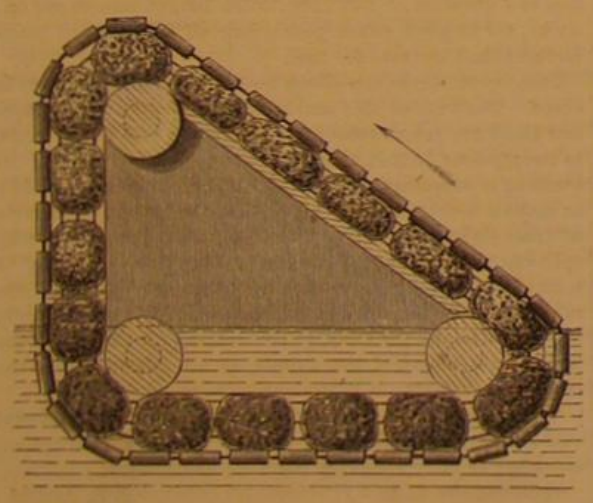
No less a person than Sir William Congreve, M. P., and inventor of the famous Congreve rocket, figured in his time as a believer in, disputant upon, and inventor of a perpetual motion. So sure was he that he had discovered the long sought principle upon which self-moving machines could be constructed, that he patented his device, although we believe he never claimed to have succeeded in getting it to work. Nevertheless, he obstinately maintained that it would work, in spite of the mathematical demonstrations, of the absurdity of his views, made by several eminent mathematicians.

Fig. 28 shows this device. As will be seen, it is based on a principle hitherto not mentioned in this series of articles, viz: the power of capillary attraction.

Three horizontal rollers are fixed in a frame; an endless band of sponge runs round these rollers, and carries on the outside an endless chain of weights, surrounding the band of sponge, and attached to it, so that they must move together; every part of this band and chain being so accurately uniform in weight that the perpendicular side will, in all positions of the band and chain, be in equilibrium with the hypothenuse, on the principle of the inclined plane. Now, if the frame in which these rollers are fixed, be placed in a cistern of water, having its lower part immersed therein, so that the water's edge cuts the upper part of the rollers, then, if the weight and quantity of the endless chain be duly proportioned to the thickness and breadth of the band of sponge, the band and chain will, on the water in the cistern being brought to the proper level, begin to move round the rollers in the direction of the arrow, by the force of capillary attraction, and will continue so to move.

On the perpendicular side of the triangle, the weights hanging perpendicularly alongside the band of sponge, the band is not compressed by them; and its pores being left open, the water, at the point where the band meets its surface, will rise to a certain hight above its level, and thereby create a load, which load will not exist on the ascending side, because on this side the chain of weights compresses the band at the water's edge, and squeezes out any water that may have previously accumulated in it; so that the band rises in a dry state, the weight of the chain having been so proportioned to the breadth and thickness of the band as to be sufficient to produce this effect. The load therefore, on the descending side, not being opposed by any similar load on the ascending side, and *the equilibrium of the other parts not being disturbed by the alternate expansion and compression of the sponge*, the band will begin to move in the direction; and as it moves downwards, the accumulation of water will continue to rise, and thereby carry on a constant motion, provided the load be sufficient to overcome the friction on the rollers.

FIG. 28.



Now, to ascertain the quantity of this load in any particular machine, it must be stated that it is found by experiment that the water will rise in a fine sponge about an inch above its level; if, therefore, the band and sponge be one foot thick and six feet broad, the area of its horizontal section in contact with the water would be 864 square inches, and the weight of the accumulation of water raised by the capillary attraction being one inch rise upon 864 square inches, would be 30 lbs., which, it is conceived, would be much more than equivalent to the friction of the rollers.

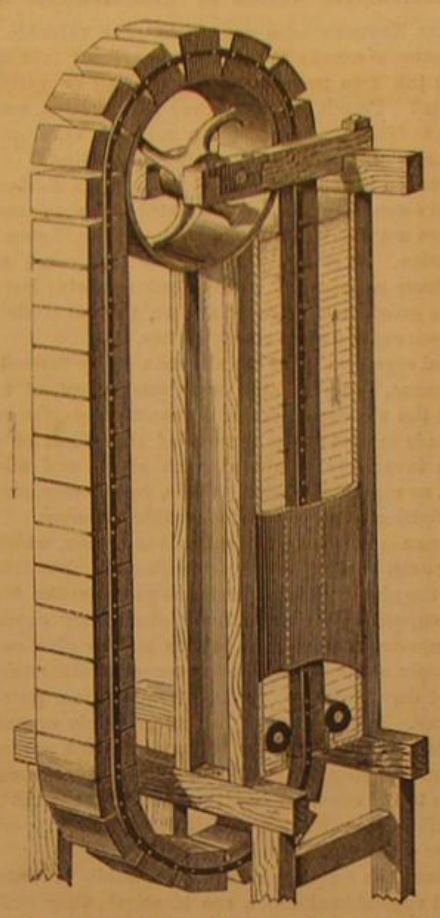
Now, the fallacy in this plausible argument is found in the words italicised. The equilibrium of the parts of the chain *is* disturbed at the moment the chain moves downward to compress the ascending file of sponges, and just enough disturbed to counterbalance the increase of weight on the perpendicular side. It is somewhat astonishing that a man of Sir William Congreve's ability, should not have seen this at once, and still more astonishing that he should have disputed it when pointed out to him, which he did vehemently. Writing upon this subject, he says:

"For my own part, not being able to see any reason why the machine should not act, I confess that my faith is sufficiently strong to have induced me to take out a patent, and I am determined to use my best exertions to give mankind the benefit of this discovery, should it turn out, as I sincerely believe it will, a source of perpetual power without expense."

Fig. 29 is a diagram sent us by Mr. Wm. B. Cooper, of Philadelphia, who writes as follows in regard to it:

"Having seen in your issue of 7th Jan., a diagram of an attempt at perpetual motion, by H. Leonhart, I send you the enclosed diagram and description, which appears to me to correct the errors in his. The diagram represents an upright tank, through which passes a number of floats connected by a band of elastic rubber attached to their ends, leaving just enough space between them to secure action on each by the water. They are each of the same weight as an equal bulk of water at the surface, therefore the upper one in the tank

FIG. 29.



has no comparative weight. The next lower one has a unit of upward force, equal to the condensation of its bulk of water, and so on, each adding a unit to the upward tendency, until we come to the last, the pressure on which is altogether downward to the amount of the entire column of water; but we already have a number of opposing upward forces, and when we look on the other side and see the thirteen active weights, it seems clear that there will be a large surplus weight, over and above the opposing weight and the friction of the rollers and upper wheel.

"Of course mercury or any other liquid could be substituted in place of water.

"If you can, by the enclosed rough diagram and description, comprehend my meaning, I would consider it a special favor if you would point out the error, if any."

The mistake of this inventor is in supposing the upward pressure of the floats, added to the weight of the floats outside the tank, will more than equal the weight of a water column having a base equal to the lower side of one of the floats, and a hight equal to the depth of the tank. If the floats be made of material more compressible than water, they would tend to sink rather than rise in the tank, but if made of material less compressible, the amount of upward face which could be obtained by their compression would be far less than the weight of water in the interstices between the floats. The downward effective pressure on the lower float in the tank would be the difference between this buoyancy and the weight of water in the interstices between the floats. The weight of the floats outside the tank is exactly balanced by the downward pressure of a bulk of water equal to that displaced by the floats in the tank, therefore if any motion should take place at all, it would be in an opposite direction from that expected, and would only continue till enough water had passed out of the bottom of the tank to bring the parts of the machine in exact balance.

W. MATTIEU WILLIAMS ON THE BESSEMER PROCESS.

From Nature.

In the first place, the pig iron is melted in a suitable furnace, usually in that form of furnace known as the "cupola." The melted iron is run from this by means of movable troughs into the "converter," which is a pear-shaped spouted vessel, lined with fire-clay, "ganister," or other refractory substance.

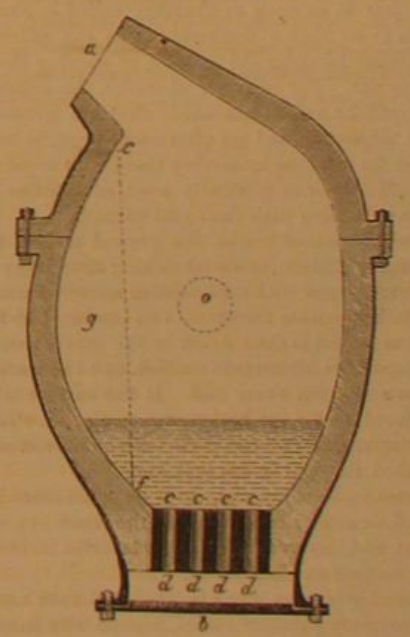
This pear-shaped vessel is truncated at the lower end, and thus a flat circular bottom is formed. This bottom, which is readily detached and renewable, is fitted with longitudinally perforated fire clay cylinders, shown in section at *cd cd cd cd*, each perforation or clay tube being about one half or three quarters of an inch in diameter, and all communicating with the space, *d d*, into which opens the blast tube from a powerful blowing engine. The number of these blast holes varies from fifty or sixty to a hundred or more, according to the size of the converter.

The converter is mounted on trunnions so arranged that it may turn on a transverse axis crossing about the middle of the vessel, as shown by the dotted circle, *o*. The turning is effected by hydraulic machinery, controlled by levers readily worked by a man who stands on a platform in full view of the converter. In order to receive the charge of melted iron, the converter (the lining of which has been previously raised to a bright-red heat) is turned over so that the dotted line, *e f*, becomes horizontal, and corresponds to the surface of a full charge. The belly, *g*, of the converter is so curved that it shall in this position retain the whole charge without any of it reaching the blast holes at *f*, or the mouth at *e*, and yet allow the whole charge to be readily "teemed" by turning the converter a little further down.

When the full charge is thus received in the belly of the converter, the blast is turned on, after which the converter is turned to the upright position, as shown in the figure, and the melted metal then stands directly over the perforated bottom. All the fluid metal above the openings is now resting upon a bed of air, and is only prevented from falling through by the blast being maintained at a pressure exceeding the falling force of the column of liquid above it. It would fall through these orifices into the blast-way and do serious mischief should the blast be stopped or slackened for an instant, or should the converter be turned upright or overcharged, before the commencement of the blast. An accident of this kind but rarely happens, though it is by no means an unknown casualty.

The "blow," as it is termed, now commences; the hundred streams of air tear through the pool of melted iron, and a huge flame roars furiously from the mouth of the converter. At irregular intervals magnificent cascades of brilliant coruscating sparks are belched forth, and the dazzling spray as it dashes against the walls of the flame shaft rebounds with redoubled splendor, each glowing globule being shattered by the shock, and bursting into rescintillating fragments. The loud-bellowing blast roars on monotonously, but the flame becomes brighter and brighter continuously, and grows in length and breadth as it increases in brilliancy, until at the end of about ten minutes it attains its maximum, when its splendor is painful to the eye, and yet so fascinating that few who see it for the first time can turn their dazzled eyes away. The spark eruptions still burst upwards from time to time, and still dash against the brickwork and the ground, and still reverberate in fiery splinters, but their appearance has changed. They are now no longer red hot, or yellow hot, or white hot, but have a curious purple luminosity different from anything one has ever seen before. If it be day time, and the sun shining, the sunlight out of doors has a sickened partial-eclipse aspect when viewed directly after gazing at the flame, and at night the ordinary gas lights appear red and smoky.

After five or ten minutes continuance of this maximum splendor, the flame is seen to contract somewhat, and presently the ponderous vessel turns a very deliberate summersault, the flame disappears, but the uninitiated spectator is startled



by a new display; for as the converter rolls smoothly over, it disgorges a continuous stream of sparks which its rotation spreads out in a fan-shaped volley, extending from end to end of the building, and reaching the roof, descends in a broad sheet of fiery hail. This is the transformation scene which concludes the first part of the performance; for now the dazzle of the flame and the roar of the blast ceases, and a general lull intervenes.

The trough from the cupola is now swung round to the mouth of the converter, a red glow is seen to creep along it, and starry sparks dance above as it advances. This is the spiegeleisen coming from its cupola by the same path as conducted the main charge. The spectator should now change his position, and, if possible, find a standing place from which he may look into the mouth of the converter. At first he will distinguish nothing but a yellow glare, but by steadily fixing his gaze, he will presently, and rather suddenly, distinguish the surface and limits of the pool of melted metal. He will see that as the spiegeleisen pours into it, a furious ebullition takes place. At the same time a great mass of pale blue flame issues from the mouth of the converter, but with a quiet, leisurely waving, that contrasts curiously with the previous roaring jet of white flame. This flame has but very little intrinsic luminosity, yet at night it lights up all the surrounding objects with a singular brilliancy, a sort of

exaggerated theatrical moonlight effect, which is the most remarkable to a spectator outside, who, on a misty night, sees the long streams of ghostly light pouring through every opening of the building in pallid beams that, under favorable conditions, may be traced for above a quarter of a mile. I have seen them projected in bright disks upon the face of low clouds, and visible through the whole of their intermediate course.

When the flow of spiegeleisen has ceased, the trough is moved aside and a large counterpoised arm bearing the "ladle" is swung round upon a hydraulic piston, which forms at the same time its axis and lifter. The ladle, a large lined iron pot, is adjusted under the mouth of the converter, which is now tilted a little more, till the melted metal is poured out in a thick brilliant white-hot stream, accompanied from time to time with great slabs of cinder of a darker color, which float upon its surface as it pours, and form a thick scum covering the contents of the ladle. When all the fluid metal is poured into the ladle, the converter is tilted over till completely inverted, and the remaining viscous mass of cinder drops out in a glowing heap upon the floor.

During these proceedings a set of workmen have been preparing the molds in which the ingots of steel are to be cast. These molds are of cast iron, nearly cylindrical, being larger at bottom than top, and open at both ends. They have lugs or handles at top by which they are lifted. They stand upon a tile, and are well packed round the bottom with sand to prevent the outflow of the melted steel. While the blow was proceeding these were arranged in an arc of a circle whose radius exactly corresponds with the length of the arm bearing the ladle.

The ladle is now swung round and adjusted till it stands directly over the first of this row of iron vases, and a plug is released, by which a hole in the bottom of the ladle is opened. Through this the steel is poured into the ingot. When the first is filled, the plug is closed, the ladle swung round to the second mold, and so on, till all the steel is thus cast into ingots, the size of which varies with the kind of work for which the steel is required. A thin steel plate is placed on the top of each casting immediately the mold is filled, and over this a bed of sand is placed, and speedily and firmly pressed down.

As soon as the ingots have solidified, and while they are still glowing, the molds are lifted off them by means of a hydraulic crane, and afterwards the ingots are picked up by tongs attached to the same machinery, and are carted away, all red hot, to the hammer shops, where they are thumped and rolled or otherwise tortured into their required forms of rails, tires, and plates.

Japanning on Metal, Wood, and Paper.

Japanning on metal, wood, and paper is executed in much the same manner as similar works in spirit or oil varnishes, except that every coat of color or varnish is dried by placing the object in an oven or chamber called a stove, heated by flues to as high a temperature as can safely be employed without injuring the articles, or causing the varnish to blister or run. For ornamental works, the colors ordinarily employed by artists are used; they are ground in linseed oil or turpentine, and are afterwards brought to a proper consistence for working by mixing them with copal or anime varnish. The latter is generally used, as it dries quicker, and is less expensive than the copal varnish.

For black japanned works, the ground is first prepared with a coating of black, made by mixing drop ivory black to a proper consistence with dark-colored anime varnish, as this gives a blacker surface than would be produced by the japan alone. The object is then dried in the stove, three or four coats of japan are afterwards applied, and the work is dried in the stove between every coat. If the surface is required to be polished, as for the best works, five or six coats of japan are necessary, to give sufficient body to prevent the japan being rubbed through in the polishing.

For brown japanned works, the clear japan alone is used as the ground, or umber is mixed with the japan to give the required tint, and the work is afterwards dried in the oven, in the same manner as black japan.

For colored works no japan is used, but they are painted with the ordinary painters' colors, ground with linseed oil or turpentine, and mixed with anime varnish; and the work is dried in the oven in the same manner as the black japan.

To protect the colors, and give brilliancy and durability to the surface, the work is afterwards varnished with copal or anime varnish, made without driers. Two or three coats of varnish suffice for ordinary works, and five or six for the best works that are polished. Very pale varnish is of course required for light colors.

Ornamental devices are painted on the objects in the usual manner, after the general color of the ground has been laid on. The colors are dried in the stove, and the work is finally varnished and polished just the same as plain colors, but more carefully.

Metal works require no other preparation than cleaning with turpentine, to free them from grease or oil, unless the latter should happen to be linseed oil, in which case the cleaning is generally dispensed with, and the articles are placed in the stove and heated until the oil is baked quite hard.

Wood that is intended to be used for the best japanned work, requires to be thoroughly well dried before it is made up, or otherwise it will be subject to all the evils of shrinking, warping, and splitting, when exposed to the heat of the stove. To avoid these evils, the wood, after having been well seasoned in the usual manner, by exposure to the air, is sawn out nearly to the required forms, and baked for several days in the japanner's stove, the heat of which is gradually increased; and the wood is afterwards worked up into chairs, tables, trays, and similar articles, which are afterwards again exposed to the heat of the stove, and any cracks or other imperfections, that may be thus rendered apparent, are carefully stopped with putty, or white lead, before the japanning is commenced.—*Handbook for the Artisan, Mechanic and Engineer.*

Correspondence.

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

The Destructive Action of Albumen--Its Remedy

MESSRS. EDITORS:—On page 81 of your valuable journal, the question is asked: What is the secret of making black (carbon) ink free from any disintegrating or perishing ingredients? Permit me to answer the question, not only in relation to black carbon ink, but to many other materials that labor under the same or similar difficulties.

The carbon in the black ink is not subject to decomposition, but some of the ingredients added to it are; these ingredients are not free from albuminous matter, hence the decomposition. It certainly is singular that cause and cure should have remained a secret until recently; but the fact has been satisfactorily proved at last, that all crude organic substances contain albuminous matter.

Animal organism takes the albumen ready formed into its nourishment, but vegetable organisms cannot, of itself, assimilate the albumen; out of its constituents, the vegetable albumen is formed in the system of the plant, in which it appears invariably combined with glutin and other substances, as vegetable gluten. (This, by the way, may be the true definition of animal and vegetable organism.)

Albumen is a necessary part in all organism, which cannot form or exist without it or its constituents. But life having ceased, the nitrogenous albuminous parts are the true basis of decomposition under ordinary elementary exposure, by their superior tendency to oxidize and to give support to microscopic organism, whose presence involves the several states of decomposition, termed fermentation, putrefaction, and decay. As the presence of microdermic organism and the albumen required for its nourishment are necessary conditions for elementary decomposition, an easy conclusion leads us to the essential condition of stability; the removal of the albuminous matter, which forms the support of destructive organism.

Albumen is a colorless substance, soluble in water. Animal and vegetable albumen are identical; they differ in the association in which they appear, and in the superior tenacity of the vegetable compound to maintain the association.

An erroneous statement, which we meet in all books on the subject, requires correction, as it leads to the incorrect conclusion that albumen may be removed, from liquids, in a coagulated state by mere heating. Crude animal albumen readily coagulates at about 160° Fah.; the erroneous conclusion is drawn that *all* albumen thus coagulates. Vegetable albumen in the form of gluten requires other conditions than mere heat for a separation preliminary to a coagulation. Simply boiling heat, continued for many hours, only produces a partial removal of the albumen from vegetable juices or extracts; for instance, saccharine or oleaginous juices of any kind, such as beerwort, the saccharine extract from malt. However, other agencies assist the coagulation of the albuminous parts at lower temperatures, even little above 32° Fah.

The very nature of the albuminous compounds, and that they form the basis of all elementary destruction of organic substances, being unrecognized, all operations with these substances remained something like empirical attempts to accomplish a resistance against unknown agencies, and the manufacturing operations improved slowly. A recognition of the all-governing principle in organic matter permits the deduction of the proper mode of treatment.

The agent, by which the albumen can be separated and removed from any crude organic substance, without injury to the other compounds, or by which it can be retained in an innocuous condition, is the air we breathe.

Intelligently applied, it enables us to meet all the difficulties successfully. Rapid passage of air through liquids or over an organic substance produces traces of ozone, that is, oxygen in an excited, highly active condition. (Ozone is produced in large quantity by electric action, by blowing of air through a flame; etc.) Want of ozone in air is destructive to dead organic matter, the slow access or quiescent contact of air favors putrefaction; rapidly-moving (ozonized) air, on the contrary, destroys the organism which causes putrefaction. It seems to act also essentially upon the albuminous matter, separating it from its compounds, and, by coagulating it, to render it innocuous. At a temperature favorable to an alcoholic or curing fermentation, this process is at the same time improved, by invigorating the mycoderms, to whose flourishing condition the fermentation is due. As soon, however, as the albuminous parts are entirely coagulated, the mycodermic action must necessarily cease for want of the required ailment, the soluble albumen.

Every part of a fluid, or of solids immersed in fluids, is uniformly acted upon, by impelling the active gas in a divided state through the fluid, in which a mechanical commotion with the chemical action is produced; or, the air or gases are made to circulate, freely and rapidly, about solid substances whose preservation is intended.

Mycodermic life is suppressed in vegetable matter, at a temperature above about 135°. The albuminous parts may thus be eliminated from vegetable fluids, with exclusion of fermentation, by currents of air through the fluid, heated above 135°; the action is more vigorous at a still higher temperature, and the action, of the atmospheric oxygen or other gases, greatly intensified at a higher than the ordinary atmospheric pressure.

No chemical can prove of universal use for purification; what improves one injures other organic substances, while air, the principal source of all organism, benefits all alike. The practical application, in the manner explained, of the universal principle, is termed, by the Californian discoverer of both, the d'Heureuse's Patent Air Treatment, and the fact that the application is patented cannot detract from the truth of the principle involved. It appears to be of universal applicability in the manufacture of sugars, oils, glue, gums, wine, cider, beer, spirits, and in the preservation of meat, produce, hides, etc. It certainly is simple, effectual, and subject to the control and comprehension of the most ordinary intellect.

The ingredients for black carbon ink are generally crude gums, or other crude organic matters, not free from albuminous parts, and decomposition of the whole compound takes place of necessity. R. D'HEUREUSE.

New York city.

Sirups.

MESSRS. EDITORS:—The explanation of Prof. Chandler, as recently quoted in the SCIENTIFIC AMERICAN, of the formation of sirups from refined sugars, I do not dispute. Such sirups are what they should be. I venture to assert they will not blacken the teeth. But the "golden sirup" made from starch and sulphuric acid is an imitation of these. That iron should necessarily occur in glucose sirup, is not true; but I contend that all I have examined did contain it, which I suppose was caused by the long continued action of the acid, upon the iron vessels in which the sirup is made, forming a solution of sulphate of iron (common copperas). When the manufacturers use other material, the test for iron may prove useless. Troemner's test for glucose can then be used. I don't wish to be understood as condemning glucose sirup. My purpose is only to give, to those who prefer cane sirup, the opportunity of distinguishing it. If the drippings of cane sugar contain iron, the sugar would exhibit like characteristics. I have applied the test for iron to cane sugar and molasses, and found none. The action of boiling cane juice, neutralized as it is by lime, has little effect on the kettles, as tests show. Under the circumstances, I say cane sirup, as now made on plantations in Louisiana, does not contain iron to an appreciable extent, blacken the teeth, or produce a burning sensation in the stomach, and that which does may fairly be supposed something else.

New Orleans. JOHN H. POPE.

Coal-Cutting Machine Wanted.

MESSRS. EDITORS:—The interest you take in improvements induces me to call your attention to the question whether machinery, or mechanical appliances, that will facilitate the mining of coal, thereby rendering operators less dependent on the miner, and relieving the consumer of coal from the high prices and fluctuations in consequence of strikes, cannot be invented. Now is a good time to call attention to a question of this kind, when 100,000 miners are on a strike, for no good cause, paralyzing all branches of manufactures that use coal for fuel.

I am operating in the Block coal field, of Clay county, Indiana. The vein of this coal is from three to five feet thick, and there are seams running through the vein every twelve to twenty-four inches, that make it very easy to mine. No blasting is necessary in this coal. All the miner has to do is to make a bearing-in with his pick, at the bottom of the vein, of from eighteen to thirty-six inches, when the coal is easily split out with wedges, the seams making this easy to do. If a machine were invented that would do this bearing-in, one miner could do the work of four or five. This would not reduce the demand for labor, as the demand for this Block coal is ten times ahead of the supply, as all the railroads that can get it are using it in preference to wood.

The inventor who constructs a machine that will mine this coal can make a good thing out of it, as every operator will want one or more for every room he has opened.

Indianapolis, Ind. J. R. ELDER.

[Patents have been taken for machines for mining coal, but we have not heard of their being introduced.—EDS.

Motive Power for Western Farmers.

MESSRS. EDITORS:—On page 49, current volume, of the SCIENTIFIC AMERICAN, is an article headed "Another Motive Power," which has set me to thinking that the new motor might be used more extensively than you there intimated.

The farmers of the great western plains are sadly in need of a new motive power. Agriculture has taken the first rank among all human pursuits; yet the farmer of the nineteenth century, the age of steam and telegraphy, plods along as his ancestors did, two thousand years ago, relying on the same forces, with this difference only: the modern farmer uses improved machinery.

But all machines require the application of force to make them move; and the only force at the command of the ordinary farmer, animal power, is expensive and inadequate. Put the farmer in possession of such a power as he demands, cheap and efficient, and we shall see as great a revolution in agriculture as has followed the introduction of steam to commerce and manufactures.

If compressed air can be made as efficient a power as steam, I propose that the farmer erect windmills to compress reservoirs of air, from which he could draw supplies to work engines, to draw his plows, cultivators, and reaping machines, to drive his threshing machine and corn sheller, as well as to grind his tools, churn his butter, and wash his clothes.

Windmills are easily and cheaply constructed, and, if it would not require cumbersome or expensive apparatus to compress the air and transmit its power to the various machines, I do not see why it should not almost entirely supersede animal power on the farm.

Wind is a variable power, and some may object to its use on this account; but there are rarely more than two consecutive days in which the wind would not produce the requisite force; and if sufficient power could be stored up to run the machinery of the farm during these days, this objection would wholly disappear. SAMUEL GRAY.

Homer, Ill.

Motive Powers--The Expansion of Gases, versus that of Fluids.

MESSRS. EDITORS:—Heretofore gases have been chiefly employed to utilize the expansive force of heat. Gases are elastic and compressible; fluids are—water, at least, is—nearly incompressible. Gases expand with a force in proportion to the increment of heat; water, with a force equal to its power of resisting compression—*i.e.*, the same increment of heat that would expand a volume of water in the open air, would expand it under any pressure, and doing any amount of work. Apply heat to water, and it will burst the strongest vessel you can put it into. Why will it not move the most heavily loaded piston you can apply it to? It will: but it is objected that the motion is too slow, and not powerful enough to be available. Let us see. Eight thousand and odd feet of inch copper pipe can be coiled in a jacket 6 feet × 6, without having the pipe nearer anywhere than half an inch, and leave a core in the center. Let the pipe be filled with water; the temperature can easily be varied, one half of the number of degrees between the freezing and boiling points, by filling the jacket alternately with steam and cold water. This I know by experience. This gives an expansion of $\frac{1}{4\,6}$ of the bulk at the minimum temperature, or enough to fill a cylinder 3 by 12 inches 20 times; and this operation can be repeated once a minute, or oftener, if necessary. Now, a piston rod of 3 inch steel fitted to this cylinder, without a follower (the pressure exerted only on the outward stroke, against the end of the piston rod) would transmit 150 horse power, while the steam (at saturation) required to fill the jacket once a minute would not be so much as whistles through a 25 horse power engine every revolution. A continuous motion is secured by having two such apparatus, one contracting and furnishing a vacuum to exhaust into, while the other is expanding, and doing the work, and *vice versa*. Now, I repeat, *the same heat that will expand that water in the open air will make it exert one or one thousand horse power, according to the strength of materials.* I have produced over 600 pounds pressure in a small experimental tube 100 feet long, by simply pouring hot water into the jacket.

I have not the means to experiment on a large scale, or to introduce my motor to the publi·; hence this article. I will give any particulars. and show plans and specifications to any one who will furnish means to do so. F. SHAW.

Cordova, Ill.

Improvement in Mowing Machines.

MESSRS. EDITORS:—I have located a grass line for the mowing machine, and have made an improvement in the cutting point, the object of which is to prevent the bla les from choking, a great drawback in harvesters. Choking is caused by the blades entering too far into the grass, or grain, when the cut is made. In very thick or wet grass, or grain, the blades slip over the grass, and draw it into the inside of the guards, which clogs the machine down, and stops the team. The operator is then obliged to pull the grass out with his hands, before starting again. This improvement will apply to all fashions of wheels and gearing. In all machines there are four gear wheels, two spur wheels, and two bevel wheels. Some have too many cogs, and some not enough. My grass line I fix at one fourth of an inch before the blades are full.

The following wheels and gear will cut at or before it reaches this line: Spur wheel, 62 cogs; its pinion, 11 cogs; bevel wheel, 44 cogs; its pinion, 11 cogs; total, 128 cogs.

This arrangement of gear and number of cogs will produce the result of the grass line I have described, and will work anywhere without choking. LABAN PERDEW.

Galion, Ohio.

How to Keep a Churn from Frothing Over.

MESSRS. EDITORS—Happening one day to visit the house of a friend who kept a cow and made butter, I there saw a simple method he used to overcome the great trouble of all butter makers using the old-fashioned upright churn, viz: the overflowing of the cream during the process of churning. His plan was as follows: Take the body of the churn and cut a groove around the inside of the mouth, about three inches from the top and three eighths of an inch deep, and then remove half the thickness of the wood, making a shoulder all around; then take the cover and cut it to fit nicely inside, and you have now done away with all the old nuisances of cloths, tubs, pans, etc., heretofore required to save the cream that flowed over. Any man, almost, can do this, or the churn may be taken to a carpenter and treated for a few cents. Many an idea of less consequence than this, is patented, but all may take this one for what I gave for it.

W. A. MACKENZIE.

Eastport, Me.

A CORRESPONDENT informs us that apples may be kep from decay by covering them with dry ashes, a method easily tried, and if found satisfactory, capable of extensive application.

INTERESTING SCHOOL STATISTICS.

[CHIEFLY FROM MR. KIDDLE'S ANNUAL REPORT.]

There are, in New York city, 271 schools of all classes, attended by 102,608 pupils. The percentage of absentees in the boys grammar schools is 11½, and in the girls, 14, showing that the boys are more regular in attendance than the girls. The pupils of the colored schools are far more irregular, the percentage of absentees being 35.

Allowing 100 cubic feet of space for each pupil in the grammar schools and 80 in the primary, it appears that the school buildings in New York afford accommodations for 99,437 pupils; but owing to changes in population, some of the school buildings are situated in neighborhoods where the attendance is necessarily small, while a few others have 3,000 more than they ought properly to receive.

In the matter of discipline, 88 per cent of the girls' schools and 64 per cent of the boys' are excellent. In reading, 63 per cent of the girls' schools are excellent, and 28 per cent of the boys'. In spelling, the girls are 42 per cent excellent and the boys 27 per cent. In writing, girls 60 per cent, boys, 36 per cent. In arithmetic, girls 30 per cent, boys, 24 per cent. It thus appears that the girl schools are in every way superior to the boys.

The number of teachers in all the schools is 2,683, of whom 363 are males and 2,320 are females.

The appropriation on account of salaries for 1871 is $1,690,000, which affords an average of nearly $630 for each teacher—or $16 a year for each child instructed; but as the total expenditures of the Board of Education are $2,626,000, it will be seen that the cost to educate one child is something over $26 per annum. The average number of pupils per teacher is 38, but in some of the primary schools, we have seen classes numbering nearly 100.

It costs $83,000 per annum to heat the school buildings, and $105,000 to pay the janitors.

Keeping pianofortes in repair is a matter of $2,500, and the Board of Education want for advertising and printing, the snug sum of $36,000.

Two hundred and eighty-seven boys and girls were banished from our schools during the year as incorrigible, out of 100,000 in attendance. This number is large of itself, but is a small percentage of the whole number, and speaks well for the power of "moral suasion," which is all the teachers have to rely upon since the abolition of corporal punishment.

It appears that 21,912 persons attend the evening schools, of whom 3,846 are over 21 years of age; 15,423 are males. 6,023 are females, and 466 colored of both sexes.

The most extraordinary information of all is in relation to the instruction in the natural sciences. Botany is taught without books or plants; Mineralogy without specimens; Physiology without charts, and Natural History with no means whatsoever for illustration. Some of the teachers have extemporized for themselves limited collections, and the pupils, in self-defense, have brought such odds and ends as they have been able to procure at home or on the streets; but that the great city of New York should be so utterly destitute of everything relating to the study of the natural sciences is an unspeakable disgrace, as inexcusable as it is disgraceful, and we trust that the recommendation of the Superintendent of Public Schools, on this important subject will be carefully heeded by the Board of Education, and that the evil complained of will be fully remedied before another year.

The Honey Trade.

This article, which, twenty-five years ago, formed quite an insignificant article of trade in this country, is rapidly increasing year after year in domestic production; whilst the amount imported is growing smaller.

In 1860 the total product of honey of the United States reported, was 23,366,357 pounds. New York stood at the head of the list, with 2,369,751 pounds, followed in order by North Carolina, 2,055,969 pounds; Kentucky, 1,768,692 pounds; Missouri, 1,585,983 pounds; Tennessee, 1,519,390 pounds; Ohio, 1,459,601 pounds; Virginia, 1,431,591 pounds; Pennsylvania, 1,402,128 pounds; Illinois, 1,346,803 pounds, and Indiana, 1,224,489 pounds; all other States falling below 1,000,000 pounds. In the winter of 1868–69, the Department of Agriculture sent out circulars, to known apiarians in most of the States, and received returns from 489 counties in 32 States. The aggregate number of hives reported was 722,385. Estimating for counties not reporting, and making due allowance for the fact that many of the counties reporting were giving special attention to bee culture, 2,000,000 of hives were deemed as low a figure as the returns would warrant. Allowing fifteen pounds of surplus honey to the hive (about two-thirds of the average reported), the total product in 1868 would be 30,000,000 pounds, which, at an average valuation of 22½ cents per pound, would give $6,750,000. When we consider that the cost of production is merely nominal, it will be seen that it pays to keep bees.

Men of Progress.

O. E. Garrison, civil engineer, St. Cloud, Minn., writes: "It is with pleasure that I acknowledge the receipt of the splendid steel engraving, "Men of Progress." I desire to say that in my judgment the men there portrayed have done more real good to the world than all the warriors, conquerors, generals, and kings, ancient or modern, history has given an account of."

M. S. Sharpe, Pendleton, S. C. writes: "The papers and engraving came to hand all right. The engraving far surpassed my utmost expectations, and Mr. A. J. Sitton, to whom the credit for getting up a club is due, expresses himself highly pleased."

History of Railroad Cars.

Of the cars constructed between the years 1826 and 1850, we may first notice those made in 1830, and placed upon the Liverpool & Manchester (England) Railway. These cars had four wheels, but no springs, the bodies consisting of sills, to which the journal boxes were bolted and upon which the floors were laid. From the sills, stakes or posts arose, to which pieces of wood were attached, some longitudinally and some vertically; and these cars were formed without roofs, they being similar to those now used, and termed "rack-cars." In 1831, in October, one Mr. Joseph Knight proposed to employ springs under all cars, to support the body of the car and contents thereof. Mr. Knight also suggested an improvement in car wheels which entitles him to be ranked as among those who have excited our wonder, and who, by the exercise of his genius, has, more than most others, contributed to the successful operation of railroad cars. The improvement suggested at this time was that the treads of car wheels should be made conical, for the purpose of facilitating their passage around the curves of the road. How important this suggestion was all now fully realize, and it is not regarded as saying too much that up to this time no more important improvement, which has referred to railroad cars, has been made in this or any other country.

In 1869, cars for the transportation of passengers in England and Scotland consisted of three classes, the first class being well finished and provided with seats for the passengers to sit upon, which seats were furnished with cushions. The second class were of plain finish, without cushions or ornaments. The third class were little more than plain boxes set upon wheels and supplied with seats, but in many cases had no roof. In addition to these three classes, there were what were termed "mixed carriages," which were designated by names, and consisted of three compartments, the center one being for first-class passengers, and the two end ones for second-class passengers.

The next novelty which will be mentioned in the way of passenger cars was introduced in the year 1847, by a Mr. Hanson, of England, and consisted of a compartment car, the body of which was iron, and constructed as follows: In each of the partitions there was placed a hoop of iron, which was bound together by two cross stays, one of which connected the roof to the floor. To this frame-work a sheet or sheets of iron were riveted, a sheet of felt being placed between the heads of the rivets and the sheets of metal. These cars had only one seat in each compartment, it being so arranged that the faces of the occupants could always be in the direction in which the car was moving. At the bottom of the car there were arranged boards for resting the feet upon, which consisted of an upper and under piece, with a space between the two into which to thrust the feet, the inner surfaces being covered with sheepskin with the wool on it, the object being to provide for keeping the feet of the passenger warm during the time of his occupying the seat. At about the hight of the faces of the passengers there was placed a headboard or cushion, formed of sponge, and covered with leather or cloth, so that in the event of any sudden shock upon the cars, the head of the occupant would be brought in contact with the cushion, and thus, to some extent, be saved from injury.

A freight car, introduced at the same time and by the same inventor, was of the same general construction, except that its interior was arranged for the reception of freight, and a portion of its roof was made to slide upon rods over or under the fixed portion, the object being to provide for the reception and discharge of the goods through the roof of the car.

In the same year, 1847, a very decided novelty in the shape of a car wheel made its appearance in England, which consisted of a wrought iron wheel, which was made in sections, a portion of the hub and rim comprising each section, and parts being joined together by means of tongues and grooves formed thereon as the sections were made, and each being provided with a projection upon the outer segmental surfaces to enter a groove formed in the entire surface of the tire. The hole in the hub of the wheel for the reception of the axle was bored larger than the axle, so as to leave room for the insertion of an expanding ring, the insertion of which was to fit the axle, while its exterior was conical in form, so that, as it was forced inward, the segments would be forced outward, and thus tightened within the tire, the cone being held in place by a ring, which was cast in two parts, and placed in a groove turned in the axle.

At about the time of the last-named date, in contracting for the passenger cars to be run upon the road leading from Strasbourg to Basle, in France, it was stipulated that the roofs, partitions, and seats were to be made of American pine, three fourths of an inch in thickness, and that the roofs were to be covered with three pieces of leather, weighing at least thirty-eight pounds each.—*National Car Builder.*

EXCAVATION AND EMBANKMENT TABLES—ADDENDUM.—In connection with the article under this heading, on page 103, the following should have been included:

"The foregoing is on the basis of the slopes being 1½ horizontal to 1 vertical, and the constant number to be added must be increased or diminished, as the slope is flatter or steeper, at the rate of 27 for every half foot increase or decrease in the horizontal designation of the slope."

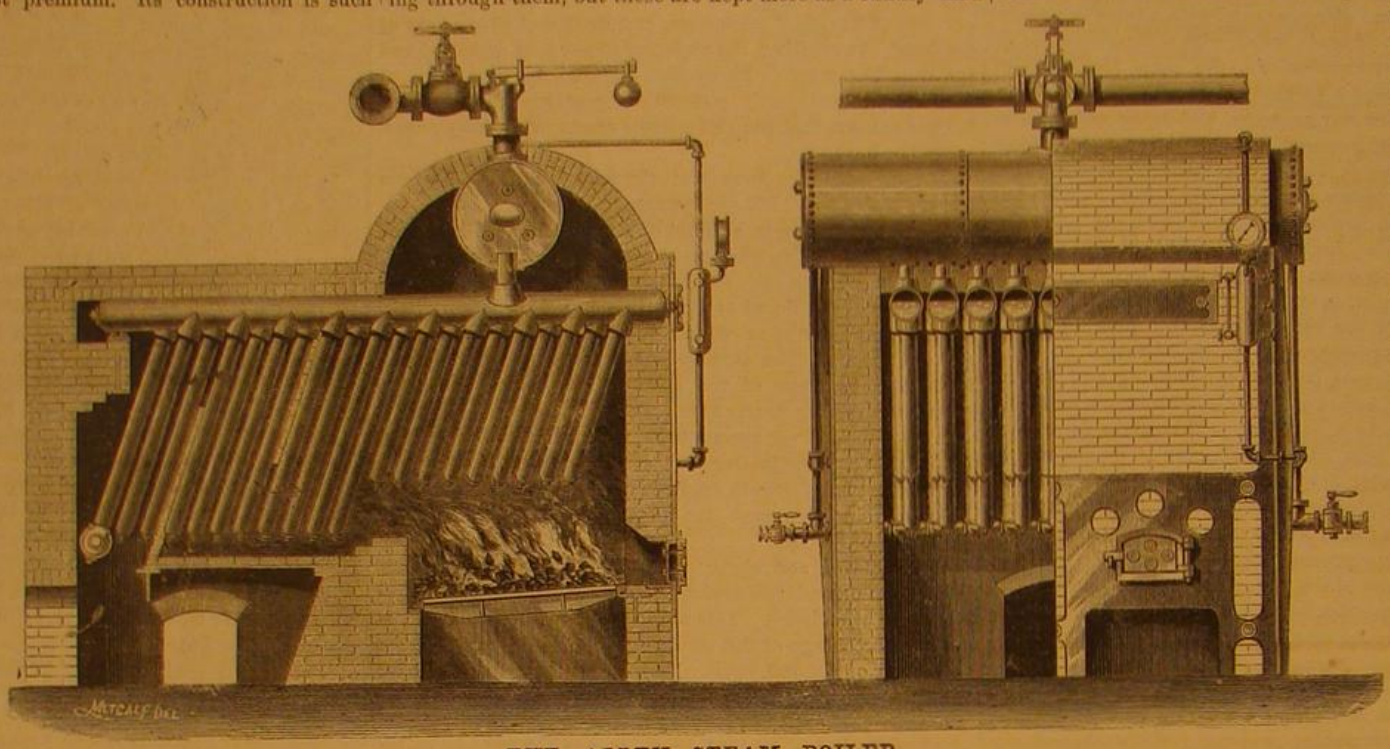
EVERY time a shot is fired from Krupp's 1,000 pounder, it costs the Prussian government 800 thalers ($600), and the monster of a gun itself has cost more than would keep an infantry regiment for a whole year.

OBJECTS seventy-two feet long can be distinctly seen on the surface of the moon by the great telescope of the Earl of Rosse.

Improved Sectional Tubular Steam Boiler.

Our engravings represent the Allen steam boiler, which many of our readers will recollect seeing at the late Fair of the American Institute, where it furnished steam to the Allen engine, an illustrated description of which appears on page 374, last volume of this journal. Two views are given, the first of which is a longitudinal section, and the second a half-cross section and half-front elevation. The boiler gave, on test at the Fair referred to, an evaporative capacity of ten pounds of water per pound of coal, under working pressure of from 60 to 80 pounds. When this economy of fuel is considered, in connection with the admitted safety of sectional boilers as a class, it will be acknowledged that the managers of the Institute acted wisely in engaging the same boiler to furnish steam for the exhibition of 1871.

The boiler was first exhibited at the Fair referred to, and was awarded the first premium. Its construction is such as obviates all strain due to unequal expansion, and a very large heating surface is obtained.



THE ALLEN STEAM BOILER.

Perfect circulation is claimed to be obtained by inclining the tubes as shown in the longitudinal section. These tubes descend obliquely from larger tubes, in which the water line is shown in the half-cross section, and which in turn communicate with an ample steam dome, where the steam is super-heated, so that under ordinary circumstances, if any water be mechanically carried along by the steam to the dome, it is immediately converted into steam, and dry steam only can issue from the boiler. Provision is, however, made for preventing accumulation of water in the steam dome, through carelessness in carrying water too high, etc., by pipes leading from the ends of the steam dome down to the feed pipe.

The cold water descends along the under sides of the inclined tubes, and the steam rises along the upper sides.

Both the outside and inside of every part of this boiler is perfectly accessible for cleaning, hand holes being formed at the lower ends of the inclined tubes, and at the front ends of the horizontal tubes. The gases have but a short distance to traverse, and ample space in passing between and around the tubes, so that a good draft is easily maintained.

The feed water is admitted at the lower end of the rear series of inclined tubes, and, coming first in contact with the cooler portions of the heated gases, passes along, as it becomes hotter, to the front tubes where the flame is the hottest. This construction enables the heat in the cooler portions of the gases to be utilized to the fullest extent.

The boiler can evidently compete in cost of construction with other sectional boilers, in market, and we have no doubt it will also be able to compete in economy.

The demand for safe boilers is daily increasing. Numerous disasters from explosions have caused people to consider whether an economy which renders steam boilers unsafe unless kept constantly under the supervision of careful experts, is not after all dearly purchased. To such as have decided this question in favor of safety, this boiler offers all they can desire on that score, while, at the same time, its evaporative power is quite equal to most of the boilers in market, whether sectional or otherwise.

For further information, address The Allen Engine Works, 4th avenue and 130th street, New York city.

Telegraphic Possibilities.

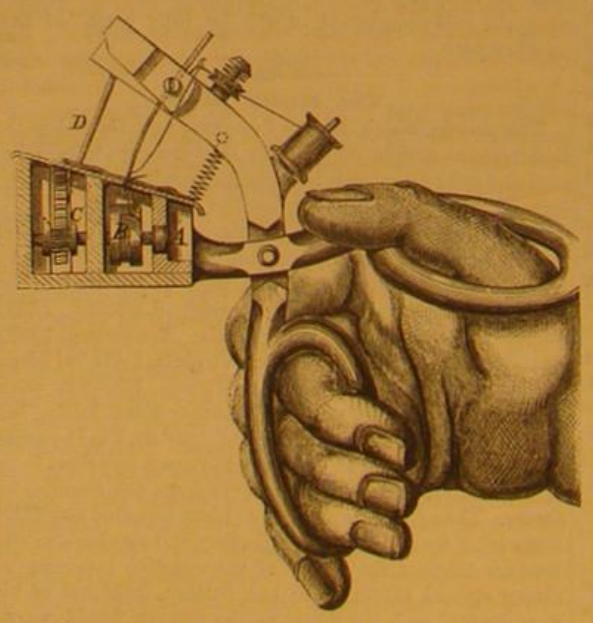
On the completion of the Russian-American telegraph line, a telegram from Alaska for New York, leaving Sitka, say at 6·40 on Monday morning, would be received at Nikolaief, Siberia, at six minutes past one on Tuesday morning; at St. Petersburg, Russia, at three minutes past six on Monday evening; at London, twenty-two minutes past four on Monday afternoon; and at New York, at forty-six minutes past six on Monday forenoon. Thus, allowing twenty minutes for each re-transmission, a message may start on the morning of one day, to be received and transmitted the next day, again received and transmitted on the afternoon of the day it starts, and finally reach its destination on the forenoon of the first day—the whole taking place in one hour.

Cheese Making.

It is absolutely necessary that means should exist in all dairies for preserving an equal temperature throughout the year; the cold of winter being hardly less injurious than the heat of summer. Care should also be taken to secure a plentiful supply of pure water, effective drainage, by which the water may be carried rapidly away, thorough ventilation, and facilities for the exercise of the most fastidious cleanliness. The building should, if possible, be built on the side of a gentle declivity facing the west, and sheltered from the north and east winds. In order to maintain an equal temperature, the walls should be of a considerable thickness, and built with a hollow space in them, through which a current of air may pass; the roof should also be of brick, of a curved or pavillion form, and the walls and roof may be plastered. The floor should be sunk about three feet under ground, made to slope to a drain (with bell trap) in the center, and paved with tiles or polished stone. On three sides of the dairy small arches should be turned about three feet high, carrying a shelf of slate or marble three feet wide, to hold the pans containing milk, and a little above this shelf, ventilating bricks should be placed with shutters sliding over them to open or shut, according to the weather. Several landed proprietors in Shropshire and Cheshire (England) have recently erected expensive and highly ornamental dairies on their estates, fitted up with massive marble tables and milk coolers, and with a constant stream of water passing through them, but these are kept more as a luxury than an object of profit, and they seldom unite all the conveniences essential to a good dairy, because the architects who plan them are seldom or never practical farmers.

HAND SEWING MACHINE.

A hand sewing machine, worked by the hand like shears, is, to say the least, a unique device. Our engraving shows such an implement. It is a lock-stitch machine. A is the bobbin; and B the hook or shuttle worked by the rack and pinion, C. The rack reciprocates in guides, and is impelled by the pitman, D. In use, the cloth is supported at one end by a sewing-bird or similar device, the other end being held tight



by the left hand. The machine is then grasped by the right hand, and worked along the seam, making one stitch for each reciprocating movement of the parts. This machine is the invention of B. W. Collier, of Oxford, Miss., who obtained a patent upon it in 1867.

The Uses of Salt.

The extent and importance of the uses of salt can scarcely be better described than in the words of Dr. Bolley, which we translate from his work, entitled "Das Kochsalz:" "We awake in the morning; the linen which we put on betrays by its whiteness that it has been bleached by the chlorine derived from salt; the shoes with which we cover our feet required salt in the hands of the tanner; in the soap that we use for the toilet, we seize a transformed piece of salt; the glass, which we bring to the mouth, hides the chief ingredient of salt; from the crude ore by means of salt, was produced the bright, white metal of the teaspoon, which is so highly esteemed by the world; the teakettle is soldered with borax which holds soda produced from salt; the milk before us contains salt; the butter has been preserved by salt perhaps for months; the bread betrays to the palate that the dough has been mixed with salt. We grasp the paper; it required the application of chlorine from salt in order to please us by its whiteness. The clean spectacles through which we see are partly composed of what once was salt. A visit is announced; a patient wishes to consult us: he enters, and, seeking scientific aid, we reflect upon the remedies at our command, and commence to write. Out of ten medicines we find that five of them owe their origin, either by their composition or the mode of their preparation, to salt. Who is able to forget for one moment this ever-present Proteus that appears in a thousand forms?"

Patent Cultivators.

Commissioner Capron, in his last report, remarks that little or no change has taken place in the manner of constructing cultivators. It is a matter of surprise, that out of the one hundred and fifty inventions patented, there should be scarcely one that for characteristic individuality merits especial mention. Inventors of this class of implements seem to be pretty well satisfied with the general construction already established, viz: a rectangular frame mounted on two wheels, and provided with a tongue and driver's seat, having swinging longitudinal beams, to which are rigidly attached standards bearing shovels or teeth, and they content themselves with improving the details. For this reason, most of the claims granted on cultivators (and patents on these machines generally embrace a long string of claims) are what are technically known as "combination claims," *i. e.*, claims on which the patentee disclaims the invention of the individual devices enumerated, but asserts that he is the first one to have brought them all together in the manner specified.

It is difficult to decide whether or not the tendency has been toward greater simplicity in cultivators. Some inventors seem to have aimed at that result and to have hit the mark, while others appear to have overlooked the idea, altogether. This remark is intended only with reference to a comparison of a few recent years, for certainly, when compared with similar inventions of twenty years ago, the complexity is all on the side of the more modern productions. Indeed, this is a safe general expression with regard to inventions of every character. The tendency of inventions at the present day is twofold, viz: to make each machine as nearly automatic as possible, and to combine in one structure the devices necessary for several purposes. These necessarily make machinery more cumbrous. It is not an exceptional thing to see combined with a cultivator, apparatus designed for several different purposes; as a breaking plow, a corn marker, a seed planter, a stock chopper, or a harrow.

In cultivators, considerable attention has been devoted to obtaining a ready and efficient expansibility and contraction of the beams, so as to admit of the adaptation of the same to the width of the rows cultivated. Successful attempts have been made to improve the shape of the teeth, that their cutting edges may act more efficiently, and to improve their adjustability, so as to throw the soil more or less to the right or left, all one way or the other, when in gangs, and to adjust their positions where more than one is used. Considerable intelligent labor has also been bestowed on constructing the teeth, so as to admit of their ready removal when worn out, or when, from any cause, it is desirable to detach them.

Several cultivators have been patented, especially devised for the culture of cotton and sugar, and which will be likely in view of the past want in those directions, to prove valuable, and consequently to go into general use.

As in the case of plows, the tendency is decidedly in favor of wheel cultivators.

METEOROLOGY IN IOWA.—The extreme dryness of last summer produced some very unusual phenomena in many parts of the United States, of which the meteorological appearances in Iowa may be specially mentioned. A correspondent, J. C. W., of Toronto, Iowa, describes the following; On March 16th, "a rare sight of sunbows;" September 24th, a magnificent aurora borealis; October 14th, "a fog sight," followed by another aurora; January 20th, a large meteor; and on February 5th, a snow storm, in which flakes of snow as large as snow birds fell in countless numbers.

TRUTH will ever be unpalatable to those who are determined not to relinquish error, but can never give offense to the honest and well meaning; for the plain-dealing remonstrances of a friend differ as widely from the rancor of an enemy, as the friendly probe of a physician from the dagger of an assassin.

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 & Goteh, 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. XXIV., NO. 9 . . . [NEW SERIES.] *Twenty-sixth Year.*

NEW YORK, SATURDAY, FEBRUARY 25, 1871.

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THE HUDSON RIVER RAILROAD DISASTER.

To be just and candid under strong excitement is hardly to be expected of the public at large. On the occurrence of such a horrible disaster as the New Hamburgh tragedy, it is to be anticipated that charges of blame willl be made indiscriminately, and without that careful weighing of both sides of the question, by which only can a correct judgment be formed.

Weighing both sides as carefully as we can, however, and desiring, if possible, to see in this accident one of those purely fortuitous events against which no human provision or foresight avails, we are reluctantly forced to conclude that there was neglect of duty on the oil train, and a want of provision against accidents at the drawbridge, which is clearly chargeable to the company, and for which it ought to be held responsible.

Whether, in this particular case, if the brakemen had been at their several posts on the oil train, and a proper signal cord had been attached to the bell of the locomotive, the breakage of the axle would have been discovered, and the engineer notified in time to have stopped the train before it entered the bridge, is a question upon which opposite opinions have been expressed at the inquest. Our opinion is, that had these regulations been strictly observed, there would have been no accident. If our opinion is sound on this point, the employés were either to blame in disobeying orders, or blameless in neglecting habitually what the lax discipline of the road had virtually countermanded. If the latter, then to the company must be transferred whatever blame would otherwise rest upon the persons in charge of the oil train.

Looking candidly at the evidence taken at the inquest, our opinion is, that there was not that laxity of discipline in regard to the regulations referred to, as would warrant the employés in regarding the regulations as virtually set aside, and therefore they must take their share of the blame.

On the part of the company, there is undeniably responsibility for neglect at the bridge. The signal man, working under orders that required his presence a quarter of a mile or thereabouts from the signal light, was thus prevented from changing the signal in time for the express train to stop. Had he been at the bridge, and changed the light from white to red, with even ordinary celerity, we have not the slightest doubt that so faithful and vigilant a man as Simmons, the unfortunate engineer of the express train, would have instantly seen it, and stopped his train before it reached the disabled oil train.

Now, while we think the men on the oil train were blamable for neglecting their duty, even on a night when the inclemency of the weather rendered the temptation to cuddle together in the caboose a strong one, what shall we say of the company which habitually requires a signal man to leave his signal to go a quarter of a mile away, in order to do double service, thus making the supervision of a point of danger only partial and fitful. Whether from parsimony, or want of judgment and foresight, there is for this neglect no even tolerable excuse.

The public has a right to demand foresight from railroad officials, and a proper expenditure for guards and watchmen to render traveling reasonably safe. The public pays for this, and if it be not given, the public is defrauded. Such frauds are, however, not to be classed with such as merely affect our pockets, or our personal comfort. They endanger and destroy valuable lives, scatter mourning and desolation over the land, and shock the moral sense of the entire civilized world. Therefore, we say, let the Hudson River Railroad Company be taught that an accident of this kind is something that even a soulless corporation can be made to feel, and that the public is firmly resolved it shall answer for to the fullest extent.

We are not prepared to say that the company is blamable for any known defect in the rolling stock. If that of the freight trains be kept in as good order as that of the passenger trains, which on this road have always been considered first-class, there is nothing to be said on this point. But if, on the contrary, the rude character of the freight trains had induced the company to supply them with inferior axles, or if the particular car in question had knowingly been permitted to run over the road while in an unsafe condition, then the responsibility for the consequences of such neglect, however unexpected, lies at the door of the corporation. No charge that the broken axle was known to be of inferior quality has yet been made, and hence we are willing to believe the company innocent in this respect.

The accident, however, teaches the important lesson that inferior stock in freight cars *may* result in the destruction of passenger trains. Axles will break, no matter what care be used, but inferior axles will break more frequently than good ones; and if the best stock in a freight car may give out, and so endanger passenger trains, poor stock will certainly increase the risk.

With regard to the carrying of petroleum oils over roads used for the transportation of passengers, it has been urged that it never ought to be permitted. We cannot see, however, in what way this can be well avoided. The demand for these oils is universal, and consumers must be supplied in some way. Special railways cannot be constructed for their transport, except in exceptional cases, and, if their carriage be confined to water conveyance, vessels collide as well as railway trains, and fire on water is even a worse disaster than fire on land.

It is folly, also, to attempt by legislation (a bill has already been introduced into the New York legislature for this purpose) to compel companies to use iron-hooped casks, instead of the tanks now used, for the carriage of oils. The more packages are multiplied the greater, in our opinion, is the risk. Had the train which broke at the New Hamburgh station been freighted with small casks, the probability is that the horrors which attended the disaster would have been hightened by a series of explosions, which would have prevented any immediate approach to the fated train by those anxious to aid the sufferers.

TOUGHENING AND REFINING GOLD.

Mr. Francis Bowyer Miller, brother of the late Professor William Allen Miller, of London, is now in this country, engaged in setting up his apparatus in the Philadelphia mint, for the purpose of toughening and refining gold on a large scale. Mr. Miller is now melter and refiner of the mints at Sydney and Victoria, Australia, and has had, in his official capacity, abundant opportunity to test the accuracy and economy of his invention. The process devised by Mr. Miller consists in passing a stream of chlorine gas through the melted gold, covered with a layer of borax. In a few hours the whole of the silver present is converted into chloride, which floats on the gold. The borax prevents the loss of silver by absorption or volatilization. As soon as the gold has become solid, the still liquid chloride of silver is poured off, and the gold is now found to have a fineness of 993 parts in 1,000. The loss of gold is less than in the ordinary processes. It is necessary very carefully to dry and heat the molds, into which the chloride of silver is poured, as the slightest moisture causes the latter to be violently dispersed, while red hot, to the great risk of the bystanders. To avoid the risk of splitting the pots by the wedging of the ingots at their contracted bottoms, the gold for refining is cast in molds of a peculiar form, yielding slipper-shaped ingots, two of which, placed face to face, fit conveniently into the pot. The chlorine is conveyed to the bottom of the melted gold, through clay pipes, which are well heated before immersion, and the gas can be heard bubbling up through the fused metal quietly, and without projecting globules from the pot.

Mr. Miller's method has been adopted at the London mint for toughening gold previous to coining; and upwards of 200,000 ounces of gold have been refined by it in Australia.

By the erection of a a new reverberatory furnace for silver refining, and by the adoption of Mr. Miller's process, it is believed that a very considerable reduction in the rates for refining bullion can be attained in this country, while the quality of the precious metals will be greatly improved.

ELECTRO-METALLURGY.

Many of our readers are of course conversant with this subject, but to those who are not, we offer these few remarks, on a most interesting and useful art. It is the art of copying any surface upon which any cut or raised figure exists, or of covering or plating any smooth or other article, by depositing on it, copper in the metallic form by galvanic agency. Let one of our readers attempt this beautiful art, and he will find no difficulty in producing a fac simile of his coin or other article upon the first trial. Suppose, for instance, a copy of the face of a coin or medal is desired. Let him proceed thus:

Dissolve in a quart of cold water as much common blue vitriol (sulphate of copper) as the water will take up, and let it stand until it clears; then pour off the clear solution, and add about one fourth more water, as the solution is better when not quite saturated; pour the diluted solution into a vessel of earthenware or glass, with a wide mouth, and suspend in it a piece of copper plate two or three inches square, turned over the top of the jar to hold it up—the copper plate should be nearly all immersed. Then suspend, opposite to the plate, and parallel with it, the coin to be copied, by a piece of wire, having previously covered that portion of the coin not requiring to be copied with wax, which will prevent copper being deposited, the wax being a non-conductor. Let an electric current, from any species of battery, be now passed through a wire connected with the copper plate, which is the positive pole, to the negative pole, the coin, and thence to the battery, completing the circuit. The vitriol in solution is thus decomposed, the electro-positive element or the copper going to the coin, and forming a uniform and solid coating upon it, while the sulphuric acid set free attacks the copper plate, and renews in the solution the sulphate which is decomposed by the current.

This action may be continued, until a thick coating forms on the surface of the coin, the deposition of which will be fast or slow, according to the strength of the battery.

To prevent the copper adhering to the face of the coin, moisten the latter with sweet oil, and rub it with silk, till it appears dry.

To coat objects which are non-conductors, a fine powder of graphite or black lead may be laid thinly over the surface with a brush. Even glass or porcelain may be covered, by first etching the surface to make it rough. This, of course, will give an inverted copy of the coin, so that to get a copy "right side up" an exact impression must be taken in wax, plaster of Paris, or gutta percha, and the metal precipitated on the cast.

Brass can be deposited when the solution is composed of 1 part sulphate of copper in 4 parts of hot water, 8 parts sulphate of zinc in 16 parts of hot water, 18 parts cyanide of potassium in 36 parts of hot water. These are mixed, and 250 parts of water added. Instead of a copper plate, one of brass is necessary; the solution is required to be kept nearly boiling, and a powerful battery to be used.

To the lover of natural history, the electrotype offers two processes of great beauty and value. By a simple adaptation of the principles above detailed, the most accurate copies may be made of any vegetable or animal substance that will remain undecomposed in the solution for a few hours. Thus the most delicate hairs, and tendrils of plants, and the smallest insects may be coated with metal and preserved.

The second process, called "nature printing," is generally used for impressions of plants. The plant is pressed with great force upon a plate of lead, to make a delicate impression. Then, by means of electrical action, these lead plates have copper deposited on them heavy enough to print from. Some of the finest plates in the best botanical works, are prepared in this manner.

Printing and engraving are much indebted to its agency. A hard copper plating is thrown down on the face of common type, increasing its durability, and entire stereotype plates are made by taking the cast of the type in gutta percha, or plaster of Paris, and depositing a thick plate of copper upon the reverse mold. Elaborately engraved plates are also by this means reproduced. Usually copper plates after passing through the press about one thousand times, become worn, so as to give indistinct impressions, and by electro-metallurgy these plates can be multiplied indefinitely. Other metals and alloys can be precipitated, of which process we will speak another time.

THE LARGEST GUN IN THE WORLD.

The latest born offspring of the art of destruction is a thirty-five tun gun, just completed at the Royal Arsenal, in England. This monstrous creation was made upon the coil principle, with two strips of wrought iron, which, before they were wrapped round the core, were about 150 feet in length. On its way to the practice ground, it crushed its own carriage and the tramway upon which it was traveling, but it was coaxed into moving again, and the sponsors of the interesting infant fired it with half a proof charge, and its own shot weighing 700 lbs., and measuring a foot in diameter and two and a half feet in length. With this load, the monster recoiled nearly nine feet up an inclined trail of seven degrees, but was otherwise unaffected. When it has cut its teeth with larger charges, it is to burn, as a regular dose, 120 lbs. of pebble powder, the shot being the 700-pounder mentioned, with brass studs to fit the rifling of the bore. In firing it, a wire was attached to the vent, the bell was rung, and all present hastened under cover. In one of the proof houses a gunner in a canvas suit stood before a magnetic battery, and at the word "fire," touched a stud, when there was a loud report, and the gun was seen smoking prodigiously. It will be tested with a charge of 150 lbs. powder, the regular service charge being 120 lbs.

It is the largest piece of ordnance in the world, not excepting those ancient Titans—the Beejapore gun, called the "King of the Plain," the huge stone-ball cannon of the Dardanelles, and "Mons. Meg." If an invading enemy will only be kind enough to come near enough to this triumph of belligerent art, we think there might be a chance of slaughter on both sides. But what a telescope might have been made for the money, and what different sort of "victories" might have been obtained with that sort of weapon! The reflection is, we know, ridiculous: "Guns, drums, and wounds" absorb the world.

DESIGN PATENTS.—Many letters reach us, complaining of the dilatory conduct of the Patent Office, in disposing of applications for design and trade-mark patents. Cannot Acting Commissioner Duncan do something to hurry up this branch?

A REMARKABLE GEOLOGICAL DISCOVERY.

Mr. Charles M. Wheatley, for many years a member of the Lyceum of Natural History of New York, and known to be an excellent naturalist and geologist, informs us that he has found a "bone cave" a few miles from Phœnixville, not far from the famous Wheatley mines, from which such choice specimens of lead ore were obtained a few years ago. This is one of the most important geological discoveries thus far made on our continent. It is the fi st genuine bone cave of America, and will help to solve some of the questions of ancient animal life of the Western continent. The floor of the cave is covered with remains of animals that are supposed to belong to the post-tertiary epoch. Professor E. D. Cope, of Philadelphia, is working up the animals, Mr. Horn will describe the insects, and it is hoped that Professor Newbery, of Columbia College, will study the plants.

So far, the investigations have disclosed 22 vertebrates, 5 insects, and 10 or more plants. Among the animals are the following: A large sloth, with gigantic claws, called by Jefferson the *Megalonyx*; a mastodon, with a tusk 11 feet long; a bear, fully as large as the grizzly bear, but entirely distinct in character from all the existing species of North America and the northern regions of the old world, as well as from the cave bear; a tapir, a horse, a wolf, and other skeletons not yet described.

We do not understand that any human remains, or any implements fashioned by human hands, have thus far been found. Many geologists are of the opinion that the mastodon, gigantic elephant, the great sloth, and many other of the extinct animals, have lived since the time of man, and the discovery of human bones in such a cave would confirm the theory.

Further developments will be looked forward to with great interest by the scientific world.

THE PECUNIARY PROSPECTS OF THE EAST RIVER BRIDGE.

The present winter has been unusually cold at this point, and both the North and East rivers have been filled with floating ice barriers, seriously interfering with the traffic between New York and the neighboring cities on Long Island and in New Jersey. The ferry companies have sustained much loss from damage to their boats, and people residing in the cities alluded to, and doing business in New York, have been obliged to submit to much detention.

These untoward events have given rise to much discussion, more particularly in the Brooklyn papers, as to the desirability of the early completion of the East River Bridge, which is evidently looked forward to as the great solution of the problem of quick transit between the two cities.

This bridge will, of course, if successfully completed, form an avenue by which travel may pass, unimpeded by fogs or ice, and free from the present inconveniences of ferry travel, but in our opinion it can never supersede the ferries as a means of transit, except on the occasions when ice or fog renders ferry passage unusually dangerous.

It is folly to suppose a single means of communication can absorb the whole travel between New York and Brooklyn, or a tenth part of it. The termini of this bridge can be reached, by a large portion of the residents of the two cities, only through an expenditure of as much time as would suffice to reach their homes by the routes they now take. Under ordinary circumstances, few will go, from a ferry that in fifteen or fewer minutes will place them across the river, a distance of a mile, or even a half a mile, to walk or ride across a bridge one mile in length.

In the ordinary routine of business, the travel will follow the shortest routes, and if a slight additional risk be unavoidable, it will take the risk, rather than make the sacrifice of time.

The traffic of the bridge will, in fine weather, be confined to small areas in the immediate vicinity of its termini; and that this, in connection with increased travel in bad weather, will make it a paying investment, we cannot believe.

In the provision of channels of communication for large and populous towns, not one large avenue, but many smaller ones, best meet the needs of the population.

INTELLIGENT LEGISLATION ABOUT MEDICAL PRESCRIPTIONS.

A bill has been presented at Albany which reads very much like a hoax, and we should hesitate to allude to it if it were not pretty well authenticated.. There are three points in it. First, it is proposed to appoint a commission of five physicians to examine the prescription clerks of druggists, to see if they are competent to be licensed for their professions. As an offset to this, it might be well to have a commission of druggists to examine the physicians to see if they know how to write prescriptions. Second, Latin prescriptions are to be prohibited, in consequence of frequent blunders committed by druggists' clerks, not to say by ignorant doctors. Third, as the prescriptions will hereafter be in English, the patient will be able to ascertain what medicines the doctor recommends, and, in case of a second attack, can send to the apothecary to have the same remedies put up, and thus avoid the necessity of paying a second fee to the physician. To prevent this shrewd economy on the part of the patient, it is proposed to prohibit the druggist from putting up a prescription a second time, unless by order of the doctor, and thus to compel the invalid to send for the doctor, or to have recourse to quack medicines, the sale of which it is not proposed to restrict. It is difficult to conceive who could have concocted such a bill as this, so full of conceit on the part of physicians, so unjust to druggists, and so revolutionary in the whole history and practice of medicine.

If we could enact by law that the physician should know his profession before obtaining his degree, and the druggist his business before procuring a licence, it would be a good thing; but how to frame such a law, and how to enforce it, is not so easy a matter. And, to cap the climax, it is proposed to empower the mayor, who is supposed to be well read in phy ic, to appoint the examining board of five physicians, and thus to make our apothecaries' shops a part of the great political machine. As there are many drug stores in the city, and an army of clerks, each one of whom would have "to see" the five political doctors before obtaining a licence, it would be a good thing for the doctors, but we are not so convinced that the public would be any better served than they are under the present system.

Better leave the Pharmaceutical College to take care of the druggists, the Medical College to look after the doctors, and the mayor to attend to the business properly appertaining to his office.

HOW THE ICE BRIDGE IS FORMED IN THE EAST RIVER.

Within the week past, many thousands of persons have crossed the East river, between New York and Brooklyn, walking on the ice. It is popularly supposed that the preliminary to this feat must have been the freezing over of the river; and on every occasion of the kind, we are entertained with marvelous stories of the hair-breadth escapes of the venturesome pedestrians. A friend who resides in full view of the river, and who has for years observed the formation of these ice bridges, was one of the many crossers on Monday last. From him we derive the following explanation of the phenomenon:

The ice bridges of the East river are dependent entirely upon two simple conditions. The first of these is the existence of large fields of heavy floating ice *in the North river*, and the second is the prevalence of a westerly wind at the time the tide-stream ceases flowing toward the ocean, and commences to flow up the rivers—technically, at the last of the ebb and the first of the flood. Ice is very rarely formed in either of the river channels about New York, and may be said never to be formed with any sustaining power. Drift ice may be frozen together, and thus form in masses, but the currents are too active, and navigation too incessant, day and night, to permit anything like the freezing process usual in less disturbed localities.

To understand the formation of the ice bridges in the East river, we must premise that the width of the river at its mouth, opposite the Battery—described by the position of Hamilton Ferry—is twice as great as its width at the point near Catherine Ferry, where the bridge is being constructed; the latter point forming, as it were, the neck of a funnel. It is also needful to know that the tide-stream begins its upward flow in the East river, half an hour, and sometimes a full hour, before the same flow occurs in the North river. Let us imagine ourselves as floating in the North river, upon one of those immense fields or ice, which, by various means, become detached from the main body at a considerable distance northward from the city. We have been floating down toward the ocean for some five hours. We arrive at the lower point of New York Island after the tide-stream has commenced the upward flow in the East river. A westerly wind prevails. The downward stream on which we float is ceasing, because the ocean tide is already coming in to check it, and because of the large expanse of water in New York Bay. The wind drifts us, little by little, along the easterly shore of the bay. Presently the North river tide-stream is turned, and runs back up the river. But the East river stream has now attained a considerable velocity, and is "sucking" in from the North river whatever comes within its reach. The westerly wind facilitates this, by driving our ice field within its clutches, and then our journey up the East river is begun. A few moments suffices to bring us to the "neck of the funnel." One side of our ice field strikes the Brooklyn shore, and it is thus held, while the other swings forward until it strikes on the New York shore. If the ice be sufficiently firm and compact, it thus becomes a wedge, which the flowing tide but makes the stronger and more secure. Thus none but compact ice is strong enough to resist the tide, and that which does resist it is abundantly secure, not only for pedestrians, but even for horses, sleighs, and cars, if the use of them were practicable.

Only when the tide changes, and the stream returns toward the ocean, is the bridge broken. Then risks are run in endeavors to get off from the the moving ice. But the risks and dangers do not arise from the insecurity of the ice itself. All around the edges of the great field are small, detached pieces. Many persons, when they find themselves being floated off by the new tide-stream, become alarmed, and seek to reach the shore by hastily jumping upon these detached pieces, or by trying even to walk upon the water itself, and their temerity is punished in the usual way. Safety is only a question of time and endurance to those who have courage enough to remain and float until a landing may be effected directly, or by means of a boat.

RAIN STATISTICS.—Water is so universally present in the air that the influence of the moon upon the rain-fall, as on the sea, in the tides, may be watched with interest. Mr. Glaisher asserts, after much long and patient investigation, that the ninth day of the moon is the most rainy of the whole twenty-eight, and that in the first and last weeks of the moon's age, the rain-fall is less than the average. The records kept by Mr. Glaisher also indicate four o'clock in the afternoon as the rainiest hour in the day.

PROGRESS OF FOREIGN INVENTION.

It is interesting to watch the progress of invention abroad, and see how the inventive minds of both hemispheres move in parallel grooves. Our late exchanges bring accounts of several inventions recently patented in England, which have also been recently patented in the United States. Doubtless some of the English applicants have pirated American inventions which they knew were valuable in England, the door having been left open by neglect on the part of the original inventor, to secure his invention by foreign patents.

ORNAMENTING PAPER.

Mr. H. Airy, of Greenwich, England, has patented a process which consists in ornamenting paper, woven fabrics, and other surfaces, first, by the swinging of a compound pendulum, whereby a great variety of separate figures is drawn in ink of any kind, or in pencil, on paper of any kind, or on wood, or by a pointed instrument, on steel or copper plate coated with protecting matter for etching, whereby, also, these figures are traced by a pointed instrument on the surface of a copper cylinder coated with protecting matter; second, by a machine which closely imitates the natural figures drawn by the pendulum, and also executes a great variety of kindred figures, all coming under the definition given above. The machine is made to trace or engrave these figures on the surface of a copper cylinder, such as is used by cotton printers and others, or on the surface of a copper, or other soft metal plate.

INSTRUMENT FOR MEASURING ANGLES.

This is also an English invention. A reservoir of any suitable shape and material is formed, with an opening in its upper side or top, or elsewhere, and with this reservoir, at or near its upper and lower parts, are connected the two ends of a bent glass tube. The tube is raised at an angle or horizontally. The reservoir is partly filled with fluid, and the opening hermetically closed so as to prevent any escape of the liquid employed. One or each of the legs of the tube is marked with a scale or indicator representing degrees, minutes, and divisions of minutes, and when needed, another scale is placed in close proximity to the legs of the tube, and so constructed as to represent at once the distances corresponding to the angles of depression or elevation for given hights, indicated by the position at which the fluid subsides. The reservoir and tube are fitted in a frame or case, to preserve them from injury. Over the reservoir a shield of wood or other material is fixed by screws or otherwise, and when necessary, some non-conducting substance is inserted between the shield and reservoir, to prevent any effects from changes of temperature upon the fluid and reservoir. The top surface of the frame of the instrument will, as a rule, be made perfectly straight, and when so made for moderate distances, such as those visible to the naked eye, the line of sight could be taken along with it; but where long distances have to be brought within view, and great accuracy is required, a telescope is placed on the upper edge of the instrument and adjusted at an angle or otherwise to the horizon. The instrument, whether to be used *with or* without a telescope, is accurately graduated by a theodolite.

APPARATUS FOR EVAPORATING LIQUIDS IN SUGAR REFINING, ETC.

This is a French invention, in which the process of evaporation or boiling is commenced: either at the atmospheric pressure, with a decrease of one tenth, or one twentieth, or less (according to the number of boilers employed), in each succeeding boiler; or the process may be commenced at a pressure above that of the atmosphere and terminated at a pressure equal to the atmosphere, or, if desired, considerably below it, in which latter case, the two systems of evaporating above and below atmospheric pressure will be combined in one series of from twenty to forty boilers. The tubular steam space of the first boiler communicates by a pipe and suitable stopcocks, either with the exhaust pipe of an engine or direct with the boiler or steam generator. From the top of No. 1 evaporating boiler of the series, a pipe conducts the steam arising from the liquid under evaporation into the tubular steam space of No. 2 boiler, which discharges its steam arising from the evaporating liquid, through another pipe into the tubular steam space of No. 3 boiler, and so on throughout the series, the pressure in each decreasing by about from one tenth to one twentieth of the original pressure; for example, if the pressure in No. 1 boiler be that of the atmosphere, that of No. 2 will be (say) one tenth less, that of No. 3, two tenths less, that of No. 4, three tenths less, and so on. The liquid to be evaporated is introduced by a pump and stopcock into No. 1 boiler, and flows through connecting pipes and stopcocks into the others of the series, after which the connections are stopped, and the steam is let into No. 1 boiler, when the process commences; the steam or vapor arising from the last or nearly the last of the series, may be conveyed to a condenser. The requisite amount of vacuum is maintained in each boiler by one or more air pumps and stopcocks, and the contents of each boiler may be discharged through cocks or valves at the bottom thereof.

MACHINE FOR CUTTING TOBACCO, ETC.

This is an English invention, in which timber, tobacco, and various substances are cut, not by a saw, nor by a knife pressing merely against the substances, but by a knife or knife edge made very sharp, and moved in the manner of a saw, so as, in fact, to constitute a saw (whether band, circular, or any other), but formed without teeth; and a stationary sharpener, consisting either of a piece of bone, steel, or other suitable material, or of a succession of those pieces being applied to the edge of the moving knife, so as to make the knife edge rub against such sharpener set at a proper angle with the edge, whereby the edge is constantly sharpened in the same way in which any knife is sharpened on a hone,

only that in this case the motion is continuous. The inventor employs these circular, band, or reciprocating knives in substitution of saws, to cut timber and other substances; and the cutting is effected with the production of a smooth surface, and without waste; and he also uses such knives or knife edges, moving not merely like a chopper against the substance to be cut endways, but like a saw, to cut tobacco and all kinds of fibrous or other similar substances requiring to be cut cleanly and without jagging.

HYDRO ELECTRIC CABLE.

This is the invention of F. Tomasi, of Paris, France. The cable is composed of one or several pipes of copper or other convenient material, equal in number to that of the despatches it may be desired to transmit simultaneously. Each pipe leads respectively and separately at one end into a little cylinder provided with a piston, and at the other end into a bent glass tube which contains some mercury. A platinum wire, isolated everywhere except at its extremity, which is always immersed in the mercury contained in the tube, is in communication with a terminus or screw nut. Another wire, also of platinum, which can be immersed more or less deeply into the mercury in the glass tube at will, is connected to another similar terminus, and a third wire, also of platinum, isolated everywhere except at its end, is in contact with a third terminus. The last wire is immersed in the glass tube, so that its uncovered end can only come in contact with the mercury at its upper level. The second mentioned terminus is put in contact with the receiving apparatus, and the latter with the pile, which in its turn is connected with the first mentioned terminus.

LUBRICATING OILS.

A Scotch inventor combines caoutchouc with mineral lubricating oils. In preparing the improved mineral lubricating oils, the oil obtained from the destructive distillation of shale at a low red heat, and refined by redistillation and treatment with acids and alkalies, is employed; and it is so far freed from paraffin as to be liquid at, say, 30° to 40° Fah., then refined to the extent which produces an oil of a permanent light yellow color, practically free from pungent odor. In this mineral oil about one per cent of caoutchouc, preferably in the form of sheet india-rubber, is dissolved, and the solution is effected by first allowing the caoutchouc to remain immersed in the oil for a few hours, the oil being, during that time, maintained at a temperature of about 100° Fah.; and, second, by violently agitating the caoutchouc and oil together for about twenty-four hours by means of a mechanically driven dasher or agitator. However, heat alone, or mechanical agitation alone may be used for effecting the solution of the caoutchouc in the oil; a more perfect solution is obtained by employing the methods together. After the solution or combination of the caoutchouc with the oil has been effected, the prepared oil is allowed to settle until it has become clear.

THE PRESENT AND THE PAST.

NUMBER V.

The incredulous reader, who has lived a lifetime by the banks of some swift running and powerful stream, on reading our last contribution, says at once: "Our stream has not sunk its bed, within our recollection, at the utmost more than a few inches, if that; it has not altered its channel more than a few yards; and what it has removed from one place it seems to have redeposited in another; and yet you would have us believe, that these rivers of the West have eaten into the bowels of the earth six thousand feet; have given rise to a series of elevated plains, traversed by endless water-courses; and have carried away rocks not to be estimated by tuns, but thousands upon thousands of cubic miles! It is too incredible; just think for a moment of the time required in such an operation; millions of years will scarce meet the demand! Can you not explain all this by the aid of fractures and dislocations of the strata and by the more energetic and rapid action of the breakers of the sea, while the land was gradually emerging from the ocean?"

No! good reader, we cannot relieve you; the facts of the case forbid a doubt, for Nature, in this instance, has recorded her own method of procedure in unmistakable characters. In the first place, the idea of these water courses being on the line of fissures or dislocations is utterly untenable. The rocks on either side of them are undisturbed, and the very sinuous course of these numberless streams forbids of their being on the line of faults. But the evidence against any action of the sea is, if possible, even still stronger.

Everywhere throughout this region Nature has left monuments to record the progress of her destroying hand. Here and there, harder portions of the rocks eroded have resisted the action of the atmosphere, and stand in fantastic shapes, resembling, as Dr. Newbery remarks, "the forms of churches, castles, gates, and monuments of various kinds." In one locality, a number of such monuments give the idea of a vast cemetery of gigantic tombstones. Had it been the violent action of breakers that had eaten away this land, these monuments had not been left. Do you doubt this statement? Then let us descend with our guide, into the gloomy depths of the cañons, and hear what Dr. Newbery says of these monuments in the early stages of their formation: "Near the mouth of the Diamond River, by the intersections of the numerous cañons which cut the plateau, portions of it have been left in a series of pinnacles and pyramids, frequently standing entirely isolated, forming some of the most striking and remarkable objects seen on our expedition. Many of these buttes exhibit a singular resemblance to the spires and pyramids, which form the architectural ornaments of the cities of civilized nations, except that the scale of magnitude of all these imitative forms is such as to render the grandest monuments of human art insignificant in comparison with them. Oh, man! what becomes of your old churches and castles, your colosseums, and triumphal arches, your ruined cities of the desert, your pyramids, and of the Cyclopean masonry of your lost races, by the side of these, the ruins of an ancient continent?"

But pardon me, reader; you ask, why could not these buttes that our guide describes, have been carved out by the action of breakers? Simply because in the depths of these cañons, even if the sea ever had had access to them, no breaker action could be possible. Visit the fjords of Norway, smaller cañons actually partially submerged, and see the land-locked waters lying these, but harmlessly ruffled by the wildest gale, and you will realize that neither Scandinavian fjords nor Colorado cañons were ever formed by breaker action. And if the buttes below, now forming, do not owe their shapes to any such cause, may we not reasonably infer that the same statement applies to the buttes on the plateau above, long since weathered out, and more completely isolated by longer exposure to atmospheric influences?

But yet another proof. The extensive plateau, marked, in the section we gave in our last, as "the Sage Plains," has been eroded in thick strata of cretaceous shales. These shales represent muddy portions of the Cretaceous sea, which were thickly tenanted by a peculiarly formed characteristic oyster, known to geologists under the name of *gryphæa*. Like other oyster-shells, these are massive and heavy; and Dr. Newbery tells us that, on the Sage plains, these shells occur, strewn over the ground in such numbers that thousands of large ships might be filled with them; these have undoubtedly all fallen from the hundreds of feet of shale that have been removed, the heavy shells resting on the surface, while the lighter particles of earthy matter have been swept away. Now, had breaker action destroyed these beds, these shells would have been ground and reground, and their fragments would have been scattered far and wide; and they thus, in their present disposition, indubitably attest the more gentle nature of the agent that has accomplished this great work of eating away these 1,600 feet of shales.

It is worth our while to cast another glance at the total amount of this erosion. Invert the section we gave in our last, and the empty space between the dotted line and the line describing the present surface will represent the mass of material that has been removed, as a section of a mountain range; a range 6,000 feet in hight, and varying in width from 1 to 180 miles, and with a length of several hundred miles Nor, in reality, does this do full justice to the case; for, to give at all an approximate idea of all this denudation, we ought to have drawn the dotted line from peak to peak, and then continued it over the valleys east and west of the Rocky Mountains and the Wasatch range, but we feared to confuse the reader. And all this work has been accomplished since the close of the cretaceous epoch!

Whither has all this material, thus removed, gone? To form the more recent strata around the Gulf of California, and to furnish material for new strips of land, to be sooner or later upheaved and added to the western edge of our continent; and this appropriately, brings us to the consideration in our next, of the mode in which such materials are re-arranged into new strata.

But we would draw attention to one more question, to which Dr. Newbery gives prominence, and which is well worth remembering, when some tell you that, in our oldest rocks, we see the commencement of geological history.

The materials eroded, as herein described, vast as they are, are as nothing to the vast total of deposits of which they once formed a part. In the Colorado region, we have sections of upwards of 6,000 feet of strata, from some of the oldest, as the silurian, up to the last of the secondary; and these deposits extend between the Colorado and the Mississippi, in a belt 1,200 miles in width, and of "great, though yet unmeasured, extension north and south."

It would have required, according to our guide, all of an island 200 miles in diameter, and at least 6,000 feet high; or, what is more probable, a continent of six times that area, and 1,000 feet high, "to furnish all the sediment that forms the stratified rocks of only that portion of this great central plateau that immediately borders the Colorado."

Where, then, was the continent whose ruin furnished the materials for the whole of the great belt? Do you tell me that fragments of it remain in the north, in Canada, and the Adirondack Mountains? Granted! but these themselves are sediments, altered, it is true, by the vicissitudes of their vast history; and whence came they? Dr. Newbery infers the existence "of broad and rapid rivers, which flowed from the mountains and through the fertile valleys of a primeval Atlantis," bearing down the sediments of our Paleozoic rocks; but what shall we call that utterly lost land, whose destruction must have accompanied the formation of the very oldest ruins, the foundations of this same Atlantis that attest the age of the world? Verily, geology might be termed "man's nescience of creation," wherein he best learns how little he can know.

Paper Wheels.

The Pullman Car Company is running a car, on the Chicago and North-western road, with what are called "paper wheels." The wheels have steel tires and cast-iron hubs, and the paper is introduced in the way of filling under the tires, for the purpose of deadening sound and diminishing the force of concussion. According to the *National Car Builder* the wheels have been running since July last under this particular car, and had been in use some four months previously.

The paper device is said to be superior to wood for the purpose designed, being stronger and lighter, and free from knots, grain, or sap. It does not expand or contract, but remains in the condition in which it is put in the wheels without liability of change. It is cheaper than wood, and can be molded into any form by pressure, and is made fire and waterproof by asbestos. It is, as a substitute for wood, adapted to a variety of uses, especially in the way of ornamentation.

SCIENTIFIC INTELLIGENCE.

A NEW PREPARATION OF THE SULPHOCYANIDE OF AMMONIUM.

A Dutch chemist, Van Zouteveen, has made the important discovery that by passing dry ammoniacal gas through the bisulphide of carbon, a brick-red precipitate forms, which upon solution in water and boiling down to half its original volume, yields sulphocyanide of ammonium. The reaction is a valuable one, as it points out a possible way of making the sulphocyanides in an economical manner. Our readers will recall the uses of this class of salts in testing for iron also in photography, and more recently in the artificial production of cold.

RECOVERY OF IODINE FROM RESIDUES.

When bromine and chlorine are present with the iodine in residues, it is difficult to separate them and to recover the latter; and various methods have been resorted to for the purpose. Beilstein recommends the following: The solution containing the iodine is rendered acid by sulphuric acid; and nitrous acid gas, made from one part starch and six parts crude nitric acid, is passed through it, and the iodine thus precipitated is separated by means of a Bunsen filter. It is then thoroughly washed by cold water, and dried over sulphuric acid. If bromine be in the filtrate, warm the liquid to expel any iodine that may have been dissolved in it, and distil with black oxide of manganese and sulphuric acid. If chlorine be present, it will go off with the bromine. It is said that a considerable portion of the nitrous acid can be reclaimed, after it has served its purpose.

A NEW OPIUM MEDICINE.

We mentioned, some time ago, the discovery of a powerful emetic called apomorphine; we now have to record the preparation of a somewhat analagous base, to which it is proposed to give the name of *apocodein*. When chloride of codein is heated for 15 minutes to 338°—348° Fah., with an excess of a concentrated solution of chloride of zinc, water is eliminated, and apocodein is formed. It cannot be obtained in a crystalline form, but in other respects closely resembles apomorphine, and is more permanent and more easily made than the morphine compound. It is likely to prove a valuable emetic.

NARROW ESCAPE FROM SUFFOCATION BY CHLORINE.

The steamship *England*, which cleared from Queenstown on January 12th, with 200 passengers on board, was obliged to put back to harbor in consequence of the breaking, during a heavy storm, of a number of barrels of bleaching powder in the hold. The heavy sea washed into the ship, and thus liberated the chlorine gas in such quantities as to nearly suffocate all on board. Attempts were made to remove the powder, but it was soon found to be impossible for any one to live in the hold long enough to put on the grappling hooks, and the captain decided to put back to port as fast as he could sail. There are few gases so suffocating as chlorine, and in case of accident to a large quantity of the bleaching powder, the lives of all on board ship would be greatly imperiled. We have frequently observed the fumes of chlorine, while passing through some of the lower business streets of the city, and have been surprised at the endurance of persons employed in certain localities. There is too much carelessness in handling an article that is capable of so much mischief.

RECENT DECISIONS AT THE PATENT OFFICE.

The Examiners-in-Chief at the Patent Office make the following report to the Acting Commissioner of Patents, in relation to the application for an extension of a patent to John Worsley, granted December 23, 1856, on the use of corn husks in manufacturing rolls for calenders, washing machines, etc.

"The invention at most was but the substitution of one known material for another, or others. It is admitted that cotton, paper, wood, rags, or cloth, etc., had formerly been used for precisely the same purpose, and probably a list might be made out, of a hundred other materials, embracing grasses, leaves, mosses, barks, etc., etc., which would be the full equivalents of husks for the purpose named. It is true that when one discovers some quality in a particular material, peculiarly adapting it to some important use not thought of before, whereby art is improved, and the public benefited, he should be rewarded with the monopoly of its use for a proper time. But this class of discovery is generally among the least meritorious.

"Artisans and manufacturers should not be improperly trammeled, but left as far as possible, consistent with the clear rights of inventors, free in the choice of material wherewith to ply their trades and carry on their occupations. To allow patents for each supposed step of improvement, where it consisted in the mere use of skill and good judgment in the selection of material, would embarrass rather than promote manufactures and arts.

"But in the case before us, the Hon. Commissioner of Patents, Judge Mason, for whose opinion we have great respect, decided the matter to be patentable; but added, as a sort of solace to his own conscience, 'If it be a valueless invention, a patent can harm no one; if it be valuable, it is patentable.' The applicant has had an opportunity of testing its value by going with it before the public for fourteen years, and though he swears that he has used extraordinary diligence in introducing it, yet a less number of his 'superior and cheaper' rolls were demanded in the last than in the second and fourth years of his patent.

"He states that he has made a profit of $3,975 in manufacturing his rolls, from which he deducts $3,500 as about the amount expended in 'traveling expenses, advertising, circulars, and incidental expenses in introducing the invention.'

"This is too indefinite to be admitted as a set-off, and we must conclude that he has been sufficiently rewarded for having discovered that husks are suitable for the purposes claimed.

"The claim that the invention is of any value to the public is only supported by two general affidavits of persons using the rolls, and think them superior to any in use, though what knowledge they possess in regard to other rolls does not appear.

"There is no proper detailed statement, or any other proper showing of the value of the patent, and we think the extension should be refused.

"R. L. B. CLARKE, }
"S. H. HODGES } Examiners-in-Chief.
"J. M. THACHER, }

DECISION.

The reasons assigned by the examiners-in-chief for the adverse report upon the merits of the present application are deemed good, and the extension is accordingly refused.

DUNCAN, Acting Commissioner.

The Acting Commissioner makes the following report, in relation to an application for the extension of letters patent, of John B. Read, for an improved projectile for ordnance, granted October 28, 1856.

The invention to which this application relates is an expanding wrought iron sabot for elongated shot and shell. Various modes are suggested by which the hollow cylinder constituting the sabot may be attached to the projectile, but the preferred mode is by imbedding it more or less in the cast

metal of which the latter is composed. The cylinder is made thin toward its free end, so that when the charge, which is partially enveloped by it, is fired, the cylinder will be expanded and forced tightly against the walls and into the rifled grooves of the gun.

From the examiner's report it appears that lead, molded into a similar form, and similarly attached, had previously been proposed for an expanding sabot upon heavy projectiles.

It is beyond question, however, that Read produced largely superior results by the substitution of the wrought iron; and his experiments doubtless had much to do with demonstrating the feasibility of using the hard metals for the expanding sabots of rifle projectiles, and thus insuring the success of rifled ordnance of large caliber. His net receipts in excess of cash expenditures are about ten thousand dollars; but in stating this no allowance is made for nearly three years time devoted to the conducting of experiments at a point distant from his place of residence, and for the consequent serious interruption of his professional practices.

In view of the importance of the invention the inference is justified that the petitioner has not been reasonably remunerated. This evidently is the judgment of the Committee on Military Affairs and the Militia in the Senate of the United States, by whom, at the last session of Congress, a report was made upon a memorial of Dr. Read, asking for compensation for his invention, in which report they recommend an appropriation of seventeen thousand dollars "as remuneration for the use of his (Read's) improvements, and as indemnity for his actual expenses in perfecting them, as well as for the time and attention devoted to them."

Congress, as endowed with the supreme legislative function of the land, has an undoubted right to vote any specified sum by way of compensation to an inventor, and, if it so choose, to take action in the premises without regard to the diligence which the inventor may have displayed in his efforts to introduce his improvements. But Congress has delegated no such power to the Commissioner of Patents. This officer is only authorized to extend a patent when he is satisfied, among other things, that the failure to receive reasonable remuneration has been without neglect or fault on the part of the inventor. I do not think the facts in the present case warrant this inference. The inventor, to be sure, displayed unusual diligence during the first four years of the patent, up to the time of the breaking out of the late civil war. But during the progress of the war, at the very time when he should have been at work aiding the Government in the further experiments necessary to the full demonstration of the merits of the invention, and when his services in this direction would, from the very nature of things, have received from the Government immediate recognition, and, it is reasonable to believe, a measure of compensation fully equal to what, under any circumstances, he could be entitled to receive: at this important juncture, this harvest time for inventors in this branch of improvements, Read withdraws from all connection with the Government, under whose auspices his previous experiments had been conducted, and casts in his lot with the pretended government of the rebellion. The very patent which he offers for extension bears upon it the certificate and seal of the so-called Confederate States government, affixed thereto in August, 1861; which shows that Read deemed it of more importance to prevent a forfeiture of his patent under rebel laws than to introduce his invention under the protection of the laws of that government which alone it was his duty as well as his interest to aid and obey. There can be but little doubt that if he had remained true to his country instead of espousing the cause of the rebellion, he would have been enabled, by reason of his established relations with the Government and the widespread introduction of his invention effected by the war, to derive, from the original term of the patent an adequate remuneration for all the time, ingenuity, and expense bestowed upon the invention and its introduction into use.

For his great mistake in this regard he has no one to blame but himself. The presumption is that he intelligently resolved to forego the superior opportunities which he must have known a course of loyalty would insure him, and with equal deliberation accepted the uncertainties in which his erratic course involved him. He cannot be permitted now to plead that this action involved no fault on his part, and that in thus deserting his country in her hour of peril he was guilty of no neglect of the rights secured to him by his patent.

I am constrained to hold that his failure to receive the remuneration to which he deems himself entitled under his patent, has arisen mainly from his own fault and neglect, and I am therefore powerless to afford him the relief which he now asks. The extension must be refused.

DUNCAN, Acting Commissioner.

Answers to Correspondents.

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

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

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

H. & R., of Ontario.—The amount of air to be admitted, through perforated pipe at back of the bridge wall, across a boiler furnace, to effect perfect combustion, will vary according to circumstances. Provision should be made for maximum admission, and regulating the same down to a point where just enough air is admitted to consume the smoke and no more. Every pound of air admitted beyond this point will result in loss of heat. Therefore we advise you to err on the safe side, if you err at all, by making the admission free, and the perforations in the pipe numerous and of good size. We cannot even approximate to proportions, as you give no data, but you need not fear to go ahead with the work, if you do not stint the capacity for the admission of air. With a good damper you can control it perfectly, and get good results.

A. J. H. & Co., of Mass.—We have never seen any iron so badly scaled or incrusted with oxide, that it could not be cleaned with a solution of one part sulphuric acid in ten parts water. Paradoxical as it may seem, strong sulphuric acid will not attack iron with anything like the energy of a solution of the same. On withdrawing the pieces from the weak solution of acid, they should be dipped in a bath of hot lime water, and held there till they become so heated that they will dry immediately when taken out. Then if they are rubbed with dry bran or sawdust, there will be an almost chemically clean surface left, to which zinc will adhere readily. We think you have been using too strong acid.

T. G., of N. Y.—The brown powder collecting on the zinc of your Daniell's battery, is a oxide of copper deposit. This deposit and the copper deposit on the surface of the cup cannot be wholly avoided, but, according to Pope, it may be greatly lessened, by suspending the zinc so that it will not touch the porous cup below the surface of the liquid, and by saturating the bottom of the porous cup to the hight of half an inch with paraffin. For answers to your other queries, we refer you to standard treatises on electricity. We cannot give space to them here.

M. L. W., of N.—If a pipe containing water have its lower end open beneath the surface of mercury, upon opening the upper end of the pipe, the water will fall in the pipe and bubble up to the surface of the mercury, until the column in the pipe just balances the pressure of the mercury, when the flow will cease. The specific gravity of mercury at 60° Fah., is 13·56, water being 1. We cannot give you its price per pound.

F. X. L., of Md.—There are many flexible transparent substances beside isinglass (mica). Thin plates of gelatin, or horn, films of collodion, tracing paper such as is used by artists, are articles which we think might some of them answer your purpose.

RESTORING THE COLOR OF GOLD AFTER SOLDERING.—Let R. R. boil the gold, after soldering, in diluted oil of vitriol; rinse in clean water, polish with tripoli mixed in oil (sweet oil is best), wash and gloss with crocus on a clean cloth.—C. J. C., of Iowa.

BORING OUT SEGMENT OF CYLINDRICAL RING.—Having published a practical method for performing the above work, we take this means of notifying correspondents that their communications upon this subject are no longer of value. We cannot undertake to reply to this effect to each personally. We have on hand a number of designs, few of which are practical, and none of which we shall use. We are much obliged to all for their attention, and shall be glad to hear from them on any other practical subject within the scope of the SCIENTIFIC AMERICAN.

TO FASTEN CHAMOIS AND OTHER LEATHER TO IRON AND STEEL.—Dr. Carl W. Heinischen, of Dresden, gives the following recipe for the above purpose: "Spread over the metal a thin, hot solution of good glue; soak your leather with a warm solution of gallnuts before placing on the metal, and leave to dry under an even pressure. If fastened in this manner it is impossible to separate the leather from the metal without tearing it.—G. E. M., of Texas.

R., of Va.—You will find information in regard to windmills in Craik's "Practical Millwright and Miller," published by Henry Carey Baird, Philadelphia, Pa.

J. H. W., of Cal.—The density of proof spirits is not materially affected by pressure, and the hydrometer would show the same results on the mountain as in the valley.

Business and Personal.

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

"Edson's Recording Steam Gage and Alarm," 91 Liberty st., N.Y. Recommended by U. S. Inspectors as protection to good engineers, the charts showing quality of work performed.

$3.—The Celebrated Craig Microscope and two mounted Entomological objects sent prepaid for $3. Magnifies 100 diameters, or 10,000 times. If not as represented money refunded. Over 60,000 sold during the past five years. Theo. Tusch, 37 Park Row, New York.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4 00 a year. Advertisements 17c. a line.

Wanted.—A good, second-hand, small Engine Lathe, *complete*. Address, with description and price, Box 1166, Galesburg, Ill.

Manufacturers of Brick Machines please send Circulars to O. S. Lee, Lexington, Miss.

For Sale.—Stereopticon, 150 Views, all complete. A. Dougherty, 75 Dykeman st., South Brooklyn, L. I., N. Y.

For Sale.—The Combined Tool illustrated in Scientific American, Jan'y 28, 1871. Wilkinson & Boyle, Plattsburgh, N.Y.

For Sale.—A valuable Water Power, Mills, etc. Peach Orchard in Delaware. I. J. W. Adams, Salisbury, Md.

Wanted, by a first-class Machinist, some article to manufacture. D. E. Cain, Hingham, Mass.

Wanted.—The address of every reader of the SCIENTIFIC AMERICAN, to whom will be sent FREE a specimen number of that first-class Family Magazine, THE PHRENOLOGICAL JOURNAL. Address S. R. Wells, 389 Broadway, N.Y.

Band Saws for Re-sawing, with Patent Elastic Wrought-Iron Wheels, 4 to 10 ft. in diameter, made by Richards, Kelley & Co., Philadelphia.

Marietta Grindstones. J. E. Mitchell, Philadelphia, Pa.

American Wickersly Grindstones. J.E.Mitchell, Philadelphia.

Drain Pipe and Brick Molding Machinery wanted. Address Wm. S. Tilton, Augusta, Me.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W.D.Andrews & Bro, 414 Water st., N.Y.

First-class Gage Cocks, at E. H. Ashcroft's, 55 Sudbury st., Boston, for $10.80 per dozen.

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McCauley's Improved Force Pump, especially adapted to deep wells. Send for Circular. R. A. McCauley, Baltimore, Md.

2d hand Worthington, Woodward and Novelty Pumps, Engines 25 to 100 H. P., 60 Horse Loc. Boiler. W. D. Andrews & Bro., 414 Water st., N.Y.

Wanted.—A Partner, with capital, in a newly invented Gun. Address A. H. Townsend, Georgetown, Colorado.

Agents wanted, to sell the Star Bevel. It supersedes the old style. Send for Circular. Hallett & White, West Meriden, Conn.

Japanese Paper-ware Spittoons, Wash Basins, Bowls, Pails, Milk Pans, Slop Jars, Commode Pails, Trays. Perfectly water-proof. Will not break or rust. Send for circulars. Jennings Brothers, 332 Pearl st., N.Y.

House Planning.—Geo. J. Colby, Waterbury, Vt., offers information of value to all in planning a House. Send him your address.

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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Patent Elliptic-geared Punches and Shears.—The greatest economy of power, space, and labor. Can be seen in operation at our factory, in Trenton, N. J. Address American Saw Co., 1 Ferry st., New York.

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Peck's Patent Drop Press. For circulars address the sole manufacturers, Milo, Peck & Co., New Haven, Ct.

English and American Cotton Machinery and Yarns, Beam Warps and Machine Tools. Thos. Pray, Jr., 57 Weybosset st., Providence, R.I.

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Taft's Portable Hot Air, Vapor and Shower Bathing Apparatus. Address Portable Bath Co., Sag Harbor, N.Y. (Send for Circular.)

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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Belting that is Belting.—Always send for the Best Philadelphia Oak-Tanned, to C. W. Arny, Manufacturer, 301 Cherry st., Phil'a.

To Ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's Manufacturing News of the United States. Terms $4 00 a year

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.—SILVER GILT MOLDINGS.—I wish a recipe for making silver gilt moldings to imitate gold.—N. B.

2.—CORE OVEN.—What is the best plan upon which to construct a core oven, to dry and bake cores, for all kinds of core work where bituminous coal is used? I find cores very expensive, and would like the most economical plan of doing this kind of work.—W. M. J.

3.—SILVER SOLDER.—How can I make an easy flowing silver solder, suitable for joining saw blades and other thin plate?—C. P.

4.—CRYSTALLING GLASS FRONTS.—How can I produce a crystalline surface on glass for shop fronts, church windows, etc., that will withstand the action of frost?—G. H. W.

5.—LETTERING STEEL PLATE.—I wish a method of transferring letters or designs to the surface of steel plate, that may be used instead of the old method of coating with wax. My impression is that there is such a process, in which the work is facilitated by the use of an elastic tamp.—J. G. H.

6.—GLUE.—I would like to have a recipe for a rapidly hardening and tenacious glue for fastening pine cones, etc., to wood, in making fancy picture frames. If you or your readers know of any such, please give it in your valuable journal.—J. F. K.

7.—MIXING IRON.—I am having considerable trouble in mixing iron. The metal I use is old car wheels with chilled rims. I use about twenty-five per cent of No. 1 Scotch pig to soften with, but it does not appear to mix. Parts of the castings are soft, and others hard. Can some of your correspondents suggest the cause and remedy?—G. H. P.

8.—JOURNAL OF MILL SPINDLE.—What substance shall I use for filling the cast iron journals for the spindle of a grist mill to run in? None of the anti-friction metals will answer, because the poisonous particles worn off pass into the meal.—H. A. S.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

APPLICATIONS FOR LETTERS PATENT.

184.—LIQUID METER.—José Francisco de Navarro, New York city. January 24, 1871.

206.—PRINTING PRESSES.—Earle Henry Smith, New York city. January 26, 1871.

209.—SEWING MACHINE.—Henry Graham Thompson, New York city. January 26, 1871.

212.—STEAM BOILER.—Jacob Lorillard, New York city. January 26, 1871.

231.—BALE TIES.—John Scott Leng, New York city. January 28, 1871.

234.—OLEAGINOUS COATING FOR WALLS AND CEILINGS.—Charles F. Kemmer, Cleveland, Ohio. January 28, 1871.

235.—PILLOWS, BOLSTERS, ETC.—Timothy S. Sperry, Chicago, Ill. January 28, 1871.

237.—VESSELS FOR VOLATILE OILS, SPIRITS, ETC.—Meissner, Ackermann & Co., New York city. January 30, 1871.

240.—PADLOCKS.—William H. Atkins, Ithaca, N.Y. January 30, 1871.

246.—COMBS FOR WORSTED MACHINERY.—Charles Weller, Philadelphia, Pa. January 30, 1871.

NEW BOOKS AND PUBLICATIONS.

GINX'S BABY: His Birth and other Misfortunes.

This book is a satire, cleverly written, to show up the modern baby question that so nearly concerns us all, and in respect to which there are diverse opinions and practices. The contents discuss "What Ginx did with him," "What Charity and the Churches did with him," "What the Parish did with him," "What the Clubs and the Politicians did with him," and "What Ginx's Baby did with himself." It is a very humorous book, and is published by George Routledge & Son, 416 Broome street, New York.

THE CONVERSION OF ST. PAUL. By Geo. Jarvis Geer, D.D. One vol., 12mo., 80 pp. New York: S. R. Wells, 389 Broadway.

The book is handsomely printed on toned paper, bound in fancy muslin beveled boards, and is sold at $1. Plain Edition, 75 cents.

LIFE OF JOHN J. CRITTENDEN.

Messrs. J. B. Lippincott & Co., of Philadelphia, announce their purpose to publish the life of this deceased statesman, edited by his gifted daughter, Mrs. Chapman Coleman, provided a sufficient number of subscribers can be obtained. The proposed work will embrace two large 8vo. volumes. Price, $5 each. The work will be one of great value to all who feel interested in the political history of the times of Crittenden and his contemporaries.

THE LOVER'S LIBRARY.

J. S. Redfield, No. 140 Fulton st., N. Y., proposes to publish a popular series of sentimental stories, under the above caption, the first volume having appeared. It contains the "Devil's Pool," by George Sand; "The Story of Leonard and Margaret," from Southey's "Doctor"; "The Maid of Malines," by Bulwer, and "Patty's Revenge." Price, in paper cover, 50 cts.

THE ALDINE PRESS, for February, is a splendid number. It contains eight very fine illustrations, three of which are full page. With this number is also a handsome oil chromo, "Ducks," which is sent as a premium, with the paper, for $2·50. As a specimen of typography, the "Press" is an honor to American art.

THEODORE TILTON, having retired from the editorship of the *Independent*, proposes to start a new paper, to be called "The Golden Age," to be devoted to the free discussion of all living questions in Church, State, Society, Literature, Art, and Moral Reform. Price, $3·00 a year. Mr. Tilton's address is box 2,848, New York city.

APPLICATIONS FOR EXTENSION OF PATENTS.

METHOD OF SECURING THE DOORS OF HAY PRESSES, ETC.—Cornelius Martratt, Waterford, N. Y., has petitioned for an extension of the above patent. Day of hearing, April 5, 1871.

GRINDING SAWS.—Daniel S. Nippes, Upper Merion Township, Pa., has petitioned for the extension of the above patent. Day of hearing, April 5, 1871.

WHIFFLETREE HOOKS.—Ann M. Cooley, Ceresco, Mich., has petitioned for an extension of the above patent. Day of hearing, June 14, 1871.

MACHINE FOR MAKING PAPER BAGS.—Roxanna Rice, South Lancaster, Mass., has petitioned for an extension of the above patent. Day of hearing April 12, 1871.

SEWING MACHINE.—James E. A. Gibbs, Steels Tavern, Va., has petitioned for an extension of the above patent. Day of hearing May 17, 1871.

HARVESTERS.—Charles Crook, New Hope, Pa., has petitioned for an extension of the above patent. Day of hearing, April 19, 1871.

CORN HUSKERS.—Evelyn F. French, New York city, has petitioned for an extension of the above patent. Day of hearing, April 26, 1871.

New Patent Law of 1870.

INSTRUCTIONS

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LETTERS-PATENT

FOR

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is made into the novelty of an invention by personal examination at the Patent Office of all patented inventions bearing on the particular class. This search is made by examiners of long experience, for which a fee of $5 is charged. A report is given in writing.

To avoid all possible misapprehension, MUNN & Co. advise generally, that inventors send models. But the Commissioner may at his discretion dispense with a model—this can be arranged beforehand.

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REJECTED CASES.

MUNN & Co. give very special attention to the examination and prosecution of rejected cases filed by inventors and other attorneys. In such cases a fee of $5 is required for special examination and report; and in case of probable success by further prosecution and the papers are found tolerably well prepared, MUNN & Co. will take up the case and endeavor to get it through for a reasonable fee to be agreed upon in advance of prosecution.

CAVEATS

Are desirable if an inventor is not fully prepared to apply for a Patent. A Caveat affords protection for one year against the issue of a patent to another for the same invention. Caveat papers should be carefully prepared.

The Government fee on filing a Caveat is $10, and MUNN & Co.'s charge for preparing the necessary papers is usually from $10 to $12.

REISSUES.

A patent when discovered to be defective may be reissued by the surrender of the original patent, and the filing of amended papers. This proceeding should be taken with great care.

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When the invention consists of a medicine or compound, or a new article of manufacture, or a new composition, samples of the article must be furnished, neatly put up. There should also be forwarded a full statement of its ingredients, proportions, mode of preparation, uses, and merits.

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EUROPEAN PATENTS.

MUNN & Co. have solicited a larger number of European Patents than any other agency. They have agents located at London, Paris, Brussels, Berlin, and other chief cities. A pamphlet containing a synopsis of the Foreign Patent Laws sent free.

MUNN & Co. could refer, if necessary, to thousands of patentees who have had the benefit of their advice and assistance, to many of the principal business men in this and other cities, and to members of Congress and prominent citizens throughout the country.

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Contains much information of value to every one who advertises in newspapers. Geo. P. Rowell & Co., the New York Advertising Agents, are the publishers. Sample copy sent to any address for 25 cents.

Recent American and Foreign Patents.

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

MEDICAL COMPOUND.—Henry Lister, Houston, Texas.—This invention and discovery relates to a new and valuable remedy for chills and fever, and consists in the use of what is commonly known as iron weed (botanical name, "*verbena urticifolia*") macerated and combined with alcohol.

ARTIFICIAL LEG.—James E. Hanger, Staunton, Va.—This invention relates to improvements in the construction of artificial legs, and it consists in certain arrangements of the knee, ankle, and toe joints, which are designed to provide more efficient and durable legs than those now in use.

LEACHING APPARATUS.—H. C. Crowell, Morgan, Ohio.—This invention relates to a new and useful improvement in apparatus for leaching bark in the process of tanning leather, and for all other similar purposes, and it consists in warming and producing a circulation of the liquid by means of a current of steam.

ASH SIFTER.—William Weaver, Greenwich, N. Y.—This invention has for its object to furnish an improved sifter for sifting ashes, coals, and other substances, which shall be so constructed as to prevent the escape of dust or ashes, thus adapting it for use in a room, yard, or other place where the dust would be a nuisance, and which shall at the same time be simple in construction, and conveniently operated.

STEP AND TRAM BOX.—William G. Norment, Dyersburgh, Tenn.—This invention relates to a new and useful improvement in step boxes for supporting and adjusting the step ends of mill spindles and upright shafts, and consists in a sectional step box, the sections of which box are so arranged on the step point of the spindle or shaft that the step end of the spindle or shaft may be moved laterally by means of a series of set screws.

COMBINED KEY RING AND DOOR FASTENER.—Bryant H. Melendy, Manchester, N. H.—This invention has for its object to improve the construction of the improved key ring and door fastener, patented by the same inventor May 17, and July 19, 1870, and numbered 103,063 and 105,471, so as to make it lighter, stronger, smaller, and better, and thus more convenient and effective in use.

POST HOLE DIGGER.—A. E. Lindsley, Paw Paw, Mich.—This invention relates to a new instrument for digging the holes for fence posts and other purposes, and consists in the application of a circular cutter and vertically adjustable clamping block, by which the earth or sand is secured in the tubular case on which the cutter is formed.

COFFEE MILL.—Francois Raymond, Woodhaven, L. I.—This invention relates to improvements in coffee mills, and it consists in an improved construction of the stationary grinder, and the hopper and rotary grinder support calculated to simplify and cheapen the cost of attaching the parts to the box top, and together, as hereinafter described.

CORN PLANTER.—J. M. Parsons, Charles City, Iowa.—This invention has for its object to furnish a convenient and reliable corn planter, which shall be so constructed that one man with two horses can plant the corn, two rows at a time, in accurate check row, upon ground just as it is left by the plow, and without its being marked or staked out.

WASHING MACHINE.—W. G. Jones, Marshall, Texas.—This invention has for its object to furnish an improved washing machine, which shall be so constructed as to do its work quickly and thoroughly, however soiled the garments may be, and which will wash the most delicate fabrics without injuring them.

BEDSTEAD.—George Snowden, Hudson, N. J.—This invention relates to a new construction of bedstead frame and bed bottom, and has for its object to provide an elastic couch, and reduce the expense of making the same.

REVERSIBLE BROILER.—Levi H. Colborne and David H. Lowe, New York city.—This invention has for its object to furnish an improved broiler, which shall be so constructed as to catch and preserve the gravy, and allow the substance being broiled to be reversed or turned without removing the broiler, or allowing the gravy to run into the fire, and which shall at the same time be simple in construction, and convenient in use.

HAY RAKE AND LOADER.—John E. Fell and John H. Mattocks, Maquoketa, Iowa.—This invention has for its object to furnish a simple and convenient machine, that may be conveniently attached to the rear part of the wagon upon which the hay is to be loaded, and which will rake or collect the hay, and raise and deposit it upon the said wagon.

CULTIVATOR.—Marshall Sattley, Taylorville, Ill.—This invention has for its object to furnish an improved cultivator, simple in construction, strong, durable, not liable to get out of order, and effective in operation.

COMBINED FENDER AND GAGE WHEEL.—Alexander B. Thornton, New Berlin, Ill.—This invention has for its object to furnish an improved fender for protecting the plants from being covered and injured by having too much dirt thrown around or over them, and which shall at the same time be so constructed as to serve as a gage wheel to regulate the depth at which the plow works in the ground.

APPARATUS FOR CHARGING WOODS WITH PRESERVING LIQUIDS.—Wm. H. Smythe, Steubenville, Ohio.—This invention relates to improvements in apparatus for forcing preserving liquids into woods, and it consists in a combination of an air pump, liquid receptacle, and compression chamber, and an attaching device for connection to the wood or to a tank adapted for the employment of compressed air, or other equivalent gases for forcing the liquids in.

BLIND REGULATOR.—John T. O'Donoghue and Alex. Leavitt, New York city.—This invention relates to improvements in window blinds, and it consists in the application, to one or more of the slats, of a notched wheel, and one or more spring holding pawls to the stile, for holding the slats in any position in which they may be set, by turning them on their bearings, for closing or opening, to exclude or admit the light.

LEATHER PUNCHING AND FEEDING MACHINE.—Wm. Barrey, Carthage, N. Y.—This invention relates to improvements in machinery for holding, punching, and feeding leather for hand sewing, and consists in a reciprocating punching awl and pair of feeding rollers, a ratchet feeding mechanism and a foot power motion, combined in a simple attachment, which may be applied to a shoemaker's, harness maker's, or other leather worker's bench, in a way to be conveniently operated by the foot, to hold the leather, punch, and feed it along while the threads are passed through by hand, by which the work may be done very much faster than by the common way of hand sewing.

IMPROVED MODE OF REMOVING SLAG.—John Thomas, Hokendauqua, Pa.—This invention relates to an improved mode of removing the slag used in furnaces as a flux, after it has performed its office and is allowed to flow out; and it consists in running the slag, while in a fluid state, into a strong current of water, which, by its chemical action on the lime contained in it, disintegrates the slag or liquid cinder, so that it will flow along with the current to some convenient place of deposit.

ANIMAL TRAP.—Ebenezer Oliver, New York city.—This invention has for its object to improve the construction of rectangular wire animal traps, so as to make them stronger, more durable, less liable to get out of order, less liable to frighten the animal trapped for, and more convenient in use.

WATER CUT-OFF.—Rufus M. Bixby, Iowa City, Iowa.—The object of this invention is to provide a cheap and convenient instrument by which water or other fluid may readily be cut off from one pipe and made to flow into another.

SEWING MACHINE SEAT.—Sarah A. Sexton, New York city.—This invention relates to a new and useful improvement in a seat for sewing machines, and consists in connecting the same with the machine, and in making it adjustable.

Official List of Patents.

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Patent Solicitors, 37 Park Row, New York.

111,714.—SEAT FOR VEHICLES.—D. R. Allen, Cumberland Me.

111,715.—COMPASS JOINT.—Theodore Alteneder, Philadelphia, Pa.

111,716.—LEATHER TO RESEMBLE CLOTH.—Moritz Altmann Baltimore, Md.

111,717.—RECEPTACLES FOR STATIONARY ARTICLES, ETC.—W. F. Baade, Buffalo, N. Y.

111,718.—VENTILATOR.—G. R. Barker, Philadelphia, Pa.

111,719.—LEATHER PUNCHING AND FEEDING MACHINE.—William Barry, Carthage, N. Y.

111,720.—WATER CUT-OFF.—R. M. Bixby, Iowa City, Iowa. Antedated Feb. 2, 1871.

111,721.—STEAM RADIATOR.—G. W. Blake, New York city.

111,722.—REFRIGERATING OYSTER CAN.—Alfred Booth, Chicago, Ill.

111,723.—CURTAIN FIXTURE.—C. M. Brown and C. L. Gates, Hartford, Conn.

111,724.—COMPOSITION FOR PAVEMENTS.—C. P. Burgess and J. R. Stevenson, Rochester, N. Y.

111,725.—STUMP EXTRACTOR.—E. W. Cady, Tomah, Wis.

111,726.—SEED SOWER.—G. A. Carman, Deer Park, N. Y.

111,727.—DRAIN TILE.—A. W. Conley, Economy, Ind. Antedated Feb. 2, 1871.

111,728.—SASH BALANCE.—J. M. Connel, Newark, Ohio.

111,729.—STATIONARY BELL HOLDER.—Sylvester Croll (assignor to S. J. Phillips), Philadelphia, Pa.

111,730.—APPARATUS FOR LEACHING BARK, ETC.—H. C. Crowell, Morgan, Ohio.

111,731.—ORNAMENTING MIRRORS.—W. M. Davis, Mount Sinai, assignor to himself and S. S. Norton, Brooklyn, N. Y.

111,732.—NIGHT LATCH.—C. C. Dickerman, Boston, Mass Antedated Feb. 4, 1871.

111,733.—WEIGHING SCALES.—Franklin Fairbanks and Harvlin Paddock, St. Johnsbury, Vt.

111,734.—TREATING BLOOD FOR THE MANUFACTURE OF FERTILIZERS.—L. S. Fales (assignor to the American Fertilizing Company) New York city.

111,735.—HAY LOADER.—J. E. Fell and J. H. Mattocks, Maquoketa, Iowa.

111,736.—DRILL REST FOR TURNING LATHES.—H. H. Folsom, assignor to C. A. Chase), Lowell, Mass.

111,737.—PURIFIER, CONDENSER, ETC., FOR GAS WORKS.—Andrew Fulton, Albany, N. Y.

111,738.—PRUNING SHEARS.—E. D. Gaines and J. A. Mechillen, Chicago, Ill.

111,739.—COTTON PRESS.—J. B. Gridley, Louisville, Ky., assignor of one third his right to Robert Patterson and Chauncy Rice Antedated Feb. 2, 1871.

111,740.—INTERFERING PAD FOR HORSES.—W. H. Hall, Boston, assignor to himself and J. W. Haskins, Charlestown, Mass.

111,741.—ARTIFICIAL LEG.—J. E. Hanger, Staunton, Va.

111,742.—AIR PUMP.—C. B. Hardick, Brooklyn, N. Y.

111,743.—EXTRACTING TURPENTINE FROM TREES.—B. I. Hazard, Georgetown, S. C.

111,744.—BARK MILL.—John Helenbrook, Olean, N. Y.

111,745.—ANIMAL TRAP.—A. A. Hotchkiss, Sharon, Conn.

111,746.—ADJUSTABLE BEVEL.—L. D. Howard, St. Johnsbury, Vt.

111,747.—CLOTHES DRYER.—L. D. Howard, St. Johnsbury Vt.

111,748.—PUMP.—John Humphrey, Keene, N. H., assignor James Wilson, Bridgeport, Conn.

111,749.—LITHOGRAPHIC PRESS.—Thomas Hunter. Philadelphia, Pa.

111,750.—WASHING MACHINE.—W. G. Jones, Marshall Texas.

111,751.—RUBBER ROLLER FOR PAPER MACHINES.—R. A. Kelty, Lambertville, N. J. Antedated Jan. 30, 1871.

111,752.—SEWING MACHINE.—E. A. Kimball, Abingdon Mass.

111,753.—BASE-BURNING FIRE-PLACE HEATER.—Philip Klotz (assignor to B. C. Bibb), Baltimore, Md.

111,754.—COMBINATION TOOL.—J. B. Lamkin, Champaign, Ill.

111,755.—WAGON HOUND COUPLING BOX AND PLATE.—W. J. Lewis, Pittsburg, Pa.

111,756.—RUBBER BLOCK HOLDER FOR WAGON BRAKES.—W. J. Lewis, Pittsburg, Pa.

111,757.—POST-HOLE DIGGER.—Aaron E. Lindsley, Paw Paw Mich.

111,758.—BUTTER TUB, ETC.—William Marsh, Waterford Penn.

111,759.—BAKER'S OVEN.—Alexander Martin, Allegheny, Pa

111,760.—MILLSTONE FEEDER AND GRAIN SCOURER.—P. H. Massey, South Bend, Ind.

111,761.—STEAM LAND CARRIAGE.—Jerome B. McKinley, Spencer county, Ky.

111,762.—COMBINED KEY RING AND DOOR FASTENER.—B. H. Melendy, Manchester, N. H.

111,763.—PUMP VALVE.—Chas. L. Merrill, Watertown, N. Y Antedated February 13, 1870.

111,764.—PLOW BEAM.—Samuel Holden Miller, Hamilton, Ill.

111,765.—MACHINE FOR MAKING CANDY.—Thomas Mills and George H. Mills, Philadelphia, Pa.

111,766.—RIDDLE AND THRASHING MACHINE.—Daniel Murphy (assignor to himself and Timothy C. Murphy), Dubuque, Iowa.

111,767.—CAR COUPLING.—James W. Musser and Ralph Carkhuff, Lewisburg, Pa.

111,768.—STEP AND TRAM-BOX FOR MILL SPINDLES.—W. G Norment, Dyersburg, Tenn.

111,769.—HAND-WASHING RUBBER.—Elwood R. Norny McDonough, Del.

111,770.—BLIND-SLAT REGULATOR.—John T. O'Donoghue and Alexander Leavitt, New York city.

111,771.—ANIMAL TRAP.—Ebenezer Oliver, New York city.

111,772.—ROLLED BAR FOR NUT BLANKS.—Henry W. Oliver, Jr., Pittsburgh, Pa.

111,773.—STAMP CANCELER.—Amos D. Owen, Thorntown, Ind.

111,774.—CORN PLANTER.—John M. Parsons, Charles City, Iowa.

111,775.—SUPPORTING CORES.—Enos B. Phillips, Cambridge, Mass.

111,776.—ADJUSTABLE ATTACHMENT OF CAMS FOR FLIERS OF PRINTING PRESSES.—Charles Potter, Jr., Plainfield, N. J.

111,777.—CLOTHES AND HAT HOOK.—Reuben W. Randall Biddeford, Me.

111,778.—COFFEE MILL.—François Raymond, Woodhaven, N. Y., assignor to the Lalance and Grosjean Manufacturing Company New York city.

111,779.—MACHINE FOR CLEANING AND SCOURING WHEAT.—Ephraim Russell, Minneapolis, Minn.
111,780.—GATE.—Cyrus W. Saladee, St. Catharines, Canada.
111,781.—CULTIVATOR.—Marshall Sattley, Taylorville, Ill.
111,782.—SEWING-MACHINE SEAT.—Sarah A. Sexton, New York city.
111,783.—WEAVING TUBULAR FABRICS.—Guilford Smith, South Windham, Conn.
111,784.—APPARATUS FOR INJECTING PRESERVATIVE LIQUIDS INTO WOOD.—William H. Smith, Steubenville, Ohio.
111,785.—BEDSTEAD.—George Snowden, Hudson, N. J.
111,786.—PRAIRIE-PLOW JOINTER.—Andrew J. Spicer, Galesburg, Mich.
111,787.—EXCAVATOR.—Thomas Symonds (assignor to John B. Curtis), Portland, Me.
111,788.—MACHINE FOR CUTTING CHEESE, BUTTER, ETC.—James H. Thomas, Lynn, Mass.
111,789.—REMOVING SLAG FROM FURNACES.—John Thomas, Hokendanqua, Pa.
111,790.—COMBINED FENDER AND GAGE WHEEL.—Alexander B. Thornton, New Berlin, Ill. Antedated February 11, 1871.
111,791.—APPARATUS FOR THE TREATMENT OF ALCOHOLIC AND OTHER SPIRITS.—Reuben D. Turner, New York city.
111,792.—METHOD OF ATTACHING HANDLES TO SAWS.—Samuel W. Valentine (assignor to Porter Saw Company), Bristol, Conn.
111,793.—DOUBLE-SHOVEL PLOW.—Robert Paten Van Horne, Gratiot, Ohio.
111,794.—SMUT AND WHEAT-SEPARATING MACHINE.—Wm. H. Wash, Howardsville, Va. Antedated February 1, 1871.
111,795.—ASH SIFTER.—William Weaver, Greenwich, N. Y.
111,796.—MACHINE FOR BUNDLING WOOD.—Wm. L. Williams, New York city.
111,797.—PAPER-TRIMMING MACHINE.—William P. Yeoman, Waukegan, Ill.
111,798.—CHEWING GUM.—Thomas Adams (assignor to John D. Adams), Hudson City, N. J.
111,799.—SULKY ATTACHMENT FOR BREAKING PLOWS.—Asa H. Allison, Charlottesville, Ind.
111,800.—TOBACCO PRESS.—Herman H. Alms, Kansas City, Mo.—Antedated February 3, 1871.
111,801.—TYING BROOMS AND BRUSHES.—James H. Anderson, Terre Haute, Ind., assignor to Thomas Marston, Jr., Walter L. Peck, and Clarence I. Peck, Chicago, Ill.
111,802.—PAPER-BAG MACHINE.—Charles F. Annan, Boston, assignor to himself and Herbert S. Merrill, Cambridge, Mass.
111,803.—PAPER-BAG MACHINE.—Charles F. Annan, Boston, assignor to himself and Herbert S. Merrill, Cambridge, Mass.
111,804.—DEVICE FOR LABELING CIGARS.—Reuben H. Andrews, Washington, D. C.
111,805.—PRINTING PRESS.—Amos H. Bangle, Brooklyn, Cal.
111,806.—CONCRETE FOR PIPES, BRICKS, ETC.—Thomas J. Barron, Brooklyn, E. D., N. Y.
111,807.—BED BOTTOM.—Van Bell, Seville, Ohio.
111,808.—CORN PLANTER.—Cyrus F. Bilhimer, Irwin's Station, Pa.
111,809.—SPRING SUPPORTER FOR CARRIAGES.—Daniel H. Brown, Utica, Mo.
111,810.—MILLSTONE PICK.—Henry J. Brunner, Nazareth, Pa.
111,811.—COOKING STOVE.—Esek Bussey, Troy, N. Y.
111,812.—COOKING STOVE.—Esek Bussey, Troy, N. Y.
111,813.—LAMP BRACKET FOR SEWING MACHINES.—Henry Campbell, San Francisco, Cal.
111,814.—BREECH-LOADING FIRE ARM.—Martin J. Chamberlain, Springfield, Mass.
111,815.—APPARATUS FOR THE MANUFACTURE OF BESSEMER STEEL.—Henry Chisholm, Cleveland, Ohio.
111,816.—LET-OFF MECHANISM FOR LOOMS.—John Clegg, Warwick, R. I.
111,817.—MACHINE FOR THE MANUFACTURE OF MOLDINGS.—Joseph C. Cooke and Henry A. Whiteley, Preston, Conn.
111,818.—ROTARY STEAM ENGINE.—Philipp Cramer, Providence, R. I.
111,819.—FEED CUTTER.—John Criley, Shiloh Hill, and Whitney Gilbreath, Rockwood, Ill.
111,820.—APPARATUS FOR SMOOTHING AND PRESSING PAPER DURING THE MANUFACTURE.—Daniel Crosby, Hampden, Me.
111,821.—DENTRIFICE.—Oliver Danforth, Bibb county, Ga.
111,822.—HUB AND AXLE.—Carlos R. Donner, Sonora, Cal.
111,823.—SHELL FUSE.—Ellis Drake, Stoughton, assignor to himself and John S. Smith, Leicester, Mass.
111,824.—RAILWAY ALARM.—George Draper, Hopedale, Mass.
111,825.—GAS BURNER.—Antoine Ernest Dupas, New Orleans, La.
111,826.—CORN PLANTER.—Arthur Edwards, Cuba, Miss.
111,827.—MAGAZINE FOR BREECH-LOADING FIRE ARMS.—Wm. H. Elliott, New York city.
111,828.—SPOOL-SILK CASE.—Samuel Elmer, Ashtabula, Ohio.
111,829.—GAGE FOR SAW FILER.—James E. Emerson, Trenton, N. J.
111,830.—TRAVELING TRUNK.—Harry Hubbard Evarts, Chicago, Ill. Antedated February 4, 1871.
111,831.—FENCE.—Osker F. A. Faulkner, Mount Pleasant, Iowa.
111,832.—BEDSTEAD AND BED BOTTOM.—Frederic G. Ford, Baltimore, Md. Antedated February 10, 1871.
111,833.—TACKLE FOR HOISTING SAILS.—George A. Ford, Oswego, N. Y.
111,834.—MORTISING MACHINE.—Joseph W. Fowle, Boston, Mass.
111,835.—GRIDDLE.—Titus D. Gail, Waukegan, Ill.
111,836.—FIRE EXTINGUISHER.—Joseph Gardner, Bedford, Ind.
111,837.—MACHINE FOR NAILING SHOE SOLES WITH WIRE.—Louis Goddu (assignor to Elmer Townsend), Boston, Mass.
111,838.—WATER METER.—Robert C. Gray and William B. Brittingham, LaFayette, Ind.
111,839.—CHIMNEY TOP.—Richard W. Griffith, Georgetown, D. C.
111,840.—COTTON PRESS.—Robert J. Harrison, Raleigh, N. C.
111,841.—ANIMAL TRAP.—Sanford H. Hart and Hubert C. Hart, Unionville, Conn.
111,842.—EARTH CLOSET.—Duncan C. Hartman, Baltimore, Md.
111,843.—CLOTHES LINE FASTENER.—Henry J. Hendey, Wolcottville, Conn.
111,844.—HAND STAMP.—Horace Holt and William W. Secombe (assignor to "Secomb Manufacturing Company"), New York city.
111,845.—SPIKE EXTRACTOR.—Wm. S. Hough, Johnstown, Pa.
111,846.—PEN HOLDER.—Isaac Jacobs, New York city.
111,847.—SASH CORD FASTENER.—William N. Jackson, Muncie, Ind.
111,848.—THRASHING MACHINE.—William N. Jackson, Muncie, assignor to himself and Benjamin F. Jackson, Anderson, Ind.
111,849.—MACHINE FOR LINING PASTEBOARDS.—Gustav L. Jaeger, New York city.
111,850.—STOVE OVEN GRATE.—W. G. James, Richland Center, Wis.
111,851.—TREATING BONES, HORNS, HOOFS, ETC., FOR MANUFACTURE OF FERTILIZERS.—William Burr Johns, Philadelphia, Pa.
111,852.—ATTACHMENT TO PLOWS FOR SUBSOILING.—Ross Johnson, Lawrence, Kansas.
111,853.—GRAIN DRILL.—Benjamin Kuhns, Dayton, Ohio.
111,854.—PLOW.—John Lane (assignor to Hapgood & Co.), Chicago, Ill.
111,855.—MACHINE FOR BENDING WOOD.—Obadiah Marland, Boston, Mass.
111,856.—METALLIC CARTRIDGE.—Edwin Martin (assignor to himself, Samuel W. Porter, and James F. Cranston), Springfield, Mass.
111,857.—COMBINED CULTIVATOR AND HARROW.—John Maxton, Seybrook, Ill.
111,858.—BOOK SUPPORT.—John McCausland, Alexander McCausland, and William J. A. McCausland, Providence, R. I.
111,859.—TURNING LATHE.—Frederick B. Miles (assignor to Ferris & Miles), Philadelphia, Pa.
111,860.—WASH BOILER.—Stephen S. Miles, Delta, N. Y.
111,861.—COFFEE POT.—Watson J. Miller (assignor to Simons & Miller), Middletown, Conn.
111,862.—CONSTRUCTION OF CAR AXLES AND SHAFTS.—James Montgomery, Croton Landing, N. Y.
111,862.—MANUFACTURE OF SHOE SHANKS.—Stephen Moore (assignor to himself and Homer Rogers), Sudbury, Mass.
111,864.—PORTABLE LAUNDRY.—Jacob Morrison (assignor to Matilda D. Morrison), Indianapolis, Ind.
111,865.—MECHANISM FOR OPERATING PUNCHING AND EYELETING MACHINES.—Charles H. Morse, Boston, assignor to himself and William A. Brown, Lynn, Mass.
111,866.—WHIFFLETREE PLATES.—Francis B. Morse (assignor to H. D. Smith & Co.), Plantsville, Conn.
111,867.—ATTACHMENT FOR SEWING MACHINES.—Schama Moritz Moschcowitz, New York city.
111,868.—BARREL.—Henry G. Porter, Grand Rapids, Mich.
111,869.—ELEVATOR AND CONVEYER.—Thomas J. Powell, Naples, N. Y.
111,870.—COOKING RANGE.—John A. Price, Scranton, Pa.
111,871.—COMBINED AGRICULTURAL IMPLEMENT.—Charles R. Rand, Dubuque, Iowa.
111,872.—STOCK CAR.—Amos Rank, Salem, Ohio.
111,873.—RAILWAY STOCK CAR.—Amos Rank, Henry King, and Joel Sharp, Salem, Ohio.
111,874.—CHIMNEY FOR LIME KILNS.—William Rennyson, Norristown, Pa.
111,875.—DEVICE FOR OBSTRUCTING ANTS.—Emery Rooks, Trenton, Tenn.
111,876.—HORSE AND CATTLE POWDER.—Abraham Rudisill and Manrow Sell, Sell Station, Pa.
111,877.—FIRE EXTINGUISHER.—Enno Saunder, St. Louis, Mo.
111,878.—BEDSTEAD FASTENING.—John Schepler (assignor to himself and Shickle, Harrison & Co.), Lambertville, N. J.
111,879.—CONCRETE PAVEMENT.—John J. Schillinger, New York city.
111,880.—SPUR ATTACHMENT TO OVERSHOES.—H. Schwandt, New Orleans, La.
111,881.—LUBRICATOR.—Nicholas Seibert, San Francisco, Cal.
111,882.—JAPANNING EYELETS, BUTTONS, ETC.—S. N. Smith, Providence, R. I.
111,883.—CORN-DROPPING ATTACHMENT FOR HOES.—E. L. Staples, Chillicothe, Ohio.
111,884.—LOCOMOTIVE BOILER FURNACES.—A. J. Stevens, San Francisco, Cal.
111,885.—APPARATUS FOR ASCERTAINING THE PROOF-SPIRITS IN FERMENTED MASH.—Giuseppe Tagliabue, New York city.
111,886.—PAPER FILE.—Jesse F. Tapley, Springfield, Mass.
111,887.—COOKING STOVE.—Nicholas S. Vedder, Troy, N. Y.
111,888.—CLOTHES DRYER.—J. K. Wagner, Potsdam, N. Y. Antedated February 3, 1871.
111,889.—PINCERS FOR SHOEMAKERS.—Michael Walpole, Milford, Mass. Antedated February 4, 1871.
111,890.—JOINERS' PLANE.—Geo. A. Warren, North Bridgewater, Mass.
111,891.—TIP FOR WOODEN SHOVELS.—W. P. Wentworth, Seneca Falls, N. Y.
111,892.—GAGE FOR THE CONSTRUCTION OF SEAT CUSHIONS.—John H. Williams, Pleasant Hill, Ohio.
111,893.—VAPOR BURNER.—Joseph S. Wood, Philadelphia, Pa.
111,894.—PLANING MACHINE.—Solomon A. Woods, Boston, Mass.
111,895.—SCROLL-SAWING MACHINE.—S. M. Young, Jacksonville, Ill. Antedated February 2, 1871.

REISSUES.

4,258.—MACHINE FOR SCRAPING LEATHER.—James T. Barnstead Peabody, assignor, by mesne assignments, to Geo. L. Newcomb, Salem, and James Perkins, Peabody, Mass.—Patent No. 101,081, dated March 22, 1870.
4,259.—PERFORATED SHEET RUBBER.—John Haskins, Boston, Mass.—Patent No. 67,208, dated July 30, 1867; reissue No. 3,105, dated August 25, 1868.
4,260.—BURNING KILN.—Balthasar Kreischer, New York city.—Patent No. 81,783 dated September 1, 1868.
4,261.—FOLDING LOUNGE.—James W. McDonough, Chicago, Ill.—Patent No. 60,400, dated December 11, 1866.
4,262.—MACHINE FOR FIGURING CARPENTERS' SQUARES.—Norman Millington Shafts ury, Vt., assignor, by mesne assignments, to The Eagle Square Company.—Patent No. 10,136, dated October 18, 1853; extended seven years.
4,263.—MACHINE FOR CUTTING STONE.—George Morgan, Brooklyn, N. Y.—Patent No. 22,569, dated January 11, 1859.
4,264.—MACHINE FOR CHANNELING STONE.—Thos. Ross and Rockwood Barrett, Rutland county, Vt., assignees, by mesne assignments, of A. T. Merriman and Thomas Ross.—Patent No. 59,856, dated Nov. 20, 1866.
4,265.—MACHINE FOR REDUCING CRACKLINGS, ETC., FOR FERTILIZERS.—Armor Smith, Cincinnati, Ohio. Patent No. 71,545, dated Nov. 26, 1867.

DESIGNS.

4,646.—INFANT'S SHOE.—Willard M. Carpenter, Rowley, Mass.
4,647 and 4,648.—STOCKING FABRIC.—Thomas Dolan, Philaphia, Pa. Two patents.
4,649.—CALENDAR CLOCK DIAL.—Daniel J. Gale (assignor of one half his right to Aaron Huyck), Sheboygan Falls, Wis.
4,650.—FLOWER STAND.—Hiland H. Kendric, Fulton, N. Y.
4,651 and 4,652.—CARPET PATTERN.—Hugh S. Kerr (assignor to Israel Foster), Philadelphia, Pa. Two patents.
4,653.—ENGINE GOVERNOR CASE.—John Augustus Lynch, Boston, Mass.
4,654.—FLOOR CLOTH PATTERN.—Charles T. Meyer, Newark, N. J., assignor to Edward C. Sampson, New York city.
4,655 to 4,661.—FLOOR OIL CLOTH PATTERN.—Charles T. Meyer, Newark, N. J., assignor to Edward C. Sampson, New York city. Seven patents.
4,662.—FRINGE.—Henry Asbury Truitt (assignor to Thomas Dolan), Philadelphia, Pa.
4,663.—TASSELED FRINGE.—Henry Asbury Truitt (assignor to Thomas Dolan), Philadelphia, Pa.

TRADE-MARKS.

155.—PLOW AND OTHER AGRICULTURAL IMPLEMENTS.—John C. Bidwell, Pittsburgh, Pa.
156 to 158.—SMOKING TOBACCO.—John W. Carroll, Lynchburg, Va. Three Patents.
159.—GINGER ALE AND WINTER BEVERAGE.—Anderson Carson and William Lemon, Hartford, Conn.
160.—COMPOSITION COATING.—D. B. Crockett, New Haven, Conn.
161.—STOVE.—Ignatius Droege & Co., Covington, Ky.
162.—PREPARATION FOR THE HAIR.—C. E. Georger, New York city.
163.—LACE GOODS.—A. G. Jennings, New York city.
164.—ILLUMINATING OILS OR BURNING FLUIDS.—William E. Jervey, New Orleans, La.
165.—MEDFORD RUM.—Daniel Lawrence & Sons, Boston, Mass.
166.—MEDICAL COMPOUND.—Pemberton, Taylor & Co., Atlanta, Ga.
167 and 168.—MEDICAL PREPARATION.—W. S. Wells and J. J. Steel, New York city. Two Patents.

EXTENSIONS.

METHOD OF FEEDING LUMBER LATERALLY IN SAWING MACHINES.—S. R. Smith, of Cincinnati, Ohio.—Letters Patent No. 16,454, dated January 20, 1857.
HARROW.—D. W. Shares, of Hamden, Conn.—Letters Patent No. 16,498, dated January 27, 1857; reissue No. 43, dated March 2, 1861.
MACHINE FOR CUTTING VENEERS.—Peter Cook, of Tonawanda, N. Y.—Letters Patent No. 16,529, dated February 3, 1857.

DISCLAIMERS.

METHOD OF FEEDING LUMBER LATERALLY IN SAWING MACHINES.—S. R. Smith, of Cincinnati, Ohio.—Letters Patent No. 16,454, dated January 20, 1857.—Filed January 28, 1871.
PLATFORM SCALES.—F. M. Strong and Thomas Ross, of Vergennes, Vt.—Letters Patent No. 14,119, dated January 15, 1856.—Filed January 10, 1871.

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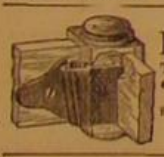
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Intercolonial Railway, Commissioners' Office, Ottawa, 19th January, 1871.

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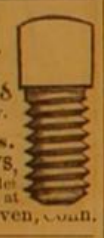

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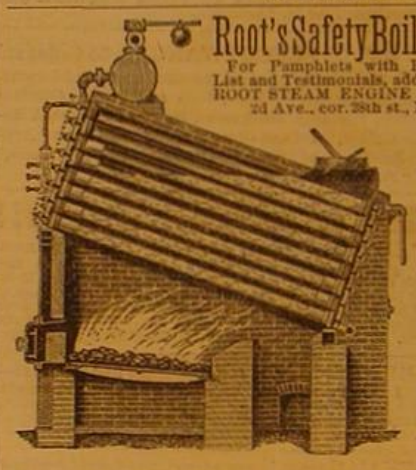

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Vol. XXIV.—No. 10. [NEW SERIES.] NEW YORK, MARCH 4, 1871. $3 per Annum. [IN ADVANCE.]

Improved Balanced Slide Valve.

It would be entirely superfluous to dwell upon the subject of valve friction in connection with this description. The great pressure to which unbalanced valves are subjected in steam engines, their consequent waste of power, and the wear resulting from their great friction, are familiar to all engineers. Engineers are also aware that many attempts at counteracting the pressure, or balancing valves, have been made, some of which have resulted in large saving of power.

Our engravings illustrate a new method of accomplishing the desired result, patented through the Scientific American Patent Agency, Sept. 7, 1870, by Owen Collier and W. H. Masterman, of Sacramento, Cal. The improvement is simple, its parts are few, and it is capable of general application on locomotives, and marine and stationary engines. The working bearings are made of steel, and have but a slight movement, so that wear takes place slowly, and the principle of the device is such that, whatever the wear may be, the adjustment takes place automatically, so that the wear will not affect the perfect operation of the invention in balancing the valve.

Fig. 1 is a perspective view of the device attached to to the steam chest of a locomotive cylinder. Fig. 2 is a vertical section, showing the interior construction.

In Fig. 2, A is the slide valve, having pivoted to the center of its upper surface, the rod, B, of a piston, D. The piston, D, runs in a cylinder which oscillates on the trunnions, E, one of which has an opening, F, through its entire length, communicating freely with the external atmosphere.

The piston rod, B, plays in a slot, C, through which steam passes into the cylinder, G, and completely surrounds the oscillating cylinder. It is evident now, that the same pressure per square inch as is sustained by the steam chest is also felt by the piston, D, and that if the area of D be made greater than the surface of the valve, A, the piston would lift the valve entirely from the seat. By proper observance of proportion between the area of the piston, D, and that of the valve, the pressure on the valve may be balanced with the utmost nicety, and the loss of power through friction, as well as the wear upon the faces of the valve and seat, may be almost entirely obviated.

An ingenious method of accurately centering the piston, B, so as to make it come in exact line with its point of connection with the valve, forms part of the details of the piston, but is not shown in the engraving. By its use the adustment is easily and accurately made.

We are informed that this device has been tested for two months on the California Pacific Railroad, and that its use effects a saving of at least five per cent fuel over the unbalanced valves previously employed,

Address, for further information, Orrin Collier, Box 773, New York city, or W. H. Masterman, Sacramento, Cal.

THE iron product of the United States for the year 1869 was 1,961,641 tuns.

Curious Case of Asymmetry.

Instances of abnormal development of parts of the body at birth are not infrequent, but the peculiar malformation known as asymmetry is very rare, and we have only heard of two cases previous to the one we now have under consideration. Professor Humphrey has recently had a female patient, the right side of whose body is much larger than the left, the increase in size affecting all the organs, the bones, and the length of the limbs. In the skull, the right side of the crown is higher; of the jaw, lower; the right sides of the tongue, the lips, and the chin, are respectively larger than the left. The right tonsil even has a similar peculiarity. The patient is right-handed, and much stronger in her right limbs than in her left; she is free from any disease, and consulted Dr. Humphrey for a trifling local complaint. She is now twenty years old.

Speaking and Singing without a Tongue.

In the Transactions of the Philosophical Society, published between 1742 and 1744, there is an account of Margaret Cutter, who, when four years old, lost her entire tongue from a cancerous affection; but who, nevertheless, afterward retained the power of taste, swallowing and speech, without any imperfection whatever. She not only spoke as fluently and with as much correctness as other people, but also sang to admiration, articulating with distinction all her words while singing. What is not less singular, she could form no idea of the use of a tongue in other persons. This remarkable case was brought before the Royal Society, under certificates of attestation from the minister of the parish, a medical practitioner and another respectable citizen, well-known in Suffolk, where she resided. On account of the extraordinary character of the case, the Society requested an additional report upon the subject, and from another set of witnesses, named by the Society for the purpose, and for whom they drew up the necessary questions and marked out the proper course of examination. The second report coincided with the first in all particulars, and shortly afterward the young woman was brought to London, where she confirmed the account, by personally appearing, and speaking and singing in the presence of the members of the Royal Society and many other persons.

Two or three years since we gave an account of a case wherein the power of articulate speech was retained after the larynx had become entirely closed, the patient breathing for years through a tracheatomy tube. The facts in the latter case were taken from the Transactions of the New York State Medical Society.

Fig 1

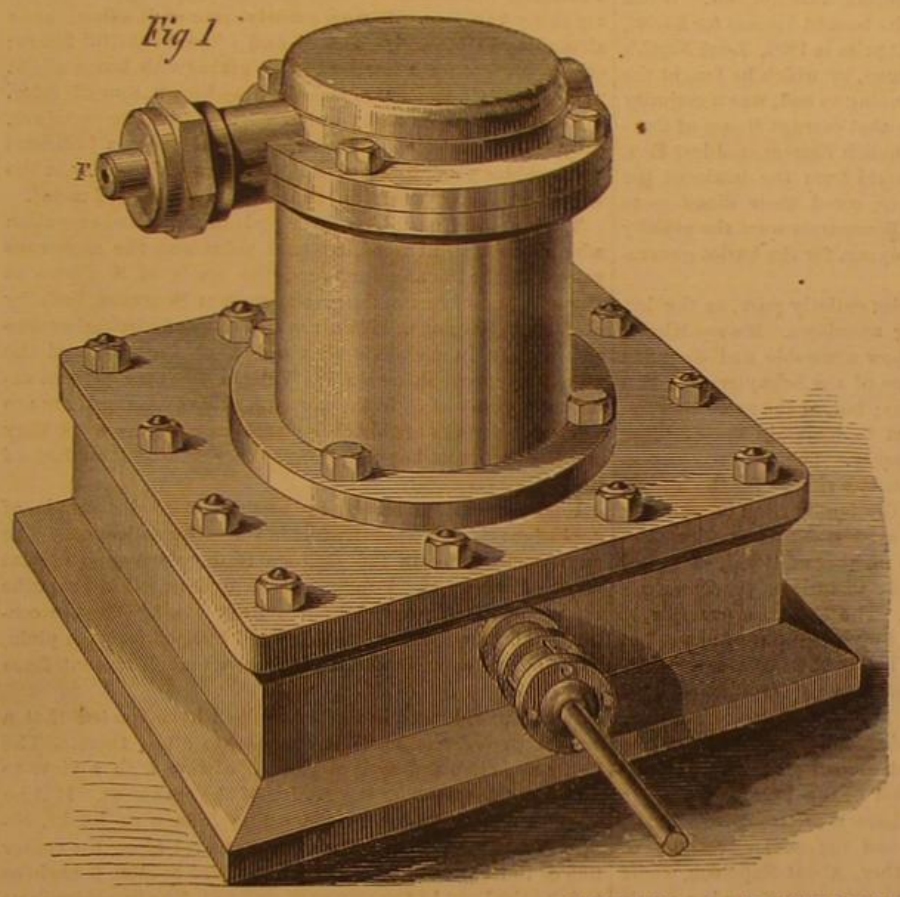
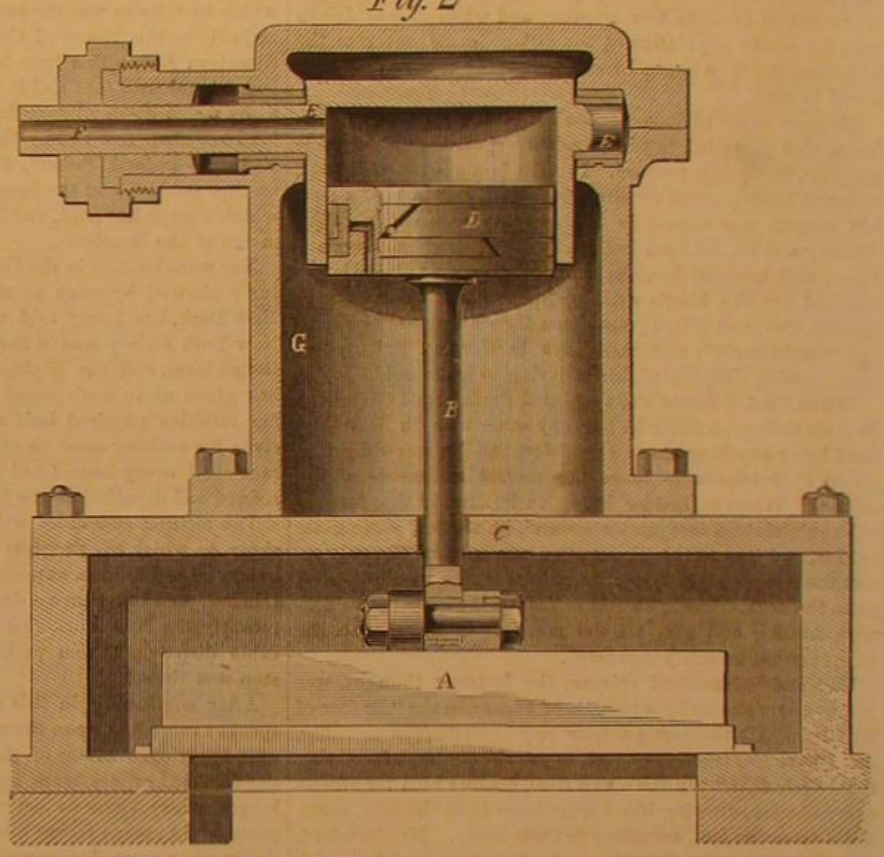


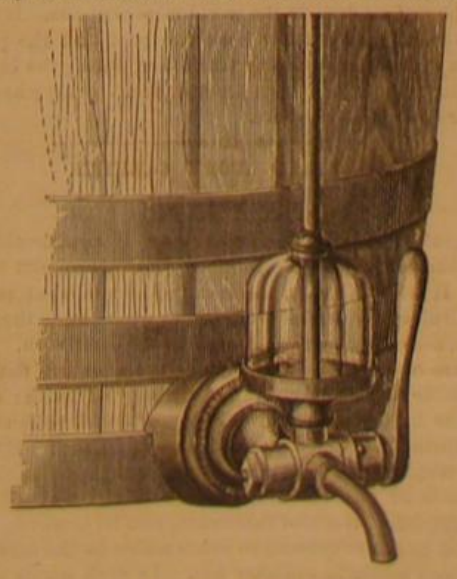
Fig. 2



COLLIER & MASTERMAN'S BALANCED SLIDE VALVE.

MEASURING FAUCET.

An English inventor has patented the device shown in the accompanying engraving. It is, in the form shown, intended to exactly measure the quantity of liquid transferred from barrels to bottles; but, with graduated glasses, the principle may be extended to the measurement of different quantities of liquids, in the sale of petroleum, oils, syrups, etc. The turning of the plug first admits the liquid to the glass receptacle, and when the receptacle is filled, the plug of the tap being of the form known as "two-way," turning it further on allows the fluid to escape into the bottle or other vessel designed to receive it. Air is admitted to the measuring glass through a vertical tube. This is a useful device, worthy of adoption in this country, but one which, we think, our inventors might easily improve



Kitchen Boilers.

An English cotemporary, the *Ironmonger*, speaks deprecatingly of the small amount of ingenuity devoted to the construction of kitchen boilers, and this in an age which has improved almost every article of use in the household. Selecting from a list of boiler accidents, more or less disastrous in result, we find a case of fatal explosion of a boiler, the bursting taking place in consequence of the pipes being frozen. A simple and intelligible occurrence, certainly, and, consequently, easy to be prevented. The blame is due to the builder who put up, and the maker who constructed, the infernal machine. No boiler should be made without a safety valve. A pressure of steam is always useful, especially where hot water is forced over a house; and those who have eaten potatoes boiled in a pressure of ten pounds on the square inch, will admit that it has value for culinary purposes. The valve should be fitted with an immovable weight, and then tampering with it, and all accidents to the boiler from bursting, will be prevented.

A DESIDERATUM: Lamp wicks about twice or thrice the length of the common wicks of kerosene lamps. It is well known that about one half of each wick, as at present used, is lost. Longer wicks are greatly needed.

ONE HUNDRED YEARS AGO.

A Lecture by James Parton.

The speaker began his lecture by the assertion that to-day is the best of all the days the world has seen, which he illustrated by contrasting the habitations of the olden time with those of the present day. He described the noted old mansion of Major Ben Perley Poore, at Newburyport, which three generations of antiquarians have filled with ancient utensils and furniture, and where there are whole suites of rooms furnished in the style of 1700. The speaker fully appreciated the taste and liberality which have created so interesting a museum, in which the whole life of old New England lives again. But, as the residence of a family, how inferior is this old house to the country villa of the present time, with apartments lofty and spacious, and all its implements happy hits of inventive talent—the whole house warmed by one invisible fire, and lighted at night by a turn of the hand! In these two houses we behold the interesting and musty past—the bright and better present.

The lecturer proceed to descant upon the simple, contracted, provincial life lived in the old houses, illustrating every point by some fact, unimportant in itself, but indicating more than it told. He described the way in which a country clergyman, seventy years ago, had a chaise built—taking into his family a carriage-maker, under whose direction trees were felled in the forest, and the best timber selected. It was all this artist, assisted by the village blacksmith, could do, to get the carriage done in five months; and when it was driven out, the whole population of the village came out into the streets to see it go by, and remained gazing at it as long as it could be seen.

He gave some curious particulars of the incredible ignorance that prevailed in Christendom, especially on scientific subjects, in the last century. In 1770, Louis XVI., of France, touched 2,400 persons for the king's evil, and in 1787 a poor old woman was stoned in Philadelphia as a witch. John Wesley and Dr. Johnson both believed in witchcraft, apparitions, and haunted houses; and Dr. Johnson himself was touched for the king's evil by Queen Anne. The German Goethe, the most gifted young man then living, was seeking the "virgin earth"; and many men in German universities were passing sleepless nights in trying to make gold.

When Prof. Silliman was appointed Professor of Chemistry in Yale College, neither he nor any other man in New England knew anything about chemistry, and he was obliged to go to Philadelphia to learn the merest rudiments of the science. When at last he began to lecture, in that famous old vault sixteen feet under ground, he wanted some glass retorts, and sent to the glassworks, as a pattern, the only retort the college could boast, the bulb of which was broken off from the neck. The glassmaker copied the model with Chinese fidelity, and sent all the new retorts home with the bulbs and necks nicely separated.

The state of medical science, the lecturer thought, was pretty fairly shown by a remark of Figaro, in the "Barber of Seville": "All the garrison take physic to-morrow morning, and I have had interest enough to get the contract for giving them their dose." In the olden time, doctors bled for almost every disease, drawing blood sometimes from the arm, sometimes from the foot, according to their fancy. Mr. Crawford, a candidate for the Presidency in 1824, was stricken with paralysis in the midst of the campaign, and was bled twenty-three times in three weeks, very profusely each time, and then people wondered that it took him three years to get well.

Along with this gross ignorance, there existed a certain dread of the advance of knowledge, as if it were impious for man to pry into Nature's secrets. When Dr. Franklin invented the lightning rod, a Harvard professor had to come forward in a pamphlet and defend Franklin against the charge of presumption. The speaker quoted from an article of 1759, in which the actors of Drury Lane theater were severely reprehended for imitating thunder and lightning in the tragedy of Macbeth. A similar feeling exists to this day, where a dealer in lightning rods is often obliged to discuss theology before he can drive a bargain.

In point of humanity and benevolence, the progress of man has been so signal that even the cynical and despairing Carlyle could scarcely deny it. It is only ninety-eight years since Howard found the jails of Europe to be filthy dungeons, the keepers of which had the privilege of selling liquor and tobacco to the inmates; so that the jail was only an infernal tap-room, wherein men and women, old and young, festered and rioted together. The very year in which Howard began his work, a woman was burned at the stake in Spain on a charge of having made a compact with the devil. The lecturer drew a hideous picture of the torture and execution of poor Damiens, a crazy fanatic, who grazed the skin of Louis XV., of Europe, with a penknife, and was torn limb from limb by four horses, after undergoing unspeakable torments of various kinds. The awful fact of this case was that all France applauded the punishment, and Europe was not shocked at it. No one protested or interceded; and, if we may judge from the memoirs of the time, all Christendom seemed to regard the penalty as just and proper.

Mr. Parton alluded, also, to the criminal system of England at that time, when, after each assize, whole cartloads of malefactors, men and boys, were taken to Tyburn, and executed—sometimes five or six carts, full of criminals, going to the place of execution, one behind the other, the criminals themselves laughing and singing.

Turning from these graver aspects of the subject, the lecturer commented, in a ludicrous vein, upon the manner in which children were treated in the good old times, and gave an amusing account of his own experience, in a New York school of ancient pattern. Washington Irving, he said, who went to school in New York soon after the Revolutionary war, was so affected by the sight of the punishments inflicted, that the teacher had to let him go home with the girls before whipping time came. Gibbon also records that his knowledge of the Latin syntax cost him a good many tears and some blood. The first President of Harvard College was a great whipper of the students, and at last he pummeled one of them so severely with a cudgel that even the old Boston Puritans could not stand it, and turned him out. At the same time, the speaker contended, weak parents were just as foolishly indulgent toward their children as they are now. He gave, in illustration, that curious scene from the memoirs of the Countess de Genlis, where a spoiled child insists on having the flowery head-dress of the Countess to play with, and sticks to the point until the Countess is obliged to take it off.

The speaker remarked upon the tendency we all have to regard the great evils of the day as things new or very recent. He used to suppose that the contentions of the bulls and bears in Wall street was peculiar to the present time. But when Blennerhassett arrived in New York, toward the close of the last century, he found plenty of bulls and bears here, although the objects of the strife then were lands and lots. There were cornering and rings, and selling short, and all the other devices now practiced, though not called by their present names. Corrupt politics were not new. When Palmerston entered Parliament, he bought his seat for £5,000, which he tells us was the market price in 1804. Lord North's majority in the House of Commons, by which he fought the American Revolution from beginning to end, was a majority bought and paid for; and it was that corrupt House of Commons which dismembered the English Empire, and lost England her chance of ruling the world from the banks of the Hudson. Ireland, Poland, France, owed their disasters to corrupt politics, and the bandit Bonapartes were the penalty which France has paid, and is paying, for the harlot governments of the Bourbons.

Nor were politics in the Colonies entirely pure, as the lecturer showed by some amusing anecdotes. Bishop Kip, of New York, has lately told us how agreeable and dignified New York society was in the time of the Schuylers, the Van Rensselaers, and the Livingstons; but, at the same time, he has given us to understand that to maintain one of those fine families required half a county. This was too expensive; for nothing must be accepted as victory for the human race until every honest and worthy family shall be as truly refined and dignified as the best aristocrat that ever lived.

The lecturer concluded with a number of items, short and sharp, in which the progress made in various provinces was indicated rather than expressed. The *Press*, for example, in London, paid two pence a dozen for paragraphs of news; but recently the New York *Tribune* had paid $3,000 for a simple cable dispatch. From pack-horses to palace cars—what a step was there!

After continuing in this strain for several minutes, the speaker remarked upon the great difficulty of getting a genuine knowledge either of the past or the present, owing to the fact that crimes, wars, and disasters are recorded at great length, while virtuous actions and the nobler triumphs of peace often escape record altogether. About Napoleon, whom the speaker seemed to regard with contempt, there is a whole library; but of the illustrious Newton we have not a tolerable biography. In illustration of this point, Mr. Parton gave a passage from his own experience, when he held the post of paragraph-maker to a New York weekly. Thinking it unjust that the press should report men's evil deeds at so much length, while passing over good actions, he determined to found a new department, which should record good deeds only. But, after ransacking all the world of journalism, and even keeping a bright lookout in the streets for acts of benevolence and heroism, he was obliged to give up the idea from the impossibility of procuring sufficient material. And yet, during that very time, as at all times, the vast majority of all the actions done in the world were virtuous. It is only those who familiarly know both the past and the present that can realize the consoling truth that, during the last hundred years, there has been improvement everywhere, and real retrogradation nowhere.

WOOD AND IVORY CARVING.

BY J. D. CHAGE.

The grain and texture of wood vary so considerably that comprehensive rules of general application cannot be laid down. It is not difficult, however, to show in what respects general rules may be observed, and at what points they must diverge, according to the material to be dealt with. Some woods are of so fine a grain and so close a texture that they are capable of almost unlimited delicacy of finish; and of these, the harder sorts will take a soft-hand polish which places them almost on a par with ivory. I need only refer to that wonderful specimen of wood carving, the cabinet by Fourdinois, of Paris, from the Paris Exhibition of 1867, now at Kensington. Work of this description is, however, so exceptional as not to demand so much notice as the carving of the various woods in ordinary use. In such woods as oak, walnut, or mahogany, we have materials with a more or less pronounced grain or texture, in color not quite even, readily cut with a sharp edge, and of a tenacity altogether different from the brittle nature of stone, enabling it to bear considerable undercutting or perforation without risk. These are all qualities admitting of or requiring special treatment.

To commence with the first-named condition—the visible grain or texture. It is obvious that the workman will select for his carving that wood which is most *even* in texture, grain, and color, since all strongly marked grain or figure tends to confuse and destroy the effect of his work. Still, even when he has done this, he has in *oak* a very apparent grain, and here and there some amount of "figure." The carver in oak, therefore, must seek carefully to execute his work in such a way as to overcome the opposition which these qualities present. His lights must be preserved broad, clear, and in high relief; the leading intention of all foliage distinctly marked, the finer lines or stems preserving a sharp outline. The shadows must be bold enough to explain the forms, intensity being given by bold undercutting. Much assistance to the expression may be given by the actual tool marks. Nothing is so fatal to the spirit of wood carving as glass paper. Yet, bold though the execution of the work be, it need not appear coarse; the strength and tenacity of the material allow of thin edges and considerable freedom as to detached and perforated work. But, above all things, let the wood carver avoid a thick, square edge—an edge at right angles with the face of the work. This at once gives his work a *stony* character, which no mere finish will obviate.

I know no examples better illustrating the exact capacities of oak than the exquisite stalls of Amiens (1528), and the beautiful paneled door inclosure by Paul van Schelden, in the Town Hall of Oudenarde. There is an excellent model of the latter in the Crystal Palace. In walnut wood we have a material extremely suitable for the carver's art. There are many varieties, differing greatly from each other; some abounding in strongly marked and often beautiful figure; others presenting a mellow, even grain (with but a slight "streakiness"), and an agreeable gray-brown tone of color. When this latter class of wood is used (and its fine pores are, upon the completion of the work, filled up by a judicious wax rubbing), results may be obtained as satisfactory in the way of wood as those from bronze are in the way of metal.

To those who would learn the style of finish and execution adapted to walnut wood, I would point out the numerous works of the Siennese carvers, the stalls of S. Pietro at Perugia, and of Santa Maria Maggiore at Bergamo, both by Stefano de Bergamo. There are also some admirable benches and a desk in the Sala di Cambio, at Perugia, and the numerous grand doors in the Vatican likewise present excellent specimens. In the museum at Kensington there are a few good works of this class; modern Siennese work they are, but the artist has well caught the style and method of the old carvers.

I do not call to mind any prominent good example of *ancient* carving in walnut wood in the latter collection. The numerous coffers in the Cartoon Gallery have no special merit of execution. I must not be understood to proscribe the use of the figured class of walnut wood. On the contrary, this, beautiful in itself, should be used for such plain, flat surfaces as will exhibit and derive embellishment from its beauty.

It will be observed in the examples I have quoted that a certain *precision of touch* is common to all of them. The lights are crisp and well preserved, always with a view to carrying the eye along the motive of the ornament. If it be a scroll with a fine stem connecting foliage or husks, observe that the eye is always made to travel along the center line of the curve. The section of foliage or stem is such as to take the light in the proper direction. The fine stem is so sharply cut (though sometimes a mere thread) as never to fail in expression, either by means of its fine high light or sharp little shadow. In this way even the finest lines are not allowed to be lost in the dark color of the wood. It will be found also that excellent use is made of the tool marks, which greatly assist the expression of the work.

Holding a place superior, but closely allied to the finer woods, is ivory. This beautiful material has been very highly prized for the purposes of art from the earliest times. Its close, homogeneous texture peculiarly fit it for the finer kinds of carving, and the beautiful surface of which it is capable, together with its soft, even tone of color, have frequently induced artists to adopt it for works of a size considerably beyond what we need consider now. The form and size of its natural growth may, in a general way, be taken to limit the size of its use, which is therefore ordinarily confined to a surface of a few inches. There is hardly any limit to the finish and elaboration of detail which may be given to a few inches of ivory. High relief or low relief appear to equal advantage, and the conditions attached to it appear most simple. The work must never be rough or coarse, and must always exhibit the exquisitely delicate texture of surface which is natural to it. Its strength admits of its being undercut to almost any extent, and of being worked to almost any degree of tenuity, whilst the remarkably soft gloss of its surface exhibits to advantage either the boldest or most delicate roundings.

THE engineering establishments of the Clyde, Scotland have been well employed. The demand for sugar mill machinery for all parts of the world, has exceeded all previous experience. The value of the general exports of machinery for the past year, were some hundreds of thousands of pounds in excess of those of 1869. The value of the vessels built and supplied with machinery, for 1869, in the Clyde, was estimated at $25,000,000, and the business in ship building and marine engineering for 1870 was fully equal to that of the previous year. The opening of the Suez Canal has, for the time being, given a direction to the construction of screw steamers, to the displacement of sailing vessels. There are probably not more than four sailing vessels at present being built on the Clyde.

A VEIN of copper has been found in Lycoming county, Pa.

Mr. Lockyer on the Eclipse.—American Observers.

Mr. Lockyer, the English astronomer, in speaking of the eclipse, says:

Cloud in Sicily, cloud in Spain, cloud in Africa. Such, at first sight, might seem to be the only result of all the observations made on the eclipsed sun of 1870; such the reception given by Nature to those who wooed her as she had never been wooed before; who approached her full of the rarest gifts which science has placed at man's disposal. But, after all, has the oracle been silent? I think not. Dare we, however, say that the great problem of the corona, that one among the many still outstanding difficulties which the eclipse was invoked to settle, is settled? This, perhaps, would be saying too much; but still, I think, a step in advance has been made. The oracle has spoken darkly, perhaps, but it has spoken.

The system of sketching, introduced for this eclipse, is at once so simple and final, that the only wonder is, it has not been introduced before. The corona must be either solar, atmospheric, or subjective; that is, more or less built up in the observer's eye, while this more or less depends, *cæteris paribus*, upon the brilliancy of the undoubted solar portion. If at all stations, the stations being as wide apart as they have been this time, the drawings be similar, the corona would be undoubtedly cosmical; if dissimilar, then it would either be terrestrial or subjective; and this point could and would have been settled this time, if the weather had permitted, by arranging the observers *in pairs*—that is, dealing with two observers instead of a single one, and so obtaining the eye-variation.

This being premised, what is the result of the very few observations, comparatively speaking, which have been made? In the first place, I submit that the fact that the corona is a compound phenomena comes out in an unmistakable way. We have, first of all, a ring some 5 min. or 6 min. high round the moon, which almost all observers alike have seen; and then we have light beyond, which some observers have seen of one shape, and some of another, now stellate with many rays, now stellate with few, now absolutely at rest, now revolving rapidly.

This, I think, is the keynote of all the observations with which I have become acquainted. I need scarcely say that it is exactly what has been predicted.

First among the fortunate ones who observed the corona, with the telescope, was Professor Watson, of Ann Arbor, who took up his station at Carlentini, and appears to have been the best favored among the Sicilian observers. From his account I gather that there was an almost perfect shell around the sun, 5 min. high, and that outside this shell were less definite rays.

Next I must mention Professor Pierce, the head of one of the American parties, who observed two miles north of Catania, at a private casino of the Marchese Sangiuliano. I believe that he also saw the shell, but of this I am not absolutely certain; but he distinctly observed that the outer corona over the prominences was rosy red, although he did not see the prominences himself. A more beautiful proof of the terrestrial nature of this portion of the corona it would be difficult to imagine; for, of course, at the sun, the hydrogen, which thus tinged it, is incapable of coloring anything, as its own light is absorbed by the transcendent brilliancy of the photosphere; while nothing would be more natural than to suppose that the light, which, in its own atmosphere, should strongly tinge any thing radially illuminated, should be that of the prominences.

But the strongest proof of the variability of the outer portion, and of the constancy of the inner portion, is afforded by the observations made on board the small fleet attempting to save the *Psyche*, off Aci Reale, where the eclipse was observed in unclouded splendor. Here were the ironclads, *Lord Warden*, *Caledonia*, and *Royal Oak*, and the tugs *Weasel* and *Hearty*, besides the Italian gunboat, *Plebiscito*, all within a stone's throw of each other. In all the drawings, and many have been received, we have a ring 5 min., or thereabouts, while the outer portion is as variable as may be.

I think that if the records of former eclipses be now examined, especially Mr. Carrington's drawing of the eclipse of 1851, and compared with the others taken at the same time, additional evidence will be gathered in favor of the compound nature of the corona, which, on the evidence now before me, I consider the great teaching of the present eclipse.

The Characteristics of Silver.

Professor Dembinsky, in the *Mechanics' Magazine*, gives the following facts in regard to silver:

Silver is malleable, ductile, laminable to a high degree, though inferior to gold; it is not changed by the air.

A wire 1-10 inch will support 270 pounds of weight. It is fusible at 1873° Fah., and remains in fusion at a lower temperature than is required to bring it into fusion.

If by means of a solution of borax a small bit of leaf silver be stuck to the top of a small glass cylynder and melted into it, it will give it a golden tinge.

By long exposure to violent heat it has been converted into a glass of an olive-green color. In the focus of a burning glass it yields a white pulverulent matter, and there appears to exist but little affinity between it and oxygen.

Gold and silver readily combine and form a useful alloy. Having different solvents, they may be parted three different ways:

1. By dissolving the silver of the alloy by nitric acid; but for this process it is necessary first to take care that the gold is more than a quarter part of the mass. This process is called quartation.

2. By cementation, or parting by concentration, the alloy being placed in a crucible, in strata, with the cementing powder. The ingredients of this powder must be such that by an intense heat it will yield either pure nitric or pure muriatic acid vapor, as these will lay hold of the silver and leave the gold untouched.

3. By dry parting, which is by fusion with sulphur, the silver quitting the gold to unite with the sulphur. When silver is alloyed with copper it is rendered hard and fit for silversmiths' work and for coinage.

The alloy for the British coinage is 11 ounces, and one pennyweight fine.

With sulphuric acid, if concentrated, the silver is converted into a true oxide of silver, mixed with a small quantity of sulphate of silver. It is dissolved in nitric acid with rapidity if water be added to the acid, and much nitrous acid gas is disengaged.

The solution is at first blue, but this color disappears when the silver is pure, and degenerates into a green if it be alloyed with copper.

Nitric acid will dissolve more than half its weight of silver, the solution letting fall crystals in hexagonal, triangular, or square plates, which are called nitrate of silver, or lunar crystals, lunar niter, or caustic of silver.

This, melted with a gentle heat and poured into molds as soon as fused, forms the *lapis infernalis* or lunar caustic.

By fixed alkalies, silver is precipitated from its solution white, by ammonia grey, and by lime water olive green. It may be precipitated from a dilute solution by a plate of copper. The silver adheres like moss to the copper, and the liquid acquires a blue tinge from the copper, which is dissolved in place of the silver. It is likewise precipitated by mercury, with which it will also amalgamate. These crystals being articulated into each other give them the form of a vegetation, known by the name of the Tree of Diana, Arbor Dianæ, etc.

Nitrated silver, being precipitated and separated from the solution, exposed three days to the light and air, and mixed with liquid ammonia, becomes, when dry, fulminating silver. This exceeds gunpowder, and even fulminating gold, in power.

Once obtained it cannot be touched without a violent detonation, the weight of one grain being sufficient to give rise to a dangerous fulmination, and the silver is then found reduced or revivified, its oxygen having combined with the hydrogen of the ammonia, by which water is produced. This water instantly vaporizes, and possessing all the elasticity and expansive power of that state is the principal cause of the phenomenon, in which the nitrogen of the ammonia with its whole expansibility bears a part.

It is readily combined with muriatic acid by adding this acid to a solution of silver in the nitric acid, the muriate of silver being precipitated. This muriate is very fusible, running into a gray and transparent substance, like horn, which is then called Luna Cornea, or horn silver. This, being fused with four parts of potash, the silver is found in the purest state, and under a stratum of sulphate of potash and the remaining alkali.

It may likewise be decomposed by several other metals. If re-dissolved in pure nitrous acid, horn silver will be obtained, and a small quantity of a black powder remain at the bottom, which seems to have the property of gold. To appearance, part of the silver is converted into gold, but this is accounted for by the silver containing it, although called pure.

The muriate of silver exposed to the light of the sun soon becomes brown, oxygen gas being disengaged.

Nitrated silver and most of the solutions of metals thus emit their oxygen and become colored.

Carbonate of silver may be obtained by precipitating it by the carbonate of alkali.

Sulphur unites with it, and this sulphuret of silver is known as vitreous silver ore.

An alkaline sulphuret of silver may be obtained by fusion with alkaline sulphuret, and from the solution of this a hydro-sulphuret of silver may be obtained by precipitation by an acid.

Phosphuret of silver is obtained by the fusion of silver and phosphor. A mixture of vitriolic and nitrous acid has the peculiar effect of dissolving silver copiously, also oxidizing tin, mercury, and nickel dissolving, however, a small quantity of the latter, and having little or no action on other metals.

By dilution the mixture becomes less capable of dissolving silver, and more capable of acting on other metals.

Stucco and Plaster Work.

The treatment of stucco and plaster work may be classed under two heads: that molded by hand, and that cast in molds. The two methods may also be blended. In working plaster-relief ornament by hand, a great freedom of touch and variety of form are attainable and desirable. At the same time, thin edges or deep undercutting are rendered undesirable by the friability of the material. The degree of finish must depend rather on the conditions of application, since its texture may be rendered as fine as that of ivory, and a pure and even tone of color may be obtained, either in the material or by subsequent tinting. Almost any degree of vigor may be given by bold modeling, keeping the lights broad, and not too much softening away the tool marks.

Excellent examples of plaster treatment may be seen in the ceilings of many old London houses of the period of the Georges, and the elegant and spirited stuccoes of both ancient and medieval Italy afford valuable teaching. Where the ornament is intended to be painted or colored, care should be taken to avoid narrow quirks, which may become stopped, and thin edges, which will easily be broken. If the relief be very low, an indented outline is useful. For the treatment of plaster ornament cast from molds, we cannot do better than observe Arabic or Moorish work. Ornaments produced in this way should be clear, well defined, not undercut, and arranged so as to draw readily from the mold, and require little subsequent finish. It is applicable, of course, chiefly for repeated or diaper ornament. In Moorish work, beautiful soft gradations of shade are obtained, not by rounding, or molding the face or edge of the ornament, but by introducing two or three distinct *strata* of ornament, interlacing with each other, each on its own level—a plan in every way adapted for work cast in molds. In combining the cast and hand-worked methods, the simpler and more rigid parts may be cast, leaving the lighter detail to show the workman's hand.

Cotton Gins.

The return of peace, and the consequent increased attention to the culture of the great southern staple, have caused marked activity in the department of cotton gins.

On account of the present efficiency of the McCarthy gin, the subject in England of at least a hundred patents, or on account of the laudable desire of our inventors to produce a machine which will perform more work in the same time, there has not been a single improvement patented on this gin during the past year. This gin, otherwise known as the roller gin, is composed of two cylinders, revolving toward each other, and provided with a fixed blade which bears against the upper cylinder just above the point where the cotton is presented, and a reciprocating blade which, in its downward motion, strikes against and removes the seeds from the cotton fiber, the cotton being drawn in a clean condition through the rollers. This style of gin is employed to gin Sea Island or long fiber cotton exclusively; but while it works well, it moves slowly. The saw gin on the contrary, which is employed for the common or short fiber, is, in its ordinary form, totally unsuited for Sea Island cotton. The rapidity of its operation, however, has attracted the attention of several inventors, and efforts have been made to adapt it to ginning Sea Island cotton. It is obvious that any improvement which would effect this result would be of great importance, as it would materially reduce the price of long fiber cotton, of which only about forty pounds per day can be ginned by the ordinary roller gin, while a saw gin, if effective, could gin five times that quantity.

Of the improvements made in this direction two have reference to the saw and one to the rib. Those of the former character consist, first, in substituting, for every alternate saw, a disk without teeth, thus widening the distance between the saws and preventing the tearing of the fiber, which is, at the same time, supported by the disks; and, secondly, in constructing each saw with blank places at intervals of, say, every six teeth, the area of blank spaces being about equal to that occupied by the teeth. The improvement on the rib consists in constructing the same with a ridge on the hopper side of the ribs, which ridge serves, to hold the fiber while being acted upon by the saws, and to prevent them from taking hold of it at too short intervals, whereby breaking is apt to take place.

Several patents have been taken out on what may be called the saw roller gin, comprising, as it does, many of the features and advantages of both the saw and roller gin. In this machine there is provided a large cylinder, which may have saws, but which is generally covered with a serrated wire arranged spirally. Between every two circles of this serrated wire is placed a packing of some description, generally metal. Above this cylinder, and revolving in the same direction, is placed a small corrugated or fluted stripping roller, which strikes back and removes the seed, etc., its operation being assisted by a horizontally reciprocating bar with a plain or serrated edge.

A patent was granted during the year for an improvement intended to adapt the ordinary saw-gin to cleaning cotton seeds. It is known that the ordinary gin turns out the seed covered with lint to such an extent that a ton of the seeds will sometimes have as much as eighty pounds of cotton adhering to them. Nor is this loss of cotton the most objectionable feature, for seeds th s covered with lint have a tendency to clog in planting, rendering that operation difficult. The improvement referred to, and it is the only patent issued during the year for the purpose, consists of a longitudinally grooved roller placed in the hopper in front of the saws, and which serves to keep the seeds in a state of continual agitation, every side of each being presented to the saws, which completely remove all the adhering lint.

An ingenious English patentee some years ago proposed to remove this lint by passing the seeds over a flame, and employed an endless apron of wire cloth for that purpose, while an American inventor, at a later period, claimed to have discovered an equally efficacious remedy, namely, the application of gunpowder, sprinkled among the seeds in sufficient quantity, and then fired. As the "sufficient quantity" is the all important question in the process, it will be well to make sure of it before experimenting, as an overcharge might remove the seeds as well as the lint.—*Commissioner Capron's Report.*

NEW STEEL PEN.—A new form of steel pen, containing a reservoir of ink, has lately been introduced by a Birmingham (Eng.) firm, who have named it, with a singular oblivion of the meaning of the word, the "*Automatic* Wonder Pen." The patentees claim that a fortnight's supply of ink can be carried in the pen; and from the description, we find that the ink is in a solid form, as only a little moisture, such as water, milk, or beer, is required. Pens loaded with ink of several colors are made, and are used by being dipped in the fluid, as is usual with the ordinary pen and ink.

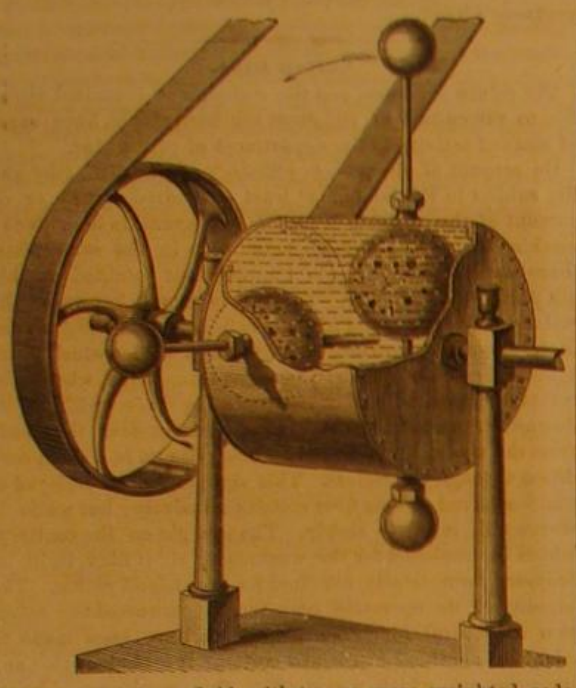
PERPETUAL MOTION.

NUMBER XII.

We this week conclude our series of articles upon perpetual motion, with an illustration of a machine, invented by a Canadian inventor, and a couple of letters upon the subject, lately received. We also would call attention to an article entitled the "Mechanical Equation," published in our editorial columns, and designed to show the folly of spending time and money in the pursuit of this chimera.

Fig. 30 is the device above referred to. It consists of a

FIG. 30.



cylinder containing a fluid, with two or more weighted rods passing through stuffing boxes in the shell. To the middle of each of these rods is fixed a ball of cork, which is expected to rise to the upper side of the cylinder whenever the revolution thereof brings it a little below the axis of the cylinder. In thus rising, it will carry the upper weight away from the center, and bring the lower one toward the center, so that it is thought the center of gravity of cylinder arms, corks, and metallic balls will be kept constantly on one side of the geometrical center, and constant revolution will result. The fact is, however, that the center of gravity will remain always in a perpendicular drawn through the axis, and, consequently, the expectations of the inventor will never be realized. Even if the movement of the arms expected to occur should take place when the cylinder is turned by hand, the decrease of weight, on that side of the cylinder to which the cork would rise, caused by the displacement of the heavier fluid, and the increase of weight on the opposite side caused by the displacement of the cork, would counterbalance the leverage of the weighted arms, and so the exact balance of the machine would remain undisturbed.

MESSRS. EDITORS:—This communication is especially designed for the benefit of those who still believe the perpetual motion of machinery possible. Let it be granted that the the terms weight and force are synonymous, *i. e.*, twenty pounds of weight will require a force precisely equal to the force of its own pressure to sustain it, or neutralize that pressure; for example: if a twenty pound weight be placed upon a scale, and a hand be placed upon the opposite scale, the force applied by the hand must equal twenty pounds to exactly balance the twenty pound weight.

So far we only affirm what every school-boy is aware of.

Keeping strong hold upon this self-evident fact, we may next affirm that each twenty pounds is at an equal distance from the center pin, or fulcrum of the beam. Observe also this additional fact. If either weight be depressed, the opposite one will rise at the same speed and through the same distance which the other has fallen; *i. e.*, equal weights will balance each other, at equal distances from a common point of support, and will move in opposite directions with equal velocities.

Suppose it be required that one of these weights shall rise faster than the other falls. To accomplish this, we must remove it further from the fulcrum or point of support. Observe that a scale beam corresponds to the diameter of a circle, and the arms to the opposite radii of this circle. To the unscientific, these self-evident definitions may appear puerile; but let them reflect that the grandest theorems of scientific investigation wholly depend upon a recognition of self-evident truths.

Returning again to what was proposed, viz.: to cause weights at the extremities of a lever to move at unequal velocities, we find that to do so they must describe arcs of different circles, as the radii are unequal.

But in removing one weight farther from the fulcrum than its opposite, we destroy the balance; for example: suppose its distance to be double that of the other, it will now move with double the velocity, but will require first double weight, or force at the opposite end to balance it; in other words, "all that is gained in velocity, must be replaced in force at the opposite end of the beam."

The converse of this is true, *i. e.*, we may cause a weight to raise a greater, as already shown, but if we raise forty pounds with twenty, we only raise it half the distance which the twenty pounds falls.

The above, being the essence of the "law of virtual velocities," needs only to be comprehended to entirely explode all possible theories of perpetual motion.

Every attempt to produce a self-moving machine has been in open defiance to the co-ordinated relations of force and motion, and any man who comprehends this law of velocities will no sooner attempt to solve the problem of perpetual motion, than to climb upon his own shoulders as a higher point of observation.

I do not propose to exhaust the numerous theories in support of the fallacy, but will analyze a few, serving as a death knell to all.

Before attempting this, let us remark that, in the search for an impossibility, so many valuable and practical certainties have been demonstrated, that perhaps no time has absolutely been thrown away; for as alchemy has fostered and developed chemistry, so has the search after perpetual motion taught how to apply force through complicated machinery, and thus, through unsought channels, has knowledge and civilization flowed all over the world.

A favorite device of the "perpetualista" is one which proposes to employ an overshot water wheel, that shall pump or convey the water back to a reservoir as fast as it comes out! To accomplish this, it only becomes necessary that all the water shall move, in equal volume or weight and equal velocity, in a given circle, or at opposite ends of the scale beam. A simple recognition of the principle laid down at the beginning of this article demonstrates that this is absurd.

The supporters of this species of nonsense, occasionally propose to lift this water above the highest point of the circle. As this supposes the less to exceed the greater, it does not require refutation. The foregoing reasoning applies with equal force to all combinations of tubes and endless chains, belts, cups, etc., proposing finally to act upon a given circle, and to be lifted back to their proper positions to continuously act upon a greater circle, or longer set of levers. The simple fact set forth, that equals can only balance equals, when acting oppositely at equal distances, completely upsets all possible theories of perpetual motion. But a few days since, one of this class of enthusiasts called upon the writer with a rude drawing, in which appeared some half dozen geared wheels, with about an equal number of mystical-appearing levers, by which he exultingly proposed to propel a first-class steamship across the Atlantic, by employing one man at a crank turning a geared wheel two feet in diameter. Of course I dissented, but his faith was sublime; and he left, evidently disgusted with my short-sighted ignorance, and mechanical bigotry. And so it will continue until minds of this class pause and observe a few simple and obvious truths, which, clearly recognized, make the theories of perpetual motion to fade like "the baseless fabric of a vision, leaving not a wreck behind."

I. D. J. SWEET.

A humorous correspondent gives the following as a method whereby a perpetual motion may be obtained. He says he has seen a steam boiler advertised which saves 33 per cent of fuel; a valve which saves 15 per cent; a governor which saves 10 per cent; a cut-off which saves 10 per cent; a fire grate which saves 20 per cent; metal packing and and damper regulator which saves 12 per cent; and a lubricator which will save 1 per cent; making in all a saving of 101 per cent. Combining all these improvements, an engine would, he thinks, run itself, and produce an additional one per cent of fuel, which might be used for domestic purposes.

IMPROVEMENTS IN CASTING PULLEYS AND GROOVED ROLLS.

The accompanying engravings illustrate improvements in lasting pulleys and chilled rolls. Figs. 1 and 2 show a method of casting pulleys invented by W. Neemis, of Pittsburgh, Pa., in which the box, A, slides, C, and pattern, B, together with the cast iron case, D, for forming the outer side or face of the pulley, are used, in conjunction with sand molds, made in the box, A. Foundrymen and molders will understand the application of the device without further description. The device was patented in March, 1867.

Fig. 1.

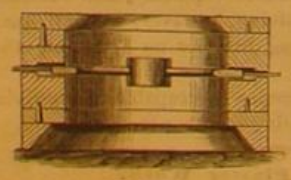


Fig. 2.

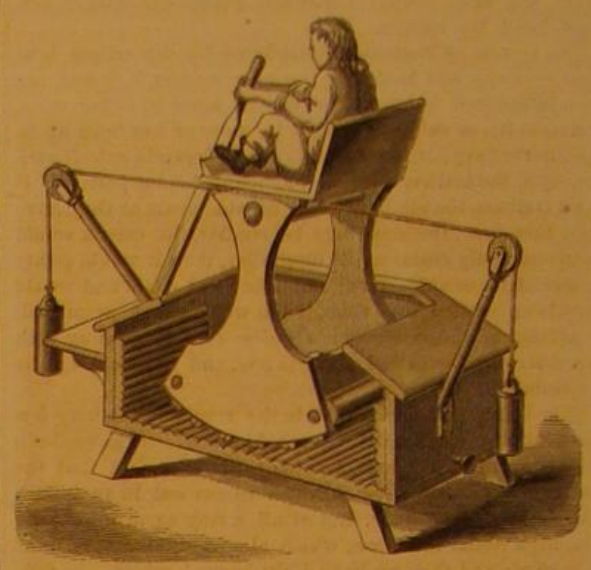
Fig. 3 illustrates a method of casting grooved rolls, invented by R. C. Totten, also of Pittsburgh, Pa., in which a series of metallic rings, made in one or more pieces, with angular, rectangular, or curved inner faces, for forming the grooves of a chilled roll, is employed. The rings are packed in a mold of sand or metallic composition, arranged, substantially as shown in the engraving, with other rings which form the cylindrical surface of the mold. This invention was patented in April, 1867.

ALL persons using coal oil, for illuminating purposes, will read with interest the statement of the manufacturers of "Astral oil," in another column.

INFANTILE POWER WASHING MACHINE.

The credit of this invention—the application of baby-power to washing machines—in the unique manner illustrated in the annexed engraving, belongs to John Highbarger, of Sharpsburg, Md., who not long since secured the patent.

A tank with ribbed sides is intended to hold the clothing, and the water and the soap. The clothes are washed by the oscillation of a rocking chair, with ribbed rocker bottom, as shown, the rocking being effected by the hands of the operator, which grasp a hand bar. The rocker is counterpoised by weights, as shown.



This plan of utilizing baby power is certainly novel, and is, no doubt, amusing to the operator, and we are sure it will be to our readers.

The Rice-Paper Plant.

It is only within a very few years that the true nature of the beautifully smooth and uniform, though very brittle paper, so largely used by the Chinese for drawings of birds, butterflies, and other objects of natural history, has been ascertained. It received its popular name of rice paper from an erroneous notion that it was made in some way from rice. It is, however, the pith of a plant not very distantly related to our common ivy, though having a very different appearance. The plant is called by the Chinese Tung-tsau (hollow plant). It grows wild in great abundance on the hills in the northern districts of the island of Formosa, where it is gathered by the natives, and exchanged on the coast for Chinese produce. It is a small tree, at first growing with a simple stem, after flowering, two or more branches are produced, and the tree increases in size until it reaches a hight of twenty or thirty feet; but as the pith deteriorates in the parts of the tree that have become old, it is generally cut down before it is twelve feet high. The large, sycamore-like leaves crown the slender stem, and, when in flower, are surmounted by several wand-like bunches of small, pale-yellowish flowers. A single flower is very insignificant, but the great number of them, borne on thin whitish-pale stalks, have a striking and beautiful effect, especially from the great contrast between them and the crown of large dark green leaves. The stem is strongly marked by the transverse scars formed by the fallen leaves. It is covered by a thickish bark, and the wood is hard, heavy, and durable.

The collectors cut the stems into lengths of nine or twelve inches. The pith is about two inches in diameter, and is very uniform in texture, except in the center, where it is broken into a series of doubly concave cavities. A straight stick is inserted into the end of each piece, and the pith is forced out at the other end by hammering on the ground The pith is then placed in the hollow bamboos, where it swells to its natural bulk, and dries straight. The pith is then dexterously cut by workmen, who hold against the cylinder a long, sharp knife, which is kept quite steady while the pith is moved round and round.

The paring thus goes on continuously until the inner broken pith is reached. Each cylinder produces a smooth, continous scroll, about four feet long. The sheets as they are cut are placed one on the other, then pressed and cut into squares of the required size. These are about three inches and a quarter square, and are sold in packets of one hundred each, at rather less than one penny the packet. The small squares are dyed different colors, and made into artificial flowers for ornamenting the hair of the Chinese ladies.

Large piths occur in other plants besides the Tung-tsau. An Indian plant named Shola, belonging to the leguminous or pea tribe, was by many believed to be the source of the rice paper. It is extensively employed in Singapore for the manufacture of floats and buoys for fishermen, and for the light sun hats worn in the east: but it is greatly inferior in color and quality, to the true rice paper. The Taccada, an erect shrub growing on the shores of India and Ceylon, has a pith of considerable size, and of a firm, white appearance. It is much used by the Malays and Siamese for making artificial flowers, small figures, and other articles used as decorations at feasts and festivals. Among British plants the elder tree has a very large pith, which has not, however, been applied to any practical use. It can be readily pushed out of the stem, in the same way by which the Chinese get the pith of the Tung-tsau. The hollow stems that remain have given to the tree its popular name of bore tree.

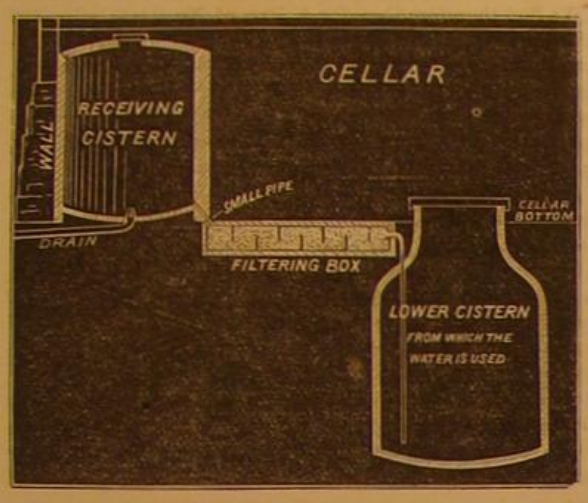
Correspondence.

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

How to Construct a Cistern.

MESSRS. EDITORS:—As some inquiries have occasionally been made in the SCIENTIFIC AMERICAN in regard to the best method of filtering rain water, I send you herewith a sketch illustrating my views, founded upon many years' experience, knowing that if it be of no value to you, no harm will result from so doing.

To obtain the best water at all times, it is not enough that the water be well filtered. To illustrate: A cistern of 2,000 gallons is filled. After some weeks of continued dry weather, the amount is reduced to, say, 1,000 gallons, at which time the quality of the water will have sensibly improved. A shower occurs, pouring into the cistern, say, 300 gallons. The 1,000 gallons is violently mixed with the newly fallen rain, and the result is, the quality of the water is injured for a time, or until sufficient time has elapsed to allow it to settle again.



Again, the process of filtration cannot properly be accomplished in the short time allowed by some devices. Water should be filtered very slowly.

Then, every filtering apparatus should be cleaned out, and all the materials employed thoroughly washed or renewed, regularly and somewhat frequently, as required by the character of the roof and the situation of the house, as regards smoke, cinders, dust, etc.

To accomplish the best results, I would construct a cistern of requisite capacity, above the bottom of the cellar, into which all the water from the roof should be turned. Another cistern of equal capacity, of what is known as the "jug" pattern, should be built below the cellar bottom, having a neck of proper size extending slightly above, and kept closed by a tight cover. Between the two cisterns, construct a box of wood or bricks, say 6 to 10 feet long, and 12 to 16 inches square, with partitions alternately extending nearly to the top and bottom, as shown. Fill this box with the proper filtering materials; broken stone, well washed coarse and fine gravel and sand, charcoal, and, finally, at the outlet, fine sponge.

The stream of water from the receiving cistern should be very small, say ¼ inch in diameter, which, entering the box box at one end, would gently percolate through the mass of filtering materials, and by a small block tin pipe, be conveyed to the bottom of the lower cistern, from which it would be pumped as wanted. The flow would be constant, or until the upper cistern was emptied. This box should also be kept closed by a tight cover, which, when lifted, would allow ready access to remove all the filtering materials, to be washed and returned, or, what is better, to be replaced by clean, fresh materials.

The bottom of the upper cistern should be concave, connecting by a pipe and stop-cock with the drain. Occasionally, when nearly exhausted, it could be easily and thoroughly cleaned and rinsed out, the sediment and dirty water escaping by the drain. The bottom of the lower cistern should also be concave, and at intervals the pipe between the two cisterns should be closed, to allow the lower one to become exhausted in order to cleanse that also.

The upper cistern should be covered by a brick arch, or by matched pine plank, made perfectly tight. Otherwise the evaporation from such a body of water will be injurious to both structure and inmates.

The device of making a filter by a brick partition, or well in the cistern, drawing the water from the side opposite the ingress pipe, is quite effectual for a time. A little reflection however, will show that the sediment taken from the water remains: either in the pores of the brick, or in the form of a coating on the surface; and that, after a time, it will vitiate its purpose, and become comparatively inoperative and useless.

The objection to the system shown is the increased expense; and those parties obliged to depend upon a rain water supply, and who, from necessity or choice, prefer the cheapest article, when first cost alone is considered, will not adopt it; but in many places in the country, where persons want permanently pure water, even if obtained at a greater expense, I think no better arrangement has been devised.

The principal value of a filter depends upon keeping it clean; and to continue to use water, month after month, after the filtering materials have become foul, is not consistent with our ideas of cleanliness, and is positively injurious.

The cistern from which the water is used being at a distance below the cellar bottom, the water is kept sufficiently cool, even in hot weather, to be very palatable.

Some persons, not using a filter, adopt the expedient of having two cisterns on the same level, both connected with the pump, using from each alternately as the other becomes exhausted. This arrangement is a great improvement upon a single cistern, but will not compare with two, arranged as shown in the sketch.

The cost of two first-class cisterns, of 2,000 gallons capacity each, with filter constructed in the most thorough manner, would, in most localities, be less than the cost of a properly constructed well forty feet in depth.

ALFRED BICKNELL.

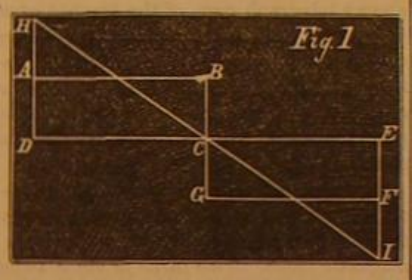
Action of Reciprocating Parts of Steam Engines.

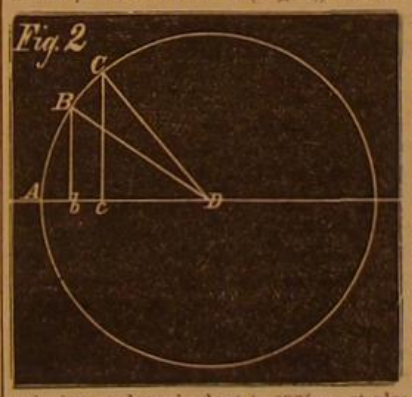
MESSRS. EDITORS:—In the paper read by Charles T. Porter, before the Polytechnic Club of the American Institute, published in the SCIENTIFIC AMERICAN of Feb. 4th, we have the following paragraph:

"We are arrived now at our final proposition: that the resistance offered by the reciprocating parts to this alternate acceleration and retardation is, at its culminating point, the dead center, precisely the centrifugal force that the same weight would exert continually if it were revolving with the crank pin."

If we admit the truth of the above "proposition," the logical inference is, that the reciprocating parts of a steam engine will answer as a substitute for a fly wheel; and that the motion will be carried through the dead points by a single crank, with sufficiently heavy reciprocating parts, as effectually as by a fly wheel.

The absurdity of this inference is so obvious that it is unnecessary to review the argument whereby Mr. Porter arrives at his remarkable conclusion. It may not be amiss, however, to call the attention of your readers to the apparent source of the error in Mr. Porter's argument: He says the line, H I (Fig. 1), is a straight line; whereas, it is readily seen, by calculating the ordinates according to his rule, that the ordinate for 45° is about two thirds of D H; and therefore the line, H C I, is a curve, with contrary flexion at C. Moreover, it is easily demonstrated that the tangent to this curve, at the point, H, is parallel to D E, and therefore the acceleration, as well as the motion of the reciprocating parts, is reduced to zero at H. It follows, therefore, that if the momentum of the reciprocating parts has not been expended in work before the crank pin arrives at A' (Fig. 2), the amount of momentum not expended will, at that point, be exerted on the piston to prevent its return, and will therefore be so much force lost.





I need hardly add that, as the velocity of the reciprocating parts is reduced to zero at the dead points, the centrifugal force, which is a function of the velocity, and equivalent to $\frac{mv^2}{r}$ must also be zero at the same points.

It is obvious, therefore, that all the centrifugal force we have, in reciprocating engines, is that derived from the motion of the crank and the end of the connecting rod or "pitman," that is, from the parts that revolve.

Des Moines, Iowa. J. E. HENDRICKS.

Ice Phenomenon.

MESSRS. EDITORS:—A few mornings ago I observed a very curious phenomenon in connection with the freezing of water, which, I think, may be of interest to some of the readers of the SCIENTIFIC AMERICAN. I therefore respectfully submit it. On the evening of the 3d inst., I left a pint wash bottle, filled with water up to the bend of the neck, in a cool place, with the cork loose. The next time I looked at it, it was in the condition represented by the figure. The water had frozen, and the ice reached some distance up the neck of the flask. The tubes were supported by the ice, as shown in the figure, reaching down about half an inch below the surface. From *a* to *b* could be faintly seen the course which the tube had taken as it was forced up. R. H.

Ithaca.

Cure of Aneurism by Manual Compression.

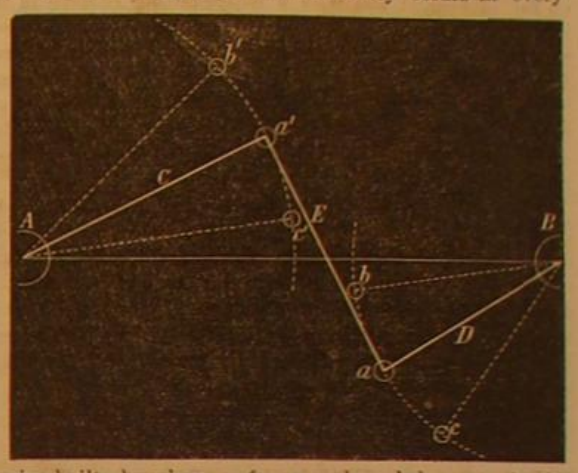
MESSRS. EDITORS:—In your journal of the 28th ultimo, you record what you demonstrate a "remarkable cure of aneurism," giving to Mr. Buxton Shillitoe the credit of being the originator of the method by manual compression. In this, I believe, you are in error. The method of treating aneurisms by digital compression was, I believe, devised some years ago by Mr. (now Sir William) Fergusson, Professor of Surgery in King's College, London. This mode was, I know, in vogue six or seven years ago, when I was in Great Britain. It is evident that it can, as a rule, only be carried on in a hospital, where the surgeon has dressers and relays of assistants from among the medical students constantly at hand; and it is, moreover, too fatiguing a plan to be adopted in ordinary practice, and would, I imagine, only be attempted in cases like the one you record, where the vessel could not be secured by a ligature.

CHARLES JOHNSTON, Surgeon and Physician.

St. John, N. B.

Practical Problem.

MESSRS. EDITORS:—Your readiness in admitting to your columns problems for solution, when such solutions are of general utility, emboldens me to present the enclosed sketch and statement, with the assurance that a thorough investigation of the matter, resulting in an accurate practical solution, would be gladly received by builders of western steamboat engines—for the problem inevitably occurs in every



engine built—by whom, so far as my knowledge extends, the answer is obtained, or "fudged out," as Byrne would say, by means of trams, etc., in a tedious and patience-killing manner.

I will not, in this article, occupy your space with an explanation of the "whys" and "wherefors," but endeavor to give, in as few words as possible, what is given and what is required in the problem, referring to the drawing to make the matter clear.

A and B, represent two shafts, parallel and in the same plane. These shafts carry arms, C and D, of different lengths, connected by a link, or connecting-rod, E. The driver-shaft oscillates, and communicates a corresponding oscillating motion to the driven.

Now the distance between the centers of the shafts, A and B, the length of arms, C and D, and angle of oscillation, b B c, or distance b c (— b' c'), *must* be given; and the length of the link *may* be given.

Required the angle that arms, C and D, make with the line between centers of A and B (above and below, as shown, to give reverse motion), length of link, if not given, and a' b' to equal a' c', and a b to equal a c. The distances a a', b b', and c c' must also be equal.

The drawing is reduced from a case in actual practice, in which A B — 14½ inches, arm C — 7½ inches, arm D — 5¾ inches, link E — 6¼ inches, angle of arm, C, with line, A B — 25½ degrees, angle of arm, D, with same line — 32 degrees, and chord of arc a b — $2\frac{5}{16}$ inches.

The relative proportions here given do not vary much in practice, but neither the arm, D, nor link, E, should be less than five inches in length.

Perhaps some of your readers can give me a readier method of solution than I now have, and thus confer a favor.

Madison, Ind. DRAFTSMAN.

Popular Errors Regarding the Watch—Chronometer Balances.

MESSRS. EDITORS:—Probably no part of a watch is less understood by the mass of those who use watches than the chronometer balance, or, more properly speaking, the compensating balance. Some persons have a vague idea of the principles upon which it is constructed, and others have no notion whatever, except that somehow it imparts some peculiar and valuable quality, and that a watch so gifted is the *ne plus ultra* of horological skill. It is very easy to explain the principles upon which it is constructed; it is only necessary to remember that if the balance of a watch be made longer in its diameter, it will run slower; if the diameter be diminished, the watch will gain time. Also, it must be recollected that heat tends to make the watch run slower, and cold produces the opposite effect. Now, the compensating balance, as its name indicates, is designed to counteract the tendencies of heat and cold in their influence on the running of the watch, and it will do that in the most perfect manner, provided that it be so adjusted that the mechanical changes produced in the diameter of the balance be just sufficient to counteract the effect of temperature, and no more. When such an adjustment is not made, the action of a compensating balance upon the running of the watch is quite as likely to be wrong as right; consequently, an unadjusted balance of that kind contains as many elemen s of error as of truth, and is far less reliable for accuracy in time keeping than a plain steel or gold balance.

Nine tenths of the watches now sold in the market have apparently compensation balances, that is, the balance has a lot of screws fixed in its edge, which, when in action, look formidable: and those dealers who palm off, on unsophisti-

cated confiding buyers, these "chronometers," invariably, before showing them, give the movement a furious shake, giving to these balances a bewildering velocity of rotation. The dealer, in order to sell these pretended chronometers, must lie outright, or by implication. American watch manufacturers have committed a great error, and done the community a grievous wrong, by putting into their watches of all grades, good and bad, compensation balances. It gives the dishonest dealer an unjust advantage over the honest one. No person, not even the maker himself, can tell an adjusted from an unadjusted balance by inspection; the quality of adjustment can only be determined by actual trial. A knave can sell, to a confiding customer, an unadjusted balance at a price far below that for which an honest dealer could sell an adjusted one; and no person should buy a watch purporting to be adjusted, of anybody without the signed certificate of the manufacturer as to the adjustment of the watch of that particular number. Then, if you be deceived, you are in a position to claim the rights of that certificate. It ought to be so that the watch of any manufacturer or company, with their names on the movement, and with a compensating balance in it, should be adjusted; then the buyer would know, by inspection for himself, that he was getting what he paid for; and I am glad to see that a Boston firm is engraving the word "adjusted" on the plates of all its watches which are sold as adjusted. This is what all the manufacturers ought to do, so long as they will put in market watches with unadjusted balances.

As things now are, watches from ten shillings to hundreds of dollars in price, have all of them the "patent double back action, rotary, self-regulating chronometer balance." And the buyer must shut his eyes, pay his money, and take his choice among these mechanical humbugs. Oh! for the time to come, when the community will cease to be like unfledged birdlings, with their mouths agape, clamoring for somebody to cram them with "numbug." R. C.

Cleveland, Ohio.

Petroleum as an Illuminator.—Dangerous Oils vs. Dangerous Lamps.

MESSRS. EDITORS:—An article in your issue of the 11th inst., entitled "The Adulteration of Petroleum," no doubt reflects the views of many intelligent firemen—those whose business it is to combat the fire fiend—and all will concur in the propriety of legal enactment to secure to consumers unadulterated oil; but I would suggest that a complete prevention of the distressing burning disasters, which so often occur in families, by the use of this light, is not to be found in that direction.

Many of the brands of oil in the market are as safe as refined petroleum can be, while still more are unquestionably dangerous; but I wish to call attention to the fact, that, as generally used in the common lamp, these oils are all dangerous, and, I will add, the difficulty is not with the oils alone, for I am confident they can be used with perfect safety.

Now, to say that "well-refined petroleum forms neither gases nor vapors," is to state what can easily be disproved; and to attribute all accidents to adulterated and worthless petroleum, is equally incorrect.

The great mistake is, in supposing that good kerosene will not generate an explosive gas until heated to 100° or 110° Fah.

Now, I am prepared to affirm that the temperature of the flashing point is not a reliable test, so far as determining the explosiveness of an oil; and I do not hesitate to say, that out of any number of samples of good oil, that will not vaporize or flash under 100° (tested in the usual way), the larger part—when used as they generally are, in common lamps—are dangerous, because of their liability to create explosion.

If this be a fact (and I can demonstrate it by experiment to be so), it clearly shows that it is one thing to "test" oil, when exposed in a shallow, open vessel, and a very different thing to test it after it has been confined closely, in the tight vase or reservoir of a lamp.

In the first test, the vapor rises slowly, and immediately mingles with, or is imbibed by, the stratum of air next over the surface of the oil; and when the match is applied, a flash cannot be produced, because the gaseous mixture contains too little of the inflammable material, carburetted hydrogen. In the other test, the reservoir not being full of oil, and being confined closely, enough vapor will accumulate, after the lamp has stood some hours, to form an inflammable compound, that will certainly explode, if ignited.

Now, who can say that the rigid enforcement of stringent laws against adulterating petroleum will completely put an end to these terrible burning accidents?

It comes to this: we must recognize the fact that the evil is not alone with the oils in use, but is largely in the faulty construction of our lamps.

There is no cheap lamp that will render kerosene oil perfectly free from the danger of explosion, or that will obviate the many accidents occasioned by filling the lamps at night.

Of course, I leave out of consideration those lamps made entirely of metal, and constructed on philosophical principles, of which I know there are several in the market, that are really a near approach to a perfectly safe lamp; but the vital objection to them all is, that they are too high in price. We must have a cheap, safe lamp—one suited to the wants and pockets of the million, for kerosene oil is now in almost universal use.

Understand me, I demur only to so much declamation against dangerous oils, while we hear so little said against dangerous lamps. It strikes me, the tendency of this course is to divert attention from some of the more frequent causes of these burning disasters.

Instead of asking for additional legislation preventing or regulating the vending of dangerous oils, enforce existing laws; and let us seriously consider the means of further improving and rendering safe our dangerous lamps. Instead of so much ado about oils to stand the "fire test," in all conscience give us lamps and burners that will stand the fire test.

When we scan the exhibit of death and destruction caused by adulterated oil, don't let us forget to ask for the record of lives lost by defective and badly constructed lamps.

Intelligent persons do many things in using these lamps that invite disaster. I could name a number of such things, but will only mention one at this time.

The heat thrown off from an *A*, or No. 1 flat-wick burner, when the blaze is at full flame, as shown by placing a thermometer near the chimney, is 108° Fah; now the same lamp, with a small-sized, common paper shade on it, shows 126° of heat; and with a small metal shade, the mercury runs up to 138°. Producing by reflection thirty degrees greater heat on the lamp than no shade at all, metal shades must have a dangerous effect.

I will only add now, that I have personally investigated every case of accident from kerosene lamps occurring in this city during the past two months; by nine or ten accidents, three lives were lost—clear cases of burning to death from lamp explosions. I could not get the oil to examine in these cases, but the evidence afforded by the badly-constructed burners, which I *did* carefully examine, left no doubt on my mind as to the real cause. CHAS. B. MANN.

Baltimore, Md

(For the Scientific American.)

ON THE PROPER RESISTANCE OF TELEGRAPHIC RELAYS.

There is not, as a general thing, any well-defined idea, among telegraph men, of the amount of resistance which develops the greatest attractive force, or magnetic effect, in a relay. If there be no resistance, there is no effect, and, on the other hand, when the resistance is infinite, the effect is also nothing. The practical question therefore, is to determine the amount of resistance that produces the maximum effect.

In order to make this point clear, it is necessary to state that every turn or convolution of a conducting wire, around the core of an electro-magnet, produces in the latter a certain magnetic effect. Two turns produce twice the effect of one turn, but the length, and consequently the resistance, of the wire is also doubled.

Now, as the magnetic effect is always inversely in proportion to the resistance of the circuit, this effect would remain unaltered—that is, it would be the same with two turns as with one turn, were there no other resistances in the circuit. But there are other resistances in the circuit; namely, that of the battery, and the connecting wires, and the sum of all the resistances must be doubled, in order to halve the attractive force of the magnet. Therefore by multiplying the turns of wire in the helices, the magnetic force is augmented.

If we wind one layer of convolutions of silk-covered wire in a helix of given size, we get a given number of turns, and it is evident that, with a smaller sized wire, we can get a greater number of turns, but, on the other hand, the smaller wire has a greater resistance, and this again diminishes the magnetic effect.

To illustrate this: I have taken a spool of the dimensions of an ordinary telegraphic relay. The spool is two inches in length, and the inside diameter one half inch. It is wound with silk-covered wire to the depth of one half inch. The spool then has a diameter of one and a half inches, by two inches in length, outside measurement. Of course one half inch of the diameter is the iron core in the center.

The spool was first wound with No. 20 wire (Birmingham gage), the turns or convolutions carefully counted, and the resistance measured. Both the resistance and the number of convolutions in a relay will be double that of a single spool. Therefore, by winding this spool successively with the different sizes of wire, from No. 20 up to No. 35 (Birmingham gage), counting the number of convolutions, and measuring the resistance in Siemens' units, we have the following table of results:

Relays. Size of wire.	Number of convolutions.	Resistance, Siemens' units.	Relays. Size of wire.	Number of convolutions	Resistance, Siemens' units.
No. 20	1,616	4·2	No. 28	6,536	87·0
" 21	1,904	5·92	" 29	8,016	135·3
" 22	2,256	8·32	" 30	9,496	184·2
" 23	2,816	16·6	" 31	10,781	280·1
" 24	2,376	25·6	" 32	12,080	376·0
" 25	4,136	39·8	" 33	12,568	416·0
" 26	5,088	46·2	" 34	13,064	504·0
" 27	5,825	67·4	" 35	13,600	560·0

This table may be considered a fair approximation to the actual value of the resistance and magnetic effect produced in relays wound with silk-covered copper wire, from No. 20 to No. 35 (Birmingham gage). In practice, we are required to select from these relays the one best adapted to the conditions of a given circuit, that is, the one which has the greatest attractive force. The latter is in direct proportion to the number of convolutions in its helices, and inversely in proportion to the total resistance in the circuit.

Suppose, for example, we have a wire 100 miles in length, of the usual average resistance, say 20 units per mile, and we wish to use one relay at each terminal without intermediates. Say there are 50 cells of battery giving 2 units resistance per cell. We can find by trial and calculation which relay will give the best result, and is therefore best adapted to the circuit

	Units.
The line resistance is	2,000
The battery resistance is	100
For trial, we select the relay wound with No. 30 wire.	
The two relays will give twice 184·2=	368
Total	2,468

These relays have 9,496 turns of wire each, which, divided by the total resistance in the circuit, gives a quotient of 3·84, and this represents the effective strength of the magnet wound with No. 30 wire.

We will now substitute the magnets wound with No. 35 wire, and observe the comparative effect:

	Units.
Resistance of line and battery (as before)	2,100
Resistance of 2 magnets (as per table)	1,120
Total resistance in circuit	3,220

Dividing the number of convolutions by the above resistance, we have $\frac{13,600}{3,220}=4{\cdot}22$.

We find therefore that, for a line of No. 9 iron wire, 100 miles in length, relays wound with No. 35 wire produce a much greater effect than relays wound with a coarser wire, and are better adapted to that circuit, when only two relays are used, one at each terminal. By the same process we find that the relays become less and less adapted to the circuit, as the size of the wire in the helices is increased.

For another example, we will take a wire with many intermediate stations. Say the length of the line is 100 miles, and the number of relays in circuit, twenty.

Calling the resistance of the line and battery 2,100 units, as before, add, to this resistance, 20 times that of any one of the relays in the above table, and dividing the number of convolutions by the total resistance, we find, by trying each magnet separately, that No. 28 wire, with 87 units resistance, gives the highest quotient, and is consequently the relay best adapted to that circuit.

Commencing with the No. 20 wire and going through the list, we have for quotients, or magnetic effects, the following:

No. 20	0·74	No. 28	1·70
" 21	0·85	" 29	1·67
" 22	1·00	" 30	1·64
" 23	1·15	" 31	1·40
" 24	1·29	" 32	1·24
" 25	1·42	" 33	1·15
" 26	1·68	" 34	1·06
" 27	1·69	" 35	1·00

We will now take the case of a short local telegraph of two miles of wire and four relays used as sounders, in which it is required to find what resistance in the sounders will produce the best results. Say the battery has ten cells of 2 units resistance each, and two miles of wire, at 20 units per mile. The total resistance of the battery and line will be 60 units. By trial, it will be found that the No. 22 wire sounder, having a resistance of 8·32 units, is the best instrument for such a circuit.

This investigation of the effect of winding a spool, or constructing a helix with different sizes of silk-covered copper wire, was carried no farther than to No. 35. It is evident that if the spool had been lengthened one inch, we would have obtained 50 per cent more convolutions, and increased the resistance in the same ratio, giving us 20,400 convolutions and 840 units resistance for the relay.

On a line of 300 miles, with a relay at each terminal, the gain in magnetic effect, with this relay of 840 units resistance, is about 50 per cent over the one wound with No. 32 wire, having a resistance of 376 units. On a line of 500 miles the gain is about 55 per cent, and on 1,000 miles 72 per cent, showing that the greater the resistance of the circuit, the greater the number of convolutions required in the relays, the resistance of which will necessarily be in exact proportion to this number.

Ruhmkorff's astatic galvanometer, an instrument made to detect currents in a circuit of great resistance, has itself a resistance of 7,000 units, and 40,000 convolutions of very fine wire.

We can see from what has been shown above, how unsuited an ordinary relay is for a local sounder. We could probably get about 1,000 turns of No. 18 wire on these spools, and the resistance would not be over one unit. With one Grove cell for battery, we would have but two units resistance in circuit. Dividing the number of convolutions by the resistance, we get a quotient or magnetic effect of 500. If we wind the same spools with No. 32 wire, and divide the number of convolutions, 12,080, by the resistance, 377 units, the quotient is 32, or less than one fifteenth the effect produced by the coarse wire.

By the aid of the above table of convolutions and resistances, and a Siemens' galvanometer, any one can determine, with a sufficient approximation to accuracy, the resistance of the relays best suited to the circuit, and work up his own particular case.

RULE.—Select from the column of resistances that of any particular magnet. Multiply this resistance by the number of magnets in the circuit. To this product, add the resistance of the line and battery. Divide the number of convolutions, in the relay selected, by this sum. By this method, ascertain the relay giving the greatest quotient, which is the one best adapted to the circuit. B.

THE steam plows used in the United States are made in England, and imported at a cost of about $10,000 in gold each. This price, of course, includes the customs duty on the importation of machinery.

[For the Scientific American.]

PEANUTS AND PEANUT OIL.

BY H. E. COLTON.

As we write this title, a friend at our elbow asks, "What can you say about peanuts for the SCIENTIFIC AMERICAN? There can't be a thousand bushels sold in the city of New York." This is a great mistake; there is hardly an article of American production, of apparently so little note, that has grown so rapidly in importance as the peanut. Instead of 1,000 there are fully 550,000 bushels sold annually in the city of New York alone. Previous to 1860 the total product of the United States did not amount to more than 150,000 bushels, and of this total, fully five sixths were from North Carolina. Now North Carolina produces 125,000 bushels; Virginia, 300,000 bushels; Tennessee, 50,000 bushels; Georgia and South Carolina, each, 25,000 bushels; while from Africa come about 100,000 bushels a year.

These data are not mathematically correct, but are so approximately. In one week of the month of January, 1871, there were received at the port of New York 2,751 bushels. It is stated that there are now 300,000 bushels on the way to this port from Africa, but, as peace is likely to be made between France and Germany these will not land, but immediately re-ship to Marseilles.

What is done with all these peanuts? In this country they are eaten, and are sent all over the land, from Maine to Oregon, for this purpose. The demand is greater than the supply.

In France they are used for making oil, which is by many considered to be superior to the best olive oil for salad purposes. In the South, during the war, it was so used. The oil made was also used as a lubricator, and as a substitute for lard, while the cake residuum was ground, roasted, and sold as a substitute for coffee. At present peanuts are not used in this country for oil, the price being too high. Thus, it will be seen, that their uses are extensive and varied, and that the crop which now yields over $2,250,000, and which did not add to the commerce of the country more than $200,000 ten years ago, is at least not unworthy of note.

Peanuts vary with the soil upon which they are grown. The Virginia peanut has the thickest hull, and is usually the largest and finest looking; but it weighs only 24 pounds, and hardly yields a quart of oil, to the bushel. On the other hand, the African peanuts weigh 34 pounds, and yield 5 quarts of oil to the bushel. The Georgia peanuts weigh about 32 pounds, and yield one gallon of oil to the bushel, while the North Carolina peanuts weigh 28 and 30 pounds, and yield 3 quarts of oil. These last bring the highest price, though some handsome Virginia peanuts bring high rates as fancy lots.

The price, as we are informed by Messrs. Dibble, North & Co., who make a specialty of the article, ranges usually from $2 to $2·50 per bushel, though bad-looking lots sometimes fall below $2.

The yield per acre averages 40 bushels, but frequently runs up to 60 bushels, especially near Wilmington, N. C. They are therefore a better crop at $1·50 per bushel than cotton at 15 cents per pound. Much land, however, which will grow cotton well, will not grow peanuts to the same extent. It is by many considered best to be near the sea, and very essential to have lime in the soil, or to manure with marl.

As with many other products, peanuts have been materially enhanced in value, and their production economized by modern inventions. For years before the war, the old, fashioned oriental style of thrashing with a flail, and winnowing by throwing up in the air, was the universal custom Both were overcome by the skill and talent of an ingenious mechanic of Wilmington, N. C., Mr. Thos. L. Colville, now deceased.

When the war commenced, the great demand for oil urged the necessity of using peanuts for this purpose; but how could the hull be gotten off? The same mechanic over came this difficulty. A modest, retiring man, not anticipating the proportions the peanut trade has even now assumed, and hence depending on his making the machines to supply all the demands, he did not have either improvement patented, and others now reap the benefit of his skill.

Again, the Virginia peanuts, being grown in a rather clayey soil, had at first a very dark appearance. This, as well as their inferior grade, made them sell so low that, two years ago, many farmers lost money, but here Mr. John M. Realing came forward with a machine, by running through which, the peanuts are so much improved in color and appearance that they have been enhanced in value full fifty cents per bushel. I might also mention the handy little machine with which the street venders roast peanuts, or take my reader down to the large establishment on Greenwich street or Peck Slip, where the glowing coke gives out its gentle and steady heat, while great cylinders, swung on large iron axles, are slowly revolving above the ruddy bed—dozens in a row—all turned by a steam engine. Here my friend might realize something of the vastness of the peanut business, and the extent of the edible capacity of our American nation, for one little article of, we may say, fancy diet.

But who eats them? Well, just ask the owner of that little sign, "PEANUTS—FRESH ROASTED EVERY 5 MINUTES," and he will tell you, everybody, from the wealthy banker to the homeless newsboy; and that his own sales are over a thousand bushels a year. We even hear from æsthetic Boston that they have taken their place among other nuts in the refections supplied to fashionable entertainments; who then will dare gainsay their right to aristocratic, or to commercial, importance?

How the News was Sent to Paris.

Attempts to establish a ready communication between the beleaguered inhabitants of Paris and their relatives and friends beyond the German lines have given rise to many contrivances, which are not unlikely to make a new era, in the history both of aeronautics and photography. Among them may be mentioned the ingenious device by which the matter of two whole pages of the *Times* has been transmitted from London to Paris. This has been accomplished by photography. Those pages of the paper which contained communications to relatives in Paris were photographed with great care by the London Stereoscopic and Photographic Company on pieces of thin and almost transparent paper, about an inch and a half in length by an inch in width. On these impressions there could be seen by the naked eye only two legible words, *The Times*, and six narrow brown bands representing the six columns of printed matter forming a page of the newspaper. Under the microscope, however, the brown spaces became legible, and every line of the newspaper was found to have been distinctly copied, and with the greatest clearness. The photographs were sent to Bordeaux, for the transmission thence by carrier pigeon to Paris. When received there, they were magnified, by the aid of the magic lantern, to a large size, and thrown upon a screen. A staff of clerks immediately transcribed the messages, and sent them off to the places indicated by the advertisers The success of this experiment gives rise to the hope that the new art of compressing printed matter into a small compass will not stop here. If a page of the *Times* can be compressed into a space little larger than that occupied by a postage stamp, the matter of an octavo volume might be made to cover not more than two of its own pages, and a library could be reduced to the dimensions of the smallest prayer book. What a relief it would be to the learned persons who frequent the library of the British Museum if, instead of having to make fatiguing journeys from letter A to letter B of the ponderous catalogue of books, they had its many hundred volumes reduced to a space a yard square, over which a microscope could be hurriedly passed! Such suggestions are now occupying the thoughts of photographers.—*London Times*,

DYERS' RECIPES.

From Haserick's Secrets of Dyeing.

BLUE PURPLE.—A curious purple was very fashionable about twenty-five years ago. 100 pounds of wool were first dipped a light blue in the vat, and well rinsed. Then take a stone pot, put in 3 pounds of half-refined tartar, 3 pounds of feathered tin, 5 pounds of blue vitriol, and 20 pounds of muriatic acid; heat all in a sand bath until dissolved.

From this mordant take 10 pounds in a suitable kettle; add 5 pounds half-refined tartar to it, stir it well, and enter the wool at 170° Fah.; let it boil for one hour; take it out, cool, and let it lay for twenty-four hours. Then boil out 20 pounds of good logwood for three quarters of an hour in fresh water; cool off the kettle to 150° Fah., enter the wool, and handle it well for half an hour, then heat it up to 185° Fah., but let it not boil; let it go for one hour more, when it will be a dark purple. This color stands the sun remarkably well, perhaps owing to the fact that there is not any alum or sulphuric acid used, except that contained in the blue vitriol.

BLUE PURPLE, FAST COLOR.—100 pounds of wool are first dipped in the blue vat to a light shade, then boiled in a solution of 15 pounds of alum and 3 pounds of half-refined tartar, for one hour and a half; the wool taken out, cooled, and let stand twenty-four hours. Then boil in fresh water 8 pounds of powdered cochineal for a few minutes; cool the kettle to 170° Fah.; handle the prepared wool in this for one hour, in which time let it boil for three quarters of an hour, when it is ready to cool, rinse, and dry. By coloring first with cochineal, as aforesaid, and finishing in the blue vat, the fast purple or dahlia, so much admired in German broadcloths, will be produced. Tin acids must not be used in this color.

LOGWOOD BLUE.—There are many ways to color that, and the dyer must choose for himself which is the best for his goods, as one way is preferable for some kinds of fabric to the other.

THE OLD-FASHIONED LOGWOOD BLUE.—To 100 pounds of cloth or wool dissolve 15 pounds of alum, 2 pounds of half-refined tartar, and 3 pounds of blue vitriol; enter the fabric, and let it boil for one hour; take it out, cool as usual. Then boil in fresh water for twenty minutes 10 pounds of good logwood in a bag or otherwise, cool the dye to 170° Fah., and enter the fabric. Handle it well for half an hour, during which time raise the heat nearly to boiling, then take it out and cool; cool the dye to 136° Fah.; add 5 pounds of pearl-ash, or 4 pails of urine. Enter the goods again, and handle for half an hour, when they will be a fine blue. Soda ought never to be used, as it makes a dull color. Rinse and dry. This color is suitable for blue-mixed hosiery.

CHROME BLUE.—100 pounds of wool are boiled for one hour in a solution of 3 pounds of bichromate of potash, 6 pounds of alum, 1 pound of half-refined tartar: then it is taken out, cooled, and rinsed. Boil 6 pounds of good logwood in a bag for half an hour in fresh water, add 3 pounds of cudbear, well moistened and dissolved. Cool the dye to 180° Fah. Enter the prepared wool, and handle it for three quarters of an hour; bring it to a boil in this time. This color ought to be always left a shade lighter when finished, as all chrome colors darken in drying.

Scientific and Theological Aspect of the Hog.

A writer in the *Chicago Post* thus expatiates on the hog:

The hog has been in disrepute a long time, at least ever since he began to play his part in the ancient religions. It is fashionable to ridicule and denounce him, to call him a filthy brute, and to insist that he is the dire author of leprosy, consumption, cancer, scrofula, and the most disgusting diseases that afflict humanity. This is the teaching of prejudice, not of science.

The hog outlives all hostility, and laughs, so to speak, at the success of his slanderers. Still is the reeking roast pig the sacrifice of many a dinner table, and still is the rural ceiling festooned with the savory sausage, and the smoke house fragrant with ham. We deal with facts, not sentiment. The hog is a true cosmopolite—a citizen of the world. He increases and multiplies, and inherits every part of the habitable globe. He is as ubiquitous as the bat. He does not stand in high repute for his manners, but he is most accommodating, thriving with equal content in the sty of the rich and the kitchen of the indigent. He wallows sometimes, but naturalists tell us he does this for the sake of cleanliness, which is next to godliness—for the same reason that the Pacific Islanders grease themselves. Among his quaint peculiarities are his grunt of satisfaction and his squeal of remonstrance and reproach. He should never be fed till he stops his squealing; it is the approved method of breaking him of the habit.

Homer, in his "Odyssey," honored the swine keeper with the confidence of Ulysses, and why not? The hog, called stupid, is really one of the most enterprising and sagacious of animals. The gamekeeper of Sir Henry Mildway actually broke a black sow to hunt game in the woods; and she ran in the hunt with wonderful success. She would track game, back and stand, and point partridges, pheasants, snipes, and rabbits as skilfully as a bred pointer. She would bound in response to a whistle, and would wag her head and squeal with delight on being shown a gun.

The Babylonian Talmud says: "Cursed be he that breedeth hogs;" and the history of the Maccabees tells us that the scribe Eleazer walked straight to the tortures of persecution rather than eat a slice of spare rib, heroically preferring the martyr's stake to the pork steak. This animal has been under the ban of many religions. The Mohammedans learned from the Jews, as the Jews had previously learned from the Egyptians, to hate him because he perversely declined to "chew the cud;" but he still manages to masticate and digest considerable pottage in the course of a year.

The hog is the product of nature's most economical thought. There is no part that cannot be utilized. His flesh, fat, bristles, hair, hoofs, and bones are all turned to account. "The divisions of his unctuous body," says Apicius, "are as familiar as the division of the earth. His ears and feet go to souse: his brains are a choice dish for the epicure. His tail has for ages been claimed by successive generations of children as their particular property. Tradition points out how to appropriate it; roast on the coals, take in the fingers, and eat without salt."

The hog is the staff of life, the arch enemy of famine, the poor man's best friend. Moreover, in his earlier days, he is strikingly playful, frisky, cunning, and graceful—as much more interesting than a human infant of the same age as the latter is more interesting than so much putty. In adult pighood, he is omnivorous and self reliant, bold and expeditionary, and he breeds faster and keeps cheaper than any other domestic animal.

America is pre-eminently the home of the hog; he is a legical deduction from Indian corn. He was introduced into Virginia in 1600, and here he multiplied so rapidly that the colonists were compelled to palisade Jamestown—high, to keep out the Indians; close, to keep out the hogs. Mrs. Hog can produce ten to twenty at a birth, as often as twice a year. The descendants of a single pair—allowing six young for a litter—would amount to six million in fifty years. The gratitude of the country is due to Cincinnati, for that, by assiduous harvesting, she keeps down the inundation which constantly threatens to overwhelm us in an uncommon ruin.

Product of Coal.

A pound of coal may be regarded as equivalent to a day's labor of a man; hence 300 pounds will represent the labor of a man for a year. It has been estimated that 20,000,000 tuns of the annual product of Great Britain is devoted to the development of motive power, and that this is equivalent to the labor of 133,000,000 men. The area of the coal fields of the carboniferous age, lying within the limits of the United States, has been estimated at 150,000 square miles. The area of Ohio is not less than 10,000 square miles, or quite equal to that possessed by Great Britain, and far in excess of that of any other European nation.

The annual coal production of Great Britain is over 100,000,000 tuns; in Ohio it is now about 3,000,000 tuns.

MICROSCOPICAL WRITING.—A machine is now on exhibition in London, Eng., with which a writer, using a pen in the usual manner, can, at the same time, produce a duplicate so small as to be invisible to the naked eye, yet so distinct that a microscope will reveal every line and dot. A most useful application of the apparatus will be for the prevention of forgery, as private marks can be made, on notes and securities, legible under microscopic power, but which no imitator could see or even suspect the presence of. The inventor, a Mr. Peters, states that the entire contents of the Bible can, with the help of this machine, be written twenty-two times in the space of a square inch.

COST OF LIVING ON THE PACIFIC COAST.—A comparison between bills of fare at respectable but not extravagant restaurants and hotels, in Boston and San Francisco, shows that living is seventy per cent cheaper in the latter city. There is nothing to justify the high prices which are maintained everywhere along the Eastern coast, and which have undergone scarcely any diminution since the war and the ending of the gold mania.

Improved Grate Bar.

Our readers will recall a description of a locomotive grate bar, published in our issue of Feb. 4th. We this week illustrate a furnace grate bar, in which the same principle of curved cross-pieces is carried out, with modifications which will appear upon examination of the annexed engravings and the previous ones referred to.

It is claimed that an important saving of fuel is effected by the use of this bar, and that it is not warped and twisted out of shape by the effects of heat; also that it possesses greater durability than other grate bars, and is easily adapted to any furnace, without alteration therein.

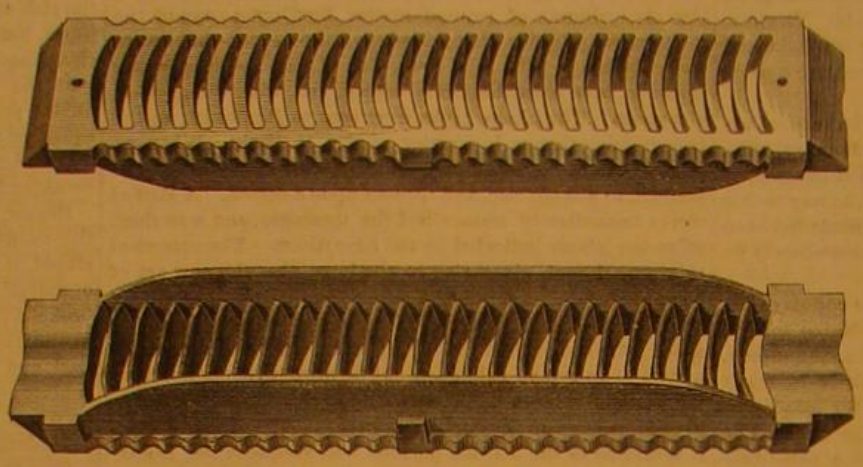
Perfectly free access of air to fuel is attained in this grate, the total space between the cross-pieces being large, as will be seen on inspection of the engravings, and all sorts of fuel may be used with it, even those considered the most difficult to burn, as nut coal slack, sawdust shavings, spent tan bark, etc.

The curved cross-pieces act as braces, and are formed like the locomotive bar, with re-entrant curves at bottom. They form a flat, even, upper surface, and their peculiar form enables the grate to be made very light in proportion to its surface.

Semicircular openings along the side pieces, form circular apertures when the bars are placed together in the furnace, admitting air to the fuel, and having no large blank spaces in the grate. The grate is not liable to be injured or broken by unequal expansion, and it is claimed that it will outlast two or three sets of ordinary bars.

Numerous testimonials submitted to us vouch for the validity of the claims made for this grate bar, both as to economy and durability.

For further information address Greenleaf Machine Works, 319 South Tennessee street, Indianapolis, Ind.



GREENLEAF'S FURNACE GRATE BAR.

Preserving Meat in Cans.

A new method of preserving meat in tin cans, which is favorably commented upon, is that of Mr. R. Jones, of London. In this process the meat is first packed in its raw state into tins of any desired size. The lids are then soldered down, the top of each lid having a small tin tube in it, which communicates with the interior of the tin. These tubes are next inserted in the exhauster, which is a receptacle connected with a machine designated a "Torricellian vacuum," an apparatus in which the air is exhausted by the action of water. The tins are then placed in the cooking bath, and at the proper juncture the vacuum is created and the meat thoroughly cooked, at a temperature varying from 180° to 228°. At this stage another feature of the invention comes into play. The vacuum having been created, a supply of gravy is turned on from a receptacle, and the tins filled with nutritious fluid. The feed pipes of the tins are then nipped and the cases hermetically sealed. By thus filling the tins with the gravy, the difficulty of collapse, which has always hitherto prevented large tins being used, is obviated, while the whole space of the package is utilized. Testimonials from captains of ships and others who have used it are furnished by the inventor, certifying to the excellent quality of the meat. By this improved process the great objection of over-cooking has been obviated, and as now prepared, the meat would seem to merit general approval.

Improved Form of Daniell's Galvanic Battery.

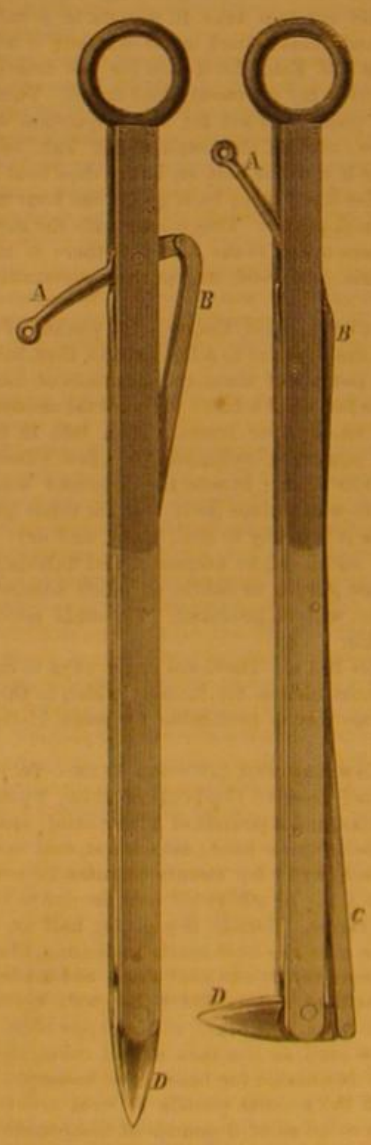
The requirements of many inventors of electric bells, signals, and other appliances using a constant current, will, according to an English scientific journal, be met by the following description of a battery, which has been used for more than two years, without any attention, except the addition of water and sulphate of copper, to supply the waste caused by evaporation. A common earthenware quart pot has a porous cell inside it, and between the two cells, a strip of pure zinc and a strip of copper riveted to the zinc above the water line, and carried with another porous cell, in a similar earthenware pot. Four cells should be arranged in this way, and the outer cells or pots filled with water, and the porous cells with sulphate of copper to the level of the surface of the water. Add some crystals of the salt of copper to continue the strength of the solution. Metallic copper will be slowly deposited in the outer cell, and can be made available for a further supply of sulphate of copper. A similar battery cost nineteen cents per cell for materials in England, and we believe it would not cost more in this country.

The Origin of Locomotives.

Somewhere about the year 1780, so runs the tale, a travelling millwright—in those days of the kings of mechanics—footsore, and with the broadest of northern Doric accent, stopped at Soho, a locality once indicative of field sports, but then and now the factory of Boulton and Watt, and asked for work. His aspect was little better than one of "beggary and poor looks," and Mr. Boulton had bidden him God speed to some other workshop, when, as he was turning away sorrowfully, Mr. B. suddenly called the poor fellow back: "What kind of hat's yon ye have on your head, my man?" "It's just timmer, sir," replied the man, "Timmer, my man!" ejaculated the manufacturer, "just let me look at it—where on earth did you get it?" "I just turned it in the lathe," said the mechanic, with just a flush of pride. "But it's oval, not round, my man," said Mr. Boulton in surprise, "and lathes turn things round." "Aweel! I just gar'd the lathe gang anither gate to please me, and I'd a long journey before me, an' I'd thocht I'd have a hat to keep out water; and I had na muckle to spare, so I just made ane." By his inborn ingenuity the man had invented the oval lathe, and made his hat with it, and the hat very soon led to making his fortune, so mysteriously do trifles work out great ends. The fact was, Mr. Boulton was a man of sharp penetration, and not one at all likely, in those days when good men were scarce, to lose sight of so valuable a helper, when he found him; and so the after famous William Murdoch took suit and service under Boulton and Watt, and in 1784 made the first wheel vehicle impelled by steam in England—ay, made it with the very hands and brain cunning that had before produced the "timmer hat." Out of that seed, after ninety years of sowing and reaping, a goodly crop has sprung up, which, like the grain of mustardseed, replenishes the civilized earth, and will yet civilize the uncivilized, though kindred still rise against kindred, and nation against nation in mortal, cruel strife, slaying each other with the infernal inventions, of men's brains, that for a time usurp all the honor and praise, that should be reserved alone for those things which tend to peace and tranquillity, brotherly love and prosperity.

IMPROVED HORSE-POWER HAYFORK.

We think the Commissioner of Agriculture was at fault in recommending grapple power forks, and suggesting that



they could be used both for unloading hay and for loading manure. There would be many practical difficulties, in adapting such a tool to both purposes, which we need not here dwell upon, but which will readily suggest themselves to practical farmers.

A grappling fork could no more be conveniently used for manure than the common light pitchfork. In this matter, the old rule of providing special tools for special purposes finds no exception.

If the necessity of special tools be conceded, the question of what principle of construction is best for raising hay stands by itself and must be decided on its own merits. Without attempting to decide this question we will say that there are strong claims made, for the fork which forms the subject of the present article, and an engraving of which accompanies this description.

This fork is extremely simple in construction and is sold under the name of "Steele's Power Saber Fork."

The working parts are nearly covered and protected by a scabbard, the form of which much resembles that of a pocket clasp knife, it being made of a strong back piece to which side plates are riveted, and between which the connecting rods, B and C, and the lever, A, work. The lever, A, is pivoted to the scabbard, as shown, and also pivoted to the upper connecting rod, B. The connecting rod, B, is pivoted to the lower connecting rod, C, in such a way as to form a toggle joint about midway of the scabbard, which, when actuated by the lever, A, forces the point, D, into a position at right angles with the scabbard, or throws it into line with the scabbard, according as the lever is moved up or down.

In use the lever, A, is first employed to bring the point into line with the scabbard. In this position the instrument is easily thrust deep into the hay, its tapering form, from handle to point, greatly facilitating its entrance. A movement of the lever then throws the point into a position at right angles with the scabbard, by which its hold upon the hay is secured. The fork, with its load, is then hoisted, and when raised to the desired hight and position, a cord, attached to a ring in the lever, is pulled, which trips the point, and the hay falls.

The shielding of the working parts by he scabbard prevents entanglement and clogging. It is claimed that this fork enters the hay when it is damp, or where it has stood a long time, much easier than forks heretofore used; and that it holds its load perfectly and releases it instantaneously when the point is tripped. The instrument, of which one has been sent as a sample to this office, is well made and strong. We are told that it has taken four premiums in public competition with other forks.

Patented, March 10, 1868, by Harvey B. Steele, M. D., of West Winsted, Conn., to whom letters should be addressed for further information.

The Sherman Process.

The Sherman process consists in the application of iodine for the purpose of removing sulphur and phosphorus from the iron. Mr. Sherman's patent covers all forms and methods by which a metallurgist can directly or indirectly apply iodine for effecting the purpose in view. The rationale of the process, however, is not given in this specification, nor is it readily perceptible on the face of any description of the process itself, particularly when the smallness of the quantity of iodine employed by Mr. Sherman is taken into consideration. It appears, however, that an indirect action may take place between the phosphide of iron in the liquid metal, and the free iodine in contact with it, by which a combination of iodine and phosphorus is formed This new compound is readily decomposed by contact with the atmosphere, or with additional quantities of phosphide of iron, and the iodine leaves the phosphorus in the amorphous state, in which it seems to be unable to combine with the iron, but is readily burnt, and escapes, as vapor or phosphorous acid, with the flame. The property of iodine to render phosphorus amorphous is well known, and the action upon the phosphorus combined with the iron may be analogous to this interesting reaction of the two elements upon each other.

The principle that iodine has a certain effect upon the phosphorus and sulphur in the iron seems to be established as a fact, by the trials hitherto made by Mr. Sherman in different metallurgical works in this country and in America, but the precise mode of applying the "medicine" so as to make it suit the requirements of the different processes of manufacturing iron and steel, will have to be developed by patient and persevering practice. In the puddling furnace Mr. Sherman appears to have had the greatest success. This may be due to the fact that the action takes place under the eyes of the workman, and can therefore be closely watched and regulated at will. For the other processes for manufacturing iron and steel, the Sherman process is said to be equally valuable, and experiments in this respect are now in progress, of which we shall publish the details in due course.—*Engineering.*

Oxygen Gas.

The use of oxygen gas in the arts and manufactures is now so general that cheap and accessible means of producing it have been eagerly sought, and, in one instance at least, with an encouraging amount of success. Dr. Kirkpatrick, of Brussels, recommends the use of a hydrated salt, or hydrated oxide of cobalt or nickel, in combination with a soluble hypochloride, such as of lime or of potash. Nitrate or chloride of cobalt and the bleaching powder of commerce, form the best combination; the bleaching powder should be of concentrated strength, to avoid too much bulk, and made into a milky fluid with water. The mixing will be accompanied with some effervescence, and a mutual decomposition of the components. The oxygen will be freely evolved, and may be collected in a gas receiver. The superfluous fluid may be poured off, and a further supply of liquid chloride of lime introduced, to disengage any remaining oxygen The beautiful and brilliant light, produced by throwing a small jet of oxygen gas on to the point of combustion in a common gas lamp, may become of general use when oxygen can be cheaply and easily produced.

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, 188 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. XXIV., NO. 10 . . . [NEW SERIES.] *Twenty-sixth Year*

NEW YORK, SATURDAY, MARCH 4, 1871.

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THE MECHANICAL EQUATION.

A true balance, with equal weights in the pans, may be said to be the type of a mathematical equation, the equality being indicated or verified by the horizontal position of the beam. Another type of the mathematical equation may be found in the double inclined plane, with a pulley at its apex, having a cord with equal weights attached to its extremities, passing over the pulley, and the weight resting upon the inclined surfaces. In this type of the equation, the horizontal position of the base of the inclined plane is the verification of the equality of the weights suspended from the cord.

No element of machinery exists in which one or both of these types of the mathematical equation is not found, and it might be shown that all the changes in the relations of parts on either side of the fulcrum of the balance are types of the changes and transformations which the members of an equation may undergo without affecting their relation of equality. A very interesting series of analogies might be thus traced, but this would be foreign to the purpose of this article, the intent of which is to show that, in the construction of machines, Nature permits no permanent violation of the grand mechanical equation which underlies her works. Man may disturb, but Nature will ultimately restore, equilibrium.

To show this in the form of a demonstration, of course, wrecks the hopes of perpetual-motion seekers, who suppose that they can add to, or multiply one side of the equation without increasing the other. Nature has provided for all this beforehand. She has uttered her fiat, that masses of matter shall all tend to a common center, that heated bodies shall transfer their heat till all reach a common temperature, and that, during the transfer, only a portion of this heat can be converted into mass motion. She has affirmed that "what goes up must come down," with a force exactly equal to that which raised it, and that, if a body be raised, or carried away from the center to which it is attracted, and its return be resisted, the force with which it would have returned, if left free to move, shall be transmitted through its support to the attracting body, and expended in changing the path of motion of that body through space. She has said that the parts of every body when left free to move must balance themselves around a common center of gravity, and, this accomplished, must forever cease their motion in relation to that center unless disturbed by some external force. She has laid down the law, that when two bodies are so connected by any medium, solid or fluid, that the motion which each tends to produce is in an opposite direction to that of the other, so that the distances through which each would move, if an additional force were made to act on either, would be inversely as the weights of the bodies, they shall not move unless some additional force be made to act upon one or the other of them.

Thus she has established her perpetual mechanical equation, which is forever opposed to perpetual motions in the sense of self-moving machines.

She has also established her mechanical equation in the transfer of motion by the law, that no motion of any kind shall diminish in one mass without an equivalent increase of motion in some other mass, or the conversion of mass motion into heat, which last is considered by many able thinkers to be only a mode of motion. If heat be really motion, then she has said "let no portion of matter, no infinitesimal part of the great aggregate of motion in the entire universe be lost;" and she has also as unmistakably decreed that no addition to either matter or motion shall be made.

We have said a demonstration of these truths would wreck the hopes of perpetual-motion seekers. This is, however, not the time nor the place for such a demonstration, which would only be a repetition of what has been written over and over again in books on physics, and taught in the lecture room, since physics became a science. In whatever way Nature has been importuned, whether by experiment, or the logic of mathematics, she invariably has responded that she will permit no violation of the laws above enunciated.

Whoever, then, invents a self-moving machine must begin by the discovery of some new law which annuls all hitherto discovered laws of motion and force. Let these dreamers cease their attempt to coerce matter into disobedience, and by experiment and study try to acquaint themselves with Nature's unchangeable statute book, and they will soon drop their chimeras, and turn their attention to something practical.

This week we publish the last of our series of articles upon Perpetual Motion. The illustrations contained in those articles exhibit every principle tried since the search began. All have been shown absurd and impracticable, and if the record of the vain search serves to show inventors the folly of its pursuit, the end we sought will be accomplished.

DANGERS OF PETROLEUM OILS. REPORT OF THE HEALTH BOARD OF NEW ORLEANS. A LAW REGULATING THE SALE OF SUCH OILS RECOMMENDED

Copies of the reports of the Board of Health of the city of New Orleans for 1869 and 1870, have been forwarded to us, and our attention has been particularly called to portions pertaining to the sale of petroleum oils, and accidents resulting from their use. Although we have said much upon this topic, we believe it to be our duty and the duty of the press generally to continue agitating it, until some adequate measures of reform shall be adopted. We therefore willingly give place to the very interesting and even startling facts made public in the reports referred to.

In the report for 1869 is given a statement of the qualities of seventy different specimens of oils used for illumination, obtained of various dealers throughout the city.

Fourteen specimens gave a flashing point from 110° Fah. to 120°; nineteen from 100° to 110°; fifteen from 90° to 100°; thirteen from 80° to 90°; seven from 2° to 28°; one gave the flashing point at zero, and one even flashed at 2° *below zero*. Only thirty-three out of the seventy were fully up to the New York standard of safe oils. In nine specimens the oil itself ignited at temperatures below 90°. One specimen of heavy oil, adulterated with benzine, flashed at 28°. Thirty-seven specimens were of a quality which the Massachusetts law requires to be branded "unsafe for illuminating purposes."

A lamp was filled with oil from No. 47 of the table, lighted, and allowed to burn for two hours; upon being purposely permitted to fall and be broken, the whole mass of oil instantly took fire.

Lamps filled from Nos. 1, 2, 3, and 5, when allowed to fall and break, burst into flame, and when water was poured on the flame, the oil continued to burn until entirely consumed.

Two specimens, No. 32 (Virginia brand) and No. 33 (Downers oil), were experimented with in the same manner. The wick continued to burn, but the oil did not take fire, and could not be lit, though tried repeatedly. This would be the result with any oil whose "flashing point" is 110° and upward. An oil whose flashing point is 110° does not itself take fire and burn till its temperature is raised to about 135° Fah.

The Board express the belief that the admixture of light oils is very general, and add that this mixing of heavy oil and naphtha may be done by persons ignorant of the rapid and great deterioration which is effected by adding small portions of naphtha to an excellent high fire-test oil. Their experiments prove that good oil is rapidly contaminated and rendered dangerous by the addition of small portions of benzine, and if burned in lamps of brittle material or bad construction, continually exposes to accident those who use it.

The following observations are worthy the consideration of all consumers of such oils:

There is probably more danger of explosion of a lamp or can containing a mixed oil than of one containing pure benzine, because the latter evolves vapor with such rapidity, as in most cases, immediately and permanently to expel all atmospheric air from the vessels containing it, although this volatility adds to the danger of fire.

Those using coal oil, can, by simple means, protect themselves from the worst oils. Pour into a cup or saucer a tablespoonful or two of the oil to be examined, and apply an ordinary match, lighted. If the oil does not take fire it may still be an unsafe oil; but if it does take fire, the oil is a very dangerous one. It is necessary to remind the experimenter that great care must be used in so simple a matter as this seems, as the flame may communicate by vapor or otherwise to vessels containing bad oils, and give rise to fire and personal accident.

The report for 1870 gives a tabulated list of thirty-four explosions, which occurred during the year in New Orleans. By these explosions seven females and one man were burned to death, and twenty persons more or less burned, of whom the greater number were women, some of whom were disfigured for life.

The names of the oil with which explosions occurred are given as follows: *petroline, puroline, black diamond, sunlight, septoline, anchor oil, etc.* Our readers will now see the force of our warning them to "beware of fancy names," given in a recent article entitled "Kerosene Murder."

The Board complete their report, by a draft of a law, two excellent provisions of which are: that persons selling oils not up to the prescribed standard shall not be able to collect pay for the same by legal process, and that they shall be liable to pay for all damages resulting from the use of such oils for illuminating purposes, with costs of suit for the recovery of the same.

We would not be understood as meaning to say that all oils sold under fancy names are essentially bad. There are notable exceptions, of which we may mention Pratt's "Astral Oil," an article which we have used for several years, and found to be excellent in all respects. Moreover, we have never heard of an accident arising from its use. The adoption of this name, however, might raise doubts in the minds of purchasers who have been cheated by other fancy names, and as we know such doubts have no foundation in regard to this particular oil, it is but just to make an exception in its favor.

A GOVERNMENT BUREAU OF MINES.

An extraordinary proposition has been laid before Congress: to create a mining fund by the issue of $50,000,000 in bonds by the Government, for the purpose of subsidizing mines of the precious metals, in amounts not exceeding $250,000 to any one mine, and to the extent of $25,000,000 a year for all mines. As it is only proposed to lend the money to the mines, and to allow the Government to participate in the profits of the venture, the direction and working of the subsidized mines will be put in the hands of government officials; in other words, the United States Government will go into the mining business on shares. The proposed bureau is to be under the control of an officer who is to receive a salary of $10,000 a year, and be known as the Chief of the Mining Bureau. Subordinate to him will be five chiefs of division, at salaries of $7,500 each, with deputies at $5,000, clerks at $2,000, and messengers at $1,000 each. These officers are to constitute the executive corps, and will be stationed at Washington. On the field will be a corps, to consist of attorneys, inspectors, and supervisors, at salaries of $5,000 each, assisted by associates who are to receive half that sum per annum.

The standing army of laborers, the medical staff, the commissary department, the chaplains, the drill sharpeners, commission merchants, assayers, brokers, and mechanics are not mentioned in the bill, but it is understood that the trifling expense of supporting them will be borne from the profits of the business, and not in any way fall as a tax upon the country.

It is proposed to discover and "to bring into being" 200 new mines every year for ten years, until the maximum of 2,000 mines has been reached. "If the working days of the mining year are reckoned so few as 250 only, the average annual yield of ore per mine should be set down at 25,000 tuns, and the aggregate product of the 2,000 mines, at the prodigious total of 50,000,000 tuns! Taking the average net returns at only $12·50 per tun, the profits receivable, over all expenses, from the 2,000 gold and silver mines, sum up $625,000,000!"

Such is the enthusiastic statement of one of the advocates of the scheme, and, according to him, the bill ought to be called a way of paying the national debt, and extinguishing all taxes. It would solve at one blow the whole question of tariffs, income tax, and the like, and fill the coffers of the Government with untold wealth.

NARROW GAGE RAILWAYS.

We are in receipt of a pamphlet on this subject forwarded to us by Paul, Brothers, of Akron, Ohio, containing general arguments in favor of a system of narrow gage railways which they style "*our system.*" Upon what grounds the gentlemen referred to claim the system as theirs does not appear. This matter has been discussed for years, and the question of gages is not a new one. We should suppose any one might exclusively claim a system of sawing boards twelve feet in length as consistently as Paul, Bros., can claim a narrow gage railway system. We find, however, in this pamphlet, a pretty fair statement of argument in favor of narrow gages; and though we have already expressed our own views upon the subject in brief, a review of this argument will not be out of place.

The pamphlet is opened by the statement of the generally unprofitable nature of railroad investments, and the fact that these investments are, for the most part, made with a view to obtain indirect advantages through the stimulation of business along the route, the development of resources, and enhancement of the value of real estate.

The question is then asked: "Is it not worth our while to inquire what the reason is, that we cannot as well build railroads with a view to direct returns upon capital invested as when we put our money into any other business?"

The attempts to economize through the use of cheaper iron and inferior construction and care have proved failures. The average number of trains run over the New York State railroads is only one half their capacity, and this average is mostly made only on the great trunk lines, the majority averaging far below this, a large portion being only able to secure traffic for from four to six trains per day. The point is now taken that it is folly to construct roads whose capacity for business is four times as great as the business done.

It is maintained that the only way to reduce the capacity of these roads down to their traffic is to narrow their gages. This would at the same time, it is claimed, reduce their cost in the following items, viz., the moving of masses of earth and rock; the curves, by shortening the radius; the right of way; the weight of iron; the cross ties, ballasting, bridging, culverts and masonry, engines, cars, and machinery; and commissions in raising the capital, by reducing the capital required.

These are the points made in the pamphlet, and we are

perfectly willing to concede them all, with the reservation that the reduction will, in our opinion, be much less than is estimated by the authors, whose figures we have not space to give.

The arguments are not new, and the most of the various items of reduction were spoken of by us in a recent article. We will not therefore go over them again at this time. Much may be said on both sides of the question, but there can be little doubt that narrower gages might be profitably adopted, on a very large proportion of American roads, at least until such time as the growth of business along their lines shall render increased carrying capacity necessary.

THE AMERICAN ECLIPSE EXPEDITION.

As is well known, an appropriation of about $30,000 was made by our Government, to be expended, under the direction of the Chief of the Coast Survey, in making observations in Europe upon the total eclipse of the sun, in December last. Some of the members of the expedition have returned to the United States, and we find, in the *American Gaslight Journal*, a preliminary account of the results obtained, from the pen of one of the most distinguished observers, Professor C. A. Young, of Dartmouth College. The observers were scattered over the continent, on the track of total obscuration, and it was well that this arrangement was made, as, in some localities, the weather was so unfavorable as to defeat the objects of the expedition.

Professor Winlock's party, of which Professor Young was a member, was placed at Jerez, some thirty miles north of Cadiz, and they were fully provided with the best instruments. They first determined accurately their geographical position, by the use of chronometers and a 46-in. transit. The photographic apparatus comprised two telescopes, equatorially mounted, with clock work, one of eight inches aperture and the other of six inches; a horizontal telescope of five inches aperture, and about thirty feet focus, with a plain unsilvered mirror of glass to reflect the sun's rays into the tube. Four spectroscopes of peculiar pattern were mounted in a way to produce the best effects, one of them with a battery of two prisms, another with a dispersive power equal to thirteen prisms. In order to fix the scale of reference, Geissler tubes, filled with hydrogen, mercury, magnesium, and sodium, were employed.

The experience acquired in the two recent total eclipses, was of great service in pointing out the precautions to be observed in this, and greatly facilitated the preparations requisite to be made.

The day and night previous to the eclipse was very fine, but early in the morning it clouded up, and even rained from time to time. The party made all their preparations, however, and before the first contact, at 10.25 A. M., there were many patches of partly clear sky, but there was always, even when clearest, considerable haze; not enough, however, to prevent photographs of the partial phases from being taken. At the moment of total obscuration a small rift in the clouds passed over the sun, and permitted the observer to see the sublime phenomenon in a satisfactory manner. Within five minutes after the end of the totality, the sky was wholly clouded, and the astronomers did not see the sun again till just at evening, after a heavy storm of wind and rain.

During the totality, one good photograph of the corona was obtained, with a six-inch glass and a one and a half minute exposure. A fine copy of this was exhibited at the last meeting of the Lyceum of Natural History, by Professor Morton, where it attracted great attention. No attempts were made to photograph the prominences, as they can be seen and studied at any time; but all efforts were concentrated on the corona. This peculiar phenomenon appeared more extensive than in 1869, but much less definite in its outline. The form of the corona was roughly quadrangular, nearly square. There was no prominence on the sun's limb which could compare with the "anvil" of 1869, but there were many small ones which were bright and active. By means of the spectroscope, two or three iron lines were observed, also two barium lines, and a magnesium line, and at the base of the chromosphere, a thin layer, in whose spectrum the dark lines of the ordinary solar spectrum are all reversed.

Professor Young is of opinion that the observations tend to confirm Kirchoff's theory of the constitution of the sun, and the origin of the dark lines in the ordinary solar spectrum. Such are the results obtained by the Spanish branch of the expedition, as contained in the preliminary report of Professor Young; but, doubtless, the official report of Professor Winlock will add somewhat to the information. It is to be hoped that some one will give us a digest of the results obtained by all the expeditions, in popular language, in order that the facts may be incorporated in our text-books, and be made common property. That a line was observed at C, another at 1474, another just grazing D, is all very well for the knowing ones, whose lines have been cast in pleasant places, but for our purposes we want these expressions to be translated into popular language.

PEAT FUEL FOR LOCOMOTIVES.

Now that the peat excitement has died out, and capitalists have had time to recover from the chagrin of poor investments, it is possible to take a rational view of the application of this fuel to the various purposes of trade and manufactures. If we could have believed the stories told by persons who had large bogs to sell, there is nothing in the earth that is capable of so many useful applications as peat. It was asserted that candles could be made from the paraffin contained in it, of a better quality than from any other source; the gas from the distillation of peat was richer than the product from the best cannel coal; the absence of phosphorus and sulphur made it the best fuel for metallurgical purposes; its heating power was considerably superior to coal; it left no clinker, ash, soot, or incrustation, on the grate or in the flues; and no such sparks were emitted from it as from wood. In fact, coal was a drug in the market, alongside of peat. This, of course, was an exaggerated statement of the case, and, in discounting it, many persons have gone to the other extreme of too greatly undervaluing a really important fuel.

The scientific experiments made upon peat, in Germany, have shown that, when properly prepared and compressed, it is admirably adapted for use in locomotives. We have seen it in constant use on the railroad from Berlin to Dresden, and on the roads through Bavaria, as well as in other parts of Europe. We procured specimens at the time, and still have them in our collection. The thorough manner in which the peat was cleaned and dried previous to being compressed, had much to do with its value as a fuel, while it did not increase its cost as much in Europe as it would in this country. There was no question in the minds of the engineers that the absence of sulphur, arsenic, and phosphorus was a decided advantage, as the flues and grate-bars were less liable to corrosion than with ordinary coal. The same observation was made in reference to the application of peat for metallurgical purposes. The metals obtained from it were found to be unusually pure. As a fuel in glass making and in chemical laboratories, the experiment proved to be quite successful. In cases where a uniform heat is required, it has been found that peat can be advantageously used.

We understand that in this country, also, peat has been successfully employed in locomotives; and where it can be obtained at reasonable cost, we have no doubt that it offers many advantages over other fuel. The disinfecting properties of ground peat are of the highest order; and in the earth-closet system it has particular value. This use of it in making compost heaps has long been known, but less attention has been bestowed upon it than it deserves.

It is well to bear in mind the really valuable properties of peat, and to encourage its industrial application.

THE LIFTING CURE.

The various ways by which men have sought to be healed of their diseases, are almost beyond enumeration. People seem to be more superstitious upon this subject than almost any other, and well they may be, for in nothing is there greater mystery than in the origin and nature of diseases. The therapeutic action of drugs is also surrounded with mystery, so much so that it may be said our knowledge (if it can be called knowledge) of the effects of drugs internally administered, is almost entirely empirical, and confined to their pathological effects. No certain clue to the chemical or other changes which take place in drugs, or in the system, previous to final effects, has been obtained in regard to the larger number of remedial agents comprised in the *materia medica*. In regard to many of them, the effects are a matter of hot dispute. Some will maintain that the administration of a particular drug in particular cases is attended with great benefit, while others will maintain it to be absolutely injurious.

When, therefore, anybody asserts that any remedy for disease has proved itself efficacious, and can point to a large number of those who, having been treated by it, assert that they have received great benefit through its use, surely this remedy has as good ground for popular favor as any pronounced officinal. The "proof of the pudding" has been, in both cases, "in the eating of it."

The new lifting cure has been tried by a great many persons afflicted with various chronic complaints, who are loud in its praise as a method of treatment for such complaints. It is our purpose in this article to briefly state the nature of this "cure," and the method of its application.

As its name implies, it is a lifting exercise, very light at first, if the patient be much debilitated, and very gradually increased with the improvement in health and strength of the patient. The *rationale* of the peculiar effect produced by this exercise, can scarcely be said to be known; but it is claimed by all we have seen and conversed with, having experimental knowledge of it, as compared with other modes of exercise, that its effects are singularly marked, and entirely different from those of any other kind of muscular effort. Those in charge of various establishments we have visited claim that the effort seems to arise through the invigoration of the spinal cord—the grand trunk line, so to speak, of nervous communication from the brain to all parts of the human system.

The great point seems to be to secure longitudinal pressure upon the spinal column without shock. The apparatus employed is therefore so constructed as to prevent the weight being lifted all at once, the full exertion being only applied at the end of the lift, and the power exerted being gradually increased from the first beginning of the effort, till the weight is raised, when the effort is sustained uniformly for a few seconds, in holding the weight suspended, and then gradually diminished to the end. The patient then rests for a short time, alternately lifting and resting until the exercise is completed. Thus, neither shock nor sudden strain is possible, no matter how great the exertion may be.

Records shown us at the various establishments visited, exhibit an astonishing increase of power on the part of debilitated patients. It would seem from these records that an extraordinary increase of nervous energy and muscular force is imparted through some mysterious effect on the nerve centers. The immediate effect of the exercise upon excessively nervous persons is sedative; a feeling of calmness and quiet pervades the system, and a good sleep may be nearly always obtained by lifting before going to bed.

The machines used are for the most part Butler's, Reilly's, and Mann's. In Butler's machine, the patient stands upon an elevated platform—the platform resting on elliptic springs—and lifts the weight by a rod attached to a cross piece held between the legs. Every joint of the machine, and even the weights, have springs of rubber or metal placed between the solid parts—even the legs of the frame standing on springs, so that in lifting, all these springs have to be compressed by the amount of weight lifted before the weight is elevated.

The Reilly machine is, we believe, a "side lifter," that is, the weight is lifted by two connecting rods, one on each side of the exerciser. The principle of elasticity is also carried out in this machine.

The Mann machine is called a "reactionary lifter." The final weight to be raised is that of the body of the exerciser, the effort necessary to accomplish this result being graduated by an ingenious system of levers with adjustable fulcrums, the elastic principle also being observed.

We are not prepared to pronounce upon the relative merits of these machines. The reactionary lifter invented by Mr. Mann is much cheaper and more compact than the others, and we cannot see any reason why the effects of its use should vary in any important particular from those of the more expensive machines.

ALASKA.---CLIMATE AND PRODUCTS.

The question as to the advisability of the purchase of Alaska was much discussed at the time of the sale, and has been ably defended by its promoter, the Hon. W. H. Seward. With the policy of the statesman we have nothing to do; but our readers will be interested in knowing some facts as to our late acquisition, which is now one extremity of the scale of our varied climate. The weather in the interior is several degrees colder on the average than that of the coast, of which latter the mean temperature is about 40° Fahr. Very high winds, heavy and long continuing rains, and dense, damp fogs, are the chief characteristics of the seaboard, while at Sitka, the capital, the inhabitants have only been able to count thirty-five days, during the past year, on which they have not had rain or snow. The latter falls in enormous quantities, and Dr. W. T. Wythe reports that he has seen the ground, thirteen inches below the surface, frozen hard at midsummer.

With such hyperborean weather, it is to be expected that the general health suffers extremely. Lung diseases are the scourge of the country, bronchitis is endemic, and variations in the atmosphere are made known to the people by the fluctuating condition of the catarrh. Influenza and pneumonia are, of course, common; the latter occasionally turning to the typhoidal diseases. The Alaskan rheumatism is powerful against all the usual remedies, and tuberculous diseases and phthisis have their own way. The *lues venerea* is common, and is exterminating the natives of one region of the country. All these diseases are doubtless encouraged by bad and insufficient food, and scarcity of vegetables, fresh meat, and antiscorbutics.

These peculiarities of the locality are not likely to attract the labor and capital of the emigrant, nor is it to the interest of Alaska that the country should be densely populated. Its only value is as a hunting ground, and the subsistence afforded by this means, cannot be enough for a large population of Americans and Europeans, accustomed to the comforts and refinements of civilized life. The chief part of the furs procured in Alaska is sent to England, a small fraction only being sold in San Francisco, and the price in Europe being much higher than in California. In December last, a parcel of 60,000 seal skins sold in London for $300,000. The furs brought to San Francisco from Alaska last year valued over $2,000,000. This figure may be taken as the total value of the Alaskan exports, as it represents all the shipment, for consumption in this country and Europe, of the sole product of the territory.

THE SUTRO TUNNEL.—A bill is before Congress to aid the construction of the Sutro tunnel, with the proceeds of the sale of the mineral lands. It provides that all moneys received by the United States from the sale of mineral lands must be used in fostering the mining interest, and be known as "the Mineral Land Fund." As soon as the Sutro Tunnel Company shall have completed 500 feet of its tunnel, it is to receive $50,000, and for every additional 500 feet, a like sum. As there are a large number of Chinese miners in California, who might be tempted to turn the direction of the tunnel downwards towards the Celestial empire, in consideration of the $50,000 per 500 feet, the aggregate amount to be advanced under this act is limited to $3,000,000. The President of the United States is to appoint three commissioners to look after the interests of the Government, and hold the property as a first mortgage.

CARE OF TEETH.—Put a piece of quicklime the size of a walnut in a pint of distilled water. Clean the teeth frequently with this fluid, washing the mouth well with clean water afterwards. The application will preserve the teeth and keep off the toothache, and will harden the gums.—*A Correspondent of the English Mechanic.*

THE manufacture of reaping and mowing machines has attained such large proportions as to make it one of general interest. The annual production is now estimated at about 125,000 machines. Few facts more clearly demonstrate the immense wealth of the farmers of our country than that they expend each year about $20,000,000 in the purchase of implements of this one class.

STATISTICS OF STEAM BOILER EXPLOSIONS FOR THE YEAR 1870.

PREPARED FOR THE SCIENTIFIC AMERICAN BY THE HARTFORD STEAM BOILER INSPECTION AND INSURANCE COMPANY.

The steam boiler explosions in this country, for the year ending January 1, 1871, were numerous and destructive. We have kept the best record we could, our information having been received mostly through our agents and from newspapers published in different parts of the country. It must be remembered that the following record is of serious and destructive explosions only. There have been numerous slight accidents, such as ruptures of plates, resulting from overheating or carelessness in management, doing little damage and injuring no one. These are not included in the following record.

	No.	Killed.	Wounded.
Breweries	1	0	0
Propellers	1	4	0
Bone dust manufactory	1	0	2
Cotton mill	1	0	1
Britannia works	1	0	1
Carriage manufactory	1	0	0
Revenue cutter	1	0	0
Thrashing machine	1	2	3
Paper mill	1	0	0
Ferry boat	1	0	0
Car works	1	4	3
Agricultural works	1	4	3
Bleachery	1	0	0
Shoe factory	1	0	0
Steel works	1	1	0
Iron foundery	1	2	5
Chair factory	1	5	20
Pile driver	1	1	1
Boiler maker	1	0	4
Distillery	1	1	4
Sugar refineries	2	7	1
Public water works	2	1	1
Soap works	2	4	1
Brass founderies	2	1	2
Steam fire engines	2	1	10
Coal mines	2	7	14
Rag boilers	2	6	2
Heating and domestic boilers	3	1	0
Rolling mills	3	10	27
Woolen mills	3	1	7
Oil works and wells	3	1	3
Machine shops	4	2	3
Flour mills	6	14	7
Steamboats	7	136	26
Tug boats	10	41	13
Railroad locomotives	16	16	19
Saw mills	29	53	44
Total	118	326	227

A number of these boilers were under Government, State, or municipal inspection. In the cases of the steamboats, many of the killed were, without doubt, drowned or burned, as fire ensued in each case; but the original difficulty was with the boiler that exploded, killing and wounding many, and then other horrors followed.

We regard this record, and similar records of previous years, as evidence of the need of some well digested and effective system of boiler inspections throughout the country. If there be not compulsory law, many boilers in use would never be inspected; and yet, with the fact before us, that almost all public offices are more or less mixed with politics, it is very doubtful whether State and municipal regulations will ever accomplish the end sought.

This corporation (The Hartford Steam Boiler Inspection and Insurance Company) has made upwards of 12,000 examinations during the year. All the boilers under its care are examined at intervals of three or four months, and it is no uncommon thing to find defects, at those periodical inspections, which require immediate attention. The result is, that there never has been a serious explosion of any boiler under the care and inspection of the Company, and no person has ever been in the slightest injured.

We are aware that any boiler is, from careless management, liable to explode, no matter how carefully it may have been inspected; but we believe that an expert, familiar with boilers of all kinds, calling at a boiler room once in three or four months, looking over boilers or attachments carefully, and conferring with the engineer, will do much to remove the risk arising from carelessness. As we have already remarked, we fully believe in wholesome inspection laws; not such as have been foisted upon some States to the disgust of intelligent engineers and manufacturers, but laws prepared by men who know the wants of manufacturers and the community in this respect. And again, not such as are framed for the purpose of making a market for some "patent appliance," which may or may not have merit. We believe further, that inspection laws should recognize the work of companies making guaranteed steam boiler inspections.

This work is growing in favor with steam users, and there should be wholesome legislation on the subject, that such corporations may have guaranteed to them the privileges accorded to other corporations; and that steam users may be protected from worthless and irresponsible companies. This can all be done, and the steam user can then choose which he will have, the State or the guaranteed inspection—one he must have.

We are not able to estimate accurately the amount of loss to property from boiler explosions, but it will approximate to $2,000,000.

The Castor Bean in California.

The U. S. Commissioner of Agriculture, in his report for January, says the cultivation of the castor bean in California is rapidly increasing. The amount raised this year will be quite large. One of the largest and most succesful enterprises in this culture is that of Mr. Hedges, whose experiments are carried on in the vicinity of Marysville. Mr. Hedges has under cultivation this season about 200 acres, and expects to realize about 125 tuns, all of the small "Illinois bean." The stalks of this variety vary in hight from six to fifteen feet. The work of gathering begins in July and continues until the frosts set in. The drying grounds on this farm are described as large places cleared off to the "hard pan" of ground, and made smooth like a brick yard. On this surface the heads or clusters of beans are laid in the sun, many of them having been picked in a green state, and here, as they dry, they open. When pretty well "snapped," the heaps are raked over, and the beans removed and placed in a fanning mill, whence they are transferred in a merchantable condition to the sack. Mr. Hedges utilizes the hulls as manure, and it is asserted that they operate to loosen as well as to enrich the clay soil of his farm. This gentleman finds the cultivation of the castor bean so profitable that he purposes next season to plant 300 acres.

French Felt Waterproof.

We have been informed of the composition of this mixture, the manufacture of which has heretofore been regarded as a secret in France, and have made the following calculations regarding its cost:

The cost price varies according to the thickness or the quality of the fabric employed. The covers for wagons, in France, are generally 39 inches wide, and are sold for $1 per yard; the original cost is about 45 cents, and the labor three cents per yard. For cart and dray purposes, they measure about 32 inches in width, and cost about the same. Their dynamometric strength is 450 pounds per square yard. The price of the covers can be reduced considerably by using cotton fabrics instead of linen.

The joint closer is sold in France at 50 cents per pound, but it can be made to cost only 20 cents.

Mr. Parent, chief engineer of the steamer *City of Paris*, who kindly furnished the information regarding this material, has used it for years with great success. It has also been adopted by the Imperial Navy.

The inoxidisable compound for waterproof is made thus:

	Grammes or	Ozs.	Drachms.
India-rubber	106·5	3	12
Finely-sifted sawdust	175	6	3½
Powdered sulphur	10		52
Slacked lime	25		14½
Sulphate of alumina	125		7½
Sulphate of iron	125		7½
Hemp tow	10		52

To mix the above, use heated cylinders, so as to obtain a very homogeneous paste, which is made into thin cakes, and afterward divide into small pieces to be dissolved.

To dissolve this substance, take 4½ pounds of spirits of turpentine, benzine (common is preferable), petroleum or sulphuret of carbon to 2½ pounds of the mixture. It must be stirred five or six times during twenty-four hours, at the end of which time the mass thoroughly dissolves.

The solution is then spread on the fabrics or articles to be preserved, by means of rollers, knives, or spatulas, adapted to the purpose. Apply as many coats as may be necessary, and then let it dry. As soon as the fabric is dry, it is passed under pasteboard laminating rollers, in order to give a luster to the surface. The fabric is then rolled up on a hollow iron pipe, which is covered with cloth to prevent it sticking to the iron, and the whole placed in a copper pipe, with a perforated lid or cover; steam is then introduced at a pressure of four atmospheres, which pressure is maintained for one hour, at the end of which time the operation is ended.

If it be desired to give these impermeable covers a black color, a solution of sulphate of iron, gall nut, and logwood is applied with a brush.

To make caps or joint closers the following proportions are used:

	Grammes.
India-rubber	2,125
Sawdust	1,500
Sulphur	200
Minium, or red lead	300
Alum	500
Slacked lime	500
Hemp tow	500

Dissolve the india-rubber in the above named quantity of benzine, then add the other articles and make a paste of the whole, and apply it when desired for joint closers, on steam engines, hydraulic pumps, or boilers.

India-rubber of inferior quality is best adapted to these compounds.—*C. Widemann, in Journal of Applied Chemistry.*

The Different Methods of Distinguishing Vegetable Fibers.

On account of the frequent practice, now-a-days, of spinning and weaving together cotton, linen, wool and silk, and on account of the difference in value between such fabrics, it has become a necessity to find reliable, simple and rapidly executed tests to distinguish them, inasmuch as the practiced sight and touch no longer suffice for this purpose. If the question be simply whether animal and vegetable fibers are mingled in the same fabric, it is possible to decide by a few very simple chemical reactions; thus wool and silk dissolve in warm caustic alkali, while vegetable fibers—cotton and linen—do not. The animal fiber is dyed yellow by nitric acid, owing to the formation of picric acid, and red by nitrate of mercury.

Schweitzer has proposed an ammoniacal copper solution as a test for cotton, as it is an excellent solvent for it. According to Persoz, silk is distinguished from wool and cotton by its capability of dissolving in chloride of zinc.

If wool be brought into an alkaline solution of oxide of lead, it is gradually blackened; for the sulphur, which is always present in wool, combines with the lead to form black sulphide of lead, which is precipitated by the fiber.

Cotton may be discovered in linen fabric by the sulphuric acid test, proposed by Kindt & Lehnerdt. The finish is carefully removed from the fabric by repeated washings; the sample is then dried, about half of it steeped 1-2 minutes in sulphuric acid; it is then placed in water and rubbed gently and carefully between the fingers to effect a solution of the product formed by the action of the sulphuric acid upon the cotton. This process may be hastened by the addition of some alkali. The sample is then squeezed out and dried. During the time mentioned, the cotton thread has been dissolved, while the linen one remains behind; but the time mentioned must not be exceeded, otherwise the linen threads will also be attacked. To render this test applicable to colored fabrics, the color must first be removed.

Elsmer's coloring and discoloring test, is applicable to the same purpose. The alcoholic solution of madder, in the course of 10 or 15 minutes, colors linen uniformly orange red, cotton uniformly yellow; cochineal tincture imparts to linen, a purple, to cotton, a light red tint. Mixed fabrics, treated with these tinctures, are not dyed uniformly, but appear striped.

The decoloration test is founded upon the fact that a linen fabric, dyed with cochineal, is discolored by chloride of lime solution more slowly than a similarly dyed cotton tissue.

Liebermann recommends fuchsin as an excellent means of distinguishing animal and vegetable fibers. Boil a solution of fuchsin with an alkaline lye, filter the colorless liquid from the precipitate, and, after gently warming, immerse the sample a few seconds in it. It remains colorless; but after thorough rinsing with cold water, the wool is dyed red, while the cotton remains colorless. After drying, every individual woolen thread may be recognized by its red color. The solution is best when prepared by dissolving a few grains of fuchsin in water, and gradually adding potash or soda lye till the color has disappeared. The solution can be preserved and used for several tests. In this test, silk behaves like woolen, linen like the other vegetable fibers.

Zimmermann proposes to discover cotton in linen tissues by dipping the sample for 8 or 10 minutes into a mixture of 2 parts of nitric and 3 parts of sulphuric acids. If cotton be present, gun cotton, which can be extracted by a mixture of alcohol and ether, would be formed in this manner.

Better than this, and really excellent for tissues that are not dyed, is Frankenstein's oil test. A sample of the goods is dipped into olive or colza oil, which is eagerly absorbed by the fabric. The sample is then pressed between pieces of unsized paper in order to remove the excess of oil. If the tissue consist of mixed fibers, it will now appear striped, the linen threads having become transparent and appearing lighter than the cotton threads, which remain unchanged. If the prepared sample, on the other hand, be placed upon a dark surface, the linen threads appear darker than those of cotton. In this, as in all other tests mentioned heretofore, it is advisable to pull out a few threads from the edge of the sample before proceeding with the experiment.

In conclusion, let us mention combustion as a means of distinguishing animal from vegetable fiber. Burning silk and woolen fiber gives rise to a disagreeable odor, like that of burnt horn, and leaves behind a black, carbonaceous mass, which is more voluminous than the original fiber. Vegetable fibre burns up more rapidly, giving off no strong smell, and leaving no voluminous residue.

Decidedly the best and safest method, and one applicable in all cases, is a microscopic examination, by which not only the structure, but also the nature of the fiber can be demonstrated. Cotton, wool and silk are easily distinguished by the microscope, as they differ materially in appearance. Cotton forms flat, narrow ribbons, curled up in spirals like those of a corkscrew; wool fiber is stouter than all others, and may be recognized by its scaly surface, while silk is the thinnest fiber, has the smoothest surface, and possesses the least structure. These appearances are very characteristic, and any one who has observed them once will ever afterwards recognize them again at first sight.

Sir Joseph Whitworth on Horse Railways.

"The use of horse tramways is being urgently pressed forward, and a large outlay is contemplated. In my opinion, they are not suited to the present times, and mechanical engineers have a right to enter their protest, considering the many obstructions there have been for many years past to the employment of road locomotives. If tollgates were abolished, and each county had an organized staff for making and keeping the roads in good order, using the steam roller, steam sweeping machine, and other necessary appliances, where there is large traffic, mechanical engineers would then, I have no doubt, soon produce a small light locomotive that would do its work quietly and most effectively; at the same time, pedestrians and those who ride and drive would have the enjoyment of good and clean roads, instead of the present badly paved and rough Macadam roads. The broken stones of the latter are now left, for the horses' feet and narrow wheels to consolidate, in a way it is quite distressing to see. The consumption of fuel per horse power is now so small that road locomotives could be employed at far less expense than the overworked and ill-conditioned horses we now see, while pedestrians and those who keep horses for pleasure would have good roads, and many gentlemen, no doubt, would have their well-made locomotives."

FROSTED FEET.—To relieve the intense itching of frosted feet, dissolve a lump of alum in a little water, and bathe the part with it, warming it before the fire. One or two applications are sure to give relief.

Chloralum---Its Value as an Antiseptic and Disinfectant Denied.

This new disinfectant, recommended by Prof. Gamgee, an account of which was recently published in this journal, has, according to the *Scientific Review*, been experimented upon by Dr. Crace Calvert, who finds it valueless as a disinfectant.

Dr. Ballard, the medical officer of health for Islington also entertains modified notions as to the value of the chloralum. He has the greatest personal respect for Prof. Gamgee, and for the admirable work he has done—no one more; but Dr. Ballard is sure that he is not warranted in propounding chloralum as a "disinfectant," and still less in recommending its use as such, without, at the same time, adducing the evidence on which his opinion and recommendation are grounded. The *onus probandi* lies with him; he cannot make the assertion, and then leave the profession to show that he is wrong, although there are plenty of bad precedents for such a course. "Chloralum" may turn out to be the best disinfectant known; his discovery may possibly be one of the highest practical value, but he cannot be permitted to anticipate observation and experiment. He has as yet advanced nothing to satisfy Dr. Ballard or anyone, that chloralum used in any way is capable of destroying the peculiar manifestations of a morbid contagion. That it is capable of checking the throat lesions in diphtheria and scarlatina is no more than has been said, by the highest authorities, of ordinary alum.

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Wanted.—An Analytical Chemist. Good references required. Address M. A., Post Office Box No. 2300, New York.

Belting that is Belting.—Always send for the Best Philadelphia Oak-Tanned, to C. W. Arny, Manufacturer, 301 Cherry st., Phil'a.

Wanted.—A partner, with a small capital, to carry out an invention of great value. For curiosity, address L. David, Montgomery, Ala.

An old established business for light machinery, pat'd articles, etc, for sale, 20 mins. from N.Y. Investment sure. Address Iron, Newark, N.J.

Hirzel's German Gas Works, for lighting towns, factories, etc., make a fixed gas, which gives the most beautiful and steady light extant. James Austin & Co., 7 Bowling Green, New York.

E. Howard & Co., Boston, make the best Stem-winding Watch in the country. Ask for it at all the dealers. Office 15 Malden Lane, N.Y.

For Sale at a bargain.—A complete one-set woolen mill, with an established trade. Address H. M. Woodruff, Pewee Valley, Ky.

Foundery and Machine Shop for sale. See page 156.

Master-Machinists will be furnished with Photographs of improved Wood Machines for Car Work, by addressing Richards, Kelley & Co., Philadelphia.

Lathe Wanted.—A second-hand Lathe, to swing 36 inches, 10 feet between centers; must be a good tool, and in good order. Marvin & Co., 265 Broadway.

"Edson's Recording Steam Gage and Alarm," 91 Liberty st., N.Y. Recommended by U. S. Inspectors as protection to good engineers, the charts showing quality of work performed.

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

For Sale.—The Combined Tool illustrated in Scientific American, Jan'y 28, 1871. Wilkinson & Boyle, Plattsburgh, N.Y.

Peteler Portable R. R. Co. contractors, graders. See adv'ment.

Wanted.—The address of every reader of the SCIENTIFIC AMERICAN, to whom will be sent FREE a specimen number of that first-class Family Magazine, THE PHRENOLOGICAL JOURNAL. Address S. R. Wells, 389 Broadway, N.Y.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W.D. Andrews & Bro, 414 Water st., N.Y.

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

For the best Self-regulating Windmill in the world, to pump water for residences, farms, city buildings, drainage, and irrigation, address Con. Windmill Co., 5 College Place, New York.

Conklin's Detachable Rubber Lip, for bowls, etc., works like a charm. For Rights, address O. P. Conklin, Worcester, Mass., or A. Dasi, Philadelphia, Pa.

For the latest and best Improved Hub Lathe, Hub Mortising Machine, Spoke Lathe, Spoke Tenoning and Throating Machine, address Kettenring, Strong & Lauster, Defiance, Ohio.

Thomson Road Steamers save 50 per cent over horses D. D. Williamson, 32 Broadway, New York.

Patent Elliptic-geared Punches and Shears.—The greatest economy of power, space, and labor. Can be seen in operation at our factory, in Trenton, N. J. Address American Saw Co., 1 Ferry st., New York.

The Merriman Bolt Cutter—the best made. Send for circulars. H. B. Brown & Co., Fair Haven, Conn.

Taft's Portable Hot Air, Vapor and Shower Bathing Apparatus. Address Portable Bath Co., Sag Harbor, N.Y. (Send for Circular.)

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.

For Fruit-Can Tools, Presses, Dies for all Metals, apply to Bliss & Williams, successor to May & Bliss, 118, 120, and 122 Plymouth st., Brooklyn, N.Y. Send for catalogue.

McCauley's Improved Force Pump, especially adapted to deep wells. Send for Circular. R. A. McCauley, Baltimore, Md.

2d hand Worthington, Woodward and Novelty Pumps, Engines 25 to 100 H.P., 60 Horse Loc. Boiler. W.D. Andrews & Bro., 414 Water st., N.Y.

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

Self-testing Steam Gage—Will tell you if it is tampered with, or out of order. The only reliable gage. Send for circular. E. H. Ashcroft, Boston, Mass.

Wanted.—A Partner, with capital, in a newly invented Gun. Address A. H. Townsend, Georgetown, Colorado.

Agents wanted, to sell the Star Bevel. It supersedes the old style. Send for Circular. Hallett & White, West Meriden, Conn.

English and American Cotton Machinery and Yarns, Beam Warps and Machine Tools. Thos. Pray, Jr., 37 Weybosset st., Providence, R.I

Diamond Carbon, of all sizes and shapes, furnished for drilling rock, sawing and turning stone, conglomerates, or other hard substances also Glazier's Diamonds, by John Dickinson, 64 Nassau st., New York.

Hand Screw Punches and Lever Punches. American Saw Co. New York.

Japanese Paper-ware Spittoons, Wash Basins, Bowls, Pails, Milk Pans, Slop Jars, Commode Pails, Trays. Perfectly water-proof. Will not break or rust. Send for circulars. Jennings Brothers, 352 Pearl st., N.Y.

House Planning.—Geo. J. Colby, Waterbury, Vt., offers information of value to all in planning a House. Send him your address.

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.

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.

Valuable property and machinery for manufacturing, in P'keepsie, N.Y. Apply to W.H. Crosby, 261 Mill st., or on the premises, Bayeaux st.

For small, soft, Gray Iron Castings, Japanned, Tinned, or Bronzed, address Enterprise Manufacturing Company, Philadelphia.

The best place to get Working Models and parts is at T. B. Jeffery's, 160 South Water st., Chicago.

To Ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's Manufacturing News of the United States. Terms $4 00 a year

Answers to Correspondents.

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

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

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

J. T. says: "I have made an improvement in machinery, by the use of which one half of the fuel now used in running machinery will be saved. I had my model about ready to send you, but have been informed that patents will not be issued to persons who participated in the late rebellion. Upon this I destroyed my models, until I can learn for certain, as I was a participant in that unfortunate affair." Our correspondent is informed that his participation in the rebellion does not debar him from applying for a patent. Since the close of the war, patents have been taken out, through the Scientific American Patent Agency, by General Beauregard, and other distinguished warriors. They have converted their swords into pruning hooks, and are heartily engaged in the conservation of peaceful and improving arts. Our correspondent is advised to reconstruct his model, and send it along by express, directed to Munn & Co., 37 Park Row, N. Y.

T. B. S., of Ind.—J. P. Joule once made an electro-magnet which raised 140 times its own weight. An account of this magnet is given in "Annals of Electricity," Vol. V., page 187. An ordinary electro-magnet will raise 20 times its weight, with proper battery power. Very small electro-magnets have been made to lift 2,834 times their own weights. The powerful electro-magnets of Joule were tubes with thick walls, split, and wound in the direction of their length.

J. C. W., of Mass.—Railroad managers have had their attention called to elastic car wheels, packed with rubber, paper, wood, etc. Some of these devices are now undergoing trials which will settle the question of their worth. All new improvements of magnitude are introduced slowly. If the wheels in question sustain in trial what is claimed for them, their general adoption is only a question of time.

B. N. P., of ——.—The same number of units of heat is required to heat a given mass of water, no matter whether the heat be conveyed into the water by steam, or hot water jets.

J. A. F., of Mo.—A gas, in expanding to its original volume after compression, absorbs as much heat as it evolved during the compression. There is neither gain nor loss in this respect.

A. R. S., of Ohio.—The marginal scale, on Auchindoss' Travel Scale is made to correspond with the travel scale.

FILING CIRCULAR SAWS.—I swage the teeth, at the point, to a gage on both sides, of sufficient width to clear the blade while in the log, and file perfectly square on the face and back of the teeth. If A. O. B. will dress his saw in this way, it will give satisfaction in soft or hard timber. —S. H., of Pa.

W. F. H., of N. Y.—You will not be able to stop the leaking of your cider vats without taking out the cider, and having them overhauled by a first-class cooper.

T. E. N., of Tenn.—You will find the information you wish in regard to capillary attraction, in any good treatise on physics. To answer you here would occupy too much space.

P. A., of Mich.—The subject of ice formation was treated at length in Vol. XXII. of this journal. We do not wish to reopen this subject at present. You will, by reference either to the volume referred to, or to works on physics, be able to answer your query.

Queries.

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

1.—CEMENT.—We want a cement to fasten wooden drawer handles on bureau drawers, after the same are painted and varnished.—S. & C.

2.—SHELLAC VARNISH.—I wish a recipe for the best shellac varnish.—A. R. S.

3.—TO IMITATE ROSEWOOD.—Will some of your numerous readers please give me a good recipe for staining, in imitation of rosewood —H. G. W.

4.—SUPERHEATING STEAM.—I have a boiler of twenty-five horse power, from which I carry steam 800 feet. Can I profitably superheat my steam? and if so in what manner?—P. W. G.

5.—SOLDERING CAST IRON.—Can any of your correspondents let me know if there is any kind of fluid that can be used, with soft solder, to solder cast iron together, and if it will do for stove foundery iron and common gray iron, providing the surface be clean? I use chloride of lime, water, and sal ammoniac for wrought iron, steel, brass, copper, zinc, etc; chloride of lime, two fluid ounces; water, two fluid ounces; sal-ammoniac, one half a teaspoonful; but it will not work on cast iron to any advantage.—W. S. B.

6.—HARDENING TALLOW CANDLES.—Is there any cheap method of hardening tallow candles, so as to render them less objectionable?—E. H. H.

7.—SPIRAL SPRING.—What sized wire must I use for a spiral spring, and what size must the coils be, to stretch three fourths of an inch, with a strain of 200 pounds, without setting the spring? Also, what size rubber spring will do the same work? Is rubber as good as wire for such a spring?—F. W. H.

8.—WATER HEATER.—How can I stop my heater from leaking? It is constructed in the cylinder form, with six copper pipes passing through, and the escape steam passing around the pipes. The leakage occurs from the expansion and contraction of the pipes, where they are fastened in the cast iron head.

Recent American and Foreign Patents.

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

MOLD AND PATTERNS FOR CASTING GROOVED ROLLERS.—John Herald, Otsego, N.Y.—The object of this invention is to so construct the molds for casting rollers or sheaves with grooved edges, that the grooves in the edges will be accurate, and throughout of the desired shape.

TILE, OR FIRE-BACK, FOR FIREPLACE.—Joseph Hackett, Louisville, Ky.—This invention relates to a new tile, or fire-back, for fireplaces, which is so made, that it can be readily applied without cementing or special fastenings, radiate the heat in the most advantageous manner, and form part of the throat of the flue.

CARPET RAG LOOPER AND SEAM RIPPER.—Daniel A. Russell, Windham, Ohio.—This invention relates to a new apparatus for connecting the ends of woolen or other rags preparatory to the weaving of the same into rag carpet. The invention consists in the use of a perforated knife blade, which is pivoted to a block, and held in an upright position thereon by a spring catch.

BALING PRESS.—E. R. Wallace, Jonesville, S. C.—This invention relates to a new baling press, of that kind in which two followers are used, one above the other, they being secured, respectively, to right and left hand screws, and moved forwards or away from each other by being turned together with the box. The invention consists in a new combination of parts.

INDIA-RUBBER SHOES.—C. Meyer, New York city, and John Evans, Rochester, N. Y.—This invention relates to improvements in india-rubber shoes, and consists in shoes provided with raised ribs or other raised figures on the surface, with rows of stitching, or imitation thereof, by the sides of the said ribs, which inclose spaces representing the openings made in the front uppers of sandals, or representing other ornamental figures, the same being made by means of compressing rollers, one having the reverse of the ribs or other raised figures, and the indentations required, engraved on it, the other being plain, between which rollers the outer sheet of which the shoe is composed is formed from the mass, at the same time receiving the impressions the said rolling being done before the rubber is vulcanized and made up into the shoe.

HOOP SKIRT.—James O. West, New York city.—This invention relates to improvements in hoop skirts, and it consists in a novel construction of the same, calculated to form, by the arrangement of the hoops and an adjusting band, a prominent and efficient adjustable bustle.

BATHING BRUSH.—Joseph Marshall, Brooklyn, N. Y.—This invention relates to improvements in bathing brushes of that kind in which a sponge or other porous article is arranged within an annular rim or border of bristles. The invention has for its object to prevent the water from entering between the back of the brush and the plate which holds the bristles and from thereby injuriously affecting the wood and wire-work of the brush.

FASTENING END BOARDS IN WAGON BOXES.—George W. Diller, Odell, Ill.—This invention relates to a new and useful improvement in mode of fastening end boards in the boxes of wagons, and consists in a hinged cleat and staple, and hook, connected with the side of the box.

HAT SIZING MACHINE.—James H. Hopkins, Newark, N. J.—This invention has for its object to furnish a simple, convenient, and effective machine for sizing hats, which shall be so constructed and arranged as to do well and thoroughly work which has heretofore been done only by hand.

OILER FOR THE JOURNALS OF PULLEYS AND OTHER WHEELS.—E. Donden, Lykens, Pa.—This invention has for its object to furnish an improved oiler for oiling the journals of loose pulleys and drift car wheels, and for use in other cases where a hub revolves upon a journal, and which be simple in construction, conveniently manipulated, and prevent the waste of oil.

WASHING MACHINE.—Lawrence White, Orford, Iowa.—This invention has for its object to furnish a simple, convenient, cheap, and effective washing machine, which will wash the clothes quickly and thoroughly, and without rubbing and wearing them, the washing being done by squeezing out the water, and again allowing them to become saturated.

REVOLVING CHURN.—F. B. Chapman, Salisbury, Mo.—This invention relates to a new and useful improvement in a churn for converting cream and milk into butter, and consists in revolving the churn instead of the dasher.

CULTIVATOR.—William Gowen, Bartlett, Tenn.—This invention has for its object to furnish an improved cultivator, designed for use in cultivating cotton, corn, and other crops planted in drills or rows, which shall be simple in construction, effective in operation, and easily controlled when at work, and which may be easily adjusted for cultivating narrow rows, or for use as a harrow.

PLOW.—Alexander Rickart, Schoharie, N. Y.—This invention has for its object to improve the construction of plows so that the draft may be applied to the plow in the rear of the moldboard, which will enable the beam to be made lighter than is possible when the beams are made in the ordinary manner, and which will at the same time give it sufficient strength.

PRESS.—Christopher D. Findlay and David D. Craig, Macon, Ga.—This invention relates to improvements in presses for hay, cotton, and other like

ubstances, and consists in a combination with the screw and nut for working the follower, of anti-friction balls for reducing the friction. It also consists in a combination with the nut and nut holder of anti-friction balls under an arrangement calculated to relieve the friction of the end thrust.

HEELS FOR BOOTS AND SHOES.—Homer S. Smythe, Darlington, Wis.—This invention relates to improvements in the construction and arrangement of heels for boots and shoes, and consists in making the heels in two parts, one of leather permanently attached, and the other of india rubber or other substance, which may be molded and attaching it by means of a screw bolt passing through a metallic plate or block formed in the detachable part, and screwing into a metal plate bedded in the other part.

METHOD OF ORNAMENTING GOLD, SILVER, OR PLATED WARE.—H. G. Reed, Taunton, Mass.—This invention is an improved process, whereby gold, silver, and plated ware can be beautifully ornamented with chased, engraved, or etched designs, without the use of pitch, or the necessity of finishing or burnishing the articles afterwards, and so rapidly and pertectly that work can, by this process, be done in a superior manner for less than one twentieth its cost by the old methods.

MACHINE FOR CUTTING LEATHER.—H. Z. Baker, Pawtucket, R. I.—This invention has for its object the cutting of leather into strips for belting and other purposes, and it consists in a machine in which a pair of parallel rolls s employed, one having a circumferential cutting flange or knife fitting in a circumferential groove in the other.

HORSE HOLDER ATTACHMENT TO CARRIAGES.—G. W. Goodwin, Petersburg, Va.—This invention has for its object to prevent horses from running away with carriages, and consists in the arrangement of a lever, in connection with the carriage wheel and with the reins, whereby it is caused to draw the reins backward when the carriage moves forward.

GATE-OPERATING APPARATUS.—Patrick O'Neill, Murfreesboro, Tenn.—This invention relates to improvements in gate-operating apparatus, and it consists in the application, to the hinged end of the gate, of a projecting arm and friction roller, and in the combination therewith, of a pair of plates hinged together, and connected by chains with an operating lever and cords, all so arranged that on approaching the gate from either side, and pulling the cord, the gate may be raised, unlocked, and swung open by one of the plates acting under the roller, and taking the weight off the hinges upon its oblique side; then, on pulling the same rope again, the other plate similarly acting on the roller, will cause the gate to shut again.

MILL STONE.—J. W. Masury, Brooklyn, N. Y.—This invention relates to mprovements in the construction and dress of mill stones for grinding paint and other wet substances, which improvements are also applicable to stones for grinding plaster, grain, or other substances.

PLATING AND POLISHING COMPOUND.—M. J. A. Keane, New York city.—This invention relates to a new compound for plating or polishing articles of soft metals, such as spoons, forks, and the like, and consists in a compound made of silver, chemically pure, or chloride of gold, cyanide of potassium, and prepared chalk, or any coloring substance of a similar nature, to hold the other ingredients in a semi-fluid state.

BOLT STRAIGHTENING APPARATUS.—C. E. Hunter, Hinsdale, N. H.—This nvention relates to improvements in apparatus to be used in straightening bolts, and it consists in a combination of a shank-holding attachment and clamping and holding devices therefor, with a metal block or "sow," so called, preferably of iron, having grooves of different sizes in or across the face, corresponding in form and size to the heads of the bolts to be straightened, with which the said shank-holding attachment is so arranged that the shank of the bolt may be placed in it, and the head in the groove in the block, and so supported that the bolt may be readily straightened at the juncture of the shank with the head, or the head and shank brought into the same axial line by blows of a hammer delivered on the shank or head.

EXCAVATING MACHINE.—J. M. Hughes and A. J. Mahez, Independence, Mo.—This invention relates to improvements in excavating machines, and consists in a pair of rotary diggers or spaders of peculiar construction located in a vertically adjustable frame, under the fore wheels of a truck, and operated by gearing connected with the said wheels in a manner to spade up the surface of the earth, and throw it upwards and backwards upon a suspended tray or receiver, on which it may be carried away to be discharged by tilting the several boards of the bottom of said tray, which are paneled and provided with tilting apparatus for the purpose.

VEGETABLE CRUSHERS.—Reuben Daniels, Woodstock, Vermont.—This invention relates to improvements in machines for crushing vegetables, apples and other like substances, by passing them between two crushing rollers, and it consists in an arrangement with a scroll hopper applied to the upper and larger roller in such a way, that that the apples or other articles are forced, by the action of the roller, from the mouth, through a gradually decreasing space, in which they are flattened preparatory to entering between the rollers of a copper or other metal covering, non-corrosive in cider or vegetable acids, for maintaining a smooth surface, which is necessary to the success of the flattening operation, which is promoted if the surface is rough, owing to the apples sticking thereto.

FISH-HOOK AND LINE LOLDER.—Levi Arnold, Belchertown, Mass.—This invention consists in a metallic connection between the hook and the line, made in one or more pieces, and in fastening the hook and the line, or either of them, to the ends thereof by means of one or more rings sliding on said connection.

FANNING MACHINE.—E. P. Doremus, Washington, La.—This invention relates to a new mechanism for moving fans by means of clock work, and consists in the use of double jointed levers, which are combined with the escapement wheel of the works to impart oscillating motion to a connecting link and the fan. The invention will be very convenient for working fans in parlors and work-rooms, but can also be used as an appendix to machinery of all kinds.

NEW BOOKS AND PUBLICATIONS.

PRINCIPLES OF MECHANISM.—Designed for the Use of Students in the Universities, and for Engineering Students generally. By Robert Willis, M.A., F.R.S., Jacksonian Professor of Natural Philosophy in the University of Cambridge, Hon. Fellow of the Institution of Civil Engineers, etc., etc. Second Edition. London: Longmans, Green & Co. New York: John Wiley & Son, 15 Astor Place. Price $6·50.

This is a work the scope of which is so well set forth in its title that we need not dwell upon it in this notice. Those who read it must bring to its perusal a sound knowledge of elementary mathematics. To those possessing such knowledge, the method pursued is one calculated to lead the mind, by easy gradations, into a thorough knowledge of the principles of mechanism. We would not be understood to find fault with the mathematical character of the treatise. A thorough knowledge of mechanics cannot be obtained without mathematics, and it is a pity that such works as this cannot be made more widely useful by more thorough and general mathematical training. The work is a large octavo, well printed and bound, but, we are sorry to say, it lacks an index, an omission which is poorly supplied by its table of contents.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

APPLICATIONS FOR LETTERS PATENT.

251.—SEWING MACHINE.—W. A. Mack, Norwalk, Ohio, and James Blake, Scranton, Pa. January 31, 1871.

—.—VAPOR ENGINE.—J. A. H. Ellis, Springfield, Vt. January 31, 1871.

262.—FILING AND SHARPENING SAWS.—Wm. Tucker and Prince Snell, Fiskdale, Mass. January 31, 1871.

293.—MACHINE FOR CUTTING CLOTH AND OTHER MATERIALS.—A. Warth, of Stapleton, and W. F. Jobbins, New York city, both in N. Y.

294.—ELECTRO MOTOR FOR RAILWAY CARRIAGES.—Solomon Jones, of New Orleans, La., William H. Smith, Randolph, Ala., and J. H. Weaver, New Orleans, La. February 2, 1871.

296.—MATTRESS AND LIFE PRESERVER COMBINED.—J. W. Wotton, New York city. February 3 1871.

PATENTS.

American and European.

MUNN & CO. continue to give opinions in regard to the Novelty of Inventions, free of charge; make special Examinations at the Patent Office; prepare Specifications, Drawings, Caveats, and Assignments; and prosecute applications for Letters Patent at Washington, and in all European countries. They give special attention to the prosecution of Rejected Claims, Appeals, Extensions, and Interferences.

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108 FULTON ST., NEW YORK, February 18, 1871.

MESSRS. MUNN & CO.,

EDS. SCIENTIFIC AMERICAN:

Gentlemen:—In your issue of the 18th inst., we note your able editorial remarks on "Kerosene Murder." You, and the public generally, are familiar with Pratt's Astral Oil, which for some years we have endeavored to make known. To fully acquaint the public of the existence of any article of this kind is a question of time. We have endeavored to inform all consumers of oil that a good and safe light can be had, but not, as the projectors of such fluid as your article refers to, say, at a lower price than ordinary good oil. It is not reasonable to expect any manufacturer can exercise the care necessary to secure perfect safety and perfect uniformity in every package of goods, and altogether make a first-class article, and sell it at retail for less than the standard value at wholesale. "Thorough work costs more, but is cheapest in the long run."

Benzine, naphtha, and the lighter properties of petroleum, are very cheap. They give a good light, and burn very freely, but are like a candle placed on a powder keg—the moment the flame strikes the fluid, all is ablaze; or, if the gas escape, an explosion occurs. Standard refined petroleum, or kerosene, of a fire test of 110°, under the name of a fancy oil or burning fluid, while safer than benzine, is only relatively so; there still remain many of the lighter vapors; to remove them entirely is to reduce in volume, and, as a result, render the balance more costly. To insure prime selling quality with safety, but still cheap, is just what Pratt's Astral Oil aims at. We cannot better renly to your article than by giving an extract from our annual circular review:

"In making the annual review of our business in Astral Oil, we ask your attention to the following: It has grown steadily in public favor; the business has increased largely, and in every case, so far as known, the oil has been satisfactory to dealers, and entirely so to consumers; and the trade gives every promise of large increase. The oil has been kept up to the same standard of purity, and retains the same excellent qualities that it had on its conception and introduction; and, from the first package sent out to this time, we have not seen a sample that was not right; neither has there been an accident of any kind, nor has a fire occurred in any way from the burning, storing, or handling of Pratt's Astral Oil.

From the large circle of trade, and great variety of consumers, it is not strange that we should have an occasional complaint. They have been few in number; we do not think they will average one to every five thousand consumers. Whenever we have heard of such, we have immediately sent for samples, but *in no instance* has a sample come to us from such complaint, in which the oil (in a well-trimmed lamp) did not burn free and give as fine a light as possible. A bad lamp or burner, a clogged wick, or a wick so tight as to prevent the free flow of the oil to the flame, or the light turned too low, will tend to produce imperfect combustion, and, as a result, a poor light. PRATT'S ASTRAL OIL—we say it with full confidence—is *not only safe*, but *will burn freely*, and *give a light equal to, if not better, than any illuminating oil ever made*, and, while burning in a well-trimmed lamp, is almost entirely *without odor*.

We ask consumers or dealers to frankly state any and every cause of complaint, and we assure them that, so far as we know, no fault has existed in the oil in the past, and will not in the future. This we warrant, and we are always ready, at any reasonable expense, to prove it.

The many *hundred thousands of gallons* we have sold in the past, is witness to the truth of these statements.

ADULTERATION.—By tracing the few complaints received, we have discovered in some cases that unprincipled dealers have taken advantage of the high reputation our oil has acquired, to give consumers an entirely different article, under the name of Astral Oil. This drawback, we are aware, is incident to the sale of every good article. We take every precaution in our power to protect consumers, and ask our friends to aid us. We may say in this connection that we are fully aware that nothing will so surely defeat our aims, destroy the business, and render useless the labor and expense to which we have been. We again caution the public to be on their guard against dealers selling other oils or fluids under this name, or under *names similar in sound*. 'PRATT'S ASTRAL OIL,' or 'ASTRAL OIL,' is our patented trademark, and we shall prosecute, to the farthest extent of the law, all infringers."

The following appears on our circular:

"Caution—Unprincipled dealers are selling inferior and dangerous oils for Astral. Be sure you get the genuine Astral Oil. See that the seals of the cans have not been tampered with. Buy only of responsible dealers.

For information that will lead to the conviction of any parties adulterating our Astral Oil, and selling it for genuine, we offer a reward of $100.00."

The Fire Insurance Companies of New York, recognizing the merits of the oil, recommend its use over that of any other; and scientific men, and thousands of consumers throughout the country, endorse its claims.

The American Institute, at its Fair held in 1869, awarded to us, for the Astral Oil, the first premium and diploma, "for the safest and best oil." At its Fair of 1870, we again took first premium and diploma, "for safest and best oil for general use," over all competitors. The trials in the latter instance were very exhaustive, and were conducted by the Chemical Committee, consisting of Professors C. F. Chandler and J. G. Pohle, and Dr. A. G. Kelley, with results as stated.

There is no occasion that danger and loss of life should attend the enjoyment of that great blessing of every household, *a good light*.

For further particulars apply to Oil House of CHAS. PRATT, (Established 1770), Manufacturers, Packers, and Dealers in Strictly Pure Oils, No. 108 Fulton st., New York. P. O. Box 3050.

Official List of Patents.

ISSUED BY THE U. S. PATENT OFFICE.

FOR THE WEEK ENDING FEB. 21, 1871.

Reported Officially for the Scientific American.

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111,896.—MACHINE FOR CUTTING AND MITERING PRINTERS' RULES.—Frank H. Aiken, Franklin, N. H.

111,897.—GOVERNOR-VALVE CONNECTION.—John F. Allen, Harlem, N. Y. Antedated February 4, 1871.

111,898.—FISH HOOK.—Levi Arnold, Belchertown, Mass.

111,899.—MACHINE FOR CUTTING SCREWS.—James S. Atkinson, Ormsby borough, Pa.

111,900.—MACHINE FOR CUTTING LEATHER.—H. Z. Baker, Pawtucket, R. I.

111,901.—CURRIER'S TOOL.—James T. Barnstead, Peabody, Mass.

111,902.—TAP FOR OIL CANS.—Jabez A. Bostwick, New York city.

111,903.—SPRING CARRIAGE CUSHION.—T. S. Burnett, Syracuse, N. Y.

111,904.—WOOD PAVEMENT.—William Bushnell, Elizabeth, N. J.

111,905.—WIRE STRETCHER.—Albert Byington, Rochelle, Ill.

111,906.—WASHING MACHINE.—Wm. H. Carman and R. P. McCollum, Philadelphia, Pa.

111,907.—CHURN.—Franklin B. Chapman, Salisbury, Mo.

111,908.—VALVE FOR WATER ENGINES.—Abraham Coates, Watertown, and George W. Lascell, Syracuse, N. Y.

111,909.—WASHING MACHINE.—John Court, Memphis, Tenn.

111,910.—TREATING BLOOD FOR THE MANUFACTURE OF FERTILIZERS AND AMMONIACAL SALTS.—John J. Craven, Jersey City, N. J.

111,911.—PLOW.—Francis Cremer Elmwood, Ill.

111,912.—MANDREL FOR GAGING AND CUTTING SOLDER WIRE.—Lewis Cutting, San Francisco, Cal., assignor to himself and Francis Cutting.

111,913.—VEGETABLE CRUSHER.—Reuben Daniels, Woodstock, Vt.

111,914.—BASE-BURNING STOVE.—Edward Mortimer Decy, New York city.

111,915.—FASTENING END BOARDS IN WAGONS.—George W Diller (assignor to himself and George B. Woodbury), Ofell, Ill.

111,916.—CONDENSER AND FEED-WATER HEATER FOR STEAM ENGINES.—Joseph Dilworth, and John C. Hodgins, Toronto, Canada.

111,917.—FANNING MACHINE.—E. P. Doremus, Washington La. Antedated February 11, 1871.

111,918.—LUBRICATOR FOR WHEELS, PULLEYS, AND JOURNALS.—Edwin Douden (assignor to himself and Chas. Broome), Lykens Pa.

111,919.—REFLECTOR.—F. P. Doyle (assignor to himself and John Cooke), New York city.

111,920.—CRUET STAND.—Josiah W. Ells, Pittsburgh, Pa.

111,921.—MACHINE FOR FORMING ARTIFICIAL STONE.—J. S Elliott (assignor to the Union Stone Company), Boston, Mass.

111,922.—MACHINE FOR MOLDING TWEERS.—Samuel English (assignor to himself and James Ostrander), Troy, N. Y.

111,923.—PRESS FOR HAY, COTTON, ETC.—C. D. Findlay and D. D. Craig, Macon, Ga.

111,924.—HORSE-HOLDER ATTACHMENT TO CARRIAGES.—G W. Goodwyn, Petersburg, Va.

111,925.—CULTIVATOR PLOW.—William Gowen, Bartlett Tenn.

111,926.—EARTH CLOSET.—Edmund Griffith, Wilmington Del.

111,927.—MILLING TOOL.—Levi Griswold, Branford, Conn.

111,928.—CARRIAGE.—Chauncey Holmes Guard, Toronto Canada.

111,929.—FIREPLACE.—Joseph Hackett, Louisville, Ky.

111,930.—MAKING CIDER.—George B. Hamlin, Willimantic Conn.

111,931.—PATTERN FOR CASTING GROOVED ROLLERS.—John Herald, Unadilla, N. Y.

111,932.—COW MILKER.—Elisha A. Hewitt, Groton, Conn.

111,933.—SELF-ADJUSTING CAR TRUCK.—Edward Hipkins, Burford township, Canada.

111,934.—CAR TRUCK.—Edward Hipkins, Burford township, Canada.

111,935.—HAT-SIZING MACHINE.—J. H. Hopkins (assignor to himself and William Carrollton), Newark, N. J.

111,936.—FLY TRAP.—Peter D. Horton aud Ezra T. Bryan Marengo township, Mich.

111,937.—STEAM ENGINE.—John Houpt, Springtown, Pa.

111,938.—ROOFING TILE.—Charles Howard, Warren, Ohio.

111,939.—SNOW-SHOVEL TIP.—Eber Hubbard, Seneca Falls, N. Y.

111,940.—EXCAVATING MACHINE.—Joseph M. Hughes and Andrew J. Mapes, Independence, Mo.

111,941.—MACHINE FOR STRAIGHTENING BOLTS.—Charles E. Hunter, Hinsdale, N. H.

111,942.—LIFTING JACK.—Benjamin F. Johnson, Glasgow, Mo.

111,943.—LOCK-STOP COCK.—J. Evans Jones, Tidioute, Pa.

111,944.—DRAFT DEVICE FOR THREE HORSES.—Owen W. Jones, Columbus, Wis.

111,945.—COMPOUND FOR PLATING AND POLISHING.—M. J. A. Keane, New York city.

111,946.—SASH HOLDER.—W. H. King, Newark, N. J., and Jared Rowland, Williamsburgh, N. Y., assignors to W. H. King.

111,947.—SECURING STEEL OR IRON PINS IN WOOD.—Richard Kitson, Lowell, Mass.

111,948.—PASSENGER REGISTER FOR CARS.—John Kurz, Philadelphia, Pa.

111,949.—HORSE POWER.—Daniel L. Lamon, Boston, Ga.

111,950.—REFRIGERATOR.—John H. Lester, Niantic, Conn.

111,951.—BASE-BURNING STOVE.—D. G. Littlefield, Albany, N. Y.

111,952.—METHOD OF ATTACHING HANDLES TO SCRAPERS.—Edward C. Locke, Providence, R. I.

111,953.—SAW-TOOTH SWAGE.—John Lough, Buckingham, Canada.

111,954.—BEAM COMPASS.—Josiah Lyman, Lenox, Mass.

111,955.—BATHING BRUSH.—Joseph Marshall, Brooklyn, N.Y Antedated February 17, 1871.

111,956.—MILLSTONE.—John W. Masury, Brooklyn, N. Y.

111,957.—LEATHER-PUNCHING MACHINE.—John Matheis Ottowa, Ill.

111,958.—WASHING MACHINE.—Erwin W. Maxson, Scranton Pa.

111,959.—BURGLAR ALARM.—John McDowell, Washington, Pa.

111,960.—LAMP BURNER.—William C. McGill, Cincinnati Ohio.

111,961.—PUMP.—Charles L. Merrill, Watertown, N. Y.

111,962.—INDIA-RUBBER SHOE.—Christopher Meyer, New York city, and John Evans, New Branswick, N. J.

111,963.—COOKING-STOVE ATTACHMENT.—Nathan S. Minniss Oil City, Pa.

111,964.—ANTI-RATTLING WASHER.—Benjamin Morton, Fertility, Pa.

111,965.—PLOW.—James Oliver, South Bend, Ind.

111,966.—DEVICE FOR GRINDING THE FLAT FACE OF VALVE SEATS.—Samuel J. Peet and Daniel Sawyer, Boston, Mass., assignors to Samuel J. Peet. Antedated Feb. 11, 1871.

111,967.—CURTAIN FIXTURE.—Phineas W. Phillips (assignor to James F. Almy), Salem, Mass.

111,968.—FELTED FABRIC.—James Ezra Pollard, Franklin City, Mass.

111,969.—MINIATURE WAR GAME.—Casimiro Portillo, New York city.

111,970.—LARD AND BUTTER BOX.—William Pratt, New York city.

111,971.—FIREPLACE GRATE.—William Pulsfort, Louisville, Ky.

111,972.—CAR COUPLING.—Samuel H. Reed and George A. Reed, Fredericktown, Ohio.

111,973.—MACHINE FOR BRONZING.—Israel L. G. Rice, Cambridge, Mass.

111,974.—SPRING BED-BOTTOM, SEAT, ETC.—Charles Rich, Poughkeepsie, N. Y.

111,975.—PLOW.—Alexander Rickard, Schoharie, N. Y.

111,976.—PRIVY.—Frank Riedel, San Francisco, Cal.

111,977.—IMPLEMENT FOR SLITTING AND LOOPING RAGS FOR CARPETS.—Daniel A. Russell, Windham, Ohio.

111,978.—SHIRT.—Adolphe Salmon (assignor to Cahm & Salmon), New York city.

111,979.—CORN PLANTER.—Joseph Schott, Peoria, Ill. Antedated Feb. 6, 1871.

111,980.—REVOLVING SHOWCASE.—William J. Scott, Albany, N. Y.

111,981.—HOSE RING.—George Sewell, Brooklyn, N. Y.

111,982.—STEAM ENGINE.—Joel Sharp and Joseph W. Thompson, Salem, Ohio.

111,983.—PUMP.—George F. Shaw and Henry F. Shaw, West Roxbury, Mass.

111,984.—NON-CONDUCTING MATERIAL FOR COVERING STEAM BOILERS, ETC.—Benjamin F. Smith (assignor of one half his right to G. L. Langsland), New Orleans, La.

111,985.—RAILWAY CAR COUPLING.—Marcus B. Smith, Mattoon, Ill.

111,986.—HEEL FOR BOOTS AND SHOES.—Homer S. Smythe Darlington, Wis.

111,987.—HARVESTER.—George H. Spaulding, Rockford, Ill.

111,988.—CONSTRUCTION OF CYLINDER FOR CARDING AND OTHER MACHINES.—Joseph M. Stone North Andover, Mass.

111,989.—CRADLE FOR CHILDREN.—William J. Stowell, Baltimore, Md. Antedated Feb. 20, 1871.

111,990.—COMBINED AUGER AND REAMER.—Owen W. Townsend (assignor to himself and George O. Townsend), Fond du Lac, Wis.

111,991.—SPINNING WHEEL.—Franz Voegtli, Montgomery City, Mo.

111,992.—SEEDER.—Teunis Vreeland, Oneida, Ill. Antedated Feb. 11, 1871.

111,993.—BALING PRESS.—Edwin R. Wallace, Jonesville, S.C.

111,994.—BREECH-LOADING FIREARMS.—William G. Ward, Edgewater, N. Y.

111,995.—SASH HOLDER.—Wm. M. Warren, Watertown, Conn.

111,996.—PRESSED NUT BLANK.—Frank Washburne, Brooklyn, N. Y., assignor to Steele & Johnson Button Company, Waterbury, Conn.
111,997.—PISTON PACKING.—George Wells, Providence, R. I.
111,998.—HOOP SKIRTS.—James O. West, New York city.
111,999.—WASHING MACHINE.—Lawrence White, Orford, Iowa.
112,000.—FAUCET.—William Crosby Wise and John Ashman, Chelsea, Mass.
112,001.—CONDENSING DOUBLE-END LOCOMOTIVE ENGINE.—Joseph P. Woodbury, West Roxbury, Mass. Antedated Feb. 6, 1871.
112,002.—SLIDE VALVE.—John C. Woodhead, Pittsburgh, Pa. Antedated Feb. 18, 1871.
112,003.—REFINING IRON, REDUCING ORES, ETC.—John F. Allen, Tremont, N. Y.
112,004.—TOWEL HOLDER.—Henry Alsop, Elkhart City, Ill.
112,005.—PAPER BAG MACHINE.—Peter Edward Armstrong, Philadelphia, Pa.
112,006.—CORN PLANTER.—James M. Aitchison, Omar, N. Y.
112,007.—BUCK SAW FRAME.—John Gulick Baker (assignor to Henry Disston), Philadelphia, Pa.
112,008.—HAND CAR.—William T. Beekman, Petersburg, Ill.
112,009.—WINDOW WASHER.—Charles Edward Bell, Greenfield, Ohio.
112,010.—PORTABLE WATER CLOSET.—Peter Bergqvist, Austin, Minn.
112,011.—SEAL LOCK.—Wilson Bohannan, Brooklyn, N. Y.
112,012.—MACHINE FOR CLEANING GARDEN WALKS.—Peter Boice, Chatham Village, N. Y.
112,013.—DETACHABLE MAGAZINE FOR COOKING STOVES AND RANGES.—Lewis Bridge (assignor to David Stuart and Richard Peterson, Philadelphia, Pa.
112,014.—MOP HOLDER.—John Brizee, Alvarado, Cal.
112,015.—VALVE GEAR FOR DIRECT-ACTING ENGINES.—Adam S. Cameron, New York city.
112,016.—SEWING MACHINE FEEDING MECHANISM.—Mary P. Carpenter, San Francisco, Cal.
112,017.—SIGNAL BOX FOR FIRE-ALARM TELEGRAPH.—Stephen Chester, New York city. Antedated Feb. 18, 1871.
112,018.—PUMP.—Nathan T. Cotlin, Knightstown, Ind.
112,019.—BINDER FOR SEWING MACHINES.—Jacob L. Coles, Newark, N. J.
112,020.—LUBRICATOR FOR STEAM ENGINE.—Henry C. De Land, Syracuse, N. Y.
112,021.—IMPLEMENT FOR DRIVING SPOKES INTO HUBS OR WHEELS.—Wesley Edwards, Indianapolis, assignor to himself, John Holloway, Crawfordville, and John F. Snider, Indianapolis, Ind.
112,022.—FRUIT DRYER.—B. F. Ells, Dayton, Ohio.
112,023.—MOSQUITO NET.—J. J. A. Ergenzinger, Atlanta, Ga.
112,024.—PATTERN FOR APPLYING MEASUREMENTS AND LAYING OUT GARMENTS.—Sarah C. Ewing, Indianapolis, Ind.
112,025.—FLOATING WATER ELEVATING WHEEL.—Chas. F. Fisher (assignor to himself, Lewis Moses, Bernard Moses, Gustave Moses, and William Bogel), New Orleans, La.
112,026.—APPARATUS FOR CARBURETING AND GENERATING GAS.—F. A. Fisher, Westfield township, N. J.
112,027.—KNITTING MACHINE.—G. W. Folts, Boston, Mass., and J. L. Branson, Chicago, Ill.
112,028.—WATER WHEEL.—Charles James Fox, Charlotte, N. C.
112,029.—LUBRICATOR.—S. F. Gates, Cambridge, assignor to the Lowell Oil-Cup Co., Lowell, Mass.
112,030.—HAY TEDDER.—Luke Hale, Hollis, N. H.
112,031.—LOUNGE AND BED.—John C. Hall (assignor to himself and Allen C. Richards), Cincinnati, Ohio.
112,032.—OIL CLOTH PRINTING MACHINERY.—William H. Halsey, Philadelphia, Pa.
112,033.—HOLDER FOR NEEDLES IN SEWING MACHINES.—H. J. Hancock, New York city.
112,034.—ROAD BED.—N. B. Heafer, Bloomington, Ill.
112,035.—FAUCET.—W. H. Hedges, Newark, N. J.
112,036.—TRIP HAMMER.—Benjamin Hershey, Erie, Pa.
112,037.—SPRING FOR VEHICLES.—Benjamin Hershey and Richard Dudley, Erie, Pa.
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112,039.—PLOW COLTER.—Ephraim C. Hodge, Oneonta, N. Y.
112,040.—FOLDING CHAIR.—Francis March Holmes, Boston, Mass.
112,041.—FOLDING CHAIR.—Francis March Holmes, Boston, Mass.
112,042.—WINDOW SASH LOCK.—B. Hotchkiss, New Haven, Conn.
112,043.—HYDROSTATIC SCALES.—Orvis D. Hudson, Waupun, Wis.
112,044.—BASE-BURNING STOVE.—George C. Hunt, Chicago, Ill.
112,045.—MANUFACTURE OF PAPER AND LEATHER BOARD.—C. B. Hutchins, Ann Arbor, Mich.
112,046.—MANUFACTURE OF FLOUR.—Elias S. Hutchinson, Baltimore, Md.
112,047.—VALVE.—John Johnson, Brooklyn, N. Y.
112,048.—HALTER BUCKLE AND RING.—L. E. Jones and T. M. Barber, Syracuse, N. Y.
112,049.—STEAM GENERATOR.—James L. Judge, Milwaukee, Wis.
112,050.—TUCK MARKER FOR SEWING MACHINES.—James F. Kellogg, North Bridgewater, Mass.
112,051.—LATHE.—James Kievlan (assignor to himself and William Wisdom), Chicago, Ill.
112,052.—DUMPING CAR.—S. D. King, Middletown, N. Y.
112,053.—FOLDING BEDSTEAD.—Kasimir Krenkel, New York city.
112,054.—CASTING SOLDER WIRE.—Eduard M. Lang, Portland, Me.
112,055.—DUMB WAITER.—Tolbert Lanston, Washington, D. C.
112,056.—BOOT.—J. S. Lewis, Baltimore, Md.
112,057.—MODE OF LASTING SHOES.—W. H. Lovejoy, Lowell, assignor to himself and Christopher Robinson, Lynn, Mass.
112,058.—ENGINE GOVERNOR.—John D. Lynde, Philadelphia, Pa.
112,059.—QUARTZ MILL.—David D. Mallory, Mystic Bridge, Conn.
112,060.—AIR PUMP.—Robert Mudge Marchant, London, England.
112,061.—HARNESS SADDLE TREE.—J. H. Martin, Columbus, Ohio.
112,062.—CARPENTERS' PLANE.—William Miller (assignor to himself and C. E. Woodman), Boston, Mass.
112,063.—AUGER BIT.—John C. Mills (assignor to himself and Richard Leake), Rochester, N. Y.
112,064.—FENCE.—John Morton, Thornville Mills, Mich.
112,065.—TOBACCO, HAY AND COTTON PRESS.—L. H. Moss, Brownsville, Ky.
112,066.—ROTARY STEAM ENGINE.—Joseph C. Mossholder, Lebanon, Oregon.
112,067.—CURTAIN.—Robert Nenninger and Friedrich Bräger, Newark, N. J.
112,068.—MANUFACTURE OF SILICON STEEL.—C. M. Nes, York, Pa.
112,069.—APPARATUS FOR STEAMING OIL WELLS.—William Nevins, Titusville, Pa.
112,070.—BOTTLE CORK.—W. H. Newton (assignor to himself and S. W. Francis), Newport, R. I.
112,071.—CLOD CRUSHER.—J. B. Okey (assignor to himself and F. A. Lehr), Indianapolis, Ind.
112,072.—CLOTHES DRYER.—Enos L. Parker, Painesville, Ohio.
112,073.—HARNESS PAD.—M. W. Pond, Elyria, Ohio.
112,074.—CLOTHES WRINGING HOOK.—J. H. Pratt (assignor to himself and B. F. Larrabee), Lynn, Mass.
112,075.—PASTEBOARD BOX.—William Pratt, New York city.
112,076.—DOOR LOCK.—J. M. Quimby, Westbrook, and A. S. Dyer, Cape Elizabeth, Me.
112,077.—MODE OF MANUFACTURING GOLD, SILVER OR PLATED WARE.—Henry G. Reed (assignor to Reed & Barton), Taunton, Mass.
112,078.—SIFTING SHOVEL.—T. F. Rooney, Chicago, Ill.
112,079.—COMBINED GANG PLOW AND CULTIVATOR.—Orestes Sampson, Petersburg, Ill. Antedated Feb. 20, 1871.
112,080.—GRINDING MILL.—George Selsor, Philadelphia, Pa.
112,081.—HOT-AIR FURNACE.—S. B. Sexton, Baltimore, Md.
112,082.—FRUIT CAN.—J. S. Shaneman and J. S. Hoon, Beaver Falls, Pa.
112,083.—KITCHEN TABLE.—John Shaw, Whitby, Canada.
112,084.—MANUFACTURE OF METAL TUBES AND COLUMNS.—F. H. Smith, Baltimore, Maryland.
112,085.—SPRING BED BOTTOM.—Howard Smith, Groveton, N. H., and James Potter, Portland, Me.
112,086.—DEVICE FOR SEPARATING EYELETS.—S. N. Smith and S. W. Young (assignors to Union Eyelet Company), Providence, R. I.
112,087.—GRAIN-CLEANING MACHINE.—Jay Sternberg, Webster City, Iowa.
112,088.—PRODUCING GAS FROM SOLID CARBON.—Levi Stephens, Washington, D. C.
112,089.—ATTACHMENT FOR RANGES AND STOVES.—David Stuart (assignor to Stuart, Peterson & Co.), Philadelphia, Pa.
112,090.—CHEESE VAT.—E. H. Stuart and W. A. Stuart, Cedarville, N. Y.
112,091.—LIQUID METER.—W. G. Stuart, Chicopee, Mass.
112,092.—MEAT TENDERER.—L. B. Tarbox, Colliersville, N. Y. Antedated Feb. 16, 1871.
112,093.—GRAIN DRILL.—J. H. Thomas and P. P. Mast, Springfield, Ohio.
112,094.—HANDLE FOR CROSS-CUT SAW.—E. W. Tilton, Oshkosh, Wis.
112,095.—COTTON PRESS.—Gabriel Utley, Chapel Hill, N. C.
112,096.—WHIFFLETREE HOOK.—Amos Verbeck, Sterling, Ill.
112,097.—PROPORTIONAL SCALES FOR THE CONSTRUCTION OF TOOTHED GEAR.—John Walker, Philadelphia, Pa.
112,098.—WHIFFLETREE.—Joseph Ward, Honeoye Falls, N. Y.
112,099.—WHEELS FOR VEHICLES.—James Weathers, Greensburg, Ind.
112,100.—WATER WHEEL.—W. N. Whipple, Niles, N. Y.
112,101.—WRENCH.—Rollin White, Lowell, Mass.
112,102.—DUST PAN.—Henry Whittemore, Orangetown, N. Y.
112,103.—DRIVING MECHANISM FOR ROVING, SLUBBING, AND OTHER MACHINES.—Alfred Wilcock, Richard Robinson, and Frederick Wilcock, Rochdale, Great Britain.

REISSUES.

4,266.—PAPER-FOLDING MACHINE.—Cyrus Chambers, Jr. Philadelphia, Pa.—Patent No. 15,342, dated October 7, 1856; reissue No. 4,079, dated July 26, 1870.
4,267.—PIPE AND FIXTURE FOR WELLS.—J. H. Duck and E. K. Whitcomb, Elgin; said Whitcomb assigns his interest to J. T. Whipple, Chicago, Ill.—Patent No. 58,721, dated October 9, 1866.
4,268.—SEAT FOR SCHOOL DESKS.—G. W. Hildreth, Lockport, N. Y.—Patent No. 55,290, dated June 5, 1866.
4,269.—Division A.—HOISTING APPARATUS.—Otis Brothers & Co., Yonkers, N. Y., assignees of E. G. Otis, deceased.—Patent No. 124, dated Jan. 15, 1861.
4,270.—Division B.—HOISTING APPARATUS.—Otis Brothers & Co., Yonkers, N. Y., assignees of E. G. Otis, deceased.—Patent No. 124, dated Jan. 15, 1861.
4,271.—Division C.—HOISTING APPARATUS.—Otis Brothers & Co., Yonkers, N. Y., assignees of E. G. Otis, deceased.—Patent No. 124, dated Jan. 15, 1861.
4,272.—BARREL.—H. G. Porter, Grand Rapids, Mich.—Patent No. 102,432, dated April 26, 1870.
4,273.—HOISTING MACHINE.—H. J. Reedy, Cincinnati, Ohio. Patent No. 78,829, dated June 9, 1868.
4,274.—ELECTRO-MAGNETIC GATE-OPENING APPARATUS.—William Robinson, Brooklyn, N. Y.—Patent No. 105,494, dated July 19, 1870; antedated July 8, 1870.
4,275.—BED LOUNGE.—James Seymour, administrator, W. H. Coolidge and Charles Stimson, Leavenworth, Kansas, assignees of W. H. Colley, deceased.—Patent No. 103,301, dated May 24, 1870.
4,276.—SAW FRAME.—The Bissell & Moore Manufacturing Co., New York city, assignee of Daniel Moore and Edwin Moore.—Patent No. 94,500, dated Sept. 7, 1869.

DESIGNS.

4,664.—POCKET-BOOK TIP.—J. C. Arms, Northampton, Mass.
4,665.—HAND STAMP FRAME.—J. P. Barnes, Rochester, N. Y.
4,666.—RAILROAD STATION INDICATOR.—F. F. Bibber, South Boston, Mass.
4,667.—SPOON.—Elise De Busson, Yonkers, N. Y.
4,668.—CLOTHES-LINE REEL IRON.—Daniel Densmore, Red Wing, Minn.
4,669.—STUCCO CENTER PIECE.—James John, Chicago, Ill.
4,670.—SHAWL.—Martin Landenberger, Philadelphia, Pa.
4,671 and 4,672.—CARPET PATTERN.—C. S. Lilley (assignor to Lowell Manufacturing Co.), Lowell, Mass. Two patents.
4,673.—TYPE.—Andrew Little, New York city.
4,674.—OIL-CLOTH PATTERN.—James Paterson, Elizabeth assignor to R. H. Reeve and B. C. Reeve, Camden, N. J.
4,675.—PARK SEAT.—E. O. Schwageri (assignor to himself and Shickle, Harrison & Co.), St. Louis, Mo.

TRADE-MARKS.

169.—FERTILIZER.—George Bourne, Baltimore, Md.
170.—HATS, CAPS, AND STRAW GOODS.—Dunlap & Co., New York city.
171.—COTTON BALE BAND AND TIE.—J. J. McComb, Liverpool, England.
172.—CORDS, FRINGES, RIBBONS, ETC.—Silbermann, Heinemann & Co., New York city.
173.—PAINT.—J. L. Smith & Co., New York city.
174.—MEDICINE.—G. H. York & Co., Cambridge, Mass.

EXTENSIONS.

ACCELERATING FIRE ARMS.—A. S. Lyman, of New York city.—Letters Patent No. 16,568, dated Feb. 3, 1857.
METHOD OF JOINING BOXES, ETC.—James Stimpson, of Baldwinsville, Mass.—Letters Patent No. 16,557, dated Feb. 3, 1857.
ABDOMINAL SUPPORTER.—J. M. Milligan, of New Albany, Ind.—Letters Patent No. 16,602, dated Feb. 10, 1857; reissue No. 403, dated Sept. 15, 1857
MACHINE FOR CUTTING TENONS ON BLIND SLATS.—S. C. Ellis, of Jersey City, N. J.—Letters Patent No. 16,534, dated Feb. 3, 1857.

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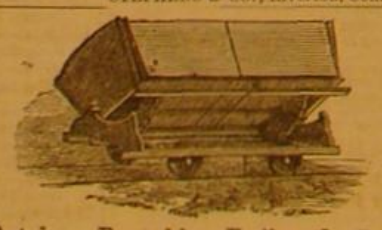

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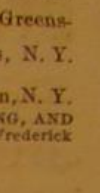

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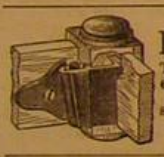

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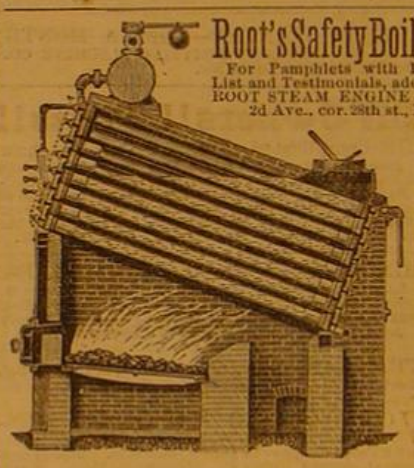

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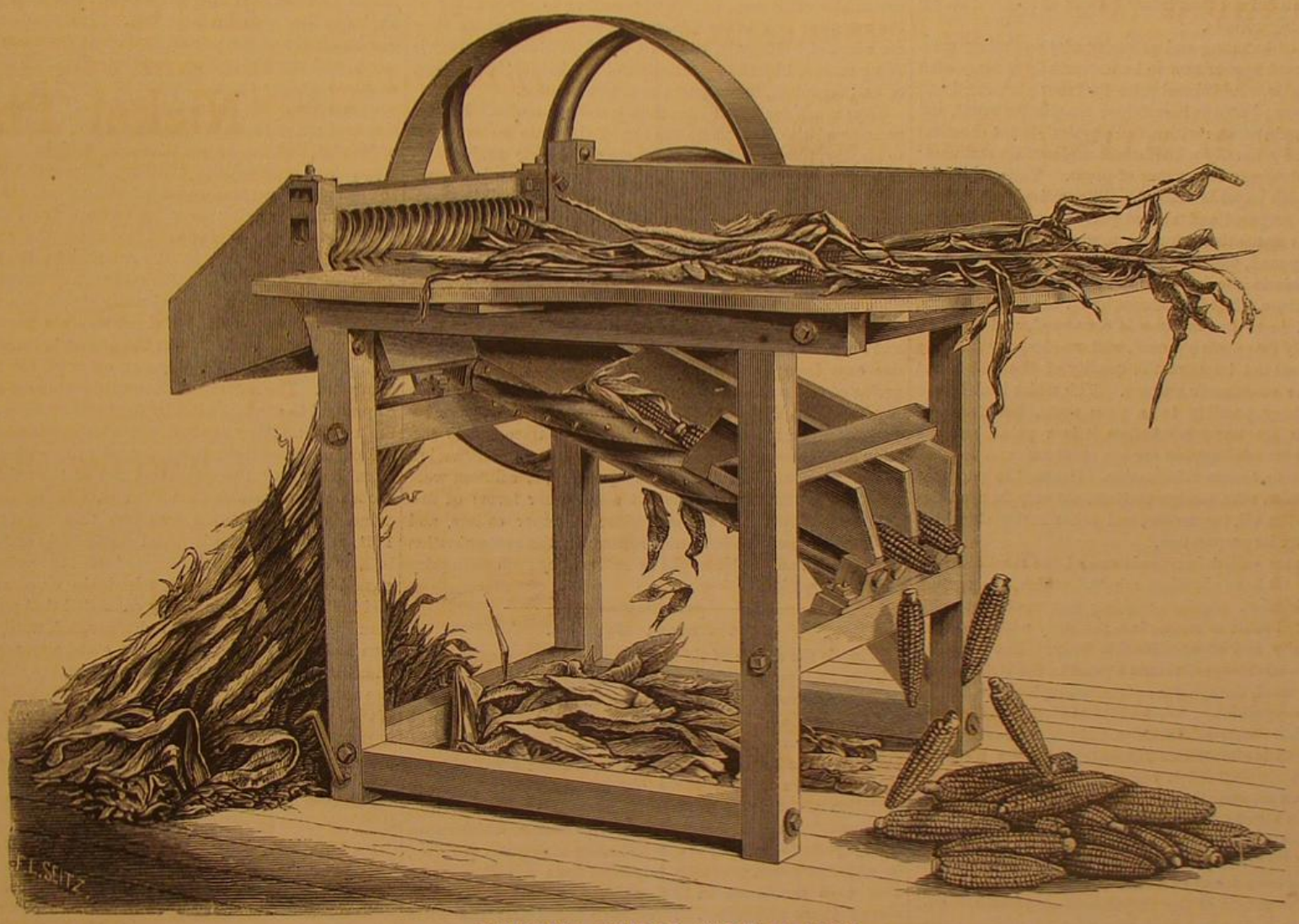
SCIENTIFIC AMERICAN

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

Vol. XXIV.--No. 11. [NEW SERIES.] NEW YORK, MARCH 11, 1871. $3 per Annum. [IN ADVANCE.]

Improved Corn-husking Machine.

The immense extent and value of the Indian corn crop of the United States gives importance to any improvement calculated to lessen the labor of its production. One of the heaviest items in the labor account is the husking—a slow and tedious process when performed by hand. Inventors have not been slow to see the great prospective value of a machine which would cheaply and rapidly husk corn, and many attempts to produce such a machine have been made. We are sorry to say that the difficulties to be surmounted, have been found so great that, for the most part, the corn-husking machines hitherto invented have proved failures. The one which forms the subject of the present article has, it is claimed, shown itself perfectly successful in practical use. If this claim be established certainly, there could be nothing of greater importance and interest, to the country at large, placed before our readers.



PHILLIP'S SPIRAL CORN HUSKER.

The machine consists of a frame about three feet long and two and one half feet in width, made of three-inch joists. Across one end and near the top of the frame are placed two picking rolls, formed with screw threads on each roll, and gearing into each other.

The stalks are fed between these rolls and fall in front of the machine, in good condition for binding, and divested of every ear, great or small.

The ears, as they are separated from the stalk, fall upon the husking rolls placed lower down on the frame, at right angles to the picking rolls and in an inclined position.

Upon the surface, of one or both the husking rolls, are spiral depressions or grooves which answer the double purpose of allowing spikes to be put upon the opposite roll corresponding with the depressions or grooves, and allowing the ear to settle down between the rolls, so that the grip upon the husk may be more certain. These depressions and spikes being placed spirally upon the rolls grip the husks first at the end of the ear, and continue the grip to the opposite end, making the process of stripping the husk from the ear very similar to that of hand husking.

It is claimed that the machine does its work thoroughly, stripping the husks and silk from every ear and nubbin, whether it be large or small, hard or soft. The stalks are delivered in a crushed state and in a much better condition for fodder than when left solid, and they also rot quicker in the manure heap. It is further claimed that the husks are delivered in so good condition as to be worth from $59 to $70 per tun for industrial purposes.

An ordinary two-horse power used for thrashing will drive the machine, and the manufacturers are preparing to build hand machines, by which they claim that two men will be able to husk 400 bushels per day.

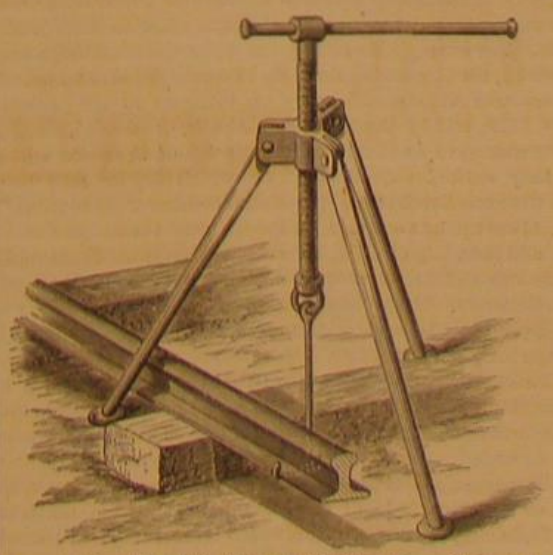
We are told the machine was extensively introduced last fall, and gave good satisfaction to those who used it.

For further information address F. F. Folger, Hudson, N. Y., or W. H. Hoag, 214 Pearl street, New York city.

During the winter of 1868-9, some piles, driven into the bed of the Connecticut river, for the purpose of building the bridge, across that stream, for the Shore Line Railroad, were broken off by ice, and, being dangerous to navigation, many attempts were made to remove them, but without success. Finally, a four inch iron pipe, shod with a steel point, was driven down besides them by means of a sliding ring, arrested by a shoulder on the tube. A charge of gunpowder (four pounds) was put down the tube and fired. The piles were fairly shaken out of the earth by the explosion.

RAILROAD JACK.

The annexed engraving illustrates a lifting jack for rails,



invented by Alfred D. Fox, of Oil City, Pa. It consists of a hooked link, attached, by a swivel, to a screw working a nut, to which the legs are pivoted, as shown. The legs, working independently, render it easy to adjust the nut directly over the rail, and a few turns of the screw will then raise the rail from the sleeper.

The Use of Silver in Decorative Art.

In silver we have a material which, apart from its intrinsic value, possesses many qualities valuable to the artist. It is far more ductile than bronze, and at the same time has natural hardness sufficient to resist any ordinary risks of wear. This hardness may be increased by alloy. In addition, it is exceedingly durable, and admits of the highest finish. It is also open to two distinct methods of treatment, which may be used separately or in combination. If polished or burnished, its whiteness and strong high lights preclude delicate work in the detail; at the same time, these qualities result in inconceivable splendor of effect when boldly treated, especially in objects which are made to depend upon form in such a way as to exhibit the burnished surface to advantage. Bold bossed work is very effective, and may be used with excellent results either alone or in combination with engraving or répoussé relief. A matted ground is then valuable to the latter. Engraving, to tell well on bright silver, must be pretty boldly executed, the lights being otherwise lost in the overlapping reflected rays of light shed from the surrounding surface. For art purposes, the most favorable form of silver is that known as "oxidised," in which the extreme whiteness and brilliancy of surface are subdued. It then possesses the finer qualifications of bronze in a higher degree, and the light gray color which it presents, together with the fine surface and softened lights, render it the best of all materials for delicate and highly-finished relief. In fact, the chasing may be as fine as the artist can bestow, nor need we fear that his labors will be lost. Many valuable modern works have been executed in this country, though by foreign artists, and some excellent reproductions have been made in *facsimile* by the electrotype process. The most beautiful modern specimens of *répoussé* silver, however, which I remember, were exhibited in 1867, by Faunière, of Paris, who, in a table service (said to have been designed by an amateur for his own use) combined excellence of form and design with most admirable treatment in execution. It is satisfactory to find that one of the English artisans whose reports were published by the Society of Arts appreciated the remarkable excellence of the works from this *atêlier*. "Other exhibitors," he says, "show some good pieces," but in Faunière's case "I think it is impossible to discover one

piece of inferior work, while many are real master-pieces." "Party-gilding" and "damascening" may both be used on dull silver with good effect, the main point to care for being to avoid confusion. Engraving may be used with both, and if the surface be not polished, may be as fine or as elaborate as may be desired. A hatched or matted ground, judiciously used, often adds greatly to the effect of low relief, or may sometimes be used to show a flat ornament with engraved outline.—*J. D. Crace.*

ADULTERATION OF ARTICLES IN GENERAL USE.

It is certainly within the memory of most of us, says the *American Exchange and Review*, when plain white cotton goods consisted alone of the fiber of the plant which gives them their name. When we bought such in those times, they were not as now, perhaps, "dressed" to the extent of more than a quarter of their weight with foreign matters, among which fine white clay holds so prominent a place. Our wall papers were then considered heavy enough, and our writing and printing papers had sufficient body without such noticeable dressings of kaolin, and the products of the workings of clay deposits were turned into their legitimate application for the production of porcelain and white stone ware. Preferring to grind our own coffee, the cup was drunk without the after-thought that chicory and dandelion root and rye were essential elements in its composition. If sand were found in the sugar, it was regarded as an adventitious matter, and we did not then hear of it and of torrified starch as prominent ingredients.

Frequency of handling and necessity of preparatory manipulations would appear now to be universally accompanied by sophistication. Additional price for labor performed and material consumed affords insufficient margin for profit, and lower priced substances: with allied physical, if not chemical properties, and generally with distinct applications and uses: are deemed necessary to increase of profit. Thus, while the rags from which paper is made are comparatively expensive, the carefully prepared and almost perfectly white clay sells to the paper manufacturer for not more than one and a half cents by the pound, and is worth, in money at least, greatly more than this in stock. The old Dutch method of white lead manufacture, while it produces by far the best of paints, is expensive, in so far as time is concerned, and barytes, worth possibly two cents a pound, will wonderfully increase profit, if it does not improve the quality of the paint; but this last is the consumer's concern. The white lead leaves the manufactury possibly in a pure state, but frequent manipulations are necessary before it is a paint, and the opportunities for adulteration are too numerous and too propitious for it to escape falsification. Hence, the pigment reaches us laden with foreign matters, not only in the basis itself, but in the oil, turpentine, and other materials which are required for its preparation.

The substance called barytes is one of the most common of falsifiers. It is an abundant mineral, which, after grinding and elutriation, requires nothing but treatment with weak or diluted acids to render it a perfectly white powder of great density and of considerable body. But notwithstanding these advantages, it is not a paint in the strict acceptation of the word, though its extensive employment might lead to such supposition. We find it entering into the composition of other commercial articles. Much of the cochineal used in the arts is simply this sulphate of baryta rolled in the moistened dye stuff till it constitutes half of the weight of the fictitious coloring matter.

There is an allied substance, gypsum, which is even more abundantly distributed than the barytes, and this has become, on account of its lower price, of much importance in adulteration. It has been found in starch to the extent of nearly one fifth of the weight of the amylaceous compound. The amount of it that may be added to artificial fertilizers, without detection by ordinary means, is only limited by the conscience of the manufacturer, and this limit can hardly be regarded as a safe one in the face of what chemical analysis points out. A purple dye material, called litmus, should be, according to Webster's Dictionary, "obtained from a lichen, the archil, and from an euphorbious plant, common in the south of Europe," but is, commercially, small cubes of gypsum, stained or impregnated with the coloring matter of these plants. Indigo itself does not escape sophistication by the same substance.

Dye stuffs seem to be favorites upon which to exercise skill in adulteration. In commercial madder, we find any or all of sawdust, almond husks, bran, pine bark, acacia wood, spent madder, sand, clay, brick dust, and ocher. Cochineal should be the dried carcasses of the *coccus cacti*, but usually consists of the same intermixed with white lead, barytes, soapstone, fragments of metallic lead, and with the spent dye. Prussian blue contains artificial ultramarine (now prepared at a cost of not more than fifteen cents per pound); chrome yellow holds fully seventy-five per cent of its weight of barytes; anotta has red ocher, powdered bricks, colcothar, chalk, gypsum, turmeric, and farinaceous substances, whilst the turmeric itself is extensively falsified.

But these are matters which affect us but little when compared to articles of food and diet. These, it might be thought, would escape falsification, since consequences much more serious and alarming might be the result of their adulteration. But we find very few articles of food, requiring previous artificial preparation, to be without sophistication. Alum, sulphate of copper, and sulphate of lime, have been found in bread, in addition to the possibilities of falsification in the original flour. Milk has been suspected to contain an undue amount of water, and has been found at times with dextrine, starch, sheeps' and calves' brains, chalk, and magnesia entering into its composition. Butter may contain water, flour, and earthy substances. Tea is adulterated with Prussian blue, indigo, gypsum, chromate of lead, and copper compounds, and is sometimes made up entirely of tea dust, ground rice, and gum. Coffee is not always the dried berries of the *Coffea Arabica*, whatever the popular belief may be, but is frequently made up of chicory, roasted corn, acorns, and leguminous seeds. Chocolate was formerly regarded as a preparation of the *Theobroma cacao*, but that was in the days of Linnæus, who justly regarded its infusion as "the nectar of the gods;" now it is largely composed of starch and amylaceous substances, iron ocher, and other mineral matters. Cayenne pepper has been known to contain red lead, and is frequently found with colored sawdust as a component. Mustard is falsified by the addition of wheat flour colored with turmeric, and the mixture is rendered sufficiently hot by the addition of red pepper. Salt, it may safely be asserted, escapes adulteration, but not so with vinegar, which, as is well known, not unfrequently contains oil of vitriol, and then of a verity there is death hidden in the cruet. Olive oil is made from lard, or else is adulterated with poppy oil, and the rancid substance is sometimes treated with litharge, for the purpose of making it sweet, leaving variable amounts of lead compounds in the article for table use. An investigation of the various pickles and proprietary sauces would hardly be conducive to the peace of mind of one devoted to their use, whilst the sweetmeats and candies, which tradition tells us were once composed mainly of sugar, are composed essentially of starch, flour, and paraffine, to say nothing of the arsenical and other mineral pigments with which they are adorned. Happily, however, this last cause of injury is being removed by the substitution of the inoffensive aniline, or coal tar colors, for purposes of ornamentation.

Thus much for the articles that grace our tables. It fares perhaps a little better with the remedial agents we are wont to employ, though many of these are alarmingly adulterated. Patent or proprietary medicines possibly escape this stigma, but as they frequently are potent enough for evil in themselves, we can hardly congratulate ourselves upon finding in them a safe refuge in disease.

In many instances, the dyes and pigments used about our wearing apparel, and in the figures on our wall papers, are open to serious objections. Arsenical and lead colors are of too frequent employment for such purposes, and suffering and death are traceable to their use. The writer found, in one case brought to his notice, as much as twenty-three grains of white arsenic in a square foot of green figured wall paper, whilst the medical and technical journals have recorded frequent instances of injury directly traceable to tarlatan and other dresses dyed with Schweinfurth or Scheele's green. It would be an interesting question, if solution were practicable, how far paralysis and some other forms of disease were traceable to the lead glaze in paper collars, and possibly some of the onus now resting on the contamination of water by leaden pipe might be removed by such an inquiry and investigation.

The Aurora Borealis.

What is the origin of this remarkable phenomenon?

Terrestrial magnetism is the unknown influence, seen by its effects upon the artificial magnet, causing the inclination and declination of a magnetised bar of steel. We have no recorded observations of magnetic phenomena before 1828, but they have been general since. Instruments called magnetometers are used for these observations. The decennial variation of the magnetic elements is very important. Thus, for example, the frequency of magnetic storms, which cause the magnets to oscillate to and fro, often with great rapidity, in different years, gradually increased from a minimum in 1843 to a maximum in 1848, giving a variation of about eleven years altogether. It has been found that the solar spots are also periodical. M. Schwabe, of Dessau, observed these for twenty-four years, and found they had a regular maximum and minimum every five years, and that the years 1843 and 1848 were minimum and maximum years—thus exactly coinciding with the magnetic decennial variation. Mrs. Somerville says the discovery of the magnetism of the atmosphere placed the aurora in the class of electro-magnetic phenomena. It may be described as a "luminous discharge of superabundant magnetism," occurring in the north and south where the air is highly magnetic, and denoting the conclusion of a magnetic storm. Not only do the solar and magnetic disturbances coincide at regular intervals, as before observed, but the auroral displays coincide also with them. For example, in 1859, great solar disturbances were observed, the Greenwich magnets were displaced, and a fine aurora was visible. Eleven years bring us to the present time, 1870; and in the *English Mechanic*, October 21, Mr. R. A. Proctor gave an illustrated description of the sun's spots as they existed September 25, on which day he says "no less than one hundred and two distinct *umbræ* were counted." Mr. Allnatt points out that, on the night of the 24th September and morning of 25th, an aurora of unwonted magnificence was visible at various outlying stations in England and Germany. Respecting the displacement of magnets, we shall presently have occasion to refer to the effects produced on the telegraphic needles.

The Rev. J. Farquharson says "that the aurora follows a determinate order in its appearance and progress; that the streamers or beams generally appear first in the north, forming an arch from east to west, having its vertex at the line of the magnetic meridian; that when this arch is yet only of low elevation, it is of considerable breath from north to south, having the streamers of which it is composed placed crossways in relation to its own line, and all directed towards a point a little south of the zenith; that the arch *moves forward towards the south*, contracting its lateral dimensions as it approaches the zenith, and increasing in intensity of light by the shortening of the streamers near the magnetic meridian, and by the gradual shifting of the angles which the streamers near the east and west extremities of the arch make with its own line, till at length these streamers become parallel to that line, and then the arch is seen as a narrow belt three degrees or four degrees only in breadth, extending across the zenith at right angles to the magnetic meridian."

There is great difficulty in determining the hight of the displays of the aurora. Mrs. Somerville says either it must occasionally be high above the earth, or its coruscations must be very extensive, as the same display is generally visible at places wide asunder. An auroral bow which appeared in the United States, June 11, 1852, had such a decided parallax that its lower edge was computed to be one hundred and forty miles above the earth, and its upper edge two hundred and eighty. The above named lady says that though it has frequently been seen in North America, and all over the north of Europe at the same time, Sir E. Parry saw a ray dart from it to the ground near him. Admiral Wrangle assigns a very moderate elevation to it. Dr. Halley says Father Boscovich determined the hight of an aurora, observed December 16, 1737, to have been eight hundred and twenty-five miles. Bergmann makes the average hight of thirty observations of aurora to be four hundred and sixty English miles. Mr. Dalton, in a paper read before the Royal Society, April 17, 1828, describes a display he witnessed on March 29, 1826, assuming the form of a regular arch at right angles to the magnetic meridian. This was seen in places one hundred and seventy miles distant from one another in a north and south direction, and forty-five miles distant from east to west, or an area of seven thousand or eight thousand square miles. He found the hight of the arch about one hundred miles above the surface of the earth over the town of Kendal, and the breath of the arch eight or nine miles. Upon these observations, Mr. Farquharson thinks there were several nearly vertical arches of the aurora almost contemporaneously hanging over many lines from Edinburgh to Warrington at a few thousand feet above the surface (*Philosophical Transactions*, i. 1829). A writer in the *Encyclopædia Britannica* states that Dr. Richardson's observations seem to show that the aurora is occasionally seated in a region of the atmosphere, below a kind of cloud which is known to possess no great altitude. He thinks the aurora is constantly accompanied by the formation of one or other of the forms of cirro-stratus. The natives of the arctic regions of North America pretend to foretell wind by the rapidity of the motions of the aurora, and they say that, when it spreads over the sky in a uniform sheet of light, it is followed by fine weather. Captain Franklin says: "The important fact of the existence of the aurora at a less elevation than that of dense clouds, was evinced on two or three occasions this night (February 13, 1821, at Fort Enterprise), and particularly at 11.50, when a brilliant mass of light, variegated with the prismatic colors, passed between a uniform steady dense cloud and the earth, and in its progress completely concealed that portion of the cloud which the stream of light covered, until the coruscation had passed over it, when the cloud appeared as before.' These statements are sufficient to show that the altitude of the aurora differs very considerably.

Observers have also differed on the question as to whether any sound accompanies the phenomenon. Parry and Richardson say not. Franklin observes: "I have not heard the noise ascribed to the aurora, but the uniform testimony of the natives and residents in this country induces me to believe that it is occasionally audible." Lieutenant Hood says: "We repeatedly heard a hissing noise, like that of a musket-bullet passing through the air; but Mr. Wentzel assured us that this noise was occasioned by severe cold succeeding mild weather, and acting upon the surface of the snow, previously melted in the sun's rays." Mr. Nairne is sure that he has heard a hissing noise when the polar lights were very bright. Giesecké says: "The polar lights appear sometimes very low, and then they are much agitated, and a crashing and crackling sound is heard, like that of an electric spark, or the falling of hail." Mr. Ramm, of Tonset, in Norway, says: "If this light occupy the whole northern sky, rising more than seventeen degrees above the zenith, the rays must proceed from under the feet of the observer, although they do not receive their reflecting power till they have reached a considerable elevation, perhaps beyond our atmosphere. It is therefore conceivable why we should frequently hear a noise attending the northern lights, when the inhabitants of southern countries, who see the phenomenon at a distance of many hundred miles, hear no report whatever." Professor Hansteen expresses his surprise that a fact so well established should be called in question. The writer of the article on the subject in the *Encyclopædia Britannica* says he has heard these noises both in this country and in the Shetland Islands.

Mr. Culley, the Engineer of Telegraphs to the Postmaster-general, in the *Times*, October 31, 1870, says the aurora is a kind of lightning, differing from ordinary lightning in being a gentle and gradual flow, instead of a violent and sudden discharge. The so-called electrical "earth currents" were especially powerful during the late displays, and different in strength and direction, so that it was often impossible to read a message.

The telegraph wires running east and west suffer most. When there are several wires available between two stations, the earth connections are cut, and the wires are looped, so as to use one of each pair as a return wire, in place of the earth thus forming a complete metallic circuit." This plan, however, enables only half of the instruments to be used. It had been remarked that the auroræ have only recently affected

the instruments, because insulation is not now so well attended to as some years since. Mr. Culley says this is a mistake, the effect of the earth-current being in many cases the greatest in the best insulated lines. The Atlantic cables, for example, whose insulation is absolutely perfect, have been more disturbed than any land line.

Anecdote of Thomas Brassey, the Great English Railroad Contractor.

The patient sagacity and calm resolution to abide by the rules he had laid down for his own conduct, which enabled Mr. Brassey to perform, at the same time, an amount of work equal to that of three or four Ministers of Public Works put together, may be illustrated by an anecdote never until now put forth.

In the year 1862 Mr. Brassey was in Turin. Some Italian notables of that day called upon him at the Hotel Trombetta, in order to obtain his support for one of the great enterprises by which it was then sought to enrich the Peninsula. Mr. Brassey was conversing with an English engineer (who had himself been served by an Italian Government much as a captive kite is served by the game-keeper, who suspends him as a terror to other predatory birds), when the deputation arrived,—a lawyer of eminence, a member of the administration, more than one deputy of the Chamber. Ensconcing his companion in the inmost chamber of the suite, where every word that passed was distinctly heard, and where he was asked to wait for half an hour, Mr. Brassey received his visitors. Nothing could be more apparently satisfactory than the commencement of the interview. The advantage of the project was set forth by the projectors, and admitted by Mr. Brassey, whose brief occasional remarks showed that he had thoroughly mastered the subject. When the whole matter had been presented in its fairest light, by one and another of its advocates, Mr. Brassey remarked that it might save time if he explained the invariable principles on which he conducted business. He was willing to afford a large measure of support to any enterprise of which he undertook the works. He was prepared, in such case, to subscribe to the capital, and to hold, without forcing on the market, a certain proportion of shares, or bonds, or both. But such financial arrangements must be entirely distinct from those made for the execution of the works. For that he must receive monthly payment in cash, according to regular monthly certificates by the engineer, of from 80 to 90 per cent. of the value of work done. If the directors were prepared to deal on these terms, he should be ready to enter at once into the details of prices.

The deputation were delighted. Nothing could be more to the point, or more in accordance with their ideas of business and habits of action. Then they commenced a review of the features of the scheme, and travelled, a second time, over the ground already covered, rising, however, in enthusiasm as they dwelt on the unrivalled advantages which the shareholders would enjoy. They considered the contract as settled with Mr. Brassey. The terms were fully acceptable to both sides, and they would send their engineer to meet Mr. Brassey's engineer, and settle the details of the schedule, as to which no difficulty could arise, as there were ample precedents to follow. They would take their leave of their honored friend with the utmost content. The little noise which accompanied the rising of half a dozen persons succeeded. The door opened, and, just in backing out, "Of course," said the first speaker, "Mr. Brassey had no objection to accept, as cash, the shares of the Company for which he had promised to subscribe!"

"Stop, gentlemen," said Mr. Brassey. "I am sorry that I have failed to explain my meaning. You must not go away under a mistake. I told you, that, if we agreed to the details, I would subscribe for a certain proportion of shares. But I told you that this must be kept quite distinct from the monthly payments. They must be regularly made in cash, to my bankers; on no other consideration will I look at the business. I have large sums to pay every month, and I cannot allow any uncertainty to subsist as to the regularity of my receipts. Pray understand that. It is a *sine quâ non*."

"Of course, if Mr. Brassey put it in that way, the directors would be delighted to meet his views. They had merely intended to avoid trouble, by proposing one transaction instead of two. But it was for Mr. Brassey to decide." Then followed a second repetition of the entire argument, to which Mr. Brassey listened with great patience. Again the leave taking process was gone through; and, again, as if a mere casual remark—"The directors understood that the company's obligations were equivalent to cash, as, in point of fact, they were at 3 per cent. premium, and therefore worth more than bank notes."

"In that case," Mr. Brassey rejoined, "it would be easy for the company to convert them, and to pay him in money. He did not wish for more than his price. The advantage to be be derived from the premium on the obligations might be very large. So much the better for the company, but he had explained his own invariable system."

It would be intolerably tedious to attempt a more detailed account of the entire conversation. In a word, the half hour for which Mr. Brassey had imprisoned his countryman, lasted from to six till nearly ten p. m., when the deputation at length retired, making arrangements for a second interview. The Italians were thoroughly beaten and tired out with their own efforts. They had not made an inch of way. The regular payment, insisted on by the Englishman, they had never dreamed of really making. They brought their fullest experience of legal and Parliamentary tactics to bear on the unaided common sense of the great contractor, whom they endeavored to use; and they came to grief against his clearsighted honesty. He never undertook their contract.—*The Builder.*

Dr. Sheridan Muspratt.

We regret to record the death of this eminent chemist, which occurred on February 4th, at Liverpool. Dr. Muspratt's name has been so long and so prominently associated with the progress of chemistry, that it is with some surprise that we learn that his age was only fifty. The following sketch of his career appears in "Men of the Time:"

James Sheridan Muspratt, M. D., F. R. S. E., M. R. I. A., etc., chemist, born in Dublin, March 8, 1821, was, on account of his father's removal to Liverpool, educated by the Rev. Mr. Hind, and afterwards by Dr. Cowan. At this early period he evinced a taste for chemistry; and, having travelled through France and part of Germany, he entered the Andersonian University of Glasgow, where he studied in the laboratory of Professor Graham, whom he followed to London. Before he was seventeen, he was intrusted with the chemical department at the works of Peel Thomyson, in Manchester, and published a paper upon "Chloride of Lime," which attracted considerable attention. Proceeding to the United States, he entered into a trading partnership, which proved unsuccessful; and after visiting the various States, he, in 1843, repaired to Giessen, and studied under the great Liebig. Having remained two years in Giessen, he resolved to test his strength, and published a paper upon the sulphites, which appeared in Liebig and Wöhler's *Annalen*, was copied into all the scientific annals, and won him his degree of Doctor of Philosophy, a title never before granted to a man so young. It was followed by a paper on the "Pretended Formation of Valerianic Acid from Indigo," read before the British Association at York.

At this period, in conjunction with Professor Hofmann, he discovered toluidine and nitraniline, two organic bases of the utmost importance; in 1845 he left Giessen, having, while there, edited Plattner's "Treatise on the Blowpipe," which reached a fourth edition, with emendations, bearing the title "Muspratt and Plattner on the Blowpipe." Dr. Muspratt, who visited various parts of Germany in order to become personally acquainted with her distinguished men, in 1847 returned to Giessen, and spent four months in its laboratory, discovering several remarkable bodies produced from the sulphocyanides of ethyle and methyle. A paper on this subject was printed in Liebig's *Annalen*, as well as in the "Chemical Society's Transactions." In 1848, he gave a paper on the Selenites; in 1849 he published some very interesting remarks in Liebig's *Annalen*, on "The Blowpipe Reactions of Strontia and Baryta." His paper on "Carmufellic Acid, a new Acid from Cloves," was published in 1851, in the "Proceedings of the Royal Society," and in the *Philosophical Magazine*. He founded a college of chemistry in Liverpool, students from which occupy prominent posts in in various parts of the globe.

In 1854, a Glasgow publisher engaged Dr. Muspratt to write a Dictionary of Chemistry, which has commanded a large sale in England, America, Germany, and France. He was elected a Fellow of the Royal Societies of Edinburgh and Dublin, and a member of the Société d'Encouragement in France; and the oldest university in the United States conferred upon him the honorary degree of M. D., the only one held by a British subject. In 1863, he published a reply to a critique in *Blackwood*, condemnatory of the "Dramatic Writings of Sheridan Knowles," his godfather; and in 1848 married Miss Susan Cushman, a popular actress (sister of the celebrated actress, Miss Charlotte Saunders Cushman), who died in 1859.

Wanted, the following Inventions.

A TRUE VELOCIPEDE, consisting of one or more wheels, of suitable diameters, with vulcanized rubber tires, attached by a frame-work to each foot, the whole being a modification and improvement of the parlor skate, the rubber tires adapt it to the inequalities of the ground. If a locomotive can, by this means, be made to drag a load up a hill, as in Scotland, why may not a man with wheels of similar construction placed under his feet propel himself along the streets at a rapid rate of speed?

A SUBSTITUTE FOR GAS in the illumination of cities; electric lights, with vertical reflectors, placed at such elevations above buildings, and at such distances apart as will illuminate the different areas of a city. A few strong electric, or calcium lights, with good reflectors, suspended, say 100 feet from the ground, would, like so many miniature suns and moons, shed a steady uniform and satisfying light upon all the buildings, alleys, and streets, embraced within a given city area. The ordinary street lamp of the gas company is placed so near the pedestrian's eye as to produce a glare and blindness instead of illumination. It is alternate glare and darkness. Unprovided with reflectors, much of the light is dissipated. An improvement on streets gas lights might be made, by suspending the lamps in the center of the street at an elevation of 20 or 30 feet, this would protect the eyes of the passers-by, and the reflectors placed above them would send their rays where most needed. The saving in lamp-posts would offset the expense of connecting and suspending rods and pipes. The whole chain of lamps in a city could be ignited by electricity, as is now done in the dome at Washington. By means of these central lights, the streets of a city would be more uniformly and effectually lighted.

A CHEAP IRON OR STEEL RAIL, adapted to farmers' freight railways, whether worked by horses or steam; a rail which, while fitted to receive the wheel of ordinary wagons, will not collect snow and ice so as to impede travel. The importance of these horse railways as substitutes for the ordinary earth or plank road, is not yet appreciated as it deserves to be. They are destined to accomplish much as lateral feeders to long lines, and as connections of small places with large ones. Were farmers to co-operate, and, with some aid from the townships on the route, build these cheap freight railways, with single or double tracks, millions of dollars might be saved in farm outfits for transportation, and untold sums added to the productive industry of the country.

A SHIP RAILROAD, by means of which to transport large and small vessels across necks of land, such as Cape Cod and and the Isthmuses of Tehuantepec and Darien. Required a firm, wide track, with rails of great strength, and an adjustable frame-work to receive and hold the vessel in position on the track; the whole resting on trucks, to be drawn at moderate speed from bay to bay, from ocean to ocean. A steam elevator or lock at each terminus of the isthmus would place the vessel in position on the truck, or remove it therefrom. Such a railway would solve the problem of uninterrupted navigation.

SCIENTIFIC INTELLIGENCE.

PRODUCTION OF THE PRECIOUS METALS.

Up to the year 1846, the value of silver produced exceeded that of gold. In 1800, it amounted to 72·2 per cent of the entire yield, as opposed to 27·8 per cent of gold. Since 1846, the gold production has taken the lead It reached its maximum in 1853, when it rose to 80·6 per cent, and declined to 67·2 in 1868. For the year 1800, the entire production of the precious metals was estimated at 44,800 pounds of gold, valued at $3,640,000, and 1,800,000 pounds of silver, valued at $40,500,000.

For the year 1868, the estimate was 410,000 pounds of gold, valued at $143,000,000; and 3,100,000 pounds of silver, valued at $70,000,000. According to these statistics, the gold production had increased from the year 1800 to 1868, 730 per cent, while the increase in silver was 172 per cent; in value, the increase in gold was 950 per cent, and in silver, 136 per cent. In the year 1500, 10½ pounds of silver were paid for 1 pound of gold; 100 years later, 11·6 pounds; in 1650, 13 pounds; 50 years later, 14·9 pounds; in 1750, 14·93 pounds; 1800, 15·42 pounds; 1850, 15·8 pounds; and 1869, 15·61 pounds.

ARTIFICIAL PRODUCTION OF CONIINE.

It is said that Socrates terminated his life by drinking coniine, extracted from the poisonous hemlock, *Conium maculatum*. The oily liquid is highly poisonous, and closely resembles the nicotin obtained from tobacco. The artificial preparation of this body has more than ordinary interest, as it suggests the possibility of our being able to make other alkaloids, such as quinine, morphine, and the like; and if we can succeed in this, why not prepare the less complex compounds, sugar, starch, etc.? The coniine was prepared by Hugo Schiff, by heating alcohol and ammonia at 210°, together with butyraldehyd, precipitating with a platinum salt, and distilling the product. The artificial alkaloid exhibits the same properties as the native. It is a violent poison, and in other respects is analogous to the extract from hemlock. As the first step in the synthesis of vegetable alkaloids, the discovery of Professor Schiff is one of the most important in modern chemistry.

DETECTION OF BLOOD STAINS.

Iodide of potassium dissolves traces of blood, even from clothing which has been thoroughly washed, but hæmin crystals cannot be obtained from the solution.

Gunning has discovered, in the acetate of zinc, a reagent that precipitates the slightest traces of the coloring matter of blood from solutions, even where the liquids are so dilute as to be colorless. Blood, washed from the hands in a pail of water, can readily be detected in this way. The flocculent precipitate, thrown down by the acetate of zinc, must be washed by decantation, and finally collected on a watch glass, and allowed to dry, when the microscope will readily reveal hæmin crystals, if any blood be present. This test has been repeatedly tried, with entire success.

USE OF SOLUTION OF SILK IN PHOTOGRAPHY.

Pure silk is soluble in hydrochloric acid, and if the solution be neutralized by ammonia, and evaporated, an organic chloride of ammonium results, which is capable of use in photography, particularly for salting paper. Paper thus prepared is said to be more sensitive than that salted in the usual way, and in printing, gives a warmer tone. It is thought that this salt could also be used in the preparation of collodio-chloride of silver, if it were sufficiently soluble in alcohol.

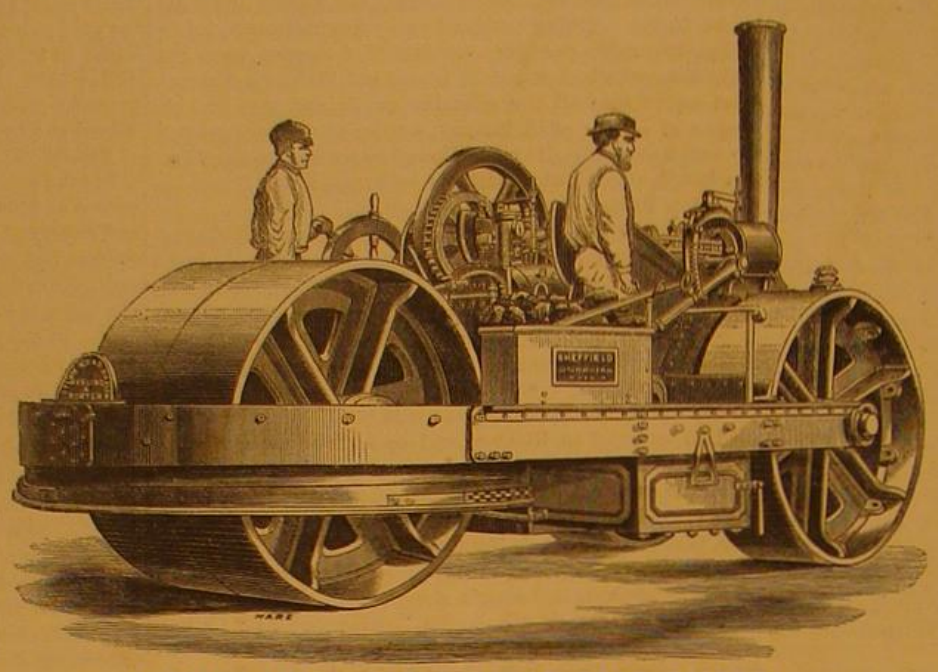
Imitation of Human Hair.

In a recent article upon the trade in human hair, it is stated that a patent has recently been taken out for converting goat's hair into hair for ladies' use; and that the experiment is so successful as to render it almost impossible to distinguish the real article from the imitation. This will be good news, not only to the dealers in hair, who might apprehend the exhaustion of their source of supply, but also to the ladies who depend upon art to compensate the deficiencies of nature. The same article states that in 1868 over 22,000 pounds of hair were imported into Great Britain, representing the clip of about 45,000 women. Much of this is obtained from the large communities of sisterhoods scattered throughout France and Belgium.

THE ICE HARVEST of 1871, on the Hudson river, is unusually large. During the winter, a vast and nearly unbroken field of ice, ten inches thick, has extended from Troy down as far as West Point, and has been crossed by the heaviest teams, and by persons in great numbers. For many weeks, the work of cutting, floating, elevating, and packing the ice has been going on along the Hudson, and all the ice houses on its banks, holding over 1,000,000 tuns, have been filled.

Improved Steam Road Roller.

In France, in 1859, the first steam road roller was patented, by M. Louis Lemoine. This roller, which was constantly used by the municipality of Bordeaux, with excellent results, on broken stone roadways, gave rise to the Paris Steam Road Rolling Company, organized in 1862, and which adopted a steam roller patented by M. Ballaison. A modification of this roller is that at present adopted in Paris. In 1863 a roller, patented by Messrs. Clarke & Batho, was the first steam road roller ever tried in Great Britain. The chief feature of this machine is the use of three sets of rollers, two in front acting as drivers, while the third is set up in a turn-table, being adjustable so as to steer the engine, at the same time overlapping the space between the two outside drivers. One of these machines was, in 1864, sent to Calcutta, and so favorable were the official reports relative to the economy and value of steam rolling that other rollers were ordered by the Indian Government. It was in 1867 that arrangements were made whereby Messrs. Aveling & Porter determined to adapt their form of road locomotive, and its driving gear, to the arrangement of rollers and turn-table patented by Clarke & Batho. The result is the form of steam roller which illustrates this article.



AVELING AND PORTER'S STEAM ROAD ROLLER.

If we examine mechanically the state of a rolled and an unrolled roadway, it will not be difficult to find causes for the economy in using the heavy steam roller. In the first case, there is a solid stone table, consisting of a mass of interlocked stones; in the second, a heap of loose stones, without any mutual cohesion From experiments made, it has resulted that an uncompressed heap of broken stone metalling contains 53 per cent of mass and 47 per cent of empty space. So that an unrolled road, on being given over to the traffic, only consists of, at the most, 30 to 45 per cent of stone; while, on the other hand, a well-rolled road covering contains at least from 70 to 80 per cent of broken stone, the interstices between which have been filled, especially at the top, with clean sand. An unrolled road, therefore, contains nearly three times more empty space than a well-rolled roadway. It is evident that it cannot be hard and strong until these spaces are filled up. Without rolling this can only be done by the particles ground by the traffic off the edges of the stones, by dirt and refuse. This last condition has been the objection always raised to macadam roadways constructed without the roller; its use removes this annoyance in a great degree, and moreover materially affects the durability of the pavement.

The testimony of the London authorities and others who have adopted steam road rolling is, that the duration of the roadway is increased two-fold by the application of the roller, and not only is this advantage gained by steam rolling, but by its means "the road is at once and immediately a pleasure to ride on, whereas, when not rolled, the roads are for many weeks (sometimes months) disagreeable to the rider, agonizing to the horse, and very costly to the owner of the horse."

By at once compacting the newly made roadway, and delivering it in a clean, smooth, and consolidated state ready for the traffic, the necessity for breaking the stone into very small fragments, is avoided, the use of larger stones being to give greater durability to the roadway by reason of their decreased liability to get loose in their bed, or to have the corners knocked or worn off by repeated hammering of horses' hoofs and carriages as they pass over. The fewer angles there are in a given space of stone, the less wear and tear is there, and consequently there is decreased cost in maintenance of road.

There are at the present time five of these steam rollers in use in the United States, and one is now building by Messrs. Aveling & Porter for the city authorities of New Haven, Conn.

The testimony of the authorities of the Central Park, New York, and of the Prospect Park, Brooklyn, is very favorable as to the advantage and economy of the steam roller in the construction of roads, and Mr. Culyer, the engineer of the Brooklyn Park, in a late report on their Aveling & Porter's fifteen-tun roller, says: "Running both systems—horse and steam power—under careful surveillance, we find the result to be largely in favor of steam and your roller. This result is $13·50, the cost of the effective service per day of ten horses of the road-rolling machine, as compared with $30, the cost of producing similar results by horse-power. . . . . Inasmuch as we are groping along in this matter of road construction in a way somewhat more determined than heretofore, I do not doubt that in a few years we shall conclude to make use of the immense store of stones supplied to us, at first hand, by nature, and so work up a system of ways which shall be more in accordance with the spirit of the age, serve our convenience better, and, in the long run, our pockets too. Ultimately I do not despair of seeing every town, of any note, owning its own stone breaker and an Aveling & Porter steam roller, very much to its own pleasure and profit."

Mr. W. Churchill Oastler, of 43 Exchange Place, New York, is Messrs. Aveling & Porter's agent in this country.

Size of the Sun.

Let the reader consider a terrestrial globe three inches in diameter, and search out, on that globe, the tiny triangular speck which represents Great Britain. Then let him endeavor to picture the town in which he lives as represented by the minutest pin-mark that could possibly be made upon this speck. He will then have formed some conception, though but an inadequate one, of the enormous dimensions of the earth's globe, compared with the scene in which his daily life is cast. Now, on the same scale, the sun would be represented by a globe about twice the hight of an ordinary sitting room. A room about twenty-six feet in length, and hight, and breadth, would be required to contain the representation of the sun's globe on this scale, while the globe representing the earth could be placed in a moderately large goblet.

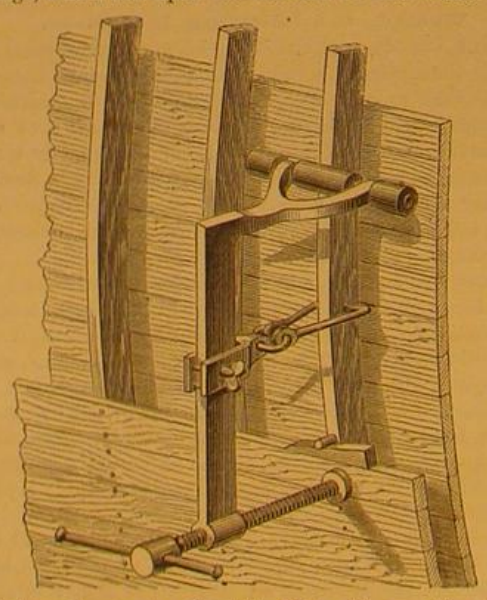
Such is the body which sways the motions of the solar system. The largest of his family, the giant Jupiter, though of dimensions which dwarf those of the earth or Venus almost to nothingness, would yet only be represented by a thirty-two-inch globe, on the scale which gives to the sun the enormous volume I have spoken of. Saturn would have a diameter of about twenty-eight inches, his ring measuring about five feet in its extreme span. Uranus and Neptune would be little more than a foot in diameter, and all the minor planets would be less than the three-inch earth. It will thus be seen that the sun is a worthy center of the great scheme he sways, even when we merely regard his dimensions.

The sun outweighs fully seven hundred and forty times the combined mass of all the planets which circle around him; so that when we regard the energy of his attraction, we still find him a worthy ruler of the planetary scheme.—*Proctor's Other Worlds than Ours.*

PLANKING SCREW.

Our engraving shows an improved form of planking screw, invented and patented by George Savage, Jr., of Bangor, Me., and designed for shipbuilder's use.

It consists of a lever, with a clamping screw at one extremity, and a bifurcated leg at the other, with roller foot bearings, which rest upon the timbers of the vessel to be



planked, as shown. An adjustable link, with grappling hooks, is also provided, which seizes the timber in the manner shown, and forms a fulcrum for the lever. By means of this instrument, planks may be bent and held to place till spiked' all of which is sufficiently indicated in the engraving, to obviate the necessity of further description.

Spontaneous Combustion.

A contributor to the Boston *Journal of Chemistry* says: Any light that can be obtained on spontaneous combustion adds not a little to the value of real estate. We believe a large percentage of the fires charged to incendiarism are really owing to spontaneous combustion, so called. We purpose giving three cases, two of which have come under our own experience.

1. Within a year, twenty-eight rolls of cotton cloth in one of our large dyeing establishments were dyed black, and were delayed a few days before they could be starched and finished. Two of these rolls were discovered to be on fire—not in flames, but in a smoldering condition, or charred into tinder; a third roll was so hot that hands could not handle the cloth and the wooden roller upon which the cloth was wound was heated almost to the point of ignition.

The rolls of cloth destroyed were the first dyed, and consequently had been longer exposed than the others, which in a measure explains why all the rolls were not in the same condition.

In the dyeing, the first rolls were dyed without washing, by an oversight of the dyer. This is the point of importance, as the chemical salts were left in the cloth. Logwood, potash, sulphate of copper, and sulphate of iron constituted the dye, and we suggest this explanation as the probable cause of the fire. The potash and sulphate of iron change to sulphate of potash and hydrate of iron, by the absorption of oxygen from the atmosphere or from moisture in the cloth, and the heat thus developed reaches the point of ignition. Cloth in drying is very liable to contain heated moisture.

2. Within a year a fire was discovered in a silk-mercer's shop in London. The fire originated in a lot of black-dyed silk, and was discovered, as in the first instance, before flame had burst out. The conclusion reached was that it was not safe to have black-dyed silk in large masses, and that each piece ought to be so placed as to allow a free circulation of air. We think it quite probable that the explanation of the combustion is the same as in the preceding case.

3. In trying to get rid of rats in a dwelling house, the floors were taken up, in order to cut off their ingress, if possible. The box that held the hot-water pipes was found to be a favorite resort for the vermin, and had actually been on fire. The sides were charred, but there had not been sufficient air to sustain combustion. Upon investigation as to the cause of the incipient fire, we are not left long in doubt, for a store of remnants of greasy cloths used in washing dishes was found, which had been brought by the rats from the kitchen. Some of these were charred, and the others were well saturated with grease andoils. This fire was quite a distance from the kitchen range, forty feet at the least.

It would be very natural in all these cases, if the real causes had not been so apparent, to attribute the origin of the fire to incendiarism.

We have a very firm impression that the introduction of coal oils for lubrication of machinery has very materially reduced the number of fires from spontaneous combustion, owing to the fact that the coal oils do not absorb oxygen; and that for this reason, if for no other, insurance companies can afford to insure mill property for less rates than they charge at present.

How a Stink Bug Utilizes Turpentine.

Mr. Thomas Meehan recently contributed to the Academy of Natural Sciences, in Philadelphia, an account of a singular habit in the common "Stink Bug" of gardens, (*Reduvius novenarius*, Say), which might lead to some important physiological discoveries by those more closely devoted to entomological studies. Wondering what made some abrasion on the bark of a *Pinus cembra* on his grounds, he was attracted by a female insect of this species near it; and noticed, that on the thigh of the middle leg, the usual grey color was of a polished black. Supposing that possibly the insect may have had something to do with the injury to the bark, through which the turpentine was oozing, he waited a few minutes to re-assure the insect—usually timid under observation—that there was no danger. It then went to work to take the turpentine with the heel of the tarsus of the fore leg, and place it on the thigh of the second leg. It took several dozen "heelsful," winding it round the gathering ball on the leg, as one would wind a ball of string. After it had collected together a ball of turpentine about the size of a pin's head, it gently wiped it off with the femora of the hind leg, and applied it to the anus, where it was very rapidly absorbed. It then walked very leisurely to the top of the nearest branch, when it flew away. This was in the end of September. He saw no more of these insects till a week afterwards, when he cut off a small branch on which was another female and carried it to the pine tree, applying the branch to the stem, so that the insect could walk on to it without much suspicion of human agency in the matter. As soon as it got to the turpentine, it went through the same operation as the other one, taking two doses of it before it walked away; which it did leisurely, and with much apparent satisfaction. Up to this time he had not been able to find a male, so as to ascertain if it also had any similar use for turpentine.

COAL PIT FIRE.—The Bank colliery, near Rotherham, on the property of Earl Fitzwilliam, England, had been on fire for a century past, when the superintendent, Mr. T. Cooper, conceived the idea of building a wall to shut the fire into one of the workings. The plan was carried out, although the wall had to be commenced by workmen creeping on their hands and knees through dense, stifling smoke. The wall, nearly 1,000 yards long, and, in places, five feet thick, is complete, being tapped at intervals with metal pipes, through which the state of the fire can be inspected. The heat from the fire has been so great that the surface of the earth, over the workings, has produced two or three crops every year.

Bevel-cutting Band-saw Machine.

Those who inspected the wood-working machinery exhibited at the last Fair of the American Institute will at once recognize in our engraving the representation of a substantial and elegant band-saw machine exhibited by First & Pryibill, of 452, 454, and 456 Tenth avenue, New York.

The machine attracted much attention, not only on account of its strength and compactness, but from the fact that it can be made to saw bevels while the table is kept level, the adjustment being made to the desired angle without even stopping the saw.

This adjustment is made by sliding the upper wheel laterally on an arched bar which supports its bearing. The table, which is level, works on a slide, and is connected with a lever, which lever is connected with the upper sideway slide, which slide is made to correspond with the arc of a circle, the center of which is the center of the lower shaft. The whole is operated by a hand wheel and screw.

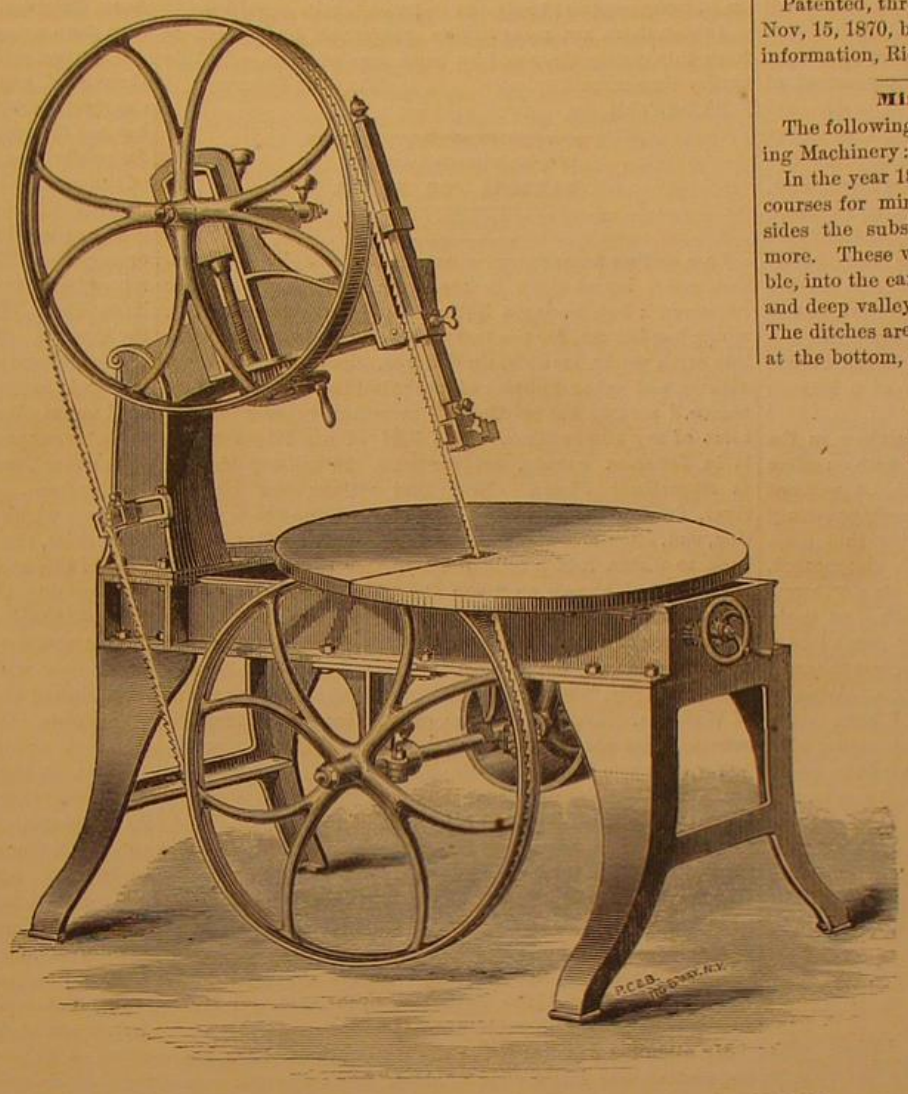
By these means the difficulties in the old method of sawing bevels on brackets, stair rails, chair work, pail work, pattern work, etc., etc., arising from the incline of the table, are entirely removed. These difficulties are the sliding of the work on an inclined table, and the trembling of the table on its pivot and segment.

In the machine under consideration the table is kept constantly level and firmly supported.

This machine, with an iron table, weighs about 1,600 lbs.; the whole hight is 7 feet 10 inches; the depth, 3 feet 9 inches; length, 9 feet 6 inches. The driving pulleys are usually 12 to 14 inches diameter, and the wheels, 3 feet 2 inches, and the speed employed 355 to 365 revolutions per minute, sawing as thick as 13 inches.

We can personally vouch for the excellence of the work done by this machine, and for its convenience in use, having repeatedly witnessed its practical operation.

The reader will find the advertisement of the manufacturers in another column.



FIRST & PRYIBIL'S BEVEL-CUTTING BAND-SAW MACHINE.

A Telegraph Dispatch Tube.

The necessity of sending telegraphic dispatches from one part of a town to another, without the loss of time occasioned by going through the busy parts on foot, has induced the post-office authorities to sanction the laying down of an experimental tube in the busiest parts of the city of London. The tube is 3 inches in diameter, and is in direct communication with the Fleet Street branch from the main office. The messages, as they arrive by the wires from the provinces or the Continent, are deciphered in the usual manner by clerks, and those intended to be delivered, say a mile from the receiving office, are then inclosed in a light cylinder.

This cylinder is covered with felt, and when filled, inserted into the tube, and the flap or cover closed, when a strong current of air, being blown into the tube and behind the cylinder, forces it through to the branch office. In a recent experiment, the carrier occupied about four minutes of time to travel the distance, 2,058 yards. Shunts are provided so that the carrier can be sent in any direction, as intermediate flaps or points are closed to allow it to pass, the shutting and opening of the points being first communicated by wire. The carriers are capable of being drawn or sent back either by suction or by a blast at the opposite end.

The invention is considered of great value by the authorities, as it will expedite the delivery of the messages—in fact, something of the kind was needed from the continually increasing use made of the telegraph by the public, since it has been in the hands of the Post-office Department. We understand that Mr. Siemens, the inventor, has been authorized to extend the tube to the station at Charing Cross, with branches leading to the post-offices *en route*, so that if the working be found successful, of which we have little doubt, there will be a complete system of tubes all over London in a very short space of time.

The plan will, in course of time, be employed for sending letters to the various branches after they have been sorted at the head office, and this will enable them to be delivered in about half an hour after being posted.—*London Mechanics' Magazine.*

Gold Ornaments.

Gold, the most valuable and the handsomest of natural products in general use, is, by reason of its powerful color and strong lights, not very favorable to the display of delicate modulations of surface. In large objects, highly bossed work, bold relief, or low relief set off by a mat ground, tell well, as also does engraving, whether fine or bold. Whilst possessing great strength and tenacity, it is extremely ductile, and in its native state, bends very readily. These qualities sufficiently account for the extent to which the ancient and oriental goldsmiths used fine twisted wire in the ornamentation of their jewellery. Angular or very sharp sections are not desirable, the latter giving a steel-like character to the subject; whilst thick, square edges have a "strong" effect. Slightly rounded edges and tolerably bold profiles seem best to suit the characteristics of gold. Very thin sharp edges seem to detract from the value and look poor. Very fine reliefs rising abruptly from their ground (as the wire ornament already mentioned) always tell very happily in gold, because, although ever so delicate, it provides itself a fine outline, and this is what gold seems to demand. On this account *répoussé* work in plain gold must always rise more suddenly from its ground than would be necessary with bronze or dull silver; but being once provided with this natural outline, the execution of the raised work should be rounded and soft, not abrupt and angular. Anything like like abrupt contrasts of light and shade will detract from the effect of work in gold. A certain repose is essential to the solid beauty of the material, so long as we are depending on the gold alone. If, however, we are merely using the gold as a setting for some more precious object (such as jewels), the rule may be modified. So far I have been speaking of gold having the fine dull surface natural to it in its native state. For almost all art purposes this has the most agreeable finish. At the same time we must not ignore the burnisher, which, when used with judgment, may produce excellent effects by contrasting the bright and dull surfaces, and so giving special emphasis to certain parts of the design. Burnished gold alone has rarely so good an effect.

IMPROVED WASHING MACHINE.

Our engraving illustrates an improved washing machine of

very simple construction. The principle adopted is the forcing of the suds through the goods by squeezing, instead of by rubbing which wears the textures rapidly.

Two ribbed conical rollers are pivoted to a curved cross bar, driven by a central vertical shaft and a winch, supported by suitable frame-work. This frame-work is hinged to the side of a tub or tank, as shown, so that it can be turned up, for putting in or taking out the goods.

The ribbed cones are pressed down upon the goods by a coiled spring, acting between a collar on the vertical shaft, and the curved cross bar. A false bottom, which also rests on springs, is placed at the bottom of the tank, and presses it upwards against the goods. This bottom is either perforated or made of lattice work, and is provided with a vertical rim, which prevents the clothing from wedging between its outer edge and the walls of the tank.

The frame work at the top is provided with a cover, not shown in the engraving, which has, on its under surface, a crescent shaped cup, placed on the hinged edge, so that when the cover is lifted, the drip will be caught, and emptied back into the tank on closing the machine.

Patented, through the Scientific American Patent Agency, Nov, 15, 1870, by Horace Warner, whom address for further information, Ridgeway, Pa.

Mining Ditches in California.

The following statements are from Blake's "Notices of Mining Machinery:"

In the year 1867 there were 5,328 miles of artificial watercourses for mining purposes in the State of California, besides the subsidiary branches, estimated at over 800 miles more. These water courses are ditches cut, wherever possible, into the earth of the hillsides, and crossing rocky points and deep valleys by means of flumes, or, better, in iron pipes. The ditches are usually about eight feet wide at the top, six at the bottom, and three feet deep. The grade varies from twelve to eighteen feet to the mile. Formerly flumes were constructed on a large scale and at great cost; but now large sheet-iron pipes are substituted with great advantage in durability and economy. Some of the flumes were of great length and hight; one near Big Oak Flat, in Tuolumne County, being 1,300 feet long, and a part of it 256 feet above the surface and supported upon wooden towers. Upon the Truckee ditch there were, at one time, 13 miles of flume, eight feet wide and four feet deep, hung upon the side of a deep cañon. Upon the Pilot Creek ditch, there was one piece of flume 300 feet long and 95 feet high.

The boards used for making flumes are usually from one and a quarter to one and a half inch thick. They are laid down rough and then battened. Sills are placed at intervals of two and a half feet, with posts and a cap for support of the flume box. The sills are four inches square, the posts three by four, and the caps one and half by four inches. In addition to the first cost of a flume, it is expensive to keep in repair, and is liable to a great many accidents. It may be burned or blown down, and if it be left dry for several months, all the boards curl up and split so that they cannot be used again. It is said that the repairs of a flume cost 90 per cent more than those of a ditch. For all these reasons, flumes are not now constructed where they can possibly be avoided, and iron pipes are substituted. These pipes are made of stout sheet-iron or boiler-iron, and vary in size from 10 to 40 inches in diameter, according to the quantity of water to be carried. From 7 to 11 inches is a common diameter, for the smaller pipes, and these are made of No. 20 iron. A sheet two feet wide and six feet long will make two joints of 11 inch pipe. These joints are put together to form sections 20 feet long, and these sections are united upon the ground and secured by means of strong wire wound around two projecting ears or hooks of iron, one upon each section. The whole pipe is also firmly fastened to the surface by posts securely set in the ground, to prevent its weight from carrying it down the steep slopes. The examples of the successful use of pipes for carrying water across depressions and ravines numerous. Upon the South Fork Canal, in Eldorado County, a pipe is used to carry 50 inches of water across a valley 1,600 feet wide and 190 feet deep. This pipe is 10 inches in diameter, the iron about one-sixteenth of an inch thick, and the supply end is ninety feet higher than the delivery. On the Excelsior Companies ditch, near Smartsville, there are five miles of low flume, 6,000 feet of 40 inch pipe, 3,000 feet of 20 inch pipe, and half a mile of 38 inch pipe. The 40 inch pipe crosses a depression 150 feet deep, and with a head of thirty-two feet carries 2,500 inches of water. Upon the Dutch Flat ditch there are 3,500 feet of 31 inch iron pipe and 837 feet of 32 inch pipe.

The aggregate cost of the ditches in California for the supply of water is reported at $15,575,400 ("Langley's Directory, 1867). They are generally built by companies and owned distinct from the mining companies; and the water is sold to the miners at so much per inch per day of ten hours.

THE money contributed to the fund for the relief of sufferers in France, by the Chamber of Commerce Committee, and the receipt of which is acknowledged by Mr. Charles Lanier, Treasurer of the fund, is $98,075. The Produce Exchange Committee have also contributed $15,045, making a total of $113,120.

CANADA is the fourth maritime power in the world, and, according to the "Year Book for 1870," has 7,591 ships, with a tunnage of 899,000 tuns. She stands ahead of every nation except Great Britain, United States, and France.

Correspondence.

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

[The subject of Perpetual Motion having been discontinued in these columns for the present, all articles received on this subject are placed on file, and may be referred to at some future time.]

Lunar Phenomenon.

MESSRS. EDITORS:—On the afternoon of Friday, February 3d, about a quarter before six o'clock I noticed, casually looking at the moon, as beautiful and rare a phenomenon as it has ever been my pleasure to behold. I thought at the time, and still think, it was a lunar rainbow, and if my description will justify my belief, it may be of sufficient interest to publish.

Lunar rainbows are undoubtedly very rare. I had never seen one before, and, after careful search, find no mention made of any. However, I think I recollect hearing of one seen at Brooklyn, perhaps a year or two ago, any record of which I have been unable to find.

The moon was nearly full, and at an angle of thirty degrees, or about one third risen toward the zenith. The evening was perhaps a little chilly, but quite clear, thin, fleecy clouds being scattered here and there. The moon itself was surrounded by a halo or belt of a light brown or chestnut color, for, perhaps, the distance of two radii directly adjoining the moon. Just outside of this again was another belt, of perhaps twice this width, and of a beautiful buff or golden color; and again, outside this, was a ring encircling the whole, the width of which was equal to both the others, resembling the beautiful transparent colors of a locust's wing.

The play of the prismatic colors of the rainbow in the outer ring—the green perhaps predominating, with an effect very like the light during an eclipse of the sun, *i. e.* without actinic force—was beautiful. It lasted for perhaps twenty minutes from my first observation, and, during that time, remained as I first saw it, until just before it disappeared, when it faded out very rapidly, beginning at its northwest limb, and continuing directly across to its south-west limb. When it had reached the center, it looked very much like a a rainbow turned topsy-turvy, and, if anything, was the most astoni hing and pleasing effect of the phenomenon. Actually a rainbow upset, or rather the lower half! I have never heard of such a thing before, nor can I find any similar phenomenon described. As it disappeared, a light hazy cloud drew off from the face of the moon, and, in a few minutes, the sky was clear and cloudless.

Can any of your readers give an explanation of this beautiful appearance, and whether it really was a lunar rainbow? Even if not, it was a beautiful and rare phenomenon, and I should have made a more extended and accurate view of it, had I been at leisure, or had an opportunity.

Dayton, Ohio A. C. GRUBE.

Supply of Water to Boilers.

MESSRS. EDITORS:—The supplying steam boilers with water is a subject, I think, which has not been thoroughly considered; at least I have never seen anything in reference to the proper locality for its admission.

The practice is now, as it always has been, since steam was first used as a power, to admit the water at the *lowest* part of a boiler.

I think if the cause of this never varying practice should be investigated, it would lead to an improvement, in this matter, of no small importance.

Water, when taken into the legs of a boiler, or, in other words, into a water space formed round the ash box, will remain comparatively cold for a time, it being below the fire grate; and after it has become more or less heated, it is forced up into the body of the boiler by a new supply of cold water from the force pump taking its place. Now, this practice must cause a disagreement in the expansion and contraction in different parts of the boiler; and the forcing of water into the bottom of any form of boiler has this objection in a greater or less degree.

I think the water should be heated as soon as possible, on entering the boiler, and for this reason should be admitted continually, at a uniform rate with its consumption. It should be admitted a little *below* the upper surface of the water, for, on entering at this point, it would immediately flow towards the bottom of the boiler, and, passing through the heated water, and blending with it, would absorb heat much sooner than if admitted in a body against the fire-box.

I think it would be an advantage for the feed water to take its heat from a large space *within* the boiler, rather than from a small portion of the fire-box, for various reasons. It would be heated sooner, and therefore a more even heat would be preserved throughout the boiler. There would be less fluctuation in the steam, as it would be made much more uniformly. It would also mitigate the evil of unequal expansion.

A friend tells me there would be danger of admitting the feed water at the point above mentioned, as the water would sometimes get low, and then the feed water would be taken into the steam, and thereby converted into steam so suddenly as to explode the boiler.

Now, in such a case, the steam would be condensed in proportion to the water taking its heat; but the water in this case takes no more heat than if it had entered the hot water; but it takes this heat more suddenly, for the nature of steam is such that it comes in contact with *all* the particles of water at once, and causes a sudden condensation, which, by the action of the force pump, would cause a slight pulsation in the steam. This would be partly counteracted by the steam made by the furnace at the same time; but this reaction would be slight, compared with what steam boilers frequently receive, especially where large steam hammers are used. But this never need occur.

The water in a steam boiler never should be allowed to get low; and it never would, if admitted as mentioned herein—namely, by a constant flow, in keeping with its consumption; and there is no reason why this should not be done.

Perhaps it would be well to extend the supply pipe into the boiler, and to inclose that part within the boiler, by a second pipe, so that the cold water may have no influence upon the shell of the boiler.

Water requires a certain amount of heat, varying with pressure, to convert it into steam, and from whatever part of the boiler the heat is derived, it will take no less; nevertheless, I think, for the reasons I have given, that it would be an improvement to supply the water as herein described.

I think there are many others who would be pleased to hear this matter discussed by some one of more scientific ability than myself. WILLIAM DENNISON.

Philadelphia, Pa.

[For the Scientific American.]

RAMBLES FOR RELICS.

NUMBER I.

I am neither an antiquarian nor an archæologist, in pretension, and I lay no claim to appear in print as a "scientific American"; but, having a liking for old and curious things, which has led me, for the last two years, to look about and into earth works, mounds, shell heaps, stone piles, cave sepulchres, and other remains of the primitive people of Tennessee, I assume the privilege of recording in your journal some of my observations. The field of my late rambles is in Jefferson county, not far from the railway station, at Strawberry Plains. Near that village the Holston river, flowing from the East, turns in a northern direction, and, after accomplishing a circuit of five miles, comes back to within half a mile of its former course, shaping a tract of land known as "The Bent." The river is called Holston, according to Haywood, from the circumstance that an explorer of that name, from Virginia, in 1658, discovered it, and was one of the first settlers upon its banks. By the same authority, it was known to the Cherokees by the name of Watauga. Ramsey, however, calls it Hogohegee, from its source to its confluent French Broad (Agiqua), and Cootcla below, to where it meets Little Tennessee (Tannasee). On an English map furnished for the use of British officers serving in America in 1766, the Holston is put down as the Kallamuckee, from its source to Little Tennessee. On Mitchell's map of 1776, the river now known as the Tennessee is the Hogohegee to French Broad; above, to its head, the Holston. This was the "storied" river of the Cherokees. Their fatherland lay beyond the "Big Mountain," (Allighanee). In the course of migration, their settlements were extended down French Broad and Little Tennessee to the principal river, forming the "Overhill" middle and lower towns.

My attention was directed to the Bent of the Holston, hearing that a stone image—not a "giant," but a dwarfed representation of the human form—had been discovered in a cave of one of the limestone ridges of the district. The idol (a real antique) was exchanged for a bushel of wheat, and sent to Knoxville; hence it passed through successive hands to Washington, and it now occupies a conspicuous place in the archæological cases of the Smithsonian Institute.

The ordinary relics of the ancient Cherokees, scattered in the valleys of the Tennessee and its tributaries, occur at the Bent; such as flint arrow and spear heads, axes, hatchets, cores, flakes, pestles, fragments of pottery, and rough, discoidal stones, called weights, used probably as rollers in a game of skill, described by the old trader and author, Adair. Rambling from this class of remains to those, left by the same race, I noticed traces of an arena, or chunkyard—a place of amusement and exhibition, where captives in war were sometimes immolated—within an elevation of earth a foot and a half high, inclosing a space twenty-five feet in diameter. In the center, in a plain raised above the surface, was a post hole, which had held the stake to which the victim was fastened. The area resembles "the ring" of a circus in the fields, after the covering is removed. It was an ancient inclosure, to judge by the depth of soil formed upon it; the ground had never been disturbed by the plow, and I am quite sure that Rice and Van Ambergh never presented the combined attractions of circus and menagerie in the face of gigantic trees two hundred years old. About twenty paces from the area, nature had provided a convenient space for spectators, on an inclined plane.

Objects of a higher grade of art than any that have been mentioned, which probably belonged to a different people, are sometimes turned up by the plow. Of such as were brought to me, after they had been thrown aside as worthless, but which rose astonishingly in their flight of valuation—many being too high to be reached by my short means—I specify a disk, with a round edge, cut in silicious rock, five inches in diameter and an inch and a half thick, having a shallow cavity in both of the flat sides, and a perforation in the center of the plane; a cup-shaped utensil of a fine variety of earthernware, coated with a dark, shining pigment which would be called glazing, if the art of the glazer had been known to the potters of the "Stone Age"; the imaged head and neck of a sea-duck, in argillite, evidently a fragment; and for a rare specimen of taste and skill in representing forms in stone, the combined figures of a pipe and bird—an orifice in the end, communicating with the bowl of the pipe on the back of the image.

The head and neck, in the outline, characterize a buzzard at rest, looking down upon its prey. Any one who has observed the traits of this species of hawk must acknowledge the resemblance. The object, which is sculptured in a fine variety of mica slate, is five inches long and weighs more than two pounds. It was found by a laborer, on the west bank of the Holston, at a point where the freshet of 1867 had washed away two feet of the surface soil.

On the east side of the river an ancient mound was observed in the Bent, near a curvature in the bank, which has been scooped out to form a beach or landing place. This had been occupied, evidently, by the recent Indians, for their misshapen earthenware in fragments, rough hatchets, and arrow heads, were found in the locality. There, without a flight of a century back, fancy might figure the warriors of the last tribe that roamed through the cane meadows of the Holston, assembled, before embarking in their canoes, for an onslaught down the river, into the "Creek country;" or, after their return from a successful expedition, with "fresh scalps."

Tradition spoke of a "town hall" or council house up on the mound, and a passage to the center, underground, from the river. Of the last, there were no signs. The occupancy, but not the erection, of similar structures, "artificial mounds" for public uses, by the Indians, is mentioned in the narratives of the earliest explorers of the country, now known as Tennessee.

Log or wood inclosures, in ruins, on hillocks made by art or on natural bluffs, are pointed out by persons living who remember that the natives described them as places for public meeting. The same race sometimes buried their dead in the mounds. This fact, in connection with the other, though it is important to the investigator, in ascertaining their character and in separating original from accidental deposits, need not confound him, as it has done some authors. Noah Webster supposed that some earthworks, which he examined at the West, were put up by the followers of De Soto, for fortifications. The annular evidence of certain trees, an evidence which is accepted in such instances by the highest authorities, throws the date of the construction beyond the time of this explorer.

Respecting the mound under our immediate notice, the "oldest inhabitant" reported that when his father drew the first furrow around it, large oak trees grew upon the summit. Being now without any protecting vegetation, and having been plowed over for seventy-five years, it has lost its original proportions. It retains the shape of a truncated cone, fifteen feet high, and one hundred and sixty-eight feet in circumference, at the base.

An excavation to the bottom, eight feet in diameter, showed its composition to be, chiefly, compacted sand-loam, with such an intermixture of clay as would come from the removal of surface soil with portions of the substratum. Two large pits or sink holes, hard by, probably contained some of the building material. From the cavity were thrown out, at intervals, for several feet down, charcoal, ashes, burned clay, and fragments of pottery.

The first regular deposit was reached at a depth of four feet, six or eight feet below the original summit. It consisted of splinters of wood and strips of bark partially decayed, laid horizontally. Beneath this layer, after the soft black earth and mold, in which it was embedded, were cut through, the outline of a human skeleton appeared, lying on the left side, the head being towards the east, and the leg bones doubled up on the chest, a position regarded, at first, as accidental, but which conformed to the mode of burial throughout the mound. The bed of earth rested upon a clay foundation, two or three square yards in extent.

The organic remains were well enough preserved to allow removal of the skull and the principal bones of the trunk and the members, entire. Below these remains, there appeared at various depths, from two to four feet, two or three skeletons on the same level, laid in the same manner, with a covering of wood and bark. Skeletons were found down to the bottom of the excavation—no particular position having been observed as to the cardinal points.

Parts of eight skeletons, including eight entire skulls, were removed. The absence of implements and utensils of various sorts was remarkable, in the burial place of a people known to have been in the habit of depositing with the dead their most valued effects. Fragments of earthenware, composed of a paste mixed with silicious particles or pulverized mussel-shells, alone rewarded my curiosity. I had observed in the wall of the cavity, four feet from the top, part of a cedar post three feet long, and four or five inches thick, set in an upright position.

My assistants, who could conceive of no other reason for my operations than a mercenary one (and who regarded the relic as a pointer to a pot of gold "hid by the Indians were they left the country," which had come to my knowledge by the spontaneous turning of the forked twig of an apple tree, held firmly by each hand, or by some necromancy of that sort), made extraordinary efforts to reach the treasure. The mattocks clanked upon some loose stones which were thrown out in such haste as prevented a thorough examination of the pile. Broken vessels, charcoal, burnt earth, ashes, shells, calcined bones of animals, among which were those of the deer, indicated that the structure was a hearth or fireplace, perhaps an altar of offering to the Sun, by fiery rites.

Without finding gold for an encouragement, our labors were renewed on the west side of the mound, by digging a trench ten feet wide, twelve feet long, and from twelve to fifteen feet deep, to meet the central opening. At the depths of five feet a layer of wood and bark covered the form of a child, apparently about six years old. It was laid with much care, perhaps by the hand of affection; a tortoise-shell covered the head, and a string of pearl beads encircled the neck. Three feet from the skeleton, in the same plane, one of a fe-

male was exposed, and upon the sunken ribs lay the bones of an infant. Beads and a cruciform shell ornament were with these remains. Nearer the central cavity a rotten cedar post, like that which had excited the cupidity of the workmen, was observed, corresponding with others describing a rectangular figure. Within the space lay a skeleton on its side, doubled up in the usual manner, and distinguished by its size from all others exhumed during the excavations.

The skull was large and round. The intellectual development would have pleased Dr. Gall or Mr. Fowler. The maxillary bones had full rows of sound teeth; and those of the trunk and limbs must have belonged to a man of massive build, about six feet high. Ten large beads, perforated lengthwise through the center, cut from the column of a marine shell, eight flint arrow points of slender shape, and sharpened at the base to be fitted to the shaft, were found on one side of the skeleton; an implement of polished serpentine, which, I imagine, was the battle ax of the chief, whose mortal remains were under my observation, was on the other. The points, only an inch and a quarter in length, had the delicate shape and finish of a class of objects usually found only in the mounds. The rough and clumsy heads, chipped from flint and other quartz rocks, and scattered over the plain, do not occur among the primary deposits, in any of these structures.

The rotted cedar posts were signs of a mode of burial in wood enclosures, practiced by the ancient people. These were made not by hewing and fastening stakes, for their connections had no marks of the ax or the hammer, but by placing logs and pieces of timber one above the other against upright posts, so as to support a roof of the same material. Remains of similar vaults have been disclosed in other mounds, one of which was examined by myself at "The Forks" of the Holston and French Broad, and another near Chattanooga, opened during the late war. While I am writing, a publisher's account comes to me of a "visit to an Indian mound in East St. Louis," in which narrative "a square structure," with "sides lined with wood," "wooden columns," and "cedar posts" is mentioned.

In an earth mound opened near Newark, Ohio, in 1850, a trough covered with logs, contained the skeleton of a man. (Smithsonian Report, 1866.) A similar object was disclosed in a frame of wood, at the bottom of an ancient mound, by Squier and Davis.

In the further prosecution of our work, ten skeletons, invariably doubled, but laid without order as to their relative positions, under wood and bark, and portions of ten others were discovered, at various depths. Several skulls were obtained entire, and the bones of a single frame. The solid parts of most of the remains, having lost their animal consistency, easily crumbled. Eight feet down the cavity were the first signs of incremation. A layer of red clay, several yards square, covered a mass of earth, ashes, charcoal, charred bones, calcined shells, broken vessels, and carbonized seeds of a species of plant, probably the cane, the stalks of which had evidently been used in the burning. This layer rested upon another bed of clay, burnt to the hardness and color of brick. These were indications of a usage of the mound building race in Tennessee—burning their dead with their treasures, in connection with the carcass of a domestic animal or one of the chase. When the remains were partially burnt, earth was thrown upon the pile, smothering the flame, which had an extinguisher in the clay layer.

Various implements and ornamental articles found in this cavity, are to be described hereafter.

PROGRESS OF FOREIGN INVENTION.

SMELTING BY PETROLEUM.

A novel application of petroleum oils in smelting furnaces has just been patented in England by J. F. Parker and E. Sunderland, of Birmingham. The inventors take petroleum or other like volatile oil, and place it in an air-tight cistern surrounded with a covering or jacket, and into the said jacket they introduce boiling water, or, by preference, steam; or, by means of a coil of piping within the cistern, and under the surface of the oil, through which piping steam is passed, they raise the oil to the required temperature. They prefer a temperature of about 212° Fah. The top of the covering or jacket is provided with a self-acting valve regulated to the desired pressure. Through an inlet pipe, they pass a current of air over the surface of the petroleum or volatile oil, which air becomes thereby carburized or charged with the vapor of the oil. By an outlet pipe, they conduct the carburised air into a larger pipe entering the tweer of the blast furnace or cupola employed in the manufacture or melting of the iron or steel, which larger pipe constitutes a common conduit, into which all the gases and vapors, supplied to the furnace or cupola at the tweer, are passed, and by which they are conducted to the furnace or cupola. The inlet and outlet pipes are each provided with a tap. In a retort or close chamber, exposed to heat, the inventors place chloride of lime or bleaching powder, intimately mixed with about one eighth its weight of dry crushed charcoal, coke, or other carbonaceous matter. The object of the chloride of lime is not stated, but it is probably intended to dry the air passed into the hydrocarbon vapor.

TREATMENT OF MINERAL OILS.

This is a Scotch invention, and has for its object the removal of the objectionable blueness, cloudiness, or apparent turbidity which occurs in various mineral oils, and the invention consists in adding, to the mineral oil, a substance which is soluble in or mixable with the oil, and of the class known as nitro-compounds, and obtained by treating hydrocarbons with nitric acid. Nitro benzole is the substance of the class which is used, and the inventor finds that the commercial quality of it, which generally also contains other nitro compounds, answers the purpose. The proportion of nitro-benzole to be employed in each case will vary with the quality and condition of the mineral oil—in other words, with the more or less purified or refined state of the oil, and with the amount of blueness present.

CUTTING TOBACCO.

An English invention for the above purpose is intended to cut timber, tobacco, and various substances, not by a saw, nor by a knife pressing merely against the substance, but by a knife or knife edge made very sharp, and moved in the manner of a saw, so as, in fact, to constitute a saw, whether band, circular, or any other saw, but formed without teeth; and he applies a stationary sharpener, consisting either of a piece of hone, steel, or other suitable material, or of a succession of those pieces, to the edge of the moving knife, so as to make the knife edge rub against such sharpener set at a proper angle with the edge, whereby the edge is constantly sharpened in the same way in which any knife is sharpened on a hone, only that in this case the motion is continuous. The inventor employs circular, band, or reciprocating knives to cut timber and other substances, in substitution of saws, whereby the cutting is effected with the production of a smooth surface and without waste; and he also uses such knives or knife edges moving, not merely like a chopper, against the substance to be cut, endways like a saw, to cut tobacco and all kinds of fibrous or other similar substances requiring to be cut cleanly and without jagging.

DECOLORIZING SIRUPS.

The inventor of this process takes ethylic (common vinous) alcohol or methylic alcohol, known as wood spirit, or a mixture of these two, known as methylated spirit, and he adds, to the alcohol to be employed, either caustic ammonia or caustic soda, potash, or lithia, or any of their salts that have causticity and are soluble in the alcohols named. To the alcohol, thus rendered caustic, he adds impalpable charcoal, and heats up, in the case of the ammonia alcohol, to from 100° Fah. to 130° Fah. In the case of alcohol and the three fixed alkalies named, he heats to 180° Fah., using proper means and sufficient condensing power to prevent loss of material.

PUDDLING FURNACES.

The object of this invention, patented by J. Russell, of Cinderford, England, is to protect puddlers from heat. The invention supports, parallel to and at a short distance from the front of the furnace, three vertical screens, two of the said screens covering the front of the furnace, on either side the puddling door, and the third screen nearly covering the said door, the hole in the door through which the puddlers' rabble passes being left exposed. Each screen is made, by preference, of a plate or slab of cast or wrought iron. The edges of the middle screen or plate project over the inner edges of the side screens or plates, and the said middle screen is supported by a chain passing over pulleys, and provided with a counterbalance weight. The side plates or screens are supported, in front of the furnace, by being hooked or otherwise fastened thereto. The heat radiated from the furnace, at that side on which the puddler stands during the puddling operation, is received upon, and absorbed by, the screens or plates described, and the said puddler is thus protected from the distressing heat of the said furnace.

IRON TUBES.

The following method of making iron tubes is the invention of H. Kesterton, of Birmingham, England. In making the tubes, the inventor reduces pig iron to the state of soft malleable iron by the Bessemer or other similar process, and casts it into a hollow cylindrical ingot. He passes this ingot, whilst still very highly heated, through a series of pairs of grooved rollers set in different planes, say alternately vertical and horizontal. The first pair of rolls takes the ingot, and reducing and elongating it, passes it to the second pair immediately beyond, and this pair passes it to a third pair, and so on, until the desired reduction is obtained. Each successive pair of rolls is driven at a surface speed greater than that of the rolls immediately in front, so that allowing for the elongation of the tube and the reduction of the section, equal quantities of metal may pass between all the pairs of rolls, gripping the ingot in equal times. A stationary mandrel passes between all the rolls, and carries a bulb at the nip of each pair of rolls.

DYERS' RECIPES.

From Haserick's Secrets of Dyeing.

DARK BLUE SUITABLE FOR THIBETS AND LASTINGS.—Boil 100 pounds of the fabric for one hour and a half in a solution of 25 pounds of alum, 4 pounds of tartar, 6 pounds of mordant, 6 pounds of common extract of indigo; cool them as usual. Boil in fresh water from 8 to 10 pounds of logwood, in a bag or otherwise, then cool the dye to 170° Fah. Reel the fabric quickly at first, then let it boil strongly for one hour. This is a very good imitation of indigo blue. Chemic can be used in the preparation; but should the shade require more of the indigo while finishing in the logwood, extract of indigo ought to be used.

The old English way of coloring a blue-black on lastings, is by boiling 100 pounds of the fabric for one and a half hours in a solution of 10 pounds of alum, 1 pound of copperas, and 1 pound of blue vitriol; take the goods out, cool them, and boil them for one hour in a dye containing 10 pounds of logwood. This color would not look well on soft goods, such as thibets, as in fact it is only a dark slate; but it looks better on lastings, on account of its gloss.

N. B.—To all these colors the logwood can be boiled in large quantities, say a barrelful in a hogshead of water at a time, 2 pounds of logwood being reckoned to a pail of liquid. This will save boiling the chips in a bag. Five pails will be equal to 10 pounds of chips. It has this advantage, too: more can be easily added if the shade require darkening. Extract of logwood should never be used for blues, as it will produce dull colors on account of its being disoxidised by time.

SAXON BLUE.—100 pounds of thibet or comb yarn, 20 pounds of alum, 3 pounds of cream of tartar, 2 pounds of mordant, 3 pounds of extract of indigo, or 1 pound of carmine instead; the latter makes a better color. When all is dissolved, cool the kettle to 180° Fah.; enter and handle quickly at first, then let it boil half an hour, or until even. If the fabric be not scoured clean, it will look shady; and about 5 pounds of common salt added will remedy this. Remember, long boiling dims the color. Zephyr worsted yarn ought to be prepared first by boiling it in a solution of alum and sulphuric acid, then the indigo added afterwards. For common coarse carpet yarn, it is only necessary to handle it through a hot dye of 175° Fah., containing 15 pounds of alum 10 pounds of sulphuric acid, 4 pounds of chemic paste, to 100 pounds of yarn, or through its equivalent of extract of indigo. If chemic be used, the dye ought not to come to a boil, otherwise the impurities of the indigo will color the yarn and dull its brilliancy. Rinse well in water before drying. The tin acid fastens the color somewhat. It will not fade so easily, nor run into the white, if wove into fiannels, which have to be scoured in soap, and bleached. The color changes in the sulphur house into a stone green shade, but the original color comes back again when the fabric is rinsed again in water.

PRUSSIAN BLUE.—Prussiate of potash was formerly only used on cotton, with a preparation of iron first; and, about the year 1828, was first used on woolens, and, of course, no one then thought that they could be colored without giving the fabric a preparation of iron, before entering into the prussiate of potash solution. Every dyer had his preference to one or the other solutions of iron; they were nitro-muriate of iron, acetate, and tartrate of iron. Some used iron oxide (burnt copperas) dissolved in sulphuric acid, etc.; but later, the yellow prussiate was only used until the introduction of the red prussiate of potash. The latter has the preference, as it can be added, for darkening the shade while in the process of coloring, which is not the case with the yellow prussiate of potash; but this would rot the cloth, as this color requires a large quantity of acid. To 100 pounds of wool or fiannel dissolve 8 pounds of red prussiate of potash, 2 pounds of tartaric acid, 2 pounds of oxalic acid, 5 pounds sulphuric acid. Handle the fabrics in this for half an hour at 120° Fah.; then reel the goods out, and heat to about 165 Fah.; add 5 pounds of sulphuric acid, and 1½ pounds of tin crystals; stir all well; enter the goods, and handle for half an hour longer; then heat it to 208° Fah., when it will be a good blue. The shade can be varied to any extent by the addition of logwood liquor and a few pounds of scarlet spirit; but the liquid ought to be cooled first, and the goods handled quickly to secure evenness while in the logwood. This color ought never to boil, especially when coloring with steam, as more than boiling heat (212°) destroys the color and makes it lighter; but letting the fabrics lay a few hours exposed to the oxygen before rinsing is an improvement to the color. This color must be well washed or else it will smut. This blue will be brighter if aniline purple be used for darkening, instead of logwood; but this ought to be done after the goods have been washed, and in fresh water. If a mordant of 10 pounds nitric acid, 36° B., 10 pounds muriatic acid, 22° B., 10 pounds sulphuric acid, 66° B., diluted with water, and 1 pound feathered tin added, be used, instead of sulphuric acid, the color will be fast.

ANILINE BLUE.—To 100 pounds of fabric dissolve 1½ pounds of aniline blue in 3 quarts of hot alcohol; strain through a filter, and add it to a bath of 130° Fah.; also 10 pounds of Glauber's salts, and 5 pounds of acetic acid. Enter the goods, and handle them well for twenty minutes; then heat it slowly to 200° Fah.; then add 5 pounds of sulphuric acid diluted with water. Let the whole boil twenty minutes longer, then rinse and dry. If the aniline be added in two or three proportions during the process of coloring, it will facilitate the evenness of the color. The blue, or red shade of blue, is governed by the kind of aniline used, as there is a variety in the market. Hard and close wove fabrics, such as braid, ought to be prepared in a boiling solution of 10 pounds of sulphuric acid and 2 pounds of tartaric acid before coloring with the aniline, as this will make the fabric more susceptible to the color. Blues soluble in water color more easily than those which have to be dissolved in alcohol.

Colored Fires.

A member of the German artillery corps gives the following formulæ for making colored fires:

1. White light: 8 parts saltpeter, 2 parts sulphur, 2 parts antimony.

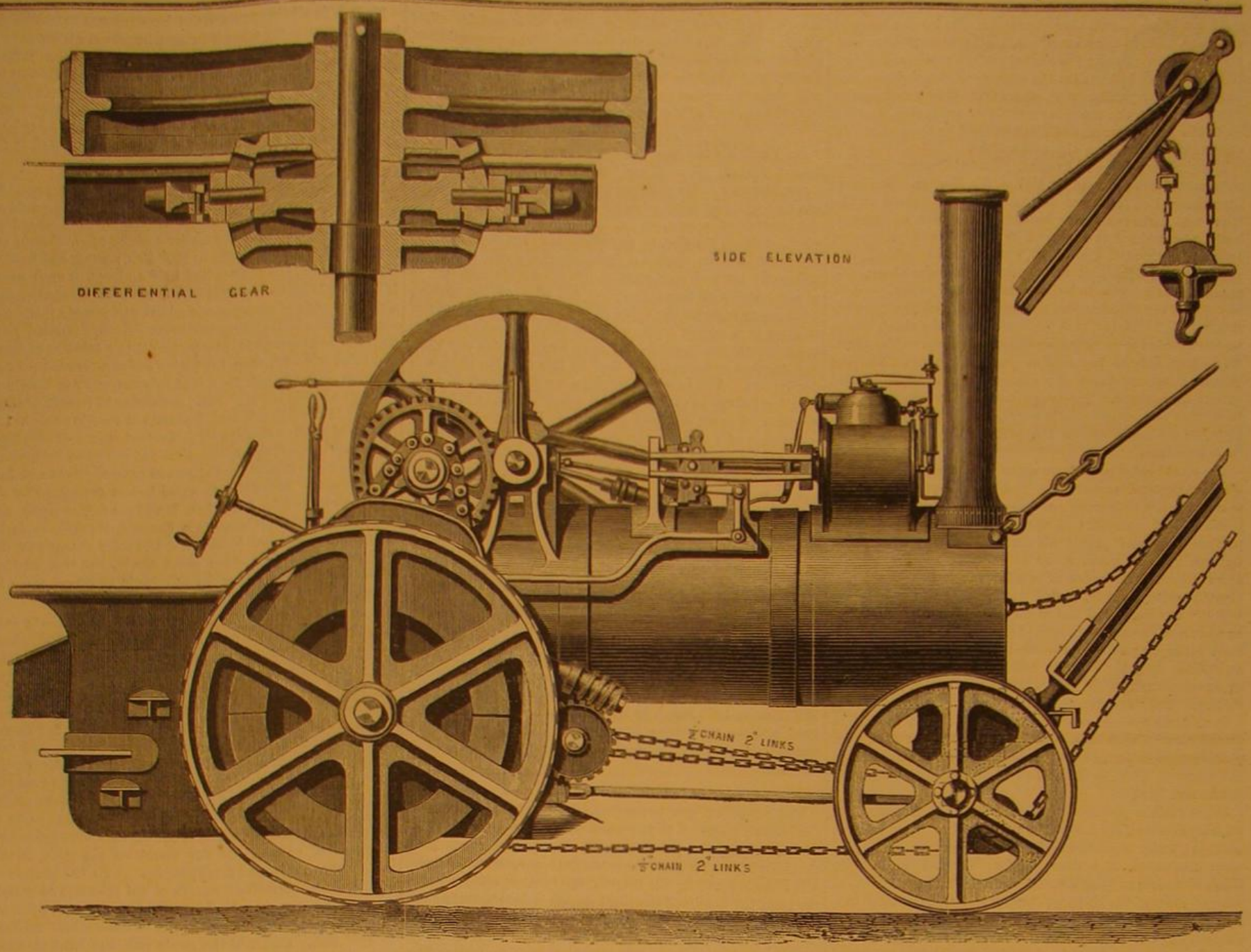
2. Red light: 20 parts nitrate of strontia, 5 parts chlorate of potash, 6½ parts sulphur, 1 part charcoal.

3. Blue light: 9 parts chlorate of potash, 3 parts sulphur, 3 parts carbonate of copper.

4. Yellow light: 24 parts nitrate of soda, 8 parts antimony, 6 parts sulphur, 1 part charcoal.

5. Green light: 26 parts nitrate of baryta, 18 parts chlorate of potash, 10 parts sulphur.

6. Violet light: 4 parts nitrate of strontia, 9 parts chlorate of potash, 5 parts sulphur, 1 part carbonate of copper, 1 part calomel.

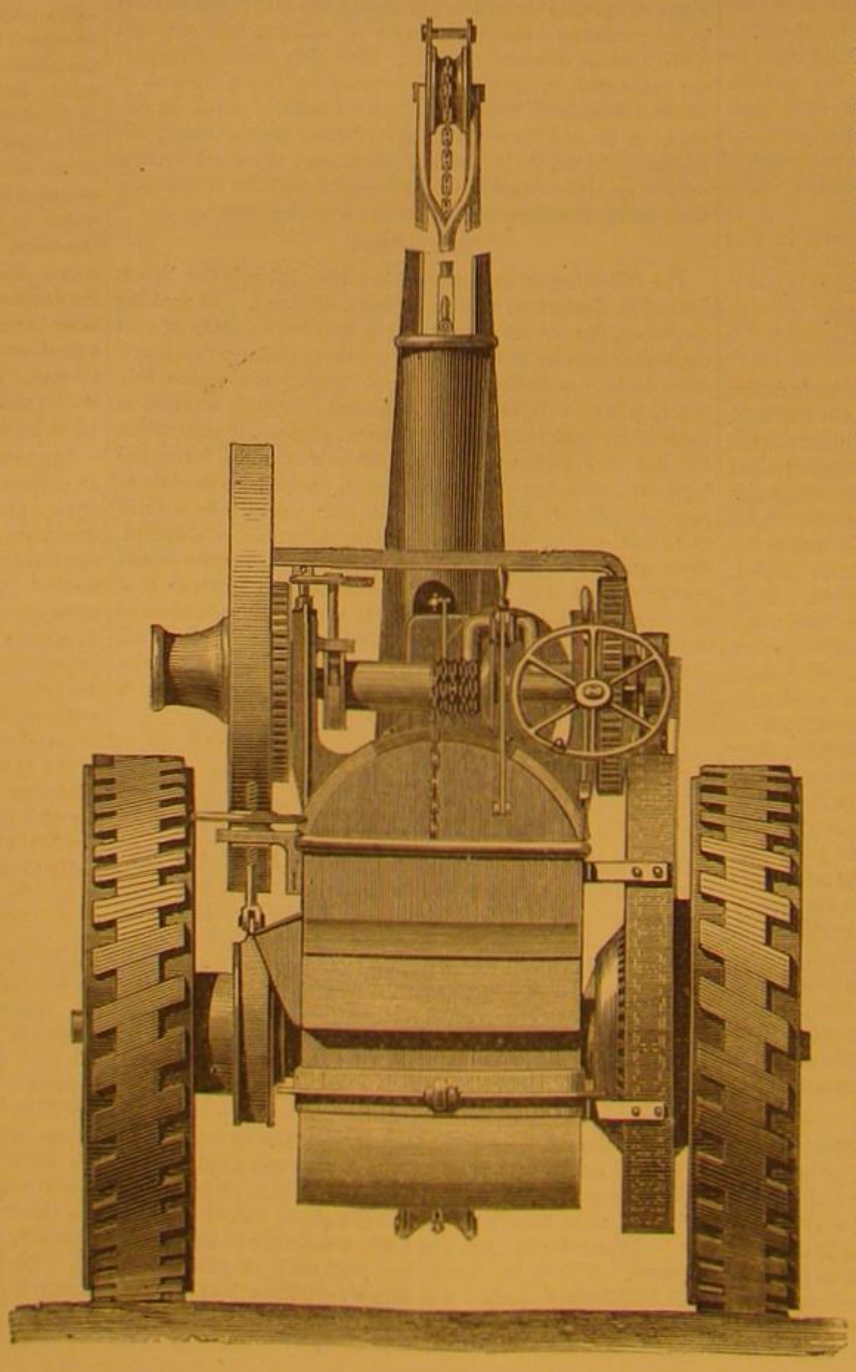


AVELING & PORTER'S COMBINED ROAD LOCOMOTIVE AND PORTABLE STEAM CRANE.

The combination of a road locomotive with a steam crane will of itself suggest many useful applications. Such machines will be found of considerable value for contractors, shipwrights, manufacturers, and for use in dockyards, quarries, etc. They are made to lift from one and a half to three or four tuns, and, when the engine is required for ordinary hauling, the crane can be detached with little trouble. The general characteristics of Messrs. Aveling & Porter's ordinary road locomotive are adhered to in this engine; and in Europe, where numbers of them are constantly in use, they have been found a handy and economical means for lifting and lowering heavy weights, removing heavy material and packages of various descriptions.

There is considerable novelty in the detail of the construction of the machine, apart from its combined advantages of a crane and road locomotive.

The crank shaft drives directly a countershaft immediately behind it, which is, at the same time, the shaft of the winch barrel. From the countershaft a pitch chain drives the main axle, or rather one of a pair of bevel wheels of a "jack-in-the-box" motion on that axle, which gear, though strong, is worked into a very small space between the fire-box and the off driving wheel. The bevel next the fire-box is keyed fast on the axle, and that outside, next the off wheel, is in one with the wheel; the motion of both wheels is, therefore, under ordinary circumstances, equal; but when unequal resistance takes place, a certain play is allowed between the driving wheels. It would, however, be inexpedient to leave the engine always at the mercy of this compensating arrangement, and therefore the near wheel is releasable, as in all Aveling's engines, from the axle, by withdrawing a pin in the box; and the off wheel can be clamped on the axle, by placing a clutch on the outside of the wheel over the grade pin, and catching the spokes of the wheel. The winch barrel moves free on the countershaft till thrown into gear, at the same time that the locomotive motion is thrown out, when only the crane is required. The hoisting chain is passed under the boiler and up over the gib, which is simply formed of two T-irons, then pivoted on a ball and socket joint capable of turning in any direction.



The steering chains are taken reversely on to a horizontal shaft under the boiler, which is worked by a worm and pinion, which can be managed from the foot plate; and so convenient are all the arrangements that the whole management of the machine—driving, steering, and working the crane, is under the control of one man.

At the last exhibition of the Royal Agricultural Society, at Oxford, England, these engines were employed in removing the machinery to and from the show yard.

Mr. W. Churchill Oastler, 43 Exchange Place, New York, is Messrs. Aveling & Porter's agent in America.

Objections to Practical Use of Oxygen in Illumination.

We have referred on several occasions to the use of oxygen as an illuminator on a large scale, and to the many advantages claimed for it by the inventors of the different processes. It is now stated, on the other hand, however, that the entire process of manufacture has many grave practical difficulties, especially in regard to the preservation and the distribution of the gas; since iron reservoirs and pipes, especially when moistened, are so liable to be attacked by the oxygen as to be soon rendered useless, thus requiring some new material for this purpose. The illuminating apparatus also requires to be totally changed, and unless the mixture of oxygen is made with the greatest exactness, the idea of the economy of the illumination is illusory. Furthermore, the intensity of the light is very variable, according as the oxygen is more or less mixed with air and moisture. So far as it regards the economical introduction of this method of illumination, the ordinary gas companies are assured that they have nothing to fear from competition.

MICROSCOPIC PHOTOGRAPHY.—A further proof of the value of this invention is shown by the letter of a French correspondent, which says that a pigeon lately arrived in Paris, bearing dispatches, which, when printed, filled four columns of a newspaper; and also private communications to the number of 15,000. The photographs were inclosed *in a quill*, tied to one of the bird's feathers. We hope the conclusion of peace will not stop this interesting work.

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. XXIV., NO. 11 . . . [NEW SERIES.] *Twenty-sixth Year*

NEW YORK, SATURDAY, MARCH 11, 1871.

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THE TRANSMISSION OF POWER BY COMPRESSED AIR.

The subject is becoming more and more a question of importance, and some capitalists have even gone so far as to signify their willingness to risk their means in making the attempt, in two places where water power is abundant, as we mentioned on page 49, Vol. XXIV. It certainly would be a great convenience to obtain power, for driving machinery, from a pipe, in the same way as we do our gas and water; and the risk of fire and boiler explosions would be done away with. Le us consider whether the economy of the idea is equal to its other advantages.

Up to the present time, compressed air for obtaining or transmitting power, has been chiefly employed in tunnels and mines. At the Hoosac Tunnel, and that under Mont Cenis, it is and has been an invaluable servant. At the former, just now, the headings are, roughly speaking, one and a half miles from the points where the air is compressed; that at the east end being forced into the receivers and pipes by water power, every two drills requiring a four-foot turbine wheel to supply the necessary air, while the west end air is compressed by steam power, each pair of drilling machines requiring about twenty horse power. The air is compressed, into large receivers made like ordinary shell boilers, to about sixty pounds per square inch, and conducted thence into the tunnel, and up to the headings, by eight-inch cast-iron pipes, of twelve feet lengths, flanged into each other and bolted together, rubber rings or gaskets being used at the joints. These pipes are almost perfectly air-tight, and, in a distance of one and a half miles, do not afford more than four pounds of friction, per results, in pressure at the headings. The drilling machines have a reciprocal motion, the cylinders being from three and a half to four inches in diameter, by one and a half foot stroke, and, with fifty-six pounds pressure, ordinarily make two hundred and fifty strokes per minute.

So far as rock drilling is concerned, it appears that there is a loss of about sixty per cent of the power required to compress the air, as an engine of eight horse power, with sixty pounds pressure of steam, acting directly, would undoubtedly drive two machine drills. Separate compressing engines are used for supplying air for ventilation, which needs from three to four pounds pressure, through similar pipes.

The great question is, can air power be transmitted long distances with advantage? We are of opinion that it can, up to a certain distance, provided the compressing power costs comparatively nothing beyond its prime cost; but, for longer distances, we must shake our heads.

It is true that in a pipe ten miles long, closed at the further end, the pressure will be the same at the closed end as if it were only ten feet long; but when the air is in motion there will be friction. The result of calculations and observations afforded us, seems to indicate that the friction, for a constant velocity, is in direct proportion to the length, and inversely as the inner circumference of the conducting pipe.

A certain percentage of supply over consumption should be allowed in a long pipe, as there will be more or less leakage; but, with this exception, when the pipe and receivers are indicating the necessary pressure, no more air will need to be compressed at one end than is used at the other; and we see no reason why the question does not resolve itself into, "How much air must be compressed at one end to balance friction and leakage, in a given time, and to furnish a required amount, in the same time, at the other?" The practical answer to this is a mere matter for calculation, and can be readily arrived at; but there is, we think, a point at a certain distance (according to the size of the conducting pipe) from the compressing power, where the expenditure and supply would exactly balance, any less distance showing "profit," any greater, "loss," so that the distance it would be profitable to conduct compressed air depends on the bore of the conductor. The greater the bore, the greater the proportion of profit, as it were, up to a certain point, and beyond that the greater proportion of loss.

Suppose it would cost about $260,000 to furnish a pressure of sixty pounds, at the end of an eight-inch pipe twenty miles long. This pipe would supply certainly no more than 100 horse power, and it would certainly take 250 horse power to keep up the supply of air, which would have to move through the pipe at a high velocity, making the loss by friction very serious. Would 100 horse power, supplied continuously at $150 per annum per horse power, be a profitable investment on an outlay of $260,000?

Suppose we take the largest size pipe admissable, one of thirty-two inches diameter. This would cost, including compressing machinery, in round numbers, $1,550,000, and the compressing power required for full capacity of pipe would be not less than 2650 horse power. The effective result would be about 1000 horse power, which, at $150 per annum per horse power, would be $150,000. This would not be a profitable investment of capital, even without any risks, and no deduction has been made for keeping the pipe and machinery in order, or for running expenses, which, however, would not be very great.

As this pipe is as large as could be reasonably used with safety, and, for other reasons, it follows, according to the above estimate, that the cost for transmitting air power a distance of twenty miles through a pipe of thirty-two inches bore, would be, in the case of 1000 horse power (its utmost capacity), about $1,550 per horse power, ten per cent of which would be $155, or $5 more than each horse power of steam would cost at present. But the large pipe pays better than a smaller one.

Therefore we are of opinion that twenty miles is too great a distance for transmitting compressed air, and, from above data, it is easy to find the point of limit to which it can be sent advantageously to supplier and consumer.

With respect to receivers at the distance of several miles from compressors, we would advise each consumer to have his own, as no general system of receivers would be sufficiently large to be of any service, besides adding enormously to the first cost and subsequent repairs.

An additional pipe alongside another of the same size would just double the cost, without any particular benefit accruing.

PAYNE'S ELECTRO-MAGNETIC MOTOR.

A wildly enthusiastic editorial in the *Journal of the Telegraph*, the organ of the Western Union Telegraph Company, on a new electro-motive power, said to have been discovered by H. M. Payne, and now in operation in Newark, N. J., has excited very great interest in the public mind. The article has been extensively copied, and widely read; and as it predicts the dawn of a new era in the mechanical world, and comes from a source which ought to be an authority upon such matters, many, no doubt, believe that really an immense advance has been made in electric science, and that the long desired cheap and economical electro-motor has at last made its advent.

The editor of the *Journal of the Telegraph* has had an advantage denied to us, namely, the opportunity to inspect the machine while in operation. It is understood that, because several scientific gentlemen, thoroughly versed in electric science, have seen it, and discredited the claims made for it, that the parties interested are not inclined to allow any further examination on the part of those whose opinions are not known beforehand to be likely to be favorable. We are, therefore, unable to speak from personal knowledge, in regard to this machine, but we can say that men whose judgment is considered reliable in electric science, pronounce the claims of Mr. Payne to be a humbug. It is but fair to say, however, that some believe Mr. Paine to be really doing all he claims to do, and that there is no kind of deception practiced.

The principal points of the construction of this engine, from what we are able to learn, seem to be the breaking of the circuit of each magnet successively, before it has drawn its armature to the center of attraction, and the making of the circuit in the next one of the series, so that the primary force, of the latter, acts together with the residual force in the former, and in the same direction, (instead of opposing each other, as in other electro-motors), besides keeping the battery current constantly unbroken; also, the peculiar form of the magnets, by which it is claimed their attractive power is enormously increased—so much so that, it is stated, a 50 pound magnet has been made to sustain 120 tuns, with a battery of four Daniell's cups, such as are ordinarily used for telegraphing. If these claims can be made good, the public will know it in due time.

We are informed that an engine, designed to develop 500 horse power, is either commenced or soon to be constructed.

These, in brief, are the facts in relation to this matter, so far as we can gather them from various sources, including the rhapsodical articles of the *Journal of the Telegraph*.

Now, a word as to the theory of the new motive power. It is claimed that the battery is merely the connecting link, so to speak, between the machine and some mysterious storehouse of magnetic energy, and that it is no more the source of the power than the trigger of a musket is the source of the power which projects the ball. This looks to us like sheer fudge. We are not prepared to believe that any power whatever is derived from any source but the battery, and we should expect to find the consumption bearing an exact relation to the power developed.

The *Journal of the Telegraph* states that the power developed was rated at two horse, yet "two gentlemen, weighing 170 pounds each, endeavored to stop the motion of the wheel by the pressure of a concave brake, having a surface six inches by four, bearing on the belt wheel, but *without visible effect*) (The italics are ours.) Now, any mechanic knows that unless the power developed was much greater than the estimate, this statement cannot be correct, (unless the motion was enormously speeded down to the belt wheel), and some would even suspect that there was concealed battery power, which could be drawn upon in case of an emergency. Surely, a brake pressure of 340 pounds, directly applied, would produce *some* visible effect on an engine of only two horse power.

In a second article on this subject, the journal referred to says: "We have the data of an examination by an experienced engineer, who gives the result of his examination as follows: Number of cells of battery, 4; number of revolutions per minute, 340; diameter of pulley, 12 inches; pressure of brake, 65 pounds; developed in horse-power, 1·99 to 2."

Not knowing the coefficient of friction of the brake and pulley, we, of course, cannot say positively that the above statement of power is not correct; but, allowing the highest coefficient of metals on wood, given by Mr. Rankine, in his work on "Machinery and Mill Work," page 349, *i.e.*, 0·6, a computation from the data given gives only 1·262 horsee power, instead of 1·99 to 2, as claimed. The latter result can only be obtained by using the entire pressure of the brake as resistance, an error an experienced engineer would not be apt to make. Perhaps, however, what is printed "pressure" was intended to mean resistance; if so, the horse-power claimed is sustained by the data.

If, as the writer of the first article referred to asserts, the battery power is only an initial force, which opens some hidden valve for the entrance of an indefinite quantity of some other force, and the size of the battery, and its consumption, need not be increased, to obtain increase of power, then we may as well cease the search for a perpetual motion, for its existence is demonstrated.

We are inclined to regard these expressions of opinion as the hasty effusions of a too sanguine observer, rather than as the sober statement of solid judgment, based upon knowledge. Whether true or erroneous, such statements made in the present stage of the invention, can only induce skepticism in the public mind, a skepticism which we regard as entirely justifiable under the circumstances.

EFFECT OF COLD UPON IRON AND STEEL.

We publish in another column a condensed statement of experiments and opinions of some engineers of high standing, upon the effect of cold upon the strength of iron and steel, the sum of which was that these metals were not rendered brittle by low temperatures. Our readers' attention will scarcely need to be pointed to the fact that most of the experiments of Joule and others were made by steady pressure, and therefore cannot be considered reliable when percussive force is brought into play.

It seems almost superfluous to argue that power applied percussively produces very different effects from simple dead weight; but when men like Joule, Fairbairn, and Spence, ignore this difference, it is fair to suppose that less skilled engineers may also ignore it. That there is a difference in these effects, so great that no relation between them can be determined, any one may convince himself by contrasting the tensile strength of glass with its extreme frangibility under percussion. We maintain, therefore, that, in so far as they go toward settling the question whether rails and tires on railways are more liable to break in cold weather than in warm weather, their experiments and the opinions based upon them are alike valueless.

Mr. Brockbank, whose paper drew forth the opinions referred to, took the ground that iron and steel were more liable to break in cold weather, and based his opinion upon percussive experiments. It is obvious, therefore, that his opinion has no weight upon the subject of tensile strength as affected by cold, but it is of great value as confirming experiments previously made to ascertain the effect of cold upon iron and steel subjected to percussion, experiments of which Mr. Brockbank was apparently ignorant at the time his paper was prepared.

In 1869, a "Treatise on Iron and Steel," by Knut Styffe, was published in London, from a translation by Christer P. Sandberg. The translator, however, took issue with the author upon this very question, and denied the applicability of Styffe's deductions, from tensile experiments, to percussion in cold temperatures, founding his denial upon experiments performed by himself in Stockholm under the authorization of the State Railway Administration of Sweden, in 1867. The results of his experiments prove that at 10° Fah. rails will not sustain much more than one fourth the blow that they will at 84° Fah. The method of performing the experiments, as well as the details of each, are given in tabulated form in a voluminous appendix to the translation of Mr. Styffe's treatise.

Mr. Sandberg concluded from his experiments that the brittleness of iron and steel under low temperatures is due to phosphorus present in the metal, and that with purer metal, the results would have been different.

It is evident that this subject is imperfectly understood, even by the highest authorities, and further extended investigations, with all kinds of iron and steel, must be made before the general effect of cold, as inducing brittleness under percussion, can be affirmed. Meanwhile, it seems to be well

settled, that the tensile strength of iron and steel when tested by stretching, is not lessened by low temperatures. On the contrary, it would seem from Mr. Spence's experiments to be increased rather than diminished.

MR. COOPER'S RECENT GIFT TO THE MECHANICS OF NEW YORK.

Mr. Peter Cooper has given one hundred and fifty thousand dollars to the trustees of the Cooper Union, in addition to the million dollars previously bestowed by him on the institution, to be expended in the purchase of books for a free reading room, and for such other purposes as the trustees may elect, for the benefit of the mechanics of New York. To call this act princely munificence, is a very inadequate expression of the appreciation in which the citizens of New York hold the last generous deed of Mr. Cooper. A prince who steals his wealth can easily afford to be liberal; one of nature's noblemen, who earns his money by the toil of his hands, when he bestows his wealth, gives what belongs to him, and is entitled to vastly more praise.

Mr. Cooper, in early life, was too poor to pay for instruction, and was compelled to acquire knowledge in the intervals of toil and at great disadvantage. He resolved that if fortune should favor him, he would found an institution in which the poorest mechanic could obtain gratuitous instruction in the evening, in such departments of learning as would add to his usefulness and chances of success in his career. Having felt the want, he knew how to apply the remedy; and, in after years, as fortune smiled upon him, he did not, as many others have done before him, forget the promise of humbler days, but set too work to carry out his intentions in his life time, and under his own energetic supervision. The Cooper Union was founded and dedicated to science and art. It has prospered under his hand. Competent teachers have been engaged to give instruction to the thousands of mechanics and women who have applied for admission. The free reading room has been thronged by persons who have gone there to prepare articles for the press,or to snatch a little information in the intervals of their work.

The School of Design for women has opened up a field of usefulness to a large class of society which has very limited opportunities for earning a support. The large hall of the Union has been the theater of popular scientific lectures before immense audiences, and thus the seed sown is scattered in every direction; and the beneficent influences of the Cooper Union are felt in the workshop and family circle by a class of persons who would otherwise have been excluded from these advantages.

There is something grand in the conception and execution of a plan of such magnitude as this; and it is rarely that the privilege is accorded to any one in his lifetime to do so much good.

The occasion of the new gift by Mr. Cooper was the anniversary of his eightieth birthday. He has "by reason of strength," attained four score years, but this strength cannot be "labor and sorrow" to one who has called down so many blessings on his head. The gratitude of the poor is a rich inheritance, and our mechanics know how to thank those who have helped to lessen their toil and to elevate their condition.

Mr. Cooper has long been anxious to see the whole of the Institute building devoted to the purposes of the foundation, but it has been necessary to provide an income to meet expenses; and to do this, the various stores and rooms of the lower floor have been let. The room thus taken up for the purposes of trade is greatly needed for the collections of apparatus, minerals, ores, and drawings required by the pupils; and it would be a handsome mode of expressing their appreciation of what Mr. Cooper has done, if the wealthy manufacturers of the city were to contribute a fund, the interest of which would equal the rent to be derived from the stores. We should like to see the whole edifice swarming with persons in search of knowledge, while the money changers find a resting place elsewhere.

It would be a just recognition of Mr. Cooper's claim upon the respect of the community, if our citizens were to raise a fund for the endowment of the institution which he has established at an expense of a million dollars. We dare say that every mechanic in the city of New York would cheerfully give a dollar towards such a testimonial fund, if the movement could be organized by responsible persons. It would be a beautiful thing to see the declining years of the good old man sweetened by these evidences of regard, and, as he has taken care, during his life time, to accomplish all this good, it would be well for the recognition of it to come while he is yet able to understand and appreciate it.

DEATH OF THOMAS BRASSEY, THE GREAT ENGLISH RAILWAY CONTRACTOR.

The subject of the present obituary notice, whose death is announced in our latest foreign exchanges, was one of the great men of his time. His field of labor was one that does not generally attract the attention of the world, yet Mr. Brassey was widely known in both hemispheres, as the most extensive railway contractor in the world. He is said to have left the largest personal estate ever administrated upon in England, and this wealth was not acquired by stock jobbing and speculation, but in the legitimate business to which he devoted his life.

Mr. Brassey was born at Baerton, England, in 1805. At the age of sixteen he was apprenticed to a surveyor, and was taken into partnership by his instructor at the end of his term.

His first contract of importance was ten miles of the line of the Grand Junction Railway from Liverpool to Birmingham, in 1835. This contract proved profitable to himself and satisfactory to the company.

His next great contract was on the London and Southampton Railway, exceeding in amount four millions of pounds sterling. One would think such a contract as this was business enough for one man, but not content, Mr. Brassey undertook at the same time portions of the Chester and Crewe, and the Manchester and Sheffield Railways, besides entering into partnership with Mr. W. McKenzie, to execute the Glasgow and Greenock line. These gentlemen, still remaining partners, undertook in 1840 the construction of a French railway from Paris to Rouen.

Between 1844 and 1848, Brassey and McKenzie contracted to construct five other French railways, and Mr. Brassey, on his own account, contracted to build three lines in Scotland and two in England and Wales. It is stated that Mr. Brassey had at this time 75,000 men in his employ, and that the weekly wages paid by him amounted to from fifteen thousand to twenty thousand pounds sterling.

The last of the various works named, the Great Northern Railway, was finished in 1851. From this date up to the time of his death, Mr. Brassey was engaged, for the most part singly, but at times in partnership, on the following works: Works in Shropshire, Somersetshire, and the county of Inverness; the lines of the Sambre and Meuse, the Dutch Rhenish, the Barcelona and Mataro, and the Maria Antonia Railways, in Belgium, Holland, Prussia, Spain, and Italy; the Grand Trunk Railway, in Canada, 1,100 miles in length; six more railways in France; six more in Italy; the Bilbao and Miranda line in Spain; various contracts in Norway, Sweden, Denmark and Switzerland, and the temporary railway over the Alps at Mont Cenis, which he built and maintained, at considerable loss; contracts in Turkey, still unfinished; the greater part of the East India Railway, the Calcutta and South-Eastern Railway, and other works in India; several hundred miles of railway in Australia; contracts for the first railways constructed in South America, and docks at Callao, in Peru; contracts for making, extending, or widening thirty-one English and Welsh railways; the construction of the Barrow Docks, and the Runcorn Viaduct.

The contracts performed by Mr. Brassey and his partners, from 1848 to 1861, comprised over 2,374 miles; and amounted to twenty-eight millions of pounds sterling.

This astonishing record leads the reader naturally to ask what manner of man this was, who could manage successfully a business, whose ramifications embraced the entire civilized world? The various obituary notices which have appeared in our foreign exchanges, unite in attributing to Mr. Brassey modest tastes, liberality in his views, large but unostentatious charity, the utmost keenness and sagacity in looking out for his own interests, extreme caution in preliminary examination before entering upon a contract, with remarkable boldness in making large contracts when his judgment was formed, and strict integrity in fulfilling the spirit as well as the letter of his agreements. He was extremely systematic in everything, and remarkably clear in all his statements. These qualities, united with an untiring energy and a physical constitution that enabled him to endure an amount of labor sufficient to break down three ordinary men, exactness in the minutest details of business, unruffled calmness under all circumstances, kindness of heart, and justice in his treatment of subordinates, make up a character rarely met with, and which might safely be predicted to win in almost any occupation. The greatest prosperity did not seem to elate him, and the heavy losses he sometimes sustained affected his composure as little as his gains.

One of the principal elements of success in his career, was his reliability in the performance of work as agreed. This character, established in his earlier contracts, was maintained in all his subsequent works.

In 1866, Mr. Brassey lost a sum larger, it is said, than any one business man of his time could have lost without bankruptcy, yet he died one of the richest men of the period.

In another column will be found an anecdote of Mr. Brassey, which illustrates the character of the man very forcibly.

THE PRESENT AND THE PAST.

NUMBER IV.—TRANSPORTATION.

To moisture, either as affected by changes of temperature, or as containing in solution corrosive gases, as the chief agent in disintegrating rocks, we must add the chemical and mechanical agency of plants, and even the wear and tear of the surface, produced by the movements of animals upon it. The volcano, also, from the loose ashes and scoriæ which it ejects, readily contributes a share to the burden of the rain-flood; and as the materials thus set loose travel downwards, they receive constant additions from the beds of the rapid streams, in which the incessant fretting of the pebbles and grit gradually wears away the hardest rock. Thus the water of a river must contain material derived from every part of its course; and the greater the variety of rocks in the region which it drains, the more varied will be the character of its sediments. Nor does it contain matter merely "in suspension," such as will, when movement ceases, settle to the bottom as sediment; but, being a great solvent, it always contains substances "in solution," which will only be deposited, or "precipitated," by some change in the chemical condition of the water, or be withdrawn by the agency of the plants and animals that inhabit it. The mud that settles at the bottom of a tumbler of dirty river water, is an example of a sediment; the fur that is deposited in a teakettle, on boiling the same river water, is carbonate of lime that was held in solution. Our readers must forgive us for lingering upon such elementary facts; we do so because people, generally well informed, will use these terms with the greatest inexactitude. Thus we have, even while writing this article, chanced upon the phrase, in a leading newspaper, "the sediment was held *in solution*" in the flooded waters of the Tiber, the words evidently referring to matter existing, mechanically divided, in suspension therein.

Everything tells us that the river, though a great destroyer, is no restorer. When a mountain brook, brawling riotously over its rocky bed, whirling along, in its quietest times, pebbles and sand, and, in the excitement of a flood rolling down even vast boulders, subsides to the majestic river, carrying along only the finest sediments, it may, from time to time, spread layer upon layer of alluvial soil over its banks, or gradually silt up its deep pools; but, sooner or later, geological changes will occur; its outlet will be lowered, it will become rapid, its course will change—now cutting here, now there, and thus itself, eventually, removing the same soil that it had laid down, and transferring the materials a stage further towards their ultimate goal. The extensive new-made lands, that form the deltas existing at the mouths of so many of the largest rivers, can scarcely be said to be the work of the river, since they are due to the action of the tides and marine currents, that prevent it from sweeping its burden out into the ocean. But even these, if we may judge from the infrequency of such deposits in geological formations, have but small chance of being permanently preserved. Being generally loose aggregations, bordering on, and even extending out into, the sea, they are the first to be devoured when a change of level, or an alteration in the direction of the currents, gives them over as a prey to the waves. Not that deposits from fresh water do not occur frequently, and of great extent, in the geological series, but these appear to have been formed mostly in lakes. Thus the river, in its geological aspect, is the link between the continents of the Past and those of the Future, a striking emblem, even from the scientific point of view, of the ever lapsing Present.

When the substances, swept down by the river, at last reach the sea (which they do in a very finely divided condition, as silt, or the finest grained sand), they become mingled with the materials abraded by its waves. The depth to which the action of the waves extends is, as we have said before, limited, so that the abrasion of the land only takes place in comparatively shallow waters. Violent storms, however, disturb sediment that has temporarily subsided at greater depths, and tides and other currents sweep finely-divided materials far out into the depths of the ocean. As, however, marine currents are never sufficiently violent to carry heavy materials, the movements of pebbles, boulders, and even of coarse gravel, can only be accomplished in the neighborhood of coasts, within the breaker action, where, as shingle, they will be tossed and retossed, continually rounding and being rounded, polishing and being polished. At each returning wave, the grating sound, as the pebbles are thrown forward and sucked back, tells you that every stone moved has lost some almost infinitesimal portion of its substance, just as surely as your grindstone wears, by being used, or your knife, by being constantly cleaned.

Thus most of the pebbles we see on a beach are ground to sand and dust, which, when reduced fine enough, will be borne off to sea; and we also learn from this history that pebbles can only accumulate permanently by being drawn back by the waves, in violent storms, into deeper waters, or by such a rapid change of level of the coast-line as shall raise or sink them out of reach of the waves, more rapidly than the latter can grind them up. It is essential to recollect those facts in studying the history of the conglomerate rocks that occur so frequently in geological formations; at the same time, however, we must not forget that it has been suggested of late that some of such conglomerates, containing large boulders, may have been accumulated by the agency of icebergs and glaciers, and may, therefore, indicate the recurrence of several glacial periods in the world's history; periods such as that, of which we have conclusive evidence, which, over a large part of the northern hemisphere, intervened between the Tertiary period and the Recent.

Excluding, however, these possible exceptional cases, pebble beds in a geological formation indicate to us, just as certainly as shingle in an existing sea does to a navigator, a coast near at hand; that, in fact, the geologist is somewhere near the dry land that bordered the ancient sea whose deposits he is studying. The navigator would, moreover, tell us that, as a general rule, the further from land, within soundings, the finer the nature of the deposit on the sea bed. Outside the pebbles he may reasonably expect to find gravel; outside the gravel, sand; beyond the sand, gritty mud; and still further at sea, impalpable ooze. This is precisely what we should infer from the carrying powers of waters; as the strong currents, originating in the confined channels near the shores, expend themselves in the open sea, they will deposit first sand, then mud; while finally, where no off-shore currents prevail, the very finest particles will subside. The same effect virtually takes place if you agitate a mixture of gravel, sand, and dirt, in a tumbler, and leave it to settle; excepting that, instead of the sustaining power dying out in time, as within the limits of the tumbler, it continues to exhaust itself contemporaneously over the range of the current. In this rule of the distribution of sediments, we have the true key, as we shall show, to one portion of the history of geological formations; a key that, pointed out long since, has, strangely enough, never been made to serve its real purpose until very recently, and remains even now unappreciated by the majority of geologists.

The general rule of the distribution of deposits is often obscured in areas where currents are numerous and constantly shifting; and we may there find a difficulty in tracing out upon a chart, such an exact disposition as above described.

But from the very fact that the currents in such a region are so variable, thus constantly removing what they have but recently laid down, it will be less likely that their deposits will be preserved, and in our present geological studies we may disregard the exception, save to remember that it exists.

A PHILANTHROPIC TEMPERANCE MAN.

Our readers will find in another column an advertisement, for which the writer pays us one hundred and ten dollars. It offers a prize of five hundred dollars for a plan to suppress the sale of intoxicating liquors and tobacco in New Jersey. This prize is offered by a man too modest to have his name published, but who has provided guarantees of his good faith, which will be found upon perusal of the advertisement in question.

However much the possibility of securing the desired result, by the offer of such a prize, may be doubted, the man who offers it has given practical proof of his earnestness in the cause of temperance.

The field chosen for the exercise of inventive genius is a peculiarly difficult one. If our memory serves us, there is a town in New Jersey known as Hoboken, which has been a favorite Sunday resort for New York guzzlers, ever since the Sunday liquor law went into operation in this State. The man who can devise a way to prevent drinking in Hoboken will prove himself a genius of no mean order, and will fully earn the prize offered.

The Lyceum of Natural History.

The New York Lyceum of Natural History celebrated its fifty-third anniversary on the 27th of February. This organization includes, on its list of members, all of the leading scientific men of the city, and its reputation, as an active publishing society, is high in this country and in Europe.

The report of the treasurer showed the society to be out of debt, with a handsome surplus, to be carried to next year's account. During the year, Volume IX. of transactions has been completed. One hundred and six learned societies, from all parts of the world, exchange transactions and proceedings with the Lyceum, so that our New York institution is rapidly accumulating a library of great value; it does not, however, speak well for the city that the society has no permanent resting-place, nor any proper receptacle for its library and collections.

It was announced that Mr. Waterhouse Hawkins would address the next meeting, on the "Rehabilitation of extinct animals," with illustrations and drawings.

NEW PLASTIC MATERIAL.—A beautiful plastic substance can be prepared by mixing collodion with phosphate of lime. The phosphate should be pure, or the color of the compound will be unsatisfactory. On setting, the mass is found to be hard, and susceptible of a very fine polish. The material can be used extensively, applied, in modes that will suggest themselves to any intelligent artist, to high class decoration. The inventor has given it the somewhat pretentious name of artificial ivory.

TILE DRAINING.—Draining tiles, laid without collars, can be protected at the joints by laying the tiles close together, and wrapping a newspaper, two or three times folded, round the ends. This plan is better than using straw, shavings, or grass, and, when the earth is packed down on the tiles, is perfectly secure.

NOTICE TO ADVERTISERS.—The circulation of the SCIENTIFIC AMERICAN having so largely increased, we are compelled to go to press hereafter one day earlier than formerly. Advertisers must bring in their advertisements as early as Thursday to insure their publication in the next issue.

TWO HUNDRED tuns of silver ore per week pass through Salt Lake City.

A SHAFT is being forged at the Bridgewater Iron Works, Mass., that will weigh forty-two tuns.

THE new hammer in the Bessemer Steel works at Harrisburg, Pa., weighs 35,000 pounds.

[ADVERTISEMENT.]

American Institute.--Judges on Bandsawing Machines.--Singular Decision.

It is notorious that in late years the American Institute, at their bi-annual Exhibitions, award their premiums in a somewhat unaccountable, loose manner, generally rewarding new improvements and mechanical skill with second-rate premiums, and machines which are merely exhibited for advertisements, with first; this we, the undersigned, have experienced to the full extent, at the 31st Exhibition, and we think it the most glaring blunder to award a second premium for an entirely new and useful improvement, and a first premium to a second-rate machine, without any improvements; and such was the decision of those judges. The fallacy of this judgment is apparent to every one, after a short explanation.

Our aim has been, for several years, to construct a Bandsaw Machine, which will cut bevel, twist, and square, without inclining the table. After spending a great deal of time and money, we have accomplished this, and have had the first machine of this construction in constant operation, at the late Exhibition, sawing three times as much as any other rival machine, the largest as well as the finest pieces of work ever sawed with a Bandsaw, and and to our knowledge it was found by all and every practical mechanic, and especially men in that business line, the most useful, practical, and finest piece of machinery of its kind. It is so constructed that if the operator desires to cut bevel, he turns a wheel below the table, connected with a lever, and he removes the upper wheel to any desired bevel, and simultaneously moves the table, which is always kept level, and all this is done without stopping the machine. No wood slides, no work is spoiled, no saw is in danger of being broken, and the whole change is made in less than half the time it would require to incline a table.

This Machine was awarded the Second Premium.

If, on the rival Bandsaw Machine, the operator desires to saw bevel, he must be very careful not to have his work slide from the table, as he works on an inclined plane, and heavy blocks he cannot saw at all.

Such a Machine received the First Premium.

If the judges be not competent, why not ask them to resign, and have others appointed that are? And if, as they claim, the Managers cannot find competent men to serve, why not let the exhibitors of each branch elect their judges, as they formerly did, and no fault could then be found with the Managers of the Institute?

But, no! the exhibitor is entirely ignored on that question, and is at the mercy of a judge, who sometimes does not take interest enough for improvements, but is influenced by the biggest show, smooth talk, etc.

The American Institute was organized for the upbuilding of the manufacturing trade, and the encouragement of inventors; but such a course, as the above mentioned, cannot fail to discourage the same, and discredit the Institute.

We need hardly to mention that we by no means shall accept the awarded Second Premium, but refuse the same most emphatically.

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Vital Force: How Wasted and How Preserved; or, Abuses of the Sexual Function, their Causes, Effects, and Means of Cure. By E. P. MILLER, M.D. Paper, 50cts. Address MILLER, HAYNES & Co., 41 West Twenty-sixth st., New York city.

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MUNN & Co. give very special attention to the examination and prosecution of rejected cases filed by inventors and other attorneys. In such cases a fee of $5 is required for special examination and report; and in case of probable success by further prosecution and the papers are found tolerably well prepared, MUNN & Co. will take up the case and endeavor to get it through for a reasonable fee to be agreed upon in advance of prosecution.

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Are desirable if an inventor is not fully prepared to apply for a Patent. A Caveat affords protection for one year against the issue of a patent to another for the same invention. Caveat papers should be carefully prepared.

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A patent when discovered to be defective may be reissued by the surrender of the original patent, and the filing of amended papers. This proceeding should be taken with great care.

DESIGNS, TRADE-MARKS, & COMPOSITIONS

Can be patented for a term of years, also new medicines or medical compounds, and useful mixtures of all kinds.

When the invention consists of a medicine or compound, or a new article of manufacture, or a new composition, samples of the article must be furnished, neatly put up. There should also be forwarded a full statement of its ingredients, proportions, mode of preparation, uses, and merits.

CANADIANS and all other foreigners can now obtain patents upon the same terms as citizens.

EUROPEAN PATENTS.

MUNN & Co. have solicited a larger number of European Patents than any other agency. They have agents located at London, Paris, Brussels, Berlin, and other chief cities. A pamphlet containing a synopsis of the Foreign Patent Laws sent free.

MUNN & Co. could refer, if necessary, to thousands of patentees who have had the benefit of their advice and assistance, to many of the principal business men in this and other cities, and to members of Congress and prominent citizens throughout the country.

All communications are treated as confidential.

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MUNN & CO.,
No. 37 Park Row,
NEW YORK.

NEW BOOKS AND PUBLICATIONS.

A DICTIONARY OF WORDS AND PHRASES USED IN COMMERCE with Explanatory and Practical Remarks. By Thomas McElrath, late Chief Appraiser of Merchandise at the Port of New York. Part I., pp. 72, 8vo. New York: N. Tibbals & Son.

The application of science to the arts, and the increase in the number of commercial articles, have been so great during the present century, that special dictionaries of the words and phrases used in each science or trade have become indispensable. Mr. McElrath proposes to supply this want for the department of commerce, with which he became very familiar while occupying the office of Chief Appraiser at the Port of New York, and previously to that, as Corresponding Secretary of the American Institute. The design of the book is to give the technical words and phrases used in mercantile transactions, also statistical information, tariffs, weights, measures, coins, rules of exchange, maxims of law, and descriptions of most articles known in trade. We can recommend it as a valuable work of reference. The following we select as illustrations of the character of the work: "Asbestos, a mineral of the hornblende family, fibrous, flexile, and elastic, found in silky filaments which, when mixed with oil, may be woven into a fire-proof cloth, and is used in various manufactures. It is of various colors, white, green, and brown. It is employed in the manufacture of iron safes, and by the natives of Greenland it is used as the wick for lamps. It is found on the eastern side of the Alleghanies and in other parts of the United States, but it is said that nowhere is it so abundant or of so good a quality for weaving as that which is found at Staten Island, within a few miles of the city of New York. The island of Corsica is noted for the excellent quality and abundance of this mineral. It is sometimes called amianthus, and also mountain flax." . . "Bath brick, a polishing brick made of a peculiar kind of clay, a calcareous substance deposited from the river or estuary at and near Bridgewater in England. The water is conveyed into vats or pits at the high spring tides, and is left there until the clay deposits itself at the bottom of the vats, when the water is drawn off at low tide. It is then manufactured into bricks, dried, and burnt; they are of the form, and nearly the size of common building brick, and are largely imported into the United States, and are used mostly for cleaning table-knives."

MYSTERY OF EDWIN DROOD. By Charles Dickens. Price, 25 cents.

MAD MONKTON. By Wilkie Collins. Price, 50 cents.

Messrs. T. B. Peterson & Bros., of Philadelphia, have just issued the above works for general circulation through the mails.

THE PHOTOGRAPHIC WORLD.

This is a new monthly magazine, somewhat similar in character to the Philadelphia *Photographer*, and is issued by the same publishers, Messrs. Benerman & Wilson, Philadelphia, Pa. The *Photographic World* is edited by Edward L. Wilson, an able writer and practical photographer. The new magazine contains a large amount of valuable information relating to the economy and practice of the art to which it is devoted, and will doubtless attain a wide and permanent circulation.

SCRIBNER'S MONTHLY MAGAZINE.

The March number of this new and popular magazine is out, and, as usual, is full of original and interesting matter. Some of the best writers in the country contribute to this monthly. J. G. Holland, the popular author, is its editor. Scribner & Co., publishers, 654 Broadway, New York.

WE are in receipt of Nos. 1 and 2, Vol. II., of the *American Journal of Syphilography and Dermatology*. Edited by M. H. Henry, M.D., Surgeon to the New York Dispensatory Department of Venereal and Skin Diseases, and published by F. W. Christern, No. 77 University Place, New York city. It is an ably conducted quarterly journal, devoted to the dissemination of professional knowledge upon two classes of diseases, intimately connected, and unfortunately, far too prevalent. To the profession, this quarterly must possess peculiar interest.

THE SEED CATALOGUE of B. K. Bliss & Sons, for 1871, is a valuable work, of 138 large pages. In addition to full information respecting cultivation, with the names, prices, and descriptions of some two thousand species, it also contains over two hundred excellent engravings of flowers, new varieties of vegetables, etc. Some colored plates are also given. Price 25 cents. See advertisement in another column.

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.—COATING FOR BOAT BOTTOMS.—What is the best material for coating the bottoms of small pleasure boats, used partly in fresh and partly in salt water? The coating is desired to protect the bottom from fouling, and to preserve the wood.—A. A. R.

2.—CANDLE WICKS.—Is there any preparation which will prevent candle wicks from smoking and smelling badly, when the flame is extinguished?—E. D. F.

3.—IVORY KEYS.—I have attempted to glue the ivory on to a melodeon key, from which the ivory veneer had loosened. The glue shows through, changing the color of the key, and the ivory curls up. How ought I to do this work?—J. H.

4.—GLASS STOPPERS.—How are glass stoppers ground to fit the necks of bottles?—L. D.

5.—PULVERIZED SOAP.—Can hard soap be reduced to a fine granular powder? and if so, how?—M. R. C.

6.—FUSEES.—How are the fusees, used for cigar lighting, made, and what is the composition used?—L. B.

7.—KEY MAKING.—What sort of machinery is used, to cut the wards in blank keys, in large establishments?

8.—SOLDERING FLUID.—How can I make a soldering fluid for soft solder that will work well on iron, brass, or copper, and that will not require the removal of grease, or the cleansing of the surfaces to be united?—C. W.

9.—SPINNING TIN PLATE.—Can common tin plate (iron and tin alloy) be spun up successfully, like brass? I do not succeed, though I can spin up brass well enough. Can any one help me by advice in this matter?—T. J. K.

10.—GRAFTING WAX.—Will some one give the best recipe for grafting wax for use early and late in the grafting season?—J. H. A.

11.—CEMENT FOR GLASS SYRINGES.—What is a better cement for the pewter cups of glass syringes than plaster of Paris? These cups, cemented in the ordinary way, come loose when the syringes are used, and cause great annoyance. Nearly all the syringes sold for medical use are defective in this respect.—P. E. G.

12.—CANNED OYSTERS.—What is the method of canning oysters? Will some one give me the title and publisher of a good work on food preserving?—J. M.

13.—BLEACHING AND COLORING BROOM CORN.—I wish recipes for the above purposes.—F. B.

14.—PAINT FOR OLD WEATHER-BOARDING.—I wish a recipe for the cheapest and best paint for outside work, so as to save oil, in the first coating on old dry weather-boarding or brick-work.—W. O. D

Business and Personal.

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

Half Interest for sale in established Machinery Depot, new and second-hand. Steam fitting connected. Small capital, with energy, required. Address T. V. Carpenter, Advertising Agent, Box 773, New York.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4 00 a year. Advertisements 17c. a line.

After an exhaustive trial at American Institute Fair for 1870, Pratt's Astral Oil was pronounced the safest and best.

Safety Kerosene Lamps (Perkins & House's Patent). Explosion or breaking impossible; light equal to gas, and no odor. Families supplied and canvassers appointed, by Montgomery & Co., 42 Barclay st., New York, or Cleveland, O.

Skilled Workers in Wood, Iron, and Stone, please notice advertisement of Warm Spring Colony, Western North Carolina, on page 172.

C. A. Woodbury, West Woodstock, Vt., wants to know who makes Asbestos Cloth.

All parties wanting a water wheel will learn something of interest by addressing P. H. Walt, Sandy Hill, N. Y., for a free circular of his Hudson River Champion Turbine.

Ashcroft's Low Water Detector, $15; thousands in use; 17 year's experience. Can be applied for $1. Send for circular. E. H. Ashcroft, Boston, Mass.

Three Universal Wood Workers, in constant use by Barney & Smith Manufacturing Co., Dayton, O. In their letter of Feb. 17, 1871, to Messrs. McBeth, Bentel & Margedant, they say: "We purchased the first Universal Wood Worker from you in 1868, the second in 1869, and the third in 1870. We find they will do all you claimed for them, entirely satisfactory to us all. We think any one of these Machines we have in use paid for themselves during the first four months. The variety of work they do saves much labor in handling material." Address, for further information, the manufacturers, McBeth, Bentel & Margedant, Hamilton, O.

The best Corn Husker in the world, to let on royalty. One to three millions can be sold annually. See SCIENTIFIC AMERICAN, June 11, 1870. N. Evinger, Sandford, Ind.

Second-hand Corliss Engine, 12x16, wanted. Address, stating condition and price, Geo. W. Rose, Pleasantville, Pa.

Manufacturers and Dealers in Tin Foil, Foil and Fancy Papers, will please send Price List and Samples to D. Miles, Jr., 35 Water st., Boston.

Wanted.—Machines for manufacturing Pails, Tubs, and Matches. Also, competent man to superintend construction of buildings, and manage all parts of business when complete. Address, with descriptive circulars, price, etc., No. 266 Lexington avenue, New York.

Turbine Water Wheels, Portable and Stationary Engines, Gang and Circular Saw Mills, Rolling Mill Machinery, and Machinery for Axe Manufacturers, manufactured by Wm. P. Duncan, Bellefonte, Pa.

For best Power Picket Header in use, apply to Wm. P. Duncan, Bellefonte, Pa.

New Blind Wirer and Rod Cutter. B. C. Davis & Co., Binghamton, N. Y.

Those having smoke-consuming devices, for burning shavings, saw dust, etc., address, with particulars, Geo. Starr, Danbury, Conn.

Self-testing Steam Gage. There's a difference between a chronometer watch and a "bull's eye." Same difference between a self-tester and common steam gage. Send for Circular. E. H. Ashcroft, Boston, Mass.

See advertisement of L. & J. W. Feuchtwanger, Chemists.

H. W. Noyes, Agent for sale of Patent Rights and Patent Goods, North Bridgewater, Mass. Agencies solicited.

$3.50. Stephens' Patent Combination Rule, Level, Square, Plumb, Bevel, etc. See advertisement in another column. Agents wanted.

Wanted.—An experienced and steady man as Foreman of Molders. Apply to Butterworth & Lowe, Engine Builders and Machinists, Grand Rapids, Mich.

Only at 63 Union st., Boston, Crane's Patent and Canvas Signs.

American Boiler Powder Co., Box 315, Pittsburgh, Pa., make the only safe, sure, and cheap remedy for "Scaly Boilers." Orders solicited.

Planing, Sawing, Mortising, Boring, and other Machines, especially arranged for Car Work, from new designs, built by Richards, Kelley & Co., Philadelphia.

Peck's Patent Drop Press. For circulars address the sole manufacturers, Milo, Peck & Co., New Haven, Ct.

Wanted.—An Analytical Chemist. Good references required. Address M. A., Post Office Box No. 2900, New York.

Belting that is Belting.—Always send for the Best Philadelphia Oak-Tanned, to C. W. Arny, Manufacturer, 301 Cherry st., Phil'a.

E. Howard & Co., Boston, make the best Stem-winding Watch in the country. Ask for it at all the dealers. Office 15 Maiden Lane, N. Y.

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

The best place to get Working Models and parts is at T. B. Jeffery's, 160 South Water st., Chicago.

"Edson's Recording Steam Gage and Alarm," 91 Liberty st., N. Y. Recommended by U. S. Inspectors as protection to good engineers, the charts showing quality of work performed.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro, 414 Water st., N. Y.

First-class Gage Cocks, at E. H. Ashcroft's, 55 Sudbury st., Boston, for $10.80 per dozen.

Thomson Road Steamers save 50 per cent over horses. D. D. Williamson, 32 Broadway, New York.

Improved Foot Lathes. Many a reader of this paper has one of them. Selling in all parts of the country, Canada, Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Steel name stamps, figures, etc. E. H. Payn, M'f'r, Burlington, Vt.

Cold Rolled-Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

Keuffel & Esser 116 Fulton st., N. Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves

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

For the best Self-regulating Windmill in the world, to pump water for residences, farms, city buildings, drainage, and irrigation, address Con. Windmill Co., 5 College Place, New York.

The Merriman Bolt Cutter—the best made. Send for circulars. H. B. Brown & Co., Fair Haven, Conn.

Taft's Portable Hot Air, Vapor and Shower Bathing Apparatus. Address Portable Bath Co., Sag Harbor, N. Y. (Send for Circular.)

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.

For Fruit-Can Tools, Presses, Dies for all Metals, apply to Bliss & Williams, successor to May & Bliss, 118, 120, and 122 Plymouth st., Brooklyn, N. Y. Send for catalogue.

McCauley's Improved Force Pump, especially adapted to deep wells. Send for Circular. R. A. McCauley, Baltimore, Md.

2d hand Worthington, Woodward and Novelty Pumps, Engines 25 to 100 H. P., 60 Horse Loc. Boiler. W. D. Andrews & Bro., 414 Water st., N. Y.

Wanted.—A Partner, with capital, in a newly invented Gun. Address A. H. Townsend, Georgetown, Colorado.

Agents wanted, to sell the Star Bevel. It supersedes the old style. Send for Circular. Hallett & White, West Meriden, Conn.

English and American Cotton Machinery and Yarns, Beam Warps and Machine Tools. Thos. Pray, Jr., 57 Weybosset st., Providence, R. I

House Planning.—Geo. J. Colby, Waterbury, Vt., offers information of value to all in planning a House. Send him your address.

For small, soft, Gray Iron Castings, Japanned, Tinned, or Bronzed, address Enterprise Manufacturing Company, Philadelphia.

Dickinson's Patent Shaped Diamond Carbon Points and Adjustable Holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24 and Nov. 20, 1869. 64 Nassau st., New York.

Conklin's Detachable Rubber Lip, for bowls, etc., works like a charm. For Rights, address O. P. Conklin, Worcester, Mass., or A. Daul, Philadelphia, Pa.

To Ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's Manufacturing News of the United States. Terms $4 00 a year.

Answers to Correspondents.

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

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

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

PASTE.—A correspondent wishes paste that will keep. Let him first prepare in the ordinary way a good flour or starch paste. It can be preserved by adding to it a small quantity of brown sugar, then corrosive sublimate in fine powder in the proportion of about a teaspoonful to the pint of paste; add also a teaspoonful of oil of lavender, or rosemary, or cloves, or any of the essential oils, and a few drops of carbolic acid, and stir well with a wooden spatula. This paste will keep for any length of time "perfectly pure." The *rationale* is this: The corrosive sublimate ensures it against fermentation, and the essential oil and carbolic acid, against mold. Corrosive sublimate in the above is a poisonous agent, but it is not expected, that the paste is to be eaten because of its containing sugar; and in the use of it as paste it is not in the least dangerous, as we all handle with impunity many things more poisonous than this. I do not know in what climate friend "Query 11" resides, but in our Alabama climate—where I now sit in my room, with no fire, windows up, coat off, and thermometer 70° precisely, this 17th February—I find no trouble in preserving paste prepared as above all the year round. If he should find any difficulty in its keeping qualities, he has only to increase a little the preserving ingredients.—B. F. R., of Ala.

ANOTHER.—A correspondent sends the following, found in the Boston *Journal of Chemistry:* Dissolve a teaspoonful of alum in a quart of warm water. When cold, stir in as much flour as will give it the consistency of thick cream, being particular to beat up all the lumps; stir in as much powdered rosin as will lie on a dime, and throw in half a dozen cloves to give a pleasant odor. Pour this flour mixture into a pan containing a teacupful of boiling water, and stir it well over the fire. In a very few minutes it will be of the consistency of mush. Pour it into an earthen or china vessel; let it cool; lay a cover on, and put in a cool place. When needed for use, take out a portion and soften it with warm water. Paste thus made will last twelve months. It is better than gum, as it does not gloss the paper, and can be written on.

CHEAP BATTERY.—Let L. D. take a gallon stone jar, and put in it a sheet of zinc bent to fit it; inside of the zinc put a porous cup, either of porcelain, unglazed earthen or stone ware, or an unglazed flower pot, with the hole in bottom stopped by waxed cork, or wax. Put a saturated solution of sulphate of copper inside the porous cup, and solution of common salt outside in stone jar. Put a piece of sheet lead or copper in the blue vitriol solution, and fasten soft copper wire both to zinc and lead, either by solder, or tied through a hole. Better get "Napier on Electro Metallurgy," or a work imported by Thomas Hall, Boston, before attempting to do much. I enclose specimen of electroplate by such battery, which has now run for twenty-three days continuously.—A. G. [The specimen referred to shows the battery to be quite effective.—EDS.

BOOT BLACKING.—W. H. P. will find the following a good recipe: Ivory black, "killed" with a tablespoonful alcohol, ¼ pound; sweet oil, 1 fluid ounce; molasses, ½ pint; hydrochloric acid, 1 ounce; sulphuric acid, 1 ounce; mix the first three ingredients, add the acids, and 3 pints of vinegar if it is to be liquid blacking. No "challenge blacking" equals this.

JOURNAL OF MILL SPINDLE.—We would suggest to H. A. S. the use of a cast-iron step, and to put a little pure plumbago in the oil. The plumbago makes the iron more slippery than Babbitt, while if there be any wear the plumbago is harmless, and the iron beneficial to health.—B. & W.

E. H. C., of Mo., desires us to give an opinion of the cause of a boiler explosion, from a brief description forwarded by him. We respectfully decline to give opinions of this kind, unless we have opportunity for personal examination.

L. A. S., of N. Y.—We recommend you the Polytechnic School, at Stuttgard, as being probably the best in Germany for an American to attend.

Dr. R. M., of Pa.—We know of no work which specially treats of drying lumber by artificial heat. Various articles on this subject have appeared from time to time in the SCIENTIFIC AMERICAN.

J. W., of Pa.—The "Painter, Gilder, and Varnisher's Companion," published by Henry Carey Baird, of Philadelphia, contains the information you seek.

F. L. C., of Ohio.—The application of a rod to dampers to regulate the draft in furnaces, by expansion and contraction, is the same idea you advance for a perpetual motion.

Recent American and Foreign Patents.

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

WASH BOILER.—T. U. Parker, Mifflintown, Pa.—This invention relates to an automatic wash boiler, and consists in attaching transverse ribs to the upper side of the false bottom, for supporting the clothes above the water line, and provides the vertical discharge tubes with perforated "rose heads," whereby water is delivered over the whole surface of the clothes.

MOWER AND REAPER.—Daniel Mulock, Mount Hope, N. Y.—This invention relates to a new mower and reaper, which is so constructed that it can be used with suitable speed of the cutters, and without side draft. The invention consists in a novel arrangement of gearing for varying the speed; in a new method of balancing the cutter bar, so that it will not drag on the ground, nor be injured by protuberances; in a new manner of constructing the cutter bar and finger bar for strengthening the same; in a novel manner of arranging stationary end cutters on the finger bar, to prevent clogging at the ends; in a new adjustable wedge, for regulating the degree of inclination of the finger bar; and in a novel construction and arrangement of joints and shafting for the parts, and novel construction of braces.

REVOLVING BATTERY GUN.—R. J. Gatling, Indianapolis, Ind.—The object of this invention is to perfect the mechanism of the original Gatling gun, in such manner that more satisfactory operation, greater strength and durability, and simpler construction will be obtained. The invention consists chiefly in making the "cocking cane" laterally adjustable, so that the same may, while experiments are made with the gun without firing the same, be drawn out to not snap the locks, and that it may also be easily set in to operate the locks when firing is to be carried on. The cocking cane is also made longitudinally adjustable, for the purpose of varying thereby the force of the spring which operates the lock hammer. Some kinds of cartridges are made of thicker metal than others, and require, consequently, stronger blows in order to explode their fulminates. It is therefore very essential that the blow should be regulated in accordance with the material of which the cartridges are made. The invention consists, also, in perforating the cascabel plate and the back diaphragm in the outer casing, and in closing the apertures through both these plates by a removable plug, for the purpose of enabling the removal and reinsertion of either one or more of the locks, without requiring the cascabel plate to be taken off. The repair or inspection of all parts of the gun is thereby considerably facilitated.

ADJUSTABLE ANIMAL POWER.—N. Potter, East Troy, Pa.—This invention has for its object to furnish an improved animal power, which shall be so constructed that the inclination of the track may be increased or lessened, as may be required, without stopping the machine, removing the animal, lengthening or shortening the endless band, or affecting any of the operating parts of the machine.

FENCE.—John Waddle, Bakerstown, Pa.—This invention has for its object to furnish an improved fence, simple and economical in construction and durable in use, and which is designed for use as a stationary or portable fence, as may be desired.

STEAM AND WATER ENGINE.—H. J. King and D. C. Mulock, Middletown, N. Y.—This invention relates to several improvements in the construction of the valve gear and other working mechanism of steam and water engines, and consists in a novel construction of valve, cut-off, piston, crosshead, and valve gear, all arranged with an object of simplifying the construction of the machinery and avoiding friction.

COTTON PLANTER.—R. F. Norwood, Charlotte, N. C.—This invention relates to improvements in feed apparatus for dropping cotton seed fertilizers and the like, and it consists in a grooved revolving cylinder, arranged in the bottom of the hopper, to receive the seed in the grooves, through a pair of vibrating gates above, operated by the attendant, and a spring cutting-off gate, which permits the discharge from more than one of the grooves at once, said spring being pushed back, to open the passage for the seed, by pins projecting from the roller, and the latter being turned by connection with the wheel on which the machine is mounted.

LIFTING JACK.—B. F. Johnson, Glasgow, Mo.—This invention relates to improvements in lifting jacks for lifting wagons and other articles, and it consists in a novel arrangement, with a stand, of a vertically movable lifting block, operating lever, and holding pawl.

COUNTERSINKING AND REAMING ATTACHMENT TO BORING INSTRUMENTS.—F. H. Palmer, Foxcroft, Me.—This invention relates to improvements in attachments for boring instruments, and consists in a countersink and rreame, provided with a kind of clamping attachement which may be clamped on the shank of a boring instrument, and so adjusted that either one may be used as it is required to countersink or ream the hole at the same time that it is bored.

SEWING MACHINE TREADLE.—F. E. Mills, California, Cal.—The nature of this invention consists in so constructing the foot board and other parts of the treadle, relative to its axis, that the ankle joint of the operator may be always placed in line with the center of motion of the treadle, and held there, thereby saving that unnecessary exertion and waste of power occasioned by the motion of the entire lower limb, whenever the ankle is in any other position.

STEAM AND HYDRAULIC PRESS.—John F. Taylor, Charleston, S. C.—This invention relates to a press for cotton or any other material, in which the platen is operated by the introduction beneath it of oil or some other liquid under pressure, communicated to said liquid by the pistons of a steam cylinder, and in which the platen is lowered by its own weight, and the expansion of the material compressed, both acting through the medium of the liquid upon the pistons, which are permitted to yield by the opening of valves in the ends of the cylinders in rear of the pistons, through which steam escapes before the returning pistons; the pistons acting upon the platen alternately, one to impart the initial pressure, and the other the finishing pressure; the piston that imparts the initial pressure being operated by the exhaust steam of the other cylinder, which steam having then done all that is required of it, is discharged into the atmosphere; and the piston that imparts the finishing pressure being operated by live steam from the boiler, which steam is subsequently discharged into the other cylinder there to communicate another initial pressure to the platen.

NAIL MACHINE.—Henry Reese, Baltimore, Md.—This invention consists in an arrangement of quadrant blocks and operating gear, whereby a heated rod introduced into transverse grooves between the blocks is reduced to a headless nail, and cut off by the blocks, which move in opposite directions. The head of the nail is formed by a subsequent operation.

SELF-LOADING DUMPING CART.—Ansell P. Boutt and John J. Keeton, Liberty Mills, Va.—This invention consists of a mechanism for holding the body of a dumping cart inclined so as to scrape up earth, and of a mechanism by which certain hoes, located within the cart body, are operated to draw the loosened earth into the same, and of a device for holding the cart body horizontal while in route to or from the place where it is employed in excavating.

FIRE-ESCAPE LADDER.—William B. Peregoy, Baltimore, Md.—This invention relates to a ladder made in curved sections that are jointed together, one end of the ladder being attached to the periphery of a drum stationed inside any one of the upper windows of the building, and provided with means for its revolution, from which drum the ladder may be uncoiled and let down to the ground or pavement.

COMBINED COTTON PLANTER AND GUANO DISTRIBUTOR.—J. H. Nicholes, Sumter, S. C.—This invention has for its object to furnish an improved machine for planting cotton seed and distributing guano, which shall be simple in construction, effective and reliable in operation, and convenient in use.

ODOMETERS.—David L. Branning, Tampa, Fla.—This invention relates to improvements in odometers, and consists in an arrangement of adjustable arms on the axle, to which motion is imparted by the wheel of the vehicle which arms may be set for indicating the distance travelled by the wheels different diameters. It also consists in a combination with the said arms secondary set, pivoted to the frame, and arranged for indicating the fractions of miles.

WASHING MACHINE.—William C. Bain and John J. Kendall, Troy's Store, N. C.—This invention relates to new and useful improvements in machines or washing clothes.

SAWING MACHINE.—N. H. Bolton, Onlro, Wis.—This invention relates to mprovements in sawing machines, whereby it is designed to provide a machine for sawing the "spalts," or waste blocks, from shingle machines, into shingles, in a manner to utilize the whole of the timber, of which a considerable percentage is now wasted, owing to the fact that, in most shingle machines, the stock cannot be wholly worked up, the holding dogs being in he way of the saws.

OPERATING ANNULAR CIRCULAR SAWS.—George W. Lombard, Westminster, Mass.—This invention consists in facing or lining the beveled groove of the driving wheel, and also the grooves of the support or guide, with raw hide or equivalent material, and also in substituting adjustable stationary supports for the ordinary rotating supports.

SWORD SCABBARDS.—Virgil Price, New York city.—This invention has for ts object to so improve iron and steel scabbards that the same will be protected from corrosion, strengthened so as not to be readily indented, and made less expensive than the metallic scabbards heretofore in use. The invention consists in providing an iron or steel scabbard with a plating of nickel.

LAMP CHIMNEY.—James M. Rankin, Jr., Brooklyn, N. Y—This invention has for its object to furnish an improved lamp chimney, which shall be so constructed and formed as to cause a more perfect combustion of the escaping and ignited gases, give a better shape to the flame, and a more perfect dissemination of light than the chimneys constructed in the ordinary manner.

COMBINED CRIMPING AND SAD IRON.—Charles Anderson, Montana, Iowa.—This invention has for its object to furnish an improved sad iron, which shall be simple in construction, conveniently manipulated, and which may be used for crimping or ironing, as may be desired.

STEAM ENGINE.—Powell F. Nickerson, Smyrna, Del.—This invention relates to a new and useful improvement in steam engines, and consists mainly in giving the cylinder a longitudinal movement at each stroke of the piston.

WHEEL FOR VEHICLES.—Daniel Mulock, Mount Hope, N. Y.—This invention relates to a new manner of securing spokes to the hubs of wheels, and to a novel construction of indented tire for the same.

SIGHTS FOR FIREARMS.—Frederic A. Churchill, Pittsfield, Mass.—This invention relates to a new construction of sights for fire-arms of all kinds, both in front and rear.

FAUCET.—W. C. Wise and John Ashman, Chelsea, Mass.—This invention relates to new and useful improvements in faucets for the discharge or stoppage of water, steam, or gas, and it consists mainly in the use of an elastic floating ball valve, which is pressed to its seat by a screw stem or pindle, upon the end of which is an adjustable cone, for bearing on the valve.

GRAIN SEPARATOR AND FANNING MILL.—S. S. Hammond and John S. Paden, North East, Pa.—This invention relates to improvements in the arrangement of mills for separating and fanning grain, and has for its object to provide clear, unobstructed air passages for the artificial draft, and ready access to all parts.

MACHINE FOR CUTTING AND MITERING PRINTERS' RULES.—F. H. Aiken, Franklin, N. H.—This invention relates to improvements in machinery for cutting and mitering printers' rules, and it consists in an arrangement, on one portable base, of a shear and gage for cutting the plates; also an adjustable holder and a reciprocating dressing tool for mitering the rules.

COMBINED HEATING AND COOK STOVE.—Lemuel Dunham, Lincoln Center, Me.—This invention relates to improvements in stoves, and it consists in a cooking attachment to what is known as the Franklin heating stove.

WASHING MACHINE.—Theophilus Beebe, Northport, N. Y.—This invention relates to improvements in machines, and it consists in a fixed rubber of round rods of wood connected to the end pieces, forming about one sixth of a circle, more or less, placed in a case, so as to be readily removed, and a suspended rubber consisting of a grooved board, which is suspended on journals supported on springs and adjusting screws, in posts at one side of the case, in a manner to allow a wide range of movement to the said rubber, for accommodating it to the quantity of clothes in hand.

GRAIN DRYER.—John Buckingham, Wethersfield, Conn.—This invention relates to improvements in grain-drying apparatus, and it consists in a combination of steam heating coils and ventilators, in a bin or other chamber, through which the grain is caused to flow slowly from top to bottom, in a simple and efficient manner, for applying the heat and carrying off the vapor generated thereby.

Official List of Patents.

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112,104.—TOY PROPELLER.—Arthur M. Allen, New York city. Antedated February 11, 1871.
112,105.—SAD AND CRIMPING IRON.—Charles Anderson, Montana, Iowa.
112,106.—PYROMETER.—William Henry Bailey, Albion Works, Salford, Great Britain.
112,107.—WASHING MACHINE.—William C. Bain and John J Kendall, Troy's Store, N. C.
112,108.—WRENCH.—Elias Beach, Titusville, Pa.
112,109.—WRENCH.—Elias Beach, Titusville, Pa.
112,110.—WASHING MACHINE.—Theophilus Beebe, Northport, N. Y.
112,111.—APPARATUS FOR CARBURETING AIR.—Alexander Dairymple Bell, San Francisco, Cal.
112,112.—CHEESE-TURNING APPARATUS.—John Q. Black, Richland Center, Wis.
112,113.—STRAW CUTTER.—Bengt C. Blomsten, Waupaca, Wis.
112,114.—SAWING MACHINE.—N. H. Bolton, Omro, Wis.
112,115.—DRILL.—Theodore V. Boyden, Bridgeport, Conn.
112,116.—ODOMETER.—David L. Branning, Tampa, Florida.
112,117.—FEED CUTTER.—Henry A. Buck, Fredonia, N. Y.
112,118.—GRAIN DRYER.—John Buckingham, Wethersfield, Conn.
112,119.—SELF-CENTERING CHUCK FOR LATHES.—George O. Buckley, New Bedford, Mass.
112,120.—APPARATUS FOR HEATING LIQUIDS.—David H. Burrell, Little Falls, N. Y.
112,121.—PROJECTILE FOR ORDNANCE.—John G. Butler, United States Army.
112,122.—HOT AIR FURNACE.—Benjamin F. Campbell, Boston, Mass.
112,123.—DOOR KEY.—Charles C. Carpenter, Huntsville, Ala.
112,124.—GUN SIGHT.—Frederic A. Churchill, Pittsfield, Mass.
112,125.—SHUTTLE FOR SEWING MACHINES.—Theodore Colston (assignor to himself and Charles E. Billings), Hartford, Conn.
112,126.—LAP BOARD.—Daniel P. Cook, Hartford, Conn.
112,127.—MAGAZINE FIRE ARM.—Joshua Davis, Limestoneville, Pa.
112,128.—WATER WHEEL CURB.—Walter S. Davis, Warner, N. H.
112,129.—PRESERVING FISH BY FREEZING.—Samuel H. Davis and David W. Davis, Detroit, Mich.
112,130.—MEADOW CULTIVATOR.—Frank Philip Davenport, Carthage, Ill., assignor to himself, John W. Cherry, and Thomas Logan.
112,131.—CORN-HUSKING BENCH.—Joel E. Draper, Northville, assignor to himself and Robert Dunlap, 1st, South Lyons, Mich.
112,132.—COOKING STOVE.—Lemuel Dunham, Lincoln Centre, Me.
112,133.—PORTABLE FEED RACK.—Edwin Farquhar, Aukenytown, Ohio.
112,134.—ATTACHING KNOBS TO THEIR SPINDLES.—William A. Fenn, Rochester, N. Y.
112,135.—TRACTION ENGINE.—George W. Fitts, Oberlin, Ohio.
112,136.—PRESERVING BLOCKS OF WOOD.—Edgar M. Fowler, New York city.
112,137.—LIGHTNING ROD.—Joseph R. Fricke, Pittsburgh, Pa.
112,138.—REVOLVING BATTERY GUN.—Richard Jordan Gatling, Indianapolis, Ind.
112,139.—BEE HIVE.—Joseph H. Gisler, St. Louis, Mo.
112,140.—BALING SHORT-CUT HAY OR STRAW.—William Hadwin, Rochester, N. Y., assignor to himself and Isaac S. Wilson.
112,141.—GRAIN SEPARATOR AND FANNING MILL.—Samuel S. Hammond and John L. Paden, North East, Pa.
112,142.—EXTRACTOR FOR OIL WELLS.—Hart Harris, Tidioute, Pa.
112,143.—SCREW DRIVER.—Henry L. Hildreth, Lockport, N. Y.
112,144.—PROJECTILE FOR ORDNANCE.—B. B. Hotchkiss, New York city.
112,145.—BELT GEARING.—George C. Howard, Philadelphia, Pa.
112,146.—LAWN MOWER.—Amer Ingrham (assignor to William L. Boyer & Brother), Philadelphia, Pa.
112,147.—HARVESTER.—Isaac A. Johnson (assignor to himself and Frederick H. Manny), Rockford, Ill.
112,148.—SHIPS' WINDLASS.—Christopher Coatsworth Jordeson, Montreal, Canada.
112,149.—HARROW AND FIELD ROLLER.—Abraham S. Keagy, Harristown, Ill.
112,150.—ANIMAL POKE.—Lewis Kelley (assignor to himself and Joel Andrews), Saranac, Mich.
112,151.—STEAM AND WATER ENGINE.—Henry James King and Daniel Charles Mulock, Middletown, N. Y.
112,152.—STUBBLE ATTACHMENT FOR PLOWS.—Jesse Kinney, London, assignor to himself and Cyrus Kinney, Ingersoll, Canada.
112,153.—SEPARATING METAL FROM ORES.—Solomon W. Kirk, Philadelphia, Pa.
112,154.—COMPOSITION FOR POLISHING.—Carl J. H. F. Kleemann (assignor of one half his right to Arnold C. Franck), New York city.
112,155.—MACHINE FOR PATCHING, PUNCHING, AND EMBOSSING BUTTON HOLES OF PAPER COLLARS.—Charles Lang, Jersey City, N. J., assignor of one half his right to Henry G. Clagstone, New York city.
112,156.—SAWING MACHINE.—George W. Lombard, Westminster, Mass.
112,157.—PUMP.—David Loomis, Joy Winters, and Albert Stark, Clyde, Ohio.
112,158.—SPRING BED BOTTOM.—Joseph E. Lord, Quincy, Ill.
112,159.—GOVERNOR FOR STEAM ENGINES.—John Augustus Lynch, Boston, Mass.
112,160.—URN FOR STOVES.—Orville F. Mack, Charlestown, Mass.
112,161.—CORN AND COTTON SCRAPER, ETC.—Cyrus Marsh, 2d, Natchez, Miss.
112,162.—TREADLE FOR SEWING MACHINES.—F. E. Mills, San Francisco, Cal.
112,163.—EXPLOSIVE COMPOUND.—William Mills, New York city.
112,164.—PORTABLE FURNACE.—D. B. Montague, Springfield, Mass.
112,165.—PORTABLE BOOK HOLDER.—Chas. C. Moore, New York city.
112,166.—HARVESTER.—Daniel Mulock, Mount Hope, N. Y.
112,167.—WHEEL FOR VEHICLES.—Daniel Mulock Mount Hope, N. Y.
112,168.—STAIR AND FLOOR PLATE.—Peter W. Neefus, New York city.
112,169.—COMBINED COTTON PLANTER AND GUANO DISTRIBUTER.—John H. Nicholes, Sumter, S. C.
112,170.—STEAM ENGINE.—Powell F. Nickerson, Smyrna, Del.
112,171.—COTTON PLANTER.—Rufus F. Norwood, Charlotte, N. C.
112,172.—CHANDELIER GAS BURNER.—Rufus Nutting, Randolph, Vt.
112,173.—FAUCET.—Cornelius B. O'Sullivan, New Orleans, La.
112,174.—GATE.—C. N. Owen, Salem, Ohio.
112,175.—MATTRESS.—W. H. Pack and J. S. Vanhorn, Jersey City, N. J.
112,176.—COUNTERSINK.—F. H. Palmer, Foxcroft, Me.
112,177.—PUMP.—John S. Patric (assignor to Hiram Lawton) Rochester, N. Y.
112,178.—STOVE-PIPE THIMBLE.—Jas. D. Pierce (assignor to himself and John B. Smith), Milwaukee, Wis.
112,179.—ADJUSTABLE ANIMAL POWER.—Nicholas Potter, East Troy, Pa.
112,180.—BALDRIC.—Virgil Price, New York city.
112,181.—METHOD OF COATING AND FINISHING SWORD SCABBARDS.—Virgil Price, New York city.
112,182.—LAMP CHIMNEY.—J. M. Rankin, Jr., Brooklyn, N. Y. Antedated February 24, 1871.
112,183.—VALVE FOR CONDENSERS.—George H. Reynolds (assignor to himself and Cornelius H. Delamater, and A. K. Rider), New York city.
112,184.—SEWING MACHINE TREADLE.—Leo W. Sapp, Cleveland, Ohio.
112,185.—BOTTLE STOPPER.—Friedrich Schlich (assignor to himself and Adrian Feyh), New York city.
112,186.—LUMBER WAGON.—Jacob Skeen, Mound City, Mo.
112,187.—GEARING AND UNGEARING PINIONS AND WHEELS.—John Skinner, Hadley, Mich.
112,188.—FIREPLACE.—John Smith, Brantford, Canada.
112,189.—SEWING MACHINE.—W. T. Smith (assignor to himself and W. T. Maher), West Zanesville, Ohio.
112,190.—VENTILATOR.—D. M. Sprogle and J. E. Dickson, Annapolis, Md.
112,191.—CORN HARVESTER.—Clement S. Stull, Poolesville, Md.
112,192.—TWEER.—Peter Sweeny, New York city.
112,193.—FLEXIBLE FASTENING FOR GLASS.—W. H. Taylor, Stamford, Conn.
112,194.—FENCE.—J. W. Teller and Wm. Townsend, Lapeer, Mich.
112,195.—STEAM HEATER.—Walter Thomson, Detroit, Mich., assignor to "Detroit Novelty Works."
112,196.—HORSE COLLAR.—William J. Thorn, New York city.
112,197.—MACHINE FOR FELTING HAT BODIES.—Joseph Vero, Dewsbury, near Leeds, England.
112,198.—FENCE.—John Waddle, Bakerstown, Pa.
112,199.—FIREPLACE.—J. W. Wetmore, Erie, Pa.
112,200.—MODE OF ATTACHING SPOKES TO WHEELS.—Jefferson G. Wiggins (assignor to J. S. Galletine), Lima, N. Y.
112,201.—MEDICAL COMPOUND OR LINIMENT.—G. S. Wood, Vassalborough, Me.
112,202.—WATER WHEEL.—Larnard M. Wright, Fort Edward, N. Y.
112,203.—JEWELER'S COMBINED CALIPERS AND POLISHING TOOL.—F. E. Allen, Keene, N. H.
112,204.—TARGET ALARM.—Andreas Anderhub (assignor to John Bayer), New York city.
112,205.—COOPER'S CROZE.—Vincent Applegate, Marline P Jacobs, and S. R. Roby, Harrison county, Ind.
112,206.—BURNING HYDROCARBON LIQUID FOR LIGHT.—T. J Barron, Brooklyn, E. D., N. Y.
112,207.—ELECTRICAL TICKET CHECKING APPARATUS.—Marcus Bebro, Manchester, Great Britain.
112,208.—SADIRON HEATER.—George Benns (assignor to L. M. West), Rockford, Ill.
112,209.—COMBINED COTTON CHOPPER, SCRAPER, ETC.—W C. Bibb, Madison, Ga.
112,210.—DOOR CHECK.—Charles Bird, Lower Merion township, assignor to himself, Chas. J. Field, and T. P. Sargent, Philadelphia Pa.
112,211.—KEYLESS PADLOCK.—Wilson Bohannon, Brooklyn, N. Y., assignor to American Seal Lock Co., New York city.
112,212.—SHOVEL PLOW.—Francis H. Bowlds, Fairfield, Ky.
112,213.—TRITURATOR.—Elijah Brady, New York city.
112,214.—APPARATUS FOR LIFTING BARRELS, ETC.—John S. Brewer, Chicago, Ill.
112,215.—STREET CAR.—C. B. Broadwell (assignor to himself and Ignatius Caulfield), New Orleans, La.
112,216.—STOP VALVE.—Sidney Broadbent and W. B. Culver, Scranton, Pa.
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112,218.—CARPENTERS' PLANE.—James Raymond Brown, and William Brown, Boston, Mass.
112,219.—WATER WHEEL.—Henry Bushnell, New Haven, Conn.
112,220.—APPARATUS FOR HEATING PROPAGATING BEDS.—William Chalmbers, Philadelphia, Pa.
112,221.—HEDGE TRIMMER.—George Clark and S. P. Clark, Dover, assignors to themselves and F. B. Ives, Princeton, Ill.
112,222.—STEAM SAFETY VALVE.—G. H Clemens, Chicago, Ill.
112,223.—BINDER FOR SEWING MACHINES.—J. L. Coles (assignor to himself and J. W. Corey), Newark, N. J.
112,224.—BALING PRESS.—T. J. Corning, San José, Cal.
112,225.—SHUTTER FASTENER.—J. L. Devol, Parkersburg, West Va.
112,226.—FERMENTATION AND PURIFICATION OF ORGANIC SUBSTANCES.—Rudolph D'Heureuse, New York city.
112,227.—SAW.—Henry Disston, Philadelphia, Pa.
112,228.—MORTISING MACHINE.—William Downing and W. H. Soley (assignors to Westford Warner), Philadelphia, Pa.
112,229.—RAILWAY CAR SPRING.—Richard Dudley and Benjamin Hershey, Erie, Pa.
112,230.—OPERATING ORDNANCE.—J. B. Eads, St. Louis, Mo.
112,231.—LOZENGE-CUTTING MACHINE.—W. P. Eayrs, Nashua, N. H.
112,232.—APPARATUS FOR TANNING.—L. C. England, Philadelphia, Pa.
112,233.—HEATING APPARATUS.—M. G. Fagan (assignor to himself and A. C. Corse), Troy, N. Y.
112,234.—PLOW.—J. B. Ferguson and S. M. White, Big Lick, Va.
112,235.—CLOTHES RUBBER.—Seymour Foster, Lansing, Mich.
112,236.—MODE OF FASTENING HARROW TEETH.—George Fry, Newaygo, Mich.
112,237.—NECK-TIE RETAINER.—E. B. Gibbud (assignor to himself and B. H. Bradley), Waterbury, Conn; said Gibbud and Bradley assignors to John Bachelder, Norwich, Conn.
112,238.—WRENCH AND OILER.—E. B. Gifford, Westport, Mass. Antedated Feb. 22, 1871.
112,239.—WOODEN PAVEMENT.—Jackson Grant, Milwaukee, Wis.
112,240.—SPOON.—Florian Grosjean, Brooklyn, N. Y.
112,241.—STRAW CUTTER.—P. P. Gross, Palmyra, Mo.
112,242.—ELECTRO-MAGNETIC SIGNAL APPARATUS.—Augustus Hahl (assignor to the Electric Clock and Bell Co.), Washington, D. C.
112,243.—BEE HIVE.—H. S. Harned and F. S. Elliott, Boonesborough, Iowa.
112,244.—LADIES' SUPPORTING BRACE.—Marx Harris, New York city. Antedated Feb. 17, 1871.
112,245.—GUIDE FOR SEWING MACHINES.—Franz Herterich, Jersey City, N. J.
112,246.—GRATE FOR BURNING COAL SCREENINGS.—G. W. Hildreth, Lockport, N. Y.
112,247.—ANCHOR.—W. M. Hughes, San Francisco, Cal.
112,248.—BOLT-HEADING MACHINE.—Thomas Hull and Nicholas Thomas, Chicago, Ill.
112,249.—PRINTING PRESS.—G. W. Hunt (assignor to himself, George Place, and C. F. Hardwick), New York city.
112,250.—FLOOD FENCE.—C. R. Hunter, Douglas, Ill.
112,251.—HORSE POWER.—J. W. Huntoon, St. Louis, Mo.
112,252.—WAGON BRAKE.—Reuben Hurd, Morrison, Ill.
112,253.—MACHINE FOR WARPING YARN.—Daniel Hussey Lowell, Mass.
112,254.—ROCK DRILL.—Simon Ingersoll, Brooklyn, N. Y.
112,255.—METHOD OF FORMING SPUR-LIP OF AUGER BITS.—W. A. Ives, New Haven, Conn.
112,256.—LOW WATER INDICATOR.—Hiram Kimball, Randolph, Vt. Antedated Feb. 23, 1871.
112,257.—HEAD BLOCK FOR SAW MILLS.—W. A. L. Kirk, Hamilton, Ohio.
112,258.—CHEST PROTECTOR.—Peter Lear, Boston, Mass.
112,259.—SOAP COMPOUND.—Henry Loos, Lawrence, Kansas.
112,260.—STOVE-PIPE DAMPER.—W. H. Lutz (assignor to himself and William Boas), Lancaster, Pa.
112,261.—LATH MACHINE.—J. C. Mackay, Ionia, Mich.
112,262.—BEE HIVE.—Gideon Marsh, Steamburg, N. Y.
112,263.—HARVESTER.—J. S. Marsh, Lewisburg, Pa.
112,264.—PAPER-FOLDING MACHINE.—John McAdams, Brooklyn, N. Y.
112,265.—FEED CUTTER.—J. B. McClinton and William McClinton, Galion, Ohio.
112,266.—TEA KETTLE.—C. W. McClure and W. A. Shepard, Wooster, Ohio.
112,267.—COMBINED HARVESTER AND BINDERS.—J. M. McKesson, Lincoln, Nebraska.
112,268.—SASH HOLDER.—J. W. McGaw, Wilmington, Del.
112,269.—DEVICE FOR TRANSMITTING AND REVERSING ROTARY MOTION.—W. H. Merrick, Philadelphia, Pa.
112,270.—APPARATUS FOR USING ELECTRICITY AS A REMEDIAL AGENT.—George Munro, Philadelphia, Pa.
112,271.—CRADLE.—R. W. Myers, Glen Gardner Station (Clarksville Post Office), N. J.
112,272.—SPOOL SHOW CASE.—R. H. Norris, Paterson, N. J.
112,273.—COUPLING FOR PLOWS.—George Owen, Jacksonville, Ill.
112,274.—CASE SHOT.—S. W. Paine, Williamsport, Pa.
112,275.—WASH BOILER.—T. U. Parker, Mifflinton, Pa.
112,276.—FIRE-ESCAPE LADDER.—W. B. Peregoy, Baltimore, Md.
112,277.—SHOW CASE FOR SPOOL THREADS.—A. C. Phillips, Chicago, Ill.
112,278.—LOCKING DEVICE FOR WINDOW CORDS.—C. R. Rand, Dubuque, Iowa.
112,279.—SPOKE AND FELLY MACHINE.—David Reed and T. E. Pierce, Sullivan, Ind.
112,280.—NAIL MACHINE.—Henry Reese, Baltimore, Md.
112,281.—INSULATOR FOR TELEGRAPH WIRES.—Zenas C. Robbins, Washington, D. C.
112,282.—SAD AND FLUTING IRON.—W. D. Robertson, Knoxville, Tenn.
112,283.—SAFETY-PLUG ATTACHMENT TO STEAM BOILERS.—Andrew Robes, Somerville, and John C. Chapman, Cambridgeport Mass.
112,284.—ICE MACHINE.—Adolphe Rock, Boston, Mass.
112,285.—PROCESS AND APPARATUS FOR CURING HIDES.—Adolphe Rock, New Orleans, La.
112,286.—MODE OF MOLDING AND CASTING PIPE ELBOWS.—George Ross, Newport, Ky.
112,287.—SELF-LOADING SCRAPER.—Ansell P. Routt and John K. Reeton Liberty Mills, Va.

112,288.—HARVESTER.—James W. Schuckers (assignor to J. W. Grub), Philadelphia, Pa.
112,289.—HARVESTER RAKE.—Francis B. Scott, Lancaster, N. Y.
112,290.—STOVE-PIPE SHELF.—Jerome D. Scott, Friendship, N. Y.
112,291.—VAPOR BURNER.—James Shay, Cincinnati, Ohio.
112,292.—NUMBERING AND PAGING MACHINE.—Alpheus C. Sine, Cincinnati, Ohio.
112,293.—AUTOMATIC FAN.—Charles Bridges Smith, Griffin, Ga
112,294.—COOLING, FREEZING, AND PRESERVING SOLIDS, LIQUIDS, AND GASES.—Daniel E. Somes, Washington, D. C.
112,295.—RUBBER TIRE FOR STEAM CARRIAGES.—Louis Sterne, London, England.
112,296.—SAW JOINTER FOR CIRCULAR SAWS.—John H. Stevenson, Birmingham, Ohio.
112,297.—WASHING MACHINE.—John Taylor, Philadelphia, Pa.
112,298.—STEAM AND HYDRAULIC PRESS.—John F. Taylor, Charleston, S. C.
112,299.—GRAIN DRILL.—John H. Thomas (assignor to himself and Phineas P. Mast), Springfield, Ohio.
112,300.—HEDGE TRIMMER.—James M. Vannosdall and Oliver Vannosdall, Newark, Ill. Antedated February 18, 1871.
112,301.—CONSTRUCTION OF WOODEN BOXES.—William F. Veber (assignor to S. P. Tolman and C. C. Roberts), Perrysburg, Ohio.
111,302.—PLOW.—Harvy Washburn, Pultney, N. Y.
112,303.—CLOTHES PIN.—Hiram J. Wattles, Rockford, Ill. Antedated February 25, 1871.
112,304.—FRUIT PRESS.—G. J. Wells, South Vineland, N. J., assignor to John W. Snyder.
112,305.—CARTRIDGE.—Rollin White, Lowell, Mass.
112,306.—PAPER BOX.—John Warren Wilcox, New York city,
112,307.—UMBRELLA.—James Willis, Stockbridge Works, near Sheffield, England.
112,308.—SEWING MACHINE.—Wm. C. Winters, Rochester, N. Y.

REISSUES.

4,277.—HAT.—John P. Beatty, Norwalk, Conn.—Patent No. 88,116, dated March 23, 1869; antedated February 2, 1869; reissue No 3,355, dated March 1, 1870.
4,278.—GLOVE.—Remus D. Burr, Kingsborough, N. Y.—Patent No. 80,707, dated August 4, 1868.
4,279.—STEAM ENGINE.—Philip Estes, Leavenworth, Kansas. Patent No. 108,576, dated October 25, 1870.
4,280.—FOLDING CHAIR.—F. M. Holmes, Boston, Mass.—Patent No. 111,455, dated January 31, 1871.
4,281.—HARVESTER.—Henry F. Mann, Pittsburgh, Pa., for himself and as assignee of Jacob J. Mann.—Patent No. 15,044, dated June 3, 1856; extended seven years.
4,282.—BREAST PUMP.—Morris Mattson, New York city.—Patent No. 85,318, dated December 29, 1868.
4,283.—LOCK NUT.—John Miller, Jr., Marshalltown, Iowa.—Patent No. 106,927, dated November 1, 1870.
4,284.—LAMP.—Albert H. North, Hartford, Conn., assignor to Rufus S. Merrill; said Merrill assigns two thirds of his right to Wm. B. Merrill and Joshua Merrill, Boston, Mass.—Patent No. 23,483, dated April 5, 1858.
4,285.—SPRING FOR BEDS, ETC.—Charles Rich (assignor to the Metallic Union Spring Company), Poughkeepsie, N. Y.—Patent No. 106,980, dated August 30, 1870.
4,286.—MODE OF SECURING SPRINGS IN UPHOLSTERY.—Wendell Wright, New York city.—Patent No. 16,254, dated December 16, 1856; extended seven years.

DESIGNS.

4,676.—SCREEN.—William N. Bartholomew, Newton Centre, Mass.
4,677.—DRAWER-PULL.—Pietro Cinquini, West Meriden, assignor to Parker & Whipple Company.
4,678.—DRAWER PULL.—Partrick J. Clark, West Meriden, Conn.
4,679 to 4,683.—CARPET PATTERN.—Jonathan Crabtree (assignor to Leedom, Shaw, & Stewart), Philadelphia, Pa. Five Patents.
4,684 and 4,685.—CARPET PATTERN.—Jo athan Crabtree (assignor to Horner Brothers), Philadelphia, Pa. Two Patents.
4,686.—STOCKING FABRIC.—Thomas Dolan, Philadelphia, Pa.
4,687.—WINDOW-SASH HOLDER.—Cassius M. Drury, Granby, N. Y.
4,688.—BED QUILT.—Frederick W. Eger and Henry H. Kunze, Philadelphia, Pa.
4,689.—SUGAR BOWL, ETC.—John H. Hobbs, Wheeling, W. Va.
4,690.—SCHOOL SEAT.—William H. Joeckel, New York city.
4,691.—OILCLOTH PATTERN.—Henry Kagy, Philadelphia, Pa., assignor to Thomas Potter, Son, & Co.
4,692.—WINDOW FASTENER.—William Nelson, Anderson, Ind.
4,693.—REFLECTOR.—August Wilhelm, Philadelphia, Pa.

TRADE MARKS.

175.—GLUE.—Baeder, Adamson, & Co., Philadelphia, Pa.
176.—BEER.—Benjamin Bates, Baltimore, Md.
177.—CHICCORY.—Blume & Co., New York city.
178.—LOCKS AND HARDWARE.—Hillebrand & Wolf, Philadelphia, Pa.
179.—SHIRT.—Lewis Levi, New York city.
180.—WHISKY.—Vidvard & Sheehan, Utica, N. Y.
181.—SEWING MACHINE.—Wheeler & Wilson Manufacturing Company, Bridgeport, Conn.

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$500 for an Invention for Suppressing Traffic in Liquors and Cigars.

TO THE EDITORS OF THE SCIENTIFIC AMERICAN:

You are advocating reforms and improvements, and encouraging inventors, in your valuable paper. As a citizen of New Jersey, one who exercises the elective franchise, and as a citizen of the United States (and here let me say, I make no pretension to learning, having never studied grammar; there was not a grammar in the school where I went to school), but as a man of some observation, I wish to say to the citizens of New Jersey, and the citizens of the United States, I am not satisfied with the laws of New Jersey regulating Inns and Taverns. These laws provide for the selling of alcoholic drinks, at excessively high prices, apparently for the purpose of sustaining the house. Does not our State treat her subjects as though these alcoholic drinks were the very articles her subjects need, and that they should use them freely, and that the more they used, the more useful, great, good, and happy they would become?

Now, if our law makers really think this is so, why not carry it out in every way? They might frame the laws so that we might pay our railroad fares, tolls on turnpikes, bridges, ferries, etc., by buying alcoholic drinks. What an immense quantity of alcoholic drinks might be sold on the Fulton ferry boats! And if it be so beneficial to men and boys, that the laws are framed so as to encourage them to drink, to sustain public houses, then it must be beneficial to ladies also; and if the laws were so as to require all the fares on railroads, boats, tolls over bridges, turnpikes, etc., to be paid by all passengers, men and women, by buying alcoholic drinks, at excessively high prices, how soon would many of our young ladies' faces become red, their noses large and red, their eyes inflamed? They would soon become full matches for the young men who travel over the railroads, with red faces, large red noses, and inflamed eyes, discharging foul breath, and often profane language. Enough of this; it is too abominable. And yet it is not more abominable than this old License Law. Why not have a general License Law, to regulate public houses, and make them so we need not fear competition; so that any one who wishes, and will comply with the law, may keep a public house without requiring their neighbors to sign a petition for the privilege. We need public houses as much as we need bridges; and when we use a bridge we do not take it with us, or any part of it; we simply pass over it, pay for the use of it, and pass on. Why can we not pay for the public house, use it, and pass on, without buying an article we do not need, which does us more harm than good if we use it? Let us make the public house what it ought to be, a comfortable house of entertainment for ladies and gentlemen, on a journey, or a stopping place for those away from home, in health. If any want alcohol, drugs, or medicine of any kind, or even tobacco, let them get them of dealers in such articles. But let us not have a liquor store, a drug store, or tobacco store, or all combined, in one store of the public house. But let us have a house of entertainment, just such a house as a temperate, healthful person needs, containing a well-supplied table and good furnished rooms. Public houses kept on what I have heard called the European plan come the nearest to what I think a public house ought to be of anything I have yet seen, but they have their drinking bar, the great destroyer.

The evils of intemperance are increasingly alarming. What miseries our country is suffering from the use of alcoholic drinks, at this time, no tongue can tell, no pen can describe. This evil is affecting all classes. Many of our best mechanics are ruined by it; many of our best physicians are ruined by it. Who want to put their lives in a drunken physician's hands? And yet we find we are in such a position before we are aware of it. These physicians drive over the country, call at the public houses for various causes, and they buy a drink to sustain the house; they soon learn to like the drink so well that they will call at the public house on purpose to get the drink. And how soon do they become so useless as physicians that even their drinking companions do not want their services. It is just so with many of our officers, such as constables and sheriffs. They have much business at public houses, and often drink at first to sustain the house; and, like the physician, soon learn to like the drink so well they will not pass by. And how often does a candidate for some office treat his fellowman to get his vote? These things ought not so to be. I think there is an opening here for inventors. The person who can invent a plan wh reby public houses can be kept up without the sale or use of alcoholic drinks, or tobacco, or any other unnecessary article, will be a great public benefactor. And to encourage inventors to think on this subject, I will offer a premium; and as I am a citizen of New Jersey, we will take New Jersey for our territory. I will offer to any man or woman (no difference whether they are American citizens or citizens of some other nationality), if such will bring forth a plan which shall be put in practice, and sustained by laws enacted by the proper authorities of New Jersey, which will prohibit alcoholic drinks, tobacco, or any other unnecessary article, from being sold, kept, used, or given—in short, no such articles as alcoholic drinks, tobacco, etc, to be kept about the premises of such public houses; and these houses are to take the place of the liquor-drinking houses, so that there shall be none kept in New Jersey; and these houses shall be sustained and kept up for two full years, and no public houses wherein alcoholic drinks are kept shall be allowed or sustained. In short, they must all have been driven out of New Jersey two full years, before such person shall be entitled to the premium. I will limit the time to January 1, 1882. If not accomplished by that time, then my offer ceases, and I will be released from the obligation to pay the premium. But if such changes be made, and sustained as aforesaid, for full two years, in the State of New Jersey, previous to January 1 1882, then I obligate myself to pay five hundred dollars to the person who has invented such plan, and brought it into practice in the State of New Jersey. And for the purpose of making the premium sure and secure, I will place securities in a good and uninterested man's hands, who shall be approved by Mr. Munn, of the firm of Munn & Co., of New York city, and those two men may be the judges of who shall be entitled to the premium, and if they cannot agree they may choose another man, and these three men shall decide, according to the provisions of this article, if any person be entitled to the premium, and, if any, who it is.

A FRIEND OF HUMANITY.
New Jersey, February, 1871.

N.B.—All editors who may publish this in their papers will please accept the thanks of the author of the above. He desires that every inhabitant of the earth may know that he is opposed to the present custom of keeping public houses, and hopes, by this publication, to free his own skirts from its guilt.

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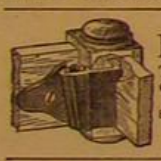

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Intercolonial Railway,
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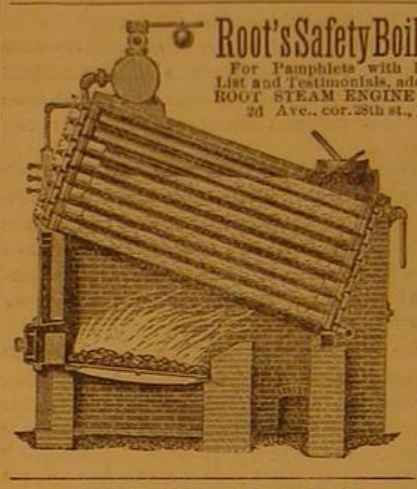

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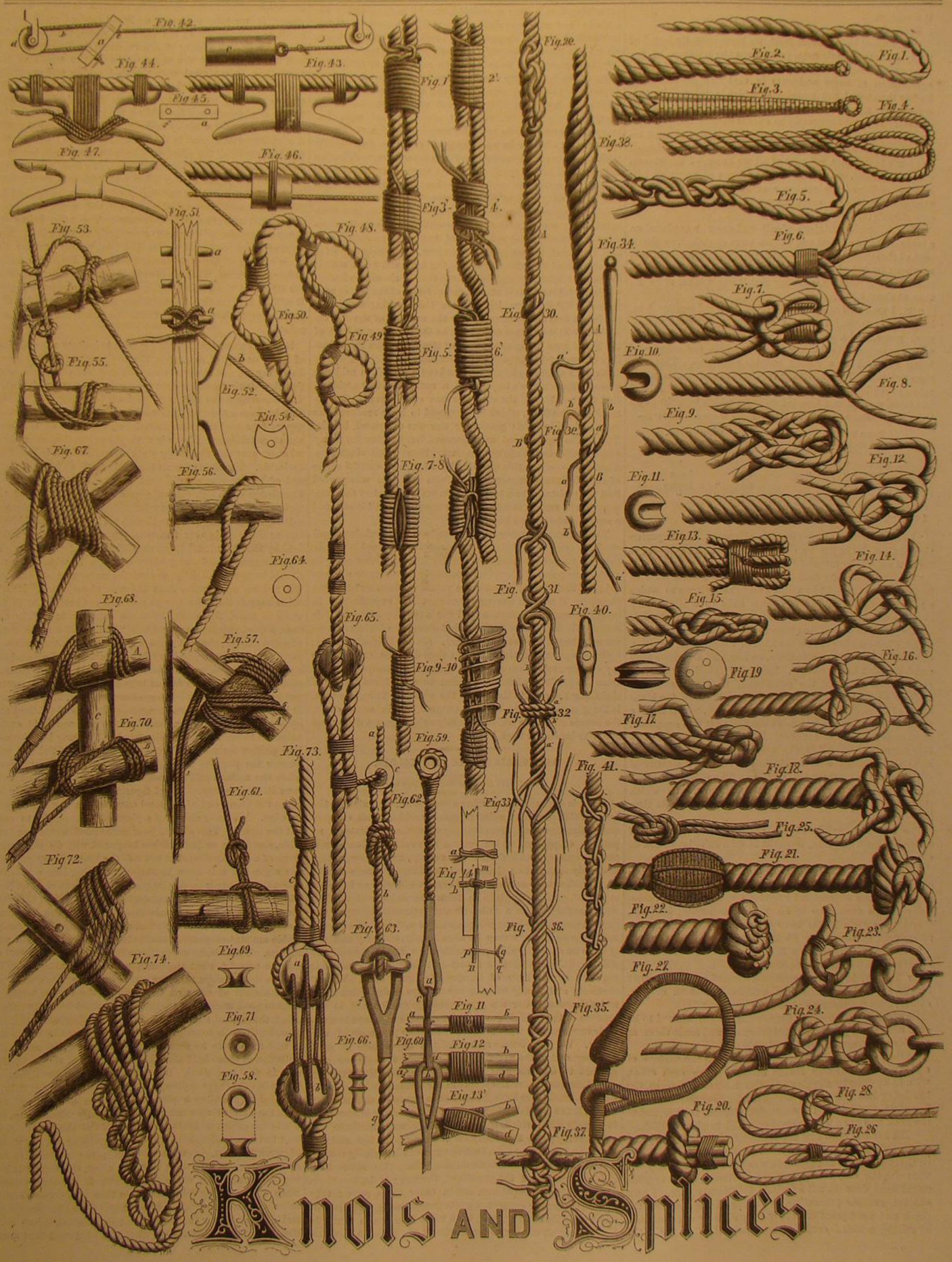


THE INFLUENCE OF INTENSE COLD ON STEEL AND IRON.

[Condensed from Nature.]

There has recently been a most interesting discussion at the Literary and Philosophical Society, Manchester, on the above subject.

The paper which gave rise to the discussion was by Mr. Brockbank, who detailed many experiments, and ended by stating his opinion that iron does become much weaker, both in its cast and wrought states, under the influence of low temperature; but Mr. Brockbank's paper was immediately followed by others by Sir W. Fairbairn, Dr. Joule, and Mr. Spence, which at once put an entirely new complexion on the matter.

Dr. Joule says:

"As is usual in a severe frost, we have recently heard of many severe accidents consequent upon the fracture of the tires of the wheels of railway carriages. The common-sense explanation of these accidents is, that the ground being harder than usual, the metal with which it is brought into contact is more severely tried than in ordinary circumstances. In order apparently to excuse certain railway companies, a pretence has been set up that iron and steel become brittle at a low temperature. This pretence, although put forth in defiance, not only of all we know, of the properties of materials, but also of the experience of everyday life, has yet obtained the credence of so many people that I thought it would be useful to make the following simple experiments:

"1st. A freezing mixture of salt and snow was placed on a table. Wires of steel and of iron were stretched, so that a part of them was in contact with the freezing mixture and another part out of it. In every case I tried the wire broke outside of the mixture, showing that it was weaker at 50° F., than at about 12° F.

"2d. I took twelve darning needles of good quality, 3 in. long, $\frac{1}{24}$ in. thick. The ends of these were placed against steel props, $2\frac{1}{2}$ in. asunder. In making an experiment, a wire was fastened to the middle of a needle, the other end being attached to a spring weighing-machine. This was then pulled until the needle gave way. Six of the needles, taken at random, were tried at a temperature of 55° F., and the remaining six in a freezing mixture which brought down their temperature to 12° F. The results were as follow:—

Warm Needles.			Cold Needles.		
64	ounces	broke	55	ounces	broke
65	"	"	64	"	"
55	"	"	72	"	"
62	"	"	60		bent
44	"	"	68	"	broke
60	"	bent	40	"	"
Average, $58\frac{1}{2}$			Average, $59\frac{5}{6}$		

"I did not notice any perceptible difference in the perfection of elasticity in the two sets of needles. The result, as far as it goes, is in favor of the cold metal.

"3d. The above are doubtless decisive of the question at issue. But as it might be alleged that the violence to which a railway wheel is subjected is more akin to a blow than a steady pull; and as, moreover, the pretended brittleness is attributed more to cast iron than any other description of the metal, I have made yet another kind of experiment. I got a quantity of cast iron garden nails, an inch and a quarter long and $\frac{1}{8}$ in. thick in the middle. These I weighed, and selected such as were nearly of the same weight. I then arranged matters so that by removing a prop I could cause the blunt edge of a steel chisel weighted to 4lb. 2oz., to fall from a given height upon the middle of the nail as it was supported from each end, $1\frac{1}{16}$ in asunder. In order to secure the absolute fairness of the trials, the nails were taken at random, and an experiment with a cold nail was always alternated with one at the ordinary temperature. The nails to be cooled were placed in a mixture of salt and snow, from which they were removed and struck with the hammer in less than 5",

The collective result of the experiments, the details of which need not be given, was that 21 cold nails broke and 20 warm ones.

Dr. Joule adds, "The experiments of Lavoisier and Laplace, of Smeaton, of Dulong and Petit, and of Troughton, conspire in giving a less expansion by heat to steel than iron, especially if the former be in an untempered state; but this, would in certain limits have the effect of strengthening rather than of weakening an iron wheel with a tire of steel.

"The general conclusion is this: Frost does *not* make either iron (cast or wrought), or steel, brittle.

Mr. Spence, in his experiments, decided on having some lengths of cast iron made of a uniform thickness of $\frac{1}{2}$ in. square, from the same metal and the same mould.

He writes:—"Two of the four castings I got seemed to be good ones, and I got the surface taken off, and made them as regular a thickness as was practicable.

"I then fixed two knife-edged wedges upon the surface of a plank, at exactly nine inches distance from each other, with an opening in the plank in the intervening space, the bar being laid across the wedges, a knife-edged hook was hung in the middle of the suspended piece of the bar, and to the hook was hung a large scale on which to place weights.

"The bar was tried first at a temperature of 60° F.; to find the breaking weight I placed 56lb. weights one after another on the scale, and when the ninth was put on the bar snapped. This was the only unsatisfactory experiment, as 14 or 28lb. might have done it, but I include it among others. I now adopted another precaution, by placing the one end of the plank on a fixed point and the other end on to a screw-jack, by raising which I could, without any vibration, bring the weight to bear upon the bar. By this means, small weights up to 7lb. could be put on while hanging, but when these had to be taken off and a large weight put on, the scale was lowered to the rest, and again raised after the change was made. I may here state that a curious circumstance occurred twice, which seems to indicate that mere raising of the weight, without the slightest apparent vibration, was equal in effect to an additional weight. $3\frac{3}{4}$ cwts. were on the scale, a 14lb. weight was added, then 7lb., then 4lb., 2lb., 1lb., and 1lb., making 4cwts. and 1lb. This was allowed to act for from one to two minutes, and then lowered to take off the small weights, which were replaced by a 56lb. with the intention of adding small weights when suspended; the whole was then raised so imperceptibly by the screw, that the only way of ascertaining that it was suspended, was by looking under the scale to see that it was clear of the rest. As soon as it was half-an-inch clear it snapped, thus breaking at once with one pound less than it resisted for nearly two minutes.

"Six experiments were carefully conducted at 60° F., the parts of the bars being selected so as to give to each set of experiments similar portions of both bars; the results are marked on the pieces. My assistant now prepared a refrigerating mixture which stood at zero, the bars were immersed for some time in this, and we prepared for the breaking trials to be made as quickly as could be, consistently with accuracy; and to secure the low temperature, each bar, on being placed in the machine, had its surface at top covered with the freezing mixture. The bars at zero broke with more regularity than at 60°, but instead of the results confirming the general impression as to cold rendering iron more brittle, they are calculated to substantiate an exactly opposite idea, namely, that reduction of temperature, *cæteris paribus*, increases, the strength of cast iron. The only doubtful experiment of the whole twelve is the first, and as it stands much the highest, the probability is that it should be lower; yet, even taking it as it stands, the average of the six experiments at 60° F.. gives 4cwt. 4lb. as the breaking weight of the bar at that temperature, while the average of the six experiments at zero gives 4cwt 20lb. as the breaking weight of the bar at zero, being an increase of strength, from the reduction of temperature, equal to 3.5 per cent."

Sir W. Fairbairn states: "It has been asserted, in evidence given at the coroner's inquest, in a recent railway accident, that the breaking of the steel tire was occasioned by the intensity of the frost, which is supposed to have rendered the metal, of which this particular tire was composed, brittle. This is the opinion of most persons, but judging from my own experience such is not the fact. Some years since I endeavored to settle this question by a long and careful series of experiments on wrought iron, from which it was proved that the resistance to a tensile chain was as great at the temperature of zero as it was at 60° or upwards, until it attained a scarcely visible red heat."

The immense number of purposes to which both iron and steel are applied, and the changes of temperature to which they are exposed, renders the inquiry not only interesting in a scientific point of view, but absolutely necessary to a knowledge of their security under the various influences of those changes. It was for these reasons that the experiments in question were undertaken, and the summary of results is sufficiently conclusive to show that changes of temperature are not always the cause of failure. Sir W. Fairbairn adds: "The danger arising from broken tires does not, according to my opinion, arise so much from changes of temperature as from the practice of heating them to a dull red heat, and shrinking them on to the rim of the wheels. This, I believe, is the general practice, and the unequal, and in some cases, the severe strains to which they are subject, has a direct tendency to break the tires."

OAK GRAINING IN OIL COLORS.

Condensed from the Building News.

There is a charm and feeling about work executed by the hand, which gives it a value no mere machine work can possess. Machine work, from its very nature, necessitates a repetition of pattern, which cannot be avoided. Hand-work, on the contrary, can imitate every variety, and follow nature so closely that no two pieces need be alike. There is also in hand-work a wide scope for the inventive faculty and the exercise of good taste (both in form and color) and skillful workmanship. As a rule, strong contrasts between the ground and the graining color should be avoided. The figure and grain should of course be seen clearly, but only so clearly as to be distinct, without interfering with the general and uniform quietness of tone necessary to fulfil the conditions required by the laws of harmony and good taste. Violent contrasts and gaudy coloring are always vulgar, brilliancy and richness of color are not necessarily vulgar; it is the absence of the guiding power of knowledge and pure taste in their arrangement which degrades them to the rank of vulgarity. We have before spoken of the importance of good combing, and of the various kinds of combs used; we now proceed to describe how the work is done. The graining color is brushed over the work, in the ordinary manner, with a pound-brush, care being taken not to put too much color on, or else it is very liable to be dirty. A dry duster is now used to stipple with, which, if properly done, will distribute the color evenly; it is now ready for combing. In the real oak it will be found, as a rule, that the grain is invariably coarser on one side of the panel than on the other; this arises from the very nature of the growth of the tree; it is, therefore, well to imitate this pattern, and in order to do so we take first a medium or coarse cut gutta-percha comb, and draw it down one side of the panel; then use a finer one to complete it. This comb will leave the marks of the grain in clear unbroken lines from top to bottom of the panel. We now take a fine steel comb and go over the whole of the previous combing, moving it in a slanting or diagonal direction across the previous grain, or with a quick and short wavy motion or curl; both the former and the latter motion will break up the long lines, left by the gutta-percha comb, into short bits, which of course represent the pores or grains of the real wood. There are several other motions of the comb having the same end in view; and by using the gutta-percha or cork combs, in conjunction with the fine steel, an infinite variety of grain may be produced. Steel combs, with one or more folds of thin rag placed over the ends of the teeth are a style of comb which has nothing to recommend it. A natural variation in the grain may be produced by one comb alone, according to the manner in which it is held. For instance, if we take a coarse or broad-toothed gutta-percha comb, and commence at the top of a panel, with the comb, placed at its full width: if drawn down in this position it will leave a grain of the same width as the width of the teeth: but if we start with the full width, and gradually turn the comb or slightly incline it to one side—that is to say, on its edge, we thereby graduate the grain from coarse to fine at pleasure, and by holding the comb at a certain inclination we may actually make very fine the coarse comb. A very important point is the formation of the joints in the wood, as much of the effect of otherwise good work is lost in consequence of neglect in this respect. In looking at a real oak door, the joints of the stiles and rails are clearly and sharply defined, not by any defect of workmanship, but by the difference in the run of the grain, the stiles being perpendicular, and the rails horizontal. The rails being cut sharp off by the stiles, show a perfectly straight line. The light also acts differently upon the two, simply because the grain or fibre of the wood is exposed to its influence under different aspects. This also tends to produce a difference in the depth of the color of rails and stiles, and panels also. It will be evident that no imitations can be considered really good except they include these seemingly unimportant points.

It is a common practice for grainers to imitate a broad piece of heart or sap of oak, upon the back rail of almost every door they do, and many of them are not even content with that, but daub the stiles over from top to bottom with it also. There is nothing so vulgar or in such bad taste. It should only be done upon those parts of the work on which it would appear on a real oak door, namely, on the edges of the doors and on mouldings. There is a vulgar pretentiousness about what we may call the sappy style of work which is very undesirable. The figures cross the grain more or less abruptly and of course are of different shapes, sizes, and forms, a knowledge of which can only be acquired by study of the real wood. The figure may be wiped out with a piece of soft rag, held tight over the thumb nail. This should have two or three folds over the nail, the superfluous rag being held by the other hand to prevent it hanging down and smearing the grain; and every time a figure is wiped, the rag should be moved slightly, so that the same part of the rag will not be used twice, thus insuring clean work. It will often happen that the thumb-nail will get broken, or is too weak to stand the work; in these cases, or, in fact, in any case, a good substitute or artificial thumb-nail may be made of gutta-percha, thus: A piece of thin sheet gutta-percha is put into warm water, and, while soft, is wrapped around the end of the thumb up to the first joint. It is then pressed with the hand, so as to fit and take the shape of the thumb and nail. This cannot be done at one heating, but will have to be put into the hot water again, and the end pinched and squeezed into form to the shape of the nail, and to fit easily upon the thumb. When this gets hard, it may be trimmed into perfect form with a penknife. This artificial nail will answer the purpose admirably if properly made; and even when the natural nail is good, the gutta-percha will serve to save it from injury. Good figuring may also be done by using the blank end of the steel comb with a rag folded over its edge. We have also used a piece of gutta-percha to take out the lights. This should be square-ended, about one inch wide, and three or four inches long, and will do successful work of a certain class, but not of the best. Many grainers use a piece of thin horn, in shape something like a spatula, about three or four inches long and three quarters of an inch wide, with rounded ends, and quite flexible. With this tool the figure is cut or scooped out—a sort of quick, side-long motion, very difficult to describe, and requiring a very considerable amount of practice before it can be worked with any success. There is, however, the same objection to this tool as may be urged against the gutta-percha for figuring, namely, that neither of them take the color clean away, but leave an accumulation of color on the edge of the figure, which is fatal to good work; and therefore we cannot honestly recommend the use of any method but the wiping out with the thumb-nail or its substitute. When the figure is wiped out it will require to be softened. By softening, we mean the imitation of those half shades seen upon and about the figures in the real wood. Between and around the lights or figure in oak, there is always a lighter tint of color; this is imitated by doubling a piece of rag into a small roll, and with the side of this the grain is partially wiped away, but not to the extent of taking off the whole of the grain. A recent but most admirable system of graining oak, by means of over-combing, is worked exactly the reverse of any of the foregoing methods; that is to say, the figure is first wiped out, and the combing or grain is done afterwards, when the graining color is dry, in this wise: The graining color is mixed somewhat thinner than for ordinary graining, and is brushed over the work sparingly, leaving it just sufficiently strong to show a clear distinction between the ground

and the color. The light or figure is then softened by drawing the end of a flat hog-hair fitch, or a small thin mottler, across each figure, and slightly softening with the badger-hair softener. The figure is broken up a little with fine lines across it in parts, such as may be seen in the real wood; but previous to wiping out, the figure, streaks of light should be wiped out and softened on one side of the panel or across the stiles, in imitation of the reflective lights seen in oak. The color should also be partially wiped off the rails or stiles at their junction; this tends to define the joint. The color is is now let to dry hard, when it will be ready for over-combing—that is, combing or graining over the figure (hence its name), and this will have to be done somewhat differently to the ordinary combing. As thus: The color is rubbed in as before, and combed solely with the gutta-percha combs, but these are specially cut for the purpose; they are best about 2 in. wide. The first must be cut with teeth about three-sixteenths of an inch in width, the next one-eighth, and the third about one-sixteenth. The broad-toothed comb is first used, and must be drawn down the panel, with a wavy motion, in short or long curls; either will answer our purpose now. The next size of comb is then drawn straight down—the straighter the better. This has the effect of breaking the wavy combing into short and long straight bits, similar to the pores or grain of the real wood. Both the first and second combing may be varied by holding the comb in a slanting direction, and may be fine or coarse, according to the width of the combs used; now take a soft rag folded, and with this partially clear off the grain which runs over the figure, leaving only a sufficient quantity crossing the light or figure, to be just distinguished, exactly as it appears upon the figure in real oak. The grain is also wiped off in parts on the plain spaces between the figure, in order to break it up and take away any formality. If this method be well and probably done, a thoroughly deceptive imitation may be produced; and except this end be kept in view, no really good work will result.

KNOTS AND SPLICES.

[*See Engraving on First Page.*]

1. Turn used in making up ropes.

2. End tapered for the purpose of passing it readily through a loop. To make this, we unlay the rope for the necessary length, reducing a rope diminishing in diameter towards the end, which is finished by interlacing the ends without cutting them, as it would weaken the work; it is lastly "whipped" with small twine.

3. Tapered end, covered with interlaced cordage for the purpose of making it stronger. This is done with very small twine attached at one end to the small eye, and at the other to the strands of the rope, thus making a strong "webbing" around the end.

4. Double turn used for making rope.

5. Eye splice. The strands of the cable are brought back over themselves, and interlaced with their original turns, as in a splice.

6. Tie for the end of a four-strand rope.

7. The same completed; the strands are tied together, forming loops, laying one over the other.

8. Commencement for making the end by interlacing the strands

9. Interlacing complete, but not fastened.

10 and 11. Shell in two views used in No. 65, showing the disposition of it at the throat. This joining is advantageous, as it does not strain the cords, and it prevents them from cutting each other; so that the rings pass one into the other, and are joined outside the intermediate shell.

12. Interlacing in two directions.

13. Mode of finishing the end by several turns of the twine continued over the cable.

14. Interlacing commenced, in one direction.

15. Interlacing finished, the ends being worked under the strands, as in a splice.

16. Pigtail commenced.

17. Interlacing fastened.

18. Pigtail with the strands taut.

19. Dead eye, shown in two views.

20. Pigtail finished. We pass the ends of the strands, one under the other, in the same way as if we were making a pudding splice: thus bringing it in a line with the rope, to which it is seized fast, and the ends cut off.

21. Scull pigtail; instead of holding the ends by a tie, we interlace them again, as in No. 16, the one under the other.

22. Pigtail, or "lark's nest." We make this to the "pennant" of a cable, which has several strands, by taking the requisite number of turns over the pudding, in such a manner that the strands shall lay under each other. This "pigtail" forms a knot at the end of the rope. It thus draws together two ropes, as shown in No. 32, forming a "shroud" knot. In these two pigtails, the strands are crossed before finishing the ends, so that the button, *a*, is made with the strands, *a*, and, *b*, with those of the rope, *b*.

23. Slip clinch to sailors' knot.

24. Slip clinch, secured.

25. Ordinary knot upon a double rope.

26. Bowline knot for a man to sit in at his work.

27. Called a "short splice," as it is not of great length, and, besides, can be made quickly.

30. Long splice. This extends from *a* to *b*. We unlay the strands of each of the ropes we intend to join, for about half the length that the splice will be, putting each strand of the one between two strands of the other.

31. Simple fastening on a rope.

32. A "shroud" knot.

33. The ends of the rope are prepared for making the splice (No. 29) in the same manner as for the "shroud" knot in No. 32. When the strands are untwisted, we put the ends of two cords together as close as possible, and place the ends of the one between the strands of the other, above and below alternately, so as to interlace them as in No. 29. This splice is not, however, very strong, and is only used when there is not time to make a long splice, which is much the best.

34 and 35. Marline spikes. Tools made of wood or iron, used to open out a rope to pass the strands of another through it.

36. Shows strands arranged as described in No. 30.

37. Fastening when a lever is used, and is employed when hauling upon large ropes, where the strength of several men are necessary.

38. A "pudding splice." This is commenced, like the others, by placing the rope end to end, the turns of the one being passed between those of the other; having first swelled out the yarns by a "rat's-tail," we put them, two by two, one over the other, twisting them tightly, and opening a way for them with the marlinspike. The inconvenience of this splice is, that it is larger in diameter than the rope itself; but when made sufficiently long, by gradually reducing the size of the strands, it has great strength.

39. This shows two strands, *a* and *b*, of the ropes, A B, knotted together, being drawn as tight as possible; we unlay the strand, *a'*, of the rope, A, for half the length of the splice, and twist the strand, *b'*, of the rope, B, strongly in its place, tying *a'* and *b'* together tightly. The same process is again gone through on the rope, B, the strand, *a''*, of the rope, A, being knotted to the strand, *b''*, of the rope, B. When all the strands are thus knotted together, we interlace them with the strands of the cable. Thus the strands, *a a' a''*, are interlocked by being passed alternately above and below the turns of the cord, B, the ends being also sometimes "whipped." In the same manner the strands, *b b' b''*, pass alternately over and under the strands of the rope, A, and are in like manner "whipped." It is important that the several interlacings and knots should not meet at one point; we reduce the size of the strands towards the end, so that they loose themselves in the body of the splice, cutting off such parts as may project. This splice is employed for joining the ends of a rope when a chafed part has been cut out, and is quite as strong as the rope itself.

40. Belaying-pin opened to serve as a button; these are used where it is necessary to stop or check velocity.

41. Chain knot, or fastening.

42. Variable or regulating lashing. By laying the piece, *a f*, horizontally, it can be slipped along the rope, *b*; by raising or lowering this, we shall raise or depress the weight, *c*, the cord, *b*, running over the two pulleys, *d*, from the piece, *a f*, in the direction shown in the figure. The friction of the cord, *b*, passing through the hole, *e*, sufficiently fixed the piece, *a f*, and holds the weight, *c*, securely.

43. Cleet, with three ties.

44. Cleet, showing the mode of belaying the cord.

45. The piece, *a f*, of No. 42.

46. Fair leader.

47. Cleet to be fixed to a stay.

48. Loop for slipping other lines.

49. A "bend" which is only used for fear of the stoppers snapping.

50. Bastard loop, made on the end of the rope, and whipped with yarns.

51. Tie to pins: *a*, the pin; *b*, small cords fixed by a cross tie.

52. Cleet, fixed to the "rail," either with screws or nails, to which the lines are belayed.

53. Waterman's knot.

54. Fair leader.

55. Tie, or bend to pier.

56. Simple fastening to tie.

57. Fastening by a loop. This can be tied or untied without loosening the loop itself. It is made by following, towards the longer loop, the direction as numbered 1, 2, 3, 4, 5, and is terminated by the loop, 6, 7, 6, finally passing it over the head of the post, A. This knot holds itself, the turns being in opposite directions. To unite it, we slack the turns of the cable sufficiently to again pass the loop, 6, 7, 6, over the post, A, and turn the ends in the contrary direction to that in which they were made (as 5, 4, 3, 2, 1).

58. Iron "shell," in two views.

59 and 60. "Wedding" knots; *a b*, eyelets; *c d*, the join; *e*, the fastening.

61. Lark's-head fastening to running knot.

62. A round turn; the cord, *a*, is passed through the bight of the cord, *b*, over the button, *c*, where it is secured by an ordinary knot.

63. Belaying-pin splice. The cord, *b*, "stops" the pin, *e*, its end being spliced upon itself, and "served" with yarn; this rope, with its pin, is passed through the spliced eye, *f* of the line, *g*.

64. Round button.

65. Joint by a spherical shell, each loop, *a* and *b*, being made by ties and splices, and surrounding the shell, *c*.

66. Belaying-pin, shown separately, before being stoppered.

67. Fastening to shears.

68. Square mooring. When the cable is round the post, A, and the piece, *c*, without being crossed, it lays in the section 1, 2, 3, 4, 5, 6, 7, and the end is fastened by tying.

69. Wooden shell in section.

70. Crossed fastening. The turns of the cable, passing in front of the post, B, are crossed at the back of C, in the direction 1, 2, 3, 4, 5, 6, 7, 8, the end, 8, being secured to the cable.

71. Wooden shell.

72. Double-chain fastening.

73. Lashing for "ram" block, or "dead-eye." The ram blocks, *a* and *b*, are strapped by the cords, *c*, which hold them; the small lanyards, *d*, pass through the holes to make the connection, and as they are tightened give the requisite tension to the cordage; the ends are fastened to the main rope. Usually one of these dead-eyes is held by an iron strap to the point where it is required to fix and strain the cordage, which is ordinarily a shroud.

74. Chain fastening.

1'. Simple band, showing the upper side.

2'. The same, showing the under side and the knot.

3'. Tie, with crossed ends, commenced; a turn is taken under the strands, to hold the ends of the cord.

4'. The same, completed.

5'. Bend with crossed strands, commenced, the one end being looped over the other.

6'. The same, completed.

7'. Necklace tie, seen on the upper side.

8'. The same, seen underneath. The greater the strain on the cords, the tighter the knot becomes.

9' and 10' are similar splices to 7' and 8' with slight modifications.

11' shows the commencement of 13', the legs in elevation; 12' being a front view. An ordinary band, made by several turns of a small rope, is lapped round them and hauled taut, and then interlaced at the ends. This done, the legs are shifted into the shape of a St. Andrew's cross. Thus the lashing is tightened, and, for further security, we pass the line several times over the tie and between the spars, knotting the ends.

13'. Portuguese knot. This is a lashing for shear legs, and must be tight enough to prevent the spars slipping on each other; the crossing of the two legs gives a means of securing the knot.

14'. For binding timbers; *a*, knot commenced. Take several turns round the timbers, and fasten the ends by passing them under the turns; *b*, knot completed. The end of a round stick, *m n*, termed a packing stick, should be passed under the knob, the cord being slack enough to allow of this. By turning the stick, the turns can be tightened to any extent; when tight, we fasten the longer arm of the lever to some fixed point, by a rope, *p q*, so that it cannot fly back. Care must be taken not to turn the stick too far, or the rope may be broken. As the timber dries and shrinks, the lever may be used to make all taut again.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections in January, 1871:

During the month, there were 522 visits of inspection made, and 1,030 boilers examined—853 externally and 363 internally, while 106 have been tested by hydraulic pressure. Number of defects in all discovered, 431, of which 163 were regarded as dangerous. These defects were as follows: Furnaces out of shape, 24—3 dangerous; fractures, 47—25 dangerous; burned plates, 29—14 dangerous; blistered plates, 54—10 dangerous; cases of sediment and deposit, 97—18 dangerous; cases of incrustation and scale, 70—24 dangerous. To show how little attention is paid to the internal condition of boilers by incompetent engineers, we copy the following from a letter of one of our inspectors:

"In one tubular boiler I found sediment in the back end, eight inches deep, and extending forward more than four feet. It seemed to be an accumulation of fine scale cemented together, so that it was necessary to break it up with a hammer and chisel before it could be removed. The engineer said *he had cleaned the boilers only three days before*, and objected to my making another examination. This is one of the many cases we find, where the proprietor trusts everything about his boilers to his engineer, supposing him to be reliable."

With such accumulation of sediment and deposit, is it any wonder that sheets are burned? A careful engineer will understand, if the feed water be impure, that he must blow down two or three inches every day, or oftener, that the sediment may be removed as it accumulates, and then an internal examination once in two weeks, or once a month, will insure a clean boiler.

Cases of external corrosion, 26—10 dangerous; cases of internal corrosion, 17—5 dangerous; cases of internal grooving, 28—11 dangerous; water gages out of order, 50; blow-out apparatus out of order, 15—7 dangerous; safety valves overloaded, 40—12 dangerous; pressure gages out of order, 54—6 dangerous, varying from —15 to +8 pounds. (We have found several gages entirely ruined from being frozen). Boilers without gages, 4; cases of deficiency of water, 5—1 dangerous; broken braces and stays, 31—7 dangerous; boilers condemned, 2—both dangerous.

Two engineers were found drunk on duty, and promptly discharged. There were 9 serious explosions during the month, by which 99 persons were killed, and 6 wounded. Eighty-seven of the killed were passengers on the ill-fated steamer *H. R. Arthur*, on the Mississippi River. Many were drowned, and some burned, but the origin of the calamity was the bad quality of the boilers, which a careless management was unable to detect. The upper and fore part of the boat was blown away by the exploded boilers, and, to add to the horror, what remained took fire.

None of these exploded boilers were under the care of this company.

FIVE ore-roasting furnaces are in full blast in Nevada

Improved Compound Spiral Car Spring for Railway Carriages.

Our engravings illustrate an improved compound car-spring, which appears to possess all the requisites of a first-class spring, combining in its construction extreme simplicity with great strength, and a feature whereby the power of the spring increases with increase of the load, and *vice versâ*, so that its flexibility remains nearly constant for all loads.

Fig. 1 is a perspective view of this spring, with a portion of the side of the case broken out to show the interior arrangement of the spiral springs. Fig. 2 is a section of the compressing plate. Fig. 3 is a plan view, showing the arrangement of the tubes which enclose the springs.

The case is cast in two pieces. Its vertical wall is cast in a single piece, and has at the top a flange or bead extending inwardly, against which the compressing plate abuts when the spring is not compressed, as shown in Fig. 2. A bottom plate completes the case.

The spiral components of the spring are inclosed in tubes, as shown in Figs. 1 and 3. It is not deemed essential that these tubes should be seamless, or that their edges, brought together in bending, should be soldered, brazed, or welded. They act merely as guides to compel the component springs to expand or contract in vertical lines, and need only be strong enough for that purpose.

The compressing plate is formed with concentric steps or ledges, as shown in Fig. 2, so that with light loads, only a portion of the component spirals act. With a heavier load a new series of spirals is brought into action, and so on, till the spring is loaded to its full capacity. This feature is novel, and as important as novel, as it gives the spring a far more easy and flexible carriage, with light loads, than would be the case if all the spirals were permitted to act.

Fig. 1

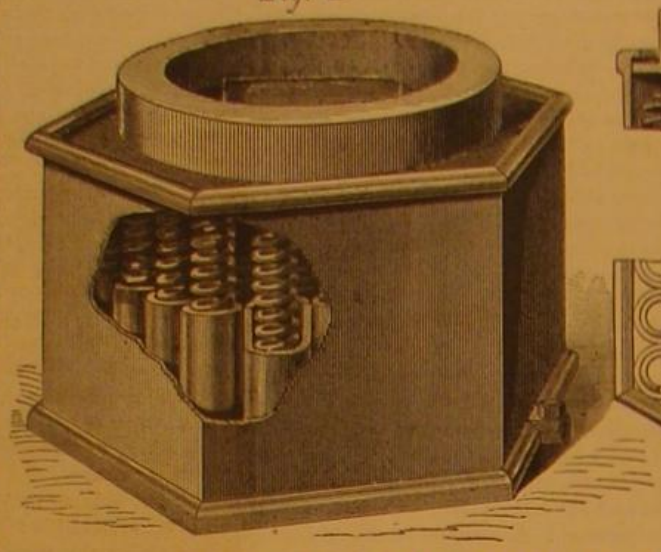


Fig. 2

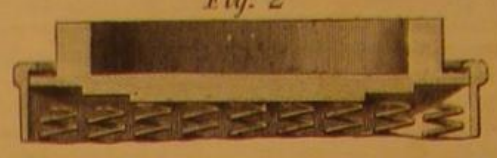
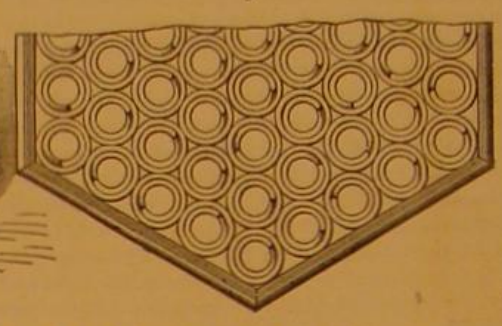


Fig. 3



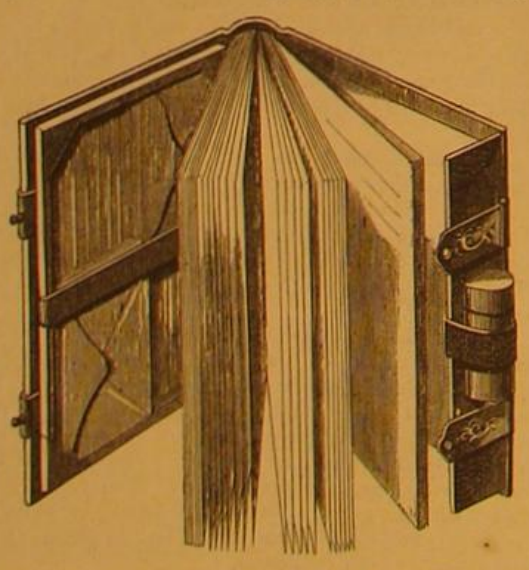
POTT'S' SPIRAL CAR SPRING FOR RAILWAY CARRIAGES.

In putting the spring together, the vertical part of the case is inverted. The compressing plate is then placed within the case, resting upon the inner flange of the case above described. The tubes with their inclosed springs are then arranged in position, as shown in the plan view, Fig. 3. The bottom plate of the case is then placed in position, and held to its place by lugs and rivets, as shown in Fig. 1; the spring is then ready for use.

The employment of tubes in the manner described, enables springs of the greatest practical length to be used, without the sectional or division plates met with in other spiral car springs. A greater and easier movement is therefore obtained. These springs can, it is claimed, compete in price with any spring in market, and are guaranteed by the manufacturers. Patented through the Scientific American Patent Agency, December 27, 1870, by Albert Potts, whom address for further information, No. 490 North Third street, Philadelphia, Pa.

PORTABLE WRITING AND COPYING CASE.

This device is the invention of A. G. Buzby, of Philadelphia, Pa. It is a combined writing and copying case. Besides the usual recesses or chambers for pen, ink, paper, etc., it is provided with a book of copying paper, in which copies



of important letters may be made, by damping the letters in the usual way, and pressing them between the leaves of the copying book; or the transfer paper may be used, so that the letter will be copied as it is written, if preferred.

How Walking Sticks are made.

Sticks are manufactured both from large timber of from two to six feet girth, and from small underwood of about the thickness of a man's thumb. The timber, which is chiefly beech, is first sawed into battens of about three feet in length and as many inches in width; and from each of these battens two square sticks, with square heads are afterwards cut in opposite directions, so that the middle portion is waste wood. The corners of each are afterwards rounded off by a planing process called "trapping," and the square head is reduced, by a small saw, to a curve or rectangular bend, so as to form a handle. When the sticks are brought in this way to the exact size and pattern, they are polished with great care, are finely varnished, and packed in boxes or bundles for the market. Many sawn sticks, however, are supplied with bone and horn handles, which are fastened on with glue; and then of course there is less wood waste, as a larger number of them may be cut from one batten.

A very different process takes place in the manufacture of sticks from small underwood, in which there is no sawing required. The rough unfashioned sticks, which are generally of hazel, ash, oak and thorn, are cut with a bill in the same way as kidney bean sticks, and are brought to the factory in large bavins or bundles, piled on a timber tug. There must of course, be some little care in their selection, yet it is evident that the woodmen are not very particular on this score, for they have in general an ungainly appearance; and many are so crooked and rough, that no drover or country boy would think it worth while to polish the like of them with his knife. Having arrived at this place, however, their numerous excrescences are soon pruned away, and their ugliness converted into elegance. When sufficiently seasoned and fit for working, they are first laid to soak in wet sand, and rendered more tough and pliable; a workman then takes them one by one, and securing them with an iron stock, bends them skillfully this way and that, so as to bring out their natural crooks, and render them at last all straight even rods. If they are not required to be knotted, they next go to the "trapper," who puts them through a kind of circular plane, which takes off knots, and renders them uniformly smooth and round. The most important process of all is that of giving them their elegantly curved handles, for which purpose they are passed over to the "crooker." Every child knows that if we bend a tough stick moderately when the pressure is discontinued, it will soon fly back, more or less, to its former position; and if we bend it very much, it will break. Now the crooker professes to accomplish the miracle of bending a stick as it might be an iron wire, so that it shall neither break nor "backen." To prevent the breaking, the wood is rendered pliant by further soaking in wet sand; and a flexible band of metal is clamped down firmly to that portion of the stick that will form the outside of the curve; the top end is then fitted into a grooved iron shoulder which determines the size of the crook, the other end being brought round so as to point in the opposite direction; the metal band during this process binding with increasing tightness against the stretching fibers of the wood, so that they cannot snap or give way under the strain. The crook having been made, the next thing is to fix it, or remove from the fibers the reaction of elasticity, which would otherwise, on the cessation of the bending force, cause it to backen more or less, and undo the work. In the old process of crooking by steam, as timber bending is effected, the stick was merely left till it was cold to acquire a permanent set; but in the new process, a more permanent set is given by turning the handle about briskly over a jet of gas. The sticks being now fashioned, it only remains to polish and stain or varnish them; and they are sometimes scorched or burned brown, and carved with foliage, animal heads and other devices.—*Chambers' Journal.*

FLOWERING OF THE VICTORIA REGIA IN THE OPEN AIR.—Joseph Mager, Esq., has succeeded in flowering the Victoria lily, in his pond in England. The pond is perfectly open, but the water is heated by hot water pipes coming from a boiler near the pond, carefully concealed. The seeds of the Victoria were planted in May last, and the first flower was produced Sept. 10th. Afterwards seven other flowers opened. The plant has eight leaves, of which the largest is five feet two inches in diameter. Mr. Mager has also succeeded in flowering a large number of other tropical lilies in his pond.

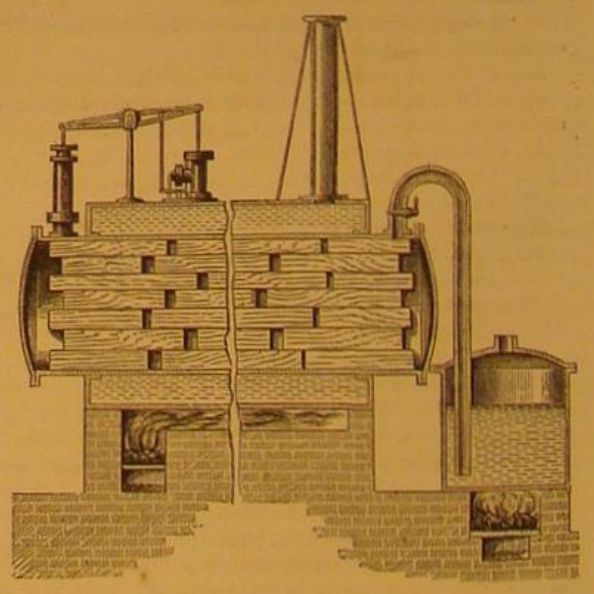
JUTE, a material largely used in combination with hemp, for making cordage, sacking, mats, and carpets, is produced in India to the extent of 300,000 tuns per annum. The scarcity of fuel prevents its manufacture on the spot, except by the rudest and most primitive means, so that the bulk of the growth is sent to Great Britain.

Ventilation of the Liverpool Tunnel.

This tunnel, which forms an ascending incline of a mile and a quarter length from the terminal station in Lime-street London and N. W. Railroad, was worked until recently by a rope and stationary engine, to avoid fouling the air of the tunnel by the passage of locomotives; but the increase of the traffic having necessitated the abandonment of the rope and the substitution of locomotives for bringing the trains up through the tunnel, it became requisite to provide some efficient means of ventilation for clearing the tunnel speedily of the smoke and steam after the passage of each train. A large exhausting fan has been designed by Mr. John Ramsbottom for this purpose, which works in a chamber situated near the middle of the length of the tunnel, and draws the air in from the tunnel, through a cross drift, discharging it up a tapering chimney that extends to a considerable hight above the surface of the ground over the tunnel. The fan is about thirty feet diameter, and is made with straight radial vanes; it revolves on a horizontal shaft at a speed of about forty-five revolutions per minute, within a brick casing, built concentric with the fan for the first half of the circumference, and afterwards expanding gradually for discharging into the base of the chimney, the air from the tunnel being drawn in at the center of the fan at each side, and discharged from the circumference of the fan by the revolution of the vanes. The engine driving the fan is started by telegraph signal at each departure of a train from the terminal station, and the fan is kept running until the discharge from it becomes quite clear, showing that no steam or smoke remains in the tunnel; this is usually the case in about eight minutes after the time of the train entering the lower end of the tunnel, the passage of the train through the tunnel occupying about three minutes. The fan draws air in at both ends of the tunnel simultaneously, and begins to clear the lower end immediately upon the train entering; the clearing of the upper end commences as soon as the train has passed out of the tunnel, and as the fan is situated nearer the upper end of the tunnel than the lower, the clearing of both lengths is completed almost simultaneously. The fan is so constructed as to allow an uninterrupted passage through it, for the air, whilst the fan is standing still; and the natural ventilation thus obtained by means of the large chimney is found sufficient for clearing the tunnel during the night and some portion of the day, without the fan being worked at those times. This natural ventilation is aided by the engine exhaust and the boiler discharging into the chimney. The fan has now been in regular operation for three-quarters of a year, and has been found completely successful.

IMPREGNATING WOOD WITH TAR OR OTHER PRESERVING MATERIAL.

The preservation of wood is a problem which is attracting increased attention, as year by year diminishes the material supply of timber, and consequently gradually increases its price. Among other methods employed, the impregnation



of wood by the vapors of tar, creosote, petroleum, etc., has been tried, and one of the practical difficulties met with has been the obtaining of suitable apparatus for the purpose.

The engraving annexed is an invention intended to supply this want. The wood is inclosed, in a tank kept hot by a steam jacket which surrounds it, as shown. A boiler at one end is used to heat the substance with which it is desired to impregnate the wood. An air pump is also employed to remove the steam, generated in the heated timber, and the air from the tank. The pores of the wood being thus rendered vacuous, the hot liquid or vapors from the heating tank readily penetrate the entire substance, and thoroughly impregnate it. This apparatus is the invention of George Pustkuchen, of Hoboken, N. J.

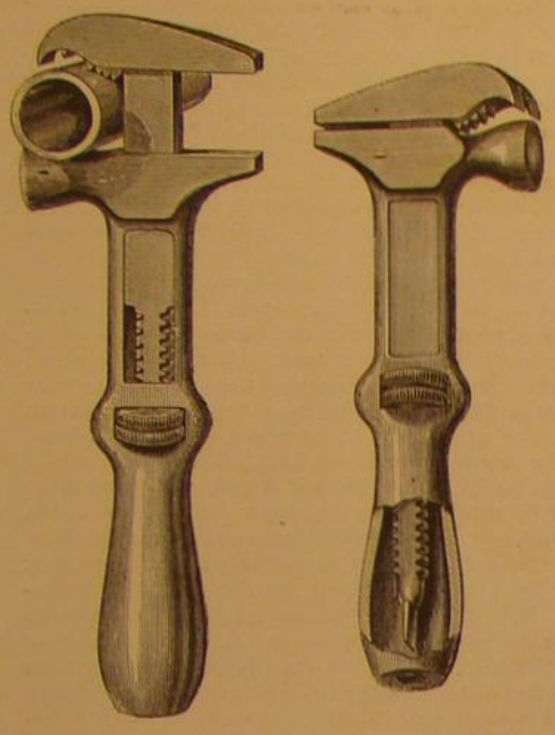
BOARDMAN'S COMBINED TOOL.

This tool, of which our engraving is a good representation, comprises a screw wrench, a pipe wrench, a hammer, a nail claw, a screw-driver, and a bit handle, or socket wrench.

The bit handle is the entire tool, the square socket or opening being made in the end of the handle, in which the shanks of bits may be inserted.

The screw driver is formed on the end of the screw bar, attached to the outer jaw of the wrench, and is taken out from the hollow of the handle when required for use.

The use of the other parts of the tool will be apparent from the engraving.

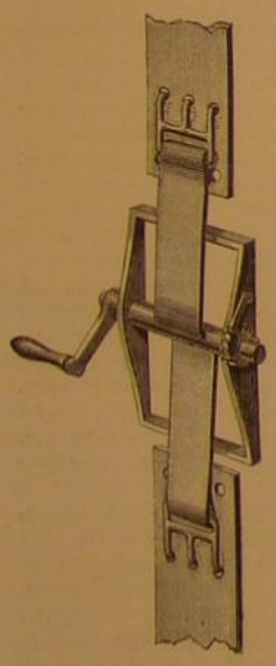


The tool is very compact, and has this advantage over the ordinary screw wrench, that its leverage increases as it is opened to receive nuts of larger size.

This invention is protected by two patents, dated respectively, May 30, 1865, and July 10, 1866.

For further information address B. Boardman & Co., Norwich, Conn.

BELT TIGHTENER.



This instrument will be found of great service in bringing together the ends of belts, the weight of which is so great that they cannot be held together by the hand while lacing. A strap engages with holes made in the belt, at the back of the holes punched for lacing, the tightening strap being provided with claws or hooks, as shown. A winch axle and ratchet, adjusted in a frame as shown, are then employed to pull the ends of the belt together and hold them firmly till the lacing is completed.

This is the invention of T. G. Stansberry, of Medora, Ill. Patented in September, 1867.

Some Things I don't want In the Building Trades.

I don't want my house put in repair, or rather out of repair, by a master who employs "Jacks of all Trades."

I don't want my foreman to tell me too much at one time about the faults of the workmen under him, as I may forget asking him about himself.

I don't want a builder or carpenter to give a coat of paint to any joinery work he may be doing for me, until I have examined first the material and workmanship.

I don't want any jobbing carpenter or joiner, whom I may employ, to bring a lump of putty in his tool basket. I prefer leave the use of putty to the painters.

I don't want jobbing plumbers to spend three days upon the roof, soldering up a crack in the gutter, and, when done, leaving fresher cracks behind them. The practice is something akin to "cut and come again."

I don't want a contractor to undertake a job at a price that he knows wfll not pay, and then throw the fault of his bankruptcy on "that blackguard building."

I don't want any more hodmen to be carrying up the weight of themselves in their hod, as well as their bricks; I would much prefer seeing the poor human machines tempering the mortar or wheeling the barrow, while the donkey engine, the hydraulic lift, or the old gray horse, worked the pulley.

I don't want house doors to be made badly, hung badly, or composed of green and unseasoned timber.

I don't want houses built first and designed afterwards, or, rather, wedged into shape, and braced into form.

I don't want to be compelled to pay any workman a fair day's wages for a half day's work.

I don't want an employer to act towards his workmen as if he thought their sinews and thews were of iron, instead of flesh and blood.

I don't want any kind of old rubbish of brick and stone to be bundled into walls and partitions, and then plastered over "hurry-skurry." Trade infamy, like murder, will out," sooner or later.

I don't want men to wear flesh and bone, and waste sweat and blood, in forms of labor to which machinery can be applied, and by which valuable human life and labor can be better and more profitably utilized.

Correspondence.

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

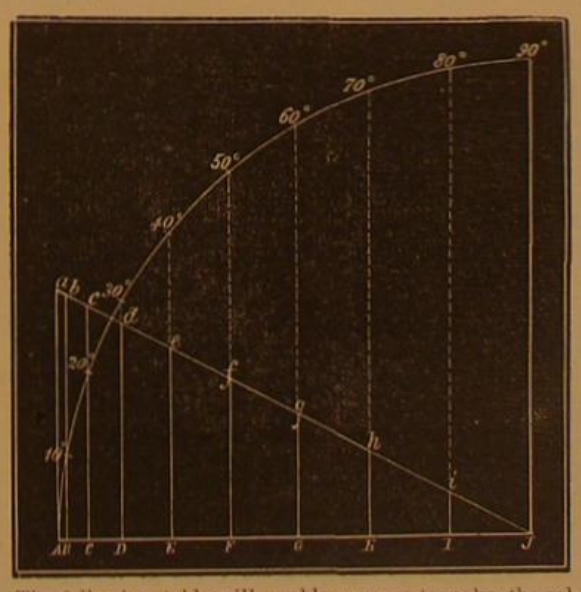
Action of the Reciprocating Parts of Steam Engines.

MESSRS. EDITORS:—I have hesitated about the propriety of replying to the criticisms of your correspondent, J. E. Hendricks, upon my paper, on the action of the reciprocating parts of steam engines. It is not to be expected that a truth so opposed to commonly received notions—the reception of which requires so much to be unlearned—should at once receive the assent of every one. Some odd fancies on the subject are likely to be ventilated first.

But your correspondent touches the root of the matter, and perhaps the fact questioned by him should be more clearly placed beyond dispute.

I will dismiss the introductory part of his letter, merely observing that his "logical inference" is quite gratuitous and unwarranted. He says himself that its absurdity is obvious, in which I quite agree with him.

The real question is this: What is the figure representing the acceleration of the motion of a piston, controlled by a crank which revolves with a uniform velocity? I stated it to be a right-angled triangle, and indicated, as I supposed, clearly enough, a simple method by which this could be shown. Your correspondent claims that the calculation, according to my own rule, gives a figure of a totally different form, and one that shows the acceleration, as well as the motion, to be reduced to zero at the commencement of the stroke. Let us see. Let the straight line, *AJ*, in the following figure, represent half the stroke of the piston, and let the distances, *AB*, *AC*, etc., on this line, represent the versed sines of 10°, 20°, etc., up to 90°, or the motion of the piston while the crank is moving through these arcs. At the points *A*, *B*, *C*, etc., erect the perpendiculars, *Aa*, *Bb*, *Cc*, etc., and let the length of each of these ordinates represent the acceleration imparted in a given time at that point of the stroke. Then will *AJ* be to *Aa* as *IJ* is to *Ii*, as *HJ* is to *Hh*, etc., showing that the straight line, *aJ*, connects the extremities of all the ordinates, and that the triangle, *AJa*, represents the acceleration of the motion of the piston, from the commencement to the middle of the stroke.



The following table will enable any one to make the calculations proving the truth of the above proposition:

Degrees.	Versed sine.		Motion for 10°		Acceleration during 1°.	
0°		·0000000			*Aa*....	·0003046
10°	*AB*....	·0151922	*AB*....	·0151922	*Bb*....	·0003001
20°	*AC*....	·0603074	*BC*....	·0451152	*Cc*....	·0002862
30°	*AD*....	·1339746	*CD*....	·0736672	*Dd*....	·0002638
40°	*AE*....	·2339556	*DE*....	·0999810	*Ee*....	·0002333
50°	*AF*....	·3572124	*EF*....	·1232568	*Ff*....	·0001958
60°	*AG*....	·5000000	*FG*....	·1427876	*Gg*....	·0001523
70°	*AH*....	·6579799	*GH*....	·1579799	*Hh*....	·0001041
80°	*AI*....	·8263518	*HI*....	·1683719	*Ii*....	·0000529
90°	*AJ*....	1·0000000	*IJ*....	·1736482	*Jj*....	·0000000

The method of obtaining the decimals representing the acceleration for 1°, at any point, was fully explained in the paper, and compared with the similar method of showing the uniform acceleration of a body acted on by a constant force. The ordinary tables in the hand-books, going only to five places of decimals, are of no use for these computations.

I would suggest a practical experiment. Let any one having an engine running at a good speed, loosen the crank pin brasses a little, so that, at starting, it will thump heavily. Let the engine be lightly loaded, so that only a small portion of the boiler pressure will need to be admitted to the cylinder. As its speed increases, the thump will die away; and, if at its full speed, the pressure of the steam admitted is not so great as to overcome the centrifugal strain of the reciprocating parts on the crank, as it passes the centers, the engine will revolve in silence. Any one can ascertain, by the rule given in the note to the paper, just what pressure can be admitted without causing a thump, or this can be found by a little experimenting. I am running an engine which does not thump with loose crank pin brasses, under eighty pounds pressure, admitted sharply on the centers.

CHARLES T. PORTER.

Answer to Practical Problem.

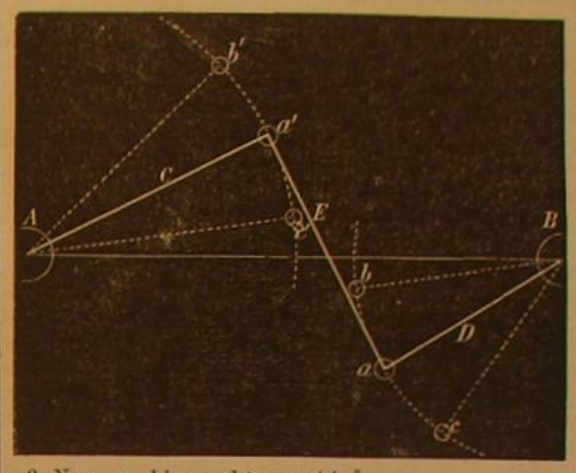
MESSRS. EDITORS:—I submit the following solution of "Practical Problem" on page 147:

Given AB, arm, C, arm, D, chord of half angle of oscillation of arm, D, and angles of arms, with line AB.

To find angles, BA*c'*, AB*b*, and length of link, E.

1. As the length of arm, D, is to the chord of arc, *ab*, divided by 2, so is the radius to the sine angle oscillation of arm, D, divided by 4.

2. 360° is to the whole circumference as the angle *b*B*a* is to the length of arc *ab*.



3. Now arc *ab* is equal to arc *a'c'*.

4. The whole circumference is to 360° as the length of arc *a'e'* is to the angle oscillation of C divided by 2.

5. Half angle oscillation, C, taken from angle BA*a'* is equa to angle BA*c'*.

6. Half angle oscillation, D, taken from angle AB*a* is equal to angle AB*b*.

7. The diagonal of the rectangle formed by the (sum of the sines of the angles of the arms with AB) into (AB—sum of cosines of same) will be the length of link, E.

G. R. NASH, Civil Engineer.

North Adams, Mass.

[We have received other solutions of this problem, but as this covers the ground in a very simple manner, we think it will be sufficient. Those forwarding the solutions not published will accept our thanks and assurances that it is not because they lack merit that they are declined.—EDS.

Reciprocating Parts of Steam Engines.

MESSRS. EDITORS:—In one of the late numbers of your journal, you publish a paper, read by Mr. Porter before some learned society in New York, on something about the possibility or practicability of running a steam engine at a high rate of speed, and claiming to give a scientific explanation of the why and wherefore. Now, scientifically, I know nothing about a steam engine; practically, I know how to stop and start one. Therefore, you will understand that what I say is not as coming from one who claims to be wise above what is written, but as simply being a statement of the case, as it appears to one who wants to learn, and takes this way to draw out the truth. A scientific theory, invested with all its sines, coefficients, and other paraphernalia, is a very pretty thing to look at, no doubt, for those who understand it, and, when properly applied, is invaluable; but when, as in this case, a practical question is to be decided, by the aid of a scientific demonstration, it will not do to throw aside the main elements of the problem, or any, in fact, of the minor points, no matter how trivial they may appear.

Mr. Porter's labors were strictly of a scientific nature. He starts out with the proposition that what he is about to explain is very simple, and very likely it is; but, for one, I can't see it, and I want more light. He says that it takes a certain number of pounds to overcome the inertia of the reciprocating parts of a certain weight, to give it a certain speed. What is inertia? He says, "we will not take into account the friction of parts." Now, my understanding of this point is, that friction is practically one of the main elements in the problem. How can we hope to obtain a correct solution when he rubs out one of the terms of the equation? What is friction doing all the time, while he is theoretically having his reciprocating parts storing up power and then giving it out again, just at the right time, and in the right quantity?

What an immense amount of iron has been wasted by being cast into fly wheels, when a fraction of the amount, if only put into cross heads, would render fly wheels unnecessary!

Mr. Porter stops short in his discussion. He should have added a table giving the proportionate length of stroke, weight of parts, and number of revolutions required to produce the effect of an engine running at a high speed, without the least fraction of inequality in the strain on the crank, and then the sun would have fairly risen in the "dawn of a new era for the steam engine." But, as it is so very simple, we can all figure it out for ourselves.

In the diagram Mr. Porter gives, to illustrate the travel of the piston, he wets his finger and draws it over another term in the equation (a method of elimination not taught by Hutton, Davies, and other mathematicians). It is a quick way, but is

it correct? He says, "the distance traveled by the piston is the versed sine of an angle formed by a line from the center of the crank pin, in any part of its stroke to the center of the circle described by the crank pin, leaving out of the calculation the angular vibration of the connecting rod" What he means by the "angular vibration," I do not know. He is wrong in the statement. If he will think of it he will see it. If he meant to say that the piston's travel was measured by the versed sine of the angle formed by the connecting rod and the line of horizontal centers, he is wrong again, yet nearer the truth than before, just as the proportion between the length of the connecting rod and the half diameter of the circle described by the crank pin. This can quickly be seen by supposing the connecting rod to be detached, and allowed to fall down on the center line, at any part of the stroke. If he understood this (as no doubt he did), he should not ignore the facts.

What I am aiming at is this. When a man attempts to demonstrate a thing mathematically, he must take into his calculation everything essentially connected with the problem, just exactly as it is, and not as he would have it; otherwise, he cannot, by any possibility, attain a correct result. When he claims, as now, the practicability of running engines at a high speed, I think he is claiming too much. Build an engine of proper materials, make it strong, and fit everything as it should be, balance crank and fly wheel to a nicety, keep everything snugly in its place, and the terrors of a quick stroke vanish.

S. W. H.

Test for White Lead.

MESSRS. EDITORS:—I have read, with much interest, Dr. Chandler's colorimetric test of the purity of white lead, as published in the SCIENTIFIC AMERICAN sometime ago. I enclose another test, which, though not new, is of value to all using white lead on account of its simplicity and effectiveness. It has been in use here for nearly two years, and has been found reliable. Having never seen it in print, I have tried to put it in as simple words as possible.

FELIX MCARDLE, Analytical Chemist.

St. Louis, Mo.

Take a piece of firm, close grained charcoal, and, near one end of it, scoop out a cavity about half an inch in diameter and a quarter of an inch in depth. Place in the cavity a sample, of the lead to be tested, about the size of a small pea, and apply to it continuously the blue or hottest part of the flame of the blow pipe; if the sample be strictly pure, it will in a very short time, say in two minutes, be reduced to metallic lead, leaving no residue; but if it be adulterated to the extent of ten per cent. only, with oxide of zinc, sulphate of baryta, whiting or any other carbonate of lime, (which substances are now the only adulterations used), or if it be composed entirely of these materials, as is sometimes the case with cheap lead, it cannot be reduced, but will remain on the charcoal an infusible mass.

Dry white lead, (carbonate of lead) is composed of metallic lead, oxygen and carbonic acid, and, when ground with linseed oil, forms the white lead of commerce. When it is subjected to the above treatment, the oil is first burned off, and then at a certain degree of heat, the oxygen and carbonic acid are set free, leaving only the metallic lead from which it was manufactured. If, however, there be present in the sample any of the above mentioned adulterations, they cannot of course be reduced to metallic lead, and cannot be reduced, by any heat of the blow pipe flame, to their own metallic bases; and being intimately incorporated and ground with the carbonate of lead, they prevent it from being reduced.

It is well, after blowing upon the sample, say for half a minute, by which time the oil will be burned off, to loosen the sample from the charcoal, with a knife blade or spatula, in order that the flame may pass under as well as over and against it. With proper care the lead will run into one button, instead of scattering over the charcoal, and this is the reason why the cavity above mentioned is necessary. A common star candle or a lard oil lamp furnishes the best flame for use of the blow pipe; a coal oil lamp should not be used.

By the above test, after a little practice, so small an adulteration as one or two per cent. can be detected; it is, however, only a test of the purity or impurity of a lead, and if found adulterated, the degree or percentage of adulteration cannot be well ascertained by it.

Jewellers usually have all the necessary apparatus for making the test, and any one of them can readily make it by observing the above directions, and from them can be obtained a blow pipe at small cost.

If you have no open package of the lead to be tested, a sample can most easily be obtained by boring into the side or top of a keg with a gimlet, and with it taking out the required quantity; care should be used to free it entirely from the borings or particles of wood, and it should not be larger than the size mentioned; a larger quantity can be reduced, but of course more time will be required, and the experiment cannot be so neatly performed.

How to Build a Chimney.

MESSRS. EDITORS:—I am satisfied that a great many fires originate through poorly constructed chimneys; and, although not a bricklayer by trade, I would offer a few hints how to construct a fire-proof chimney. Let the bed be laid of brick and mortar, iron, or stone; then the workman should take a brick in his left hand, and with the trowel, draw the mortar upon the end of the brick, from the under side, and not from the outside edge, as is usual. Then, by pressing the brick against the next one, the whole space between the two bricks will be filled with mortar; and so he should point up the inside as perfectly as the outside, as he proceeds.

By drawing the mortar on the edge of the brick, the space between the ends will not always be entirely filled, and will make (where the inside pointing is not attended to) a leaky and unsafe chimney, which, if not kept clear of soot, will, in burning out, stand a good chance of setting the building on fire. The best thing that I know of, to put the fire out in a burning chimney is salt; but the matter of first importance, after having a chimney properly constructed, is to keep it clean.

AUSTIN B. CULVER.

Westfield, N. Y.

Crystallized Honey.

MESSRS. EDITORS:—Please allow me to say to the querist who, through your columns, asks what to do with crystalline honey, that if he will "doctor" it with almost any artificial honey of the day, it will not become like lard in cold weather, which change is a natural proof that it is pure. For almost any purpose, pure honey is preferable to that which has been adulterated, but purity is a minor consideration with many.

Next we shall hear of some fastidious customer who objects to pure lard, because it looks white when cold. To such we would recommend lard oil as a great improvement, especially for cooking purposes.

A. M. B.

Louisville, Ky.

[For the Scientific American.]

RAMBLES FOR RELICS.

NUMBER II.

At a depth of fifteen feet, we were about to suspend our labors, supposing from the nature and uniformly dark color of the earth, that we had reached the surface of the alluvium, when a sign of the inevitable wood and bark layer was seen in a crevice. An excavation, five or six feet, into the wall, revealed the skeleton of a man laid at length, having an extra coverlid of wooden material. Eighteen large oblong beads, an ax of polished green stone, eleven arrow points, and five implements of bone (to be described) were deposited on the left side; and a few small beads, an ornamental shell pin, two small hatchets, and a sharp-pointed flint knife or lance, eight inches long, having a neck or projection at the base, suitable for a handle, or for insertion in a shaft, on the right side. The earth behind the skull being removed, three enormous conch shells presented their open mouths. One of my assistants started back as if the ghost of the departed had come to claim the treasure preserved, in accordance with superstitious notions, for its journey to the "happy lands." The alarm seemed to be a warning, for at the moment the embankment, overloaded on one side, caved in, nearly burying three workmen, myself, and a spectator. Our tools being at the bottom of the heap, and the wall on the other side, shaken by the falling earth, giving tokens of a change of base, our prospects of a ready deliverance were not very hopeful. The bystanders, however, went to work with their hands, and we were soon relieved, not without casualty, the spectator having the worst of it. Struggling to extricate himself, instead of abiding his time, he dragged one leg out of the pile shorter than the other.

The occurrence of marine shells in a burial depository, especially of the varieties pyrula and oliva, four or five hundred miles from the Gulf and that portion of the Southern coast where the mollusks exist, bears upon the question of migration and tribal intercourse, and the commercial value of these articles. Obtained from a distance and regarded as precious commodities, they were used in exchange, for the material of ornaments, and for choice utensils Only two or three of these shells have been found in a perfect condition, but defective ones are frequent, with fragments, "cuttings," and various trinkets made out of them—such as ornamental pins, needles, crosses, buttons, amulets, engraved plates, and beads. From one of the specimens recovered from the mound sepulchre, the spire and columella had been removed, leaving a hollow utensil. It would have been suitable for a water vessel, but for a hole in the bottom, which had furnished a button-shaped ornament, or piece of money, which was found with the relic, and exactly corresponded to the orifice. The twirled end of the shell, however, had been improved for a handle by shallow cavities, one on the inside slanting from the middle longitudinal line, and one crossing that line at right angles on the convex side, so as to be fitted to the thumb and fore finger of the left hand, suggesting a use of the implement as a shield, or a mask held before the face. Adair speaks of large shells in use by the Indians of his time (1735), suspended about the neck for shields, and regarded as badges of priestly dignity.

A trench was dug on the east side of the mound, nearly corresponding in dimensions to the one on the west side, making the length of the whole excavation, including the central cavity, thirty-two feet.

In the last opening, eight skeletons were exhumed; the mode of burial was the same throughout. The only article of value recovered was a curiously wrought pipe of stone, having a "figure head" representing the human face, which I have put down in a list of "articles stolen," and which the thief can describe better than the writer. After filling up all the gaps, and levelling the surface to suit the taste of the proprietor, we closed our labors on the mound in the Bent.

Of the skulls collected, it is sufficient to say that they belong to the "short heads," the length and breadth having a comparative medium proportion, a common form of cranium in the mounds of Tennessee.

Of stone implements I specify an ax of serpentine, ten inches long, two thick, and four broad, having plain sides and a straight edge ground down on both of the flat faces; hatchets ("tomahawks") of green stone, flint, and diorite, from five to eight inches long, with rounded faces and sides contracted to an edge at one end, and to a flat heel at the other; a wedge of black slate, seven inches long and half an inch thick, of a square finish on the faces and sides and at the heel, which was diminished two inches, as compared with the length of the edge; hatchets with a serrated edge at each end, plane on both sides, convex on one face and flat on the other.

With one skeleton was deposited a "set of tools," eight in number, of the species of rock before mentioned, varying in length from two to eight inches. Their peculiarity consists in a variety of shapes—no two being precisely alike—and in their fitness to various uses, such as carving, hacking, paring, and grooving. The smallest of them, having a square finish, was held by the thumb and two fingers, and is suitable for cutting lines and figures in wood and shells. Specimens of this art were furnished from the mound. The largest number might serve for hatchets, chisels, and gouges. One had been ground in the form of a cylinder five inches long and an inch thick, and then cut an inch on two sides to an edge, and worked into a handle with a round head, from the center of the elliptical faces. It might be used for chipping wood and stone. One answered the purpose of a cold chisel; another was somewhat similar, but had a hollow face reduced to a curved edge for grooving. These polished instruments, wrought with much care, seemed intended for use by the hand rather than for insertion in a handle or socket, or attachment to a shaft by means of a strap or withe. Only one was perforated. The drilling through granite, quartz, and diorite, without the use of metal, was a severe labor, even for savage patience. A long knife of silex, with a wrought handle, lance heads, leaf shaped, of the same material, of beautiful workmanship, arrow points of fine finish, furnished, with others before mentioned, an assortment of arms. Several flint points, though only an inch long, were curved like a cimeter, and used probably as flaying instruments. True disks, of various mineral substances, from an inch to five inches in diameter, having convex faces, complete the list of stone implements. Those of bone comprise several like hollow chisels, sharpened at one end, and pierced through one face, near the other extremity, so as to be fastened to a handle; these were used for dressing skins. One was formed like a poniard, with a worked hilt. With these may be connected arrow heads and sharp pointed weapons of the worked antlers of the stag, and tusks of the wild boar.

Of ornaments, I noticed pins used for dressing the hair, made of the columns of large sea shells. The head is generally round, sometimes oval, from an eighth to a half of an inch in diameter, retaining the diagonal groove of the pillar from which it is made. The stems vary in length from one to six inches. It would be tedious even to classify ornamental beads and buttons of shell work, such as are usually found in the mounds. These trinkets are perforated, and, in addition to their being articles of dress, were used probably as "wampum," the currency of the recent Indians.

A miscellaneous collection includes a hematite stone, wrought in the shape of a cup weighing half a pound; when rubbed or ground it furnished the war paint of the savages; also the extremity of a copper tube, two inches long; needles in bone and shell, from an inch to six inches long, with grooves round the head, to serve the purpose of eyes; and plates of mica. The use of mica plates, which are found of large size in some of the Western mounds, has excited some inquiry. Of a certain thickness, they make good mirrors. Beside their use for ornamental purposes, they were probably looking-glasses of the beauties of the stone age. There was also found a pipe of soap stone, having a stem five inches long, and a bowl with a broad brim, like a Quaker's hat.

Of earthenware, there was an endless variety of fragments of the usual black, grey, or red compressed clay, mixed with pulverized shells or stones. One kind I have never seen described. The sherds had a red coating on both sides, an eighth of an inch in thickness, evidently not a paint or a glaze. The red coloring might have come from the pottery being burnt in the open air, instead of baked in a furnace, were not the layer of uniform thickness and of homogeneous paste, unlike the material of the vessel, which was a gray mixture of clay and particles of shells.

I give the above memoranda to the general fund of information, touching a subject that invites inquiry on account of its novelty and ethnological importance. Every examination of the monumental remains of the ancient Americans brings to light some new feature in structure or type of rudimental art. And since archæology has become a science, investigators, for half a century, may be looking about for facts to complete the system auspiciously introduced by the antiquarians of Northern Europe, and advanced in our own country by the researches of Caleb Atwater (*Archæologia Americana*) and by those of the Smithsonian contributors to knowledge, especially Squier and Davis.

RAMBLER.

A SMALL WATER WHEEL.—There is in the town of Meriden, Conn., a Leffel double turbine wheel, running under 240 feet fall and driving a manufactory. It uses only about one-half of a square inch of water, and runs at the marvelous speed of 3,000 revolutions per minute, or 50 revolutions per second, which is by far the most rapid rate of motion ever imparted to a water wheel. This is, also, beyond comparison the greatest fall applied to the propulsion of a wheel in America. The wheel at Meriden is of the most diminutive size, scarcely exceeding in dimensions the old-fashioned "turnip" watches which our grandfathers used to carry in their capacious vest pockets. The complete success of this wheel has attracted much attention and affords further evidence of the wide range of adaptability of the Leffel turbine

[For the Scientific American.]

SILK CULTURE.

BY W. V. ANDREWS.

A vague notion that silk culture ought to form one of the industrial pursuits of the American people seems to be prevalent enough; but it does not take practical hold upon anybody. The nearest approach to anything practical which we have seen, in late years—excepting, of course, what has been done in California—occurred in New York in July last, when a number of gentlemen pledged themselves, according to a report given in the *Tribune* of July 30, "to promote the native silk trade."

The gentlemen present at the meeting represented the most prominent silk manufacturing and importing houses in this country. What these gentlemen have since done towards promoting the native silk trade, I do not know, but, having pledged themselves, it is presumed they have done something.

At the meeting, of which the *Tribune* article is a report, flags, and other things, manufactured from California silk, were exhibited; and the report goes on to say that "Mr. Warren also exhibited samples of native and foreign cocoons, and of raw and thrown silk, together with the common *Cecropia* and *Bombyx Cynthia*, species of silkworms which feed upon oak leaves. * * Also the *Bombyx Yamamai* which feeds upon mulberry leaves; also the *Bombynx Pernyi*, of which the cocoons are early as good as the cocoons of worms fed upon mulberry leaves."

I have given this extract, word for word, as it stands in the columns of the *Tribune*, because it contains more blunders of one kind or another than I remember ever to have seen in so many words. *Cecropia* is certainly not very particular as to its food, but it is not an oak feeder. *Cynthia* will thrive on nothing except ailanthus, though it will eat one or two other things, but not oak. The *Yamamai*, on the other hand, will eat oak, indeed it is its natural food; but Mr. Warren errs greatly when he says that it will feed on mulberry. The last clause of the sentence, which says that cocoons of *Pernyi* are nearly as good as those of worms fed on mulberry leaves, must be a sort of entomological joke, of which the point is not discoverable by me, so I pass it over.

I do not, however, notice this report on account of its grammatical and entomological mistakes. It is because of the evil effects it may, and probably will, have on amateur silk culturists, that I notice it; for most assuredly, failure will be the result of all attempts to produce silk cocoons by feeding the caterpillars of the different moths on the food prescribed by Mr. Warren. Any patriotic, money-making farmer, who believes in the *Tribune*, purchasing *Yamamai* eggs and setting his worms to feed upon mulberry, which they refuse to eat, and consequently, all die, will probably give up silk culture as being nothing more or less than a humbug. And thus the cause is injured.

For several years past, I have made some experiments in the rearing of the silkworms, giving the result of my experience in the first year in Vol. II., page 311, of the *American Naturalist;* and of a subsequent year in the *Entomologist*, for November, 1869.

The paper in the *Naturalist* is devoted to my experiments with the ailanthus silkworm, *Samia Cynthia* (G. & R.), a naturalized species from the East. In that paper, I have said all that is necessary to say at present, on that species, except perhaps that I am further convinced, from the inspection of samples of sewing and other silks, made from the cocoons of *Cynthia*, that one day it will be reared very extensively in the United States. It is perfectly hardy, is double brooded, and may be reared by any one possessed of a few acres of land, which may be good enough for growing ailanthus trees, but not good enough to grow any thing else. The labor of a few old men, or women, or even children, is sufficient for the purpose. The cost is therefore trifling.

The objection to the cultivation of *Cynthia* is that the cocoon cannot be reeled. But it can be carded, and of the Chinese can make excellent silk goods from it, why cannot we? I suspect, too, that *Cynthia* silk can be worked in with cotton, or, perhaps, woolen goods, adding to their beauty and durability (for it is indestructible in wear), and thus open up branches of manufacture hitherto unknown.

For manufacturers of coarse goods, I have no doubt that the silk from our native silk moths, *Cecropia* and *Polyphemus*, may be used. Indeed, I believe that M. Trouvelot is of opinion that *Polyphemus* may fairly enter into competition with *Bombyx mori*, the ordinary mulberry silkworm. The worm, however, is rather difficult to rear.

In reference, however, to *Bombyx mori*, it is well known that the silk crop in France and Italy has been reduced greatly, and the price of silk goods consequently enhanced, by prevalence of disease among the worms. So much is this the case, that silk breeders have been obliged to look around for some silk-producing moths whose products may, at any rate, supplement the deficient crop. *Cynthia*, as already mentioned as one of these, and two others mentioned by Warren in the *Tribune* reports above adverted to, are at present the subjects of experiment.

My article mentioned before as appearing in the *American Entomologist* is mainly devoted to my experiments, and those of my correspondents, with *Yamamai*, which, as I said before, is an oak feeder. In Japan, which is its native country, it feeds, in its wild state, on *Quercus serrata*. Whether that oak be found in America, I do not know, but it is of little importance, as the worm will feed on almost any species of oak, although I think that it prefers white oak. The importance of acclimatizing new species of silk moths is of so much prospective importance, that I shall devote the remainder of this article to the consideration of whether *Yamamai* and *Pernyi* may not be naturalized here.

Any one, who happens to have the number of the *Entomologist* containing the article above alluded to, may find it worth while to read it, but as many persons may not be able to obtain that number, I will here repeat the substance of my remarks, adding as much new matter as subsequent experience has afforded.

The silk from the *Yamamai* being considered being considered superior to that produced by any other of the substitute silk moths, great efforts have been made in Europe to acclimatize it; but, it must be confessed, hitherto with but slight success. There are exceptions, however, particularly among amateurs in Germany, sufficient to show that success is possible. The Baron de Bretton raises about 27,000 cocoons annually.

In this country but little has been done, or attempted, and that little has not been very successful.

The fact is, that *Yamamai* is a difficult moth to rear in a country like this, where in early spring the temperature varies so much; but that success is possible, I am convinced.

The moth emerges from the cocoon in the latter part of the summer, copulates, lays its eggs, and of course dies. And now the trouble commences; that is, with eggs laid, say in Japan, from whence we mainly get our supplies.

As soon as the egg is laid, the young larva commences its formation, which in a short time (about one month) is perfected. It lies in the egg in a quiescent state till early spring. If the egg remain in the country where it is laid, and is kept at a pretty even temperature, and free from damp, the caterpillar emerges in a healthy condition. But if it be removed some thousands of miles, passing in the transit from heat to cold, and back to heat again: and if, in addition, it be closely confined in a damp place, with little or no circulation of air, the egg is attacked by a fungus which sometimes prevents the worm from emerging at all; or, if it emerge, it is in a sickly condition. That these conditions obtain in the transit of eggs, from Japan to Europe, and thence to America, is evident enough; and it may, therefore, require the efforts of many persons, continued for a long time, to enable us to acclimatize the *Yamamai*. But this is all that is required, and I feel confident that ultimate success is certain.

On hatching out, the worm is of a brimstone yellow, and thinly covered with strong hairs; after the second month it is greenish, with black, longitudinal streaks, and the thread a dull coral red color. After the third month it becomes of a fine apple green, with yellow tubercles on each segment, from which issue a few black hairs. The head and legs are chocolate brown, the prolegs reddish, and the first segment edged with pinkish color. The greatest care is necessary, as the spring advances, to prevent the eggs from hatching before the oak buds are ready for them, and the temperature must be regulated with the greatest nicety. If the eggs can be kept somewhere about 50 deg. Fah., it would be quite safe; higher than that the mercury should not be allowed to rise, till you are quite ready for the worms, and, on the other hand, the eggs should not be allowed to freeze.

On emerging from the eggs, the worms should be allowed either to crawl to the oak branches, or rather to sprigs obtained for that purpose, the end of which should be placed in a jar, or bottle, of water, or the worms may be placed on gently with a camel-hair brush. The leaves should be well sprinkled with clean water that the caterpillars may drink.

From some cause, not well understood, the young caterpillars have a tendency to wander; and if care be not taken many may be lost. To prevent this, it is well to cover the branches with a gauze bag, tied tightly around the stems, and close to the bottle. Care must also be taken that the caterpillars do not find their way into the water, which they assuredly will if they have the opportunity, committing suicide in the most reckless manner. If the number of caterpillars be few, it is a good plan to place them at the outset with their food, in a wide-mouthed bottle, covering the mouth with gauze. The branches, particularly if the weather be warm, must still be occasionally sprinkled, so that the caterpillars may have the opportunity of drinking. It must be remembered that experiment is necessary in rearing *Yamamai*, but one thing is ascertained, and that is, that the worms must not be exposed to direct sunshine, at least not after seven or eight in the morning. If the spring be warm, I am inclined to think that a northeastern exposure is the best, and we may sum up by saying, that comparatively cool and moist reasons are more favorable to success that hot, dry weather. In America the worms suffer in the early spring, from the rapid changes of temperature, 40° at 9 A.M. increasing to 70° in the afternoon and falling off to freezing point during the night. The worms cannot stand this. They become torpid, refuse to eat, and consequently die. To prevent this, if the nights be cold, they must be placed where no such change of temperature can occur.

It is scarcely necessary to say that an ample supply of fresh food must be always supplied, but it may not be amiss to say that it is well, when supplying fresh branches, to remove the worms from the old to the new. The best way of doing this is to clip off the branch, or leaf, on which the worm is resting, and tie, pin, or in some way affix the same to the new branches. If this be not done, they will continue to eat the old leaf, even if it be withered, and this induces disease. If the worm has fastened itself for the purpose of moulting, the best way is to remove the entire branch, clipping off all the dried leaves before so removing it. These remarks apply, in general, to the treatment of all silkworms, except *Bombyx mori*.

The results of numerous experiments with *Yamamai* go to show that it is, as I said before, a difficult worm to rear; but it has been reared near New York to the extent of eight hundred cocoons out of sixteen hundred eggs, and this, although not a remunerative result, is encouraging.

The Chinese silk moth, *Aulterea Pernyi*, also an oak feeder, has been successfully raised by me and by others, for several years. Eggs have been sold to persons in States widely separated, and the results show that this worm is perfectly hardy.

The moth winters in the cocoon, emerges early in May, if the weather be warm, pairs readily, and lays from 150 to 200 eggs. These hatch out in about fourteen days, and like *Yamamai*, always about 5 or 6 o'clock in the morning. It is necessary to be on the alert to catch them on hatching only, and to remember that they are vagabonds, even to a greater extent than *Yamamai*. Consequently similar precautions must be taken.

The worm on emerging from the egg is large, and of a chocolate-brown color. After the first month it becomes of a yellowish green; head, pale brown; feet and prolegs of nearly the same color. The body has numerous reddish tubercles, from which issue a few reddish hairs. At the base of some of the tubercles on the anterior segments are silvery patches.

The *Pernyi* worm is much more easily reared than that of *Yamamai*, but still great care is needed; fresh food of course is essential, and a slight sprinkling of the branches and worms in very warm weather is advisable; although it is not so necessary as with *Yamamai*. It is remarkable that *Pernyi* worms, fed in the open air, on oak trees, do not, at present, thrive so well as those fed in-doors, but this, doubtless, is a question of acclimation. I advise white oak (*Quercus alba*) as food, if it can be readily obtained, but failing that, pin oak (*Quercus palustris*) will do; and I have no doubt that they will feed on any kind of oak. They will, indeed, feed on birch, and on sweet gum (*Liquidambar*), but oak is the proper food. It is worthy of remark that *Pernyi* bears a strong resemblance to our *Polyphemus*, but it is more easily reared in confinement, and double brooded; an important fact for the silk culturist. From American reared eggs, I obtained cocoons as early as July 4th, the perfect insect emerging on July 31. Copulation immediately ensued, and the resulting eggs hatched only on August 12, ten days only from the time of laying; and as the worm feeds up in about four or five weeks, this affords plenty of time for rearing the second brood. It must be remembered that on the quantity and quality of food, much depends, not only with *Pernyi* but with all caterpillars. By furnishing food sparingly the time of feeding would be much prolonged.

I have already said that both *Yamamai* and *Pernyi* should be fed under shelter for the reasons given, but there is another reason of less importance. The young worms are liable to be attacked by spiders and wasps, and even after the second month, they are not safe from these enemies. I have seen a wasp bite a large caterpillar in two, carry off the anterior section and return for the posterior, which had held on by its prolegs. Did the wasp anticipate this fact, and therefore carry off the anterior part first? As to the spiders, they form a series of pulleys and hoist the caterpillar off its legs, sucking its juices at leisure.

And now I must devote a few words to the advisability of silk culture from a pecuniary point of view. *Bombyx mori*, or the ordinary mulberry silkworm, is, of course, the best to rear, if you can obtain healthy eggs. But this is the difficulty, and thence arises the necessity of cultivating other silk-producing species. I imagine that silk can be produced in most of the States of the Union, and manufactured from the cocoon at a large profit; but for the present, we will leave the manufacture out of the question, and consider only, whether it will not pay to rear eggs and cocoons for sale? It must be remembered that European manufacturers are at this moment largely dependent on foreign countries for the supply of both eggs and cocoons; and this, because of the general prevalence of disease among all the races of *Bombyx mori*. And now, to what extent does the reader suppose this dependence exists? Of cocoons I have no returns at hand, but, of raw silk, European manufacturers purchase, annually, not less than $160,000,000 worth; and of eggs (*Bombyx mori*) to the value of $10,000,000. This, then, is a business of no trifling amount. California seems to be alive to the fact, and, I am informed, raised, this last season, $3,000,000 cocoons; and, for sale, about 4,000 ounces of eggs, worth at least $4 per ounce, wholesale. Now, there is no earthly reason why California should monopolize this business. Why are not companies formed in other States for this purpose? or if private individuals lack the enterprise or the means, why do not the legislatures, of those States most favorably located, do something by way of starting the business? A few thousand dollars loaned, or even donated, may prove to be a valuable investment for the people at large, and, even supposing a failure, would not be a very great loss to any body.

So far as farmers are concerned, it may interest them to know that one man in England, Capt. Mason, clears $50 per acre by rearing silkworms (*Bombyx mori* in this case), and I much doubt whether any crop raised here pays as well.

By way of commencement, then, let everybody that has sufficient leisure set to work, and rear as many silkworms, of the above-named species, as he possibly can; and if the process be not remunerative in a pecuniary sense, it most assuredly will be in the amount of pleasure and knowledge obtained.

One caution I must give to those who cultivate *Bombyx mori*. Although *Yamamai* requires sprinkled branches, *Bombyx mori* does not; nor must the leaves be furnished to them while wet with rain or dew.

EFFECT OF COLD UPON IRON.—The article upon this subject, giving experiments of Fairbairn and others, referred to in our editorial upon the same subject, in our last issue, was crowded out by press of matter. The reader will find it in the present number.

Universal Boring Machine.

Our readers will recollect an illustrated description of an universal wood-working machine, published on page 79, Vol. XIII. of the SCIENTIFIC AMERICAN. The machine herewith illustrated is manufactured by the same firm, and is a valuable addition to the many excellent wood-working machines now in use. A boring machine, though one of the simplest, is by no means an unimportant adjunct to a full outfit of wood-working machines. The one shown in our engraving is one of the most complete ever brought to our notice, and the great variety of work it is capable of performing, renders the name chosen for it peculiarly applicable. It is called the "Universal Boring Machine" because the most prominent feature of its construction is its power to bore a hole in any desired angle with the axis of the bit.

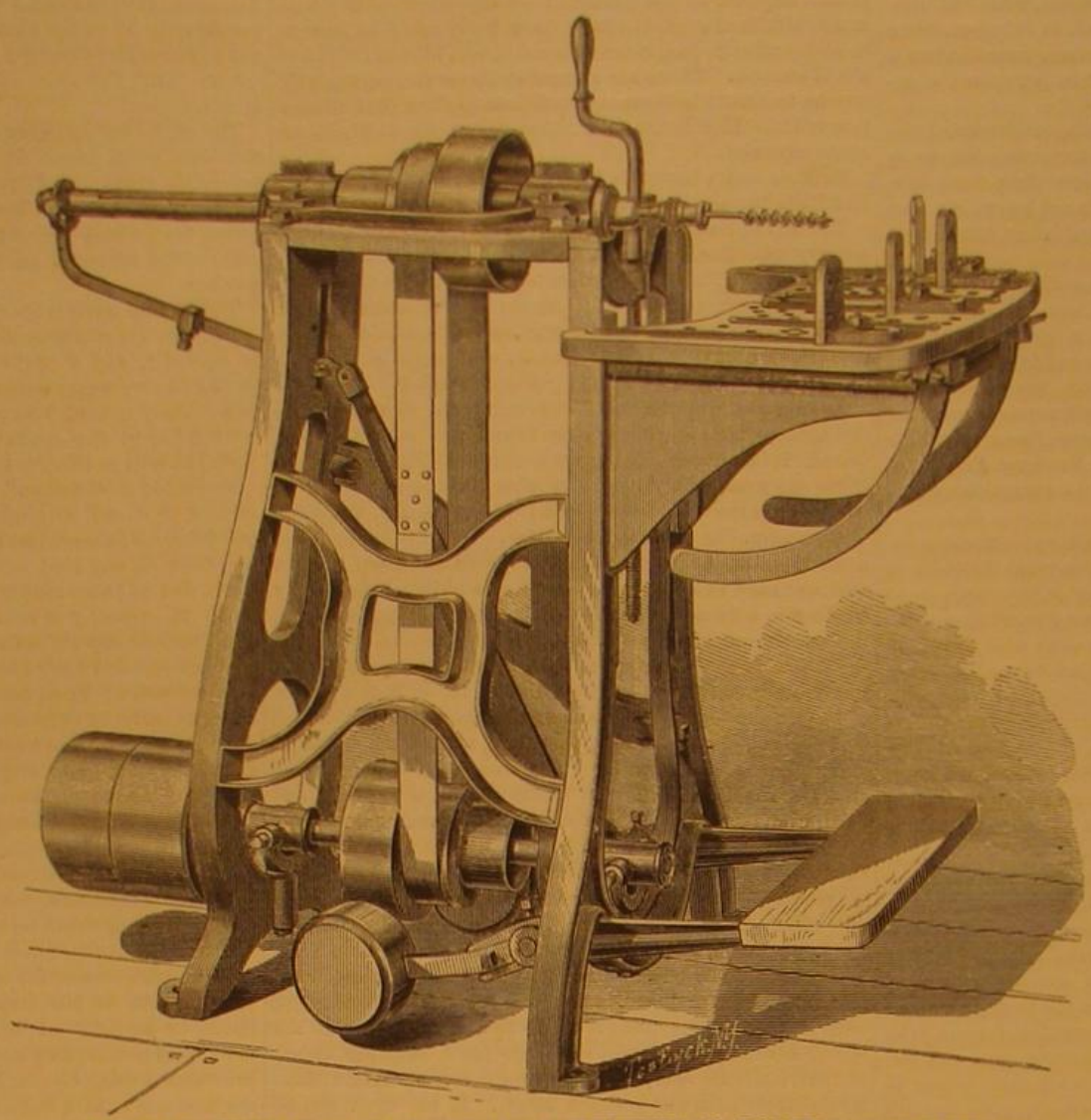
Any sized bit required is inserted into the chuck, which is adjustable to fit large and small shanks. The mandrel which carries the chuck is made to traverse by a foot lever, so as to bore any depth up to twelve inches. The mandrel is driven by belt from a cone pulley of three faces, which gives the proper speeds for different sized bits.

Slots and stops upon the table enable the work to be set at any desired angle on the horizontal plane, while the table can be set on an incline to any angle not exceeding forty-five degrees. The table is twenty-one inches wide, with fifteen inches slide, and it can be raised or lowered fifteen inches.

The countershaft rests in self-adjusting boxes, and has a tight and a loose pulley eight inches in diameter. The traversing mandrel is of the best quality of steel, and the machine is otherwise made of iron in a substantial manner.

The several adjustments enable the operator to do all kinds of light and heavy boring, with ease and with great rapidity.

This machine was awarded the first premium at the Cincinnati Industrial Exposition, in October, 1870, and was patented through the Scientific American Patent Agency, Aug. 16, 1870. It is manufactured by McBeth, Bentel and Margedant, of Hamilton, Ohio, whom address for machines rights to manufacture, or other information.



McBETH, BENTEL, & MARGEDANT'S UNIVERSAL BORING MACHINE.

COMBINED TRUNK AND ROCKING CHAIR.

A unique invention, calculated to increase the comforts of travellers on steamboats, ships, and in crowded rooms of hotels, is illustrated in the engraving published herewith. It is the invention of T. Nye, of Westbrook, Me., and was

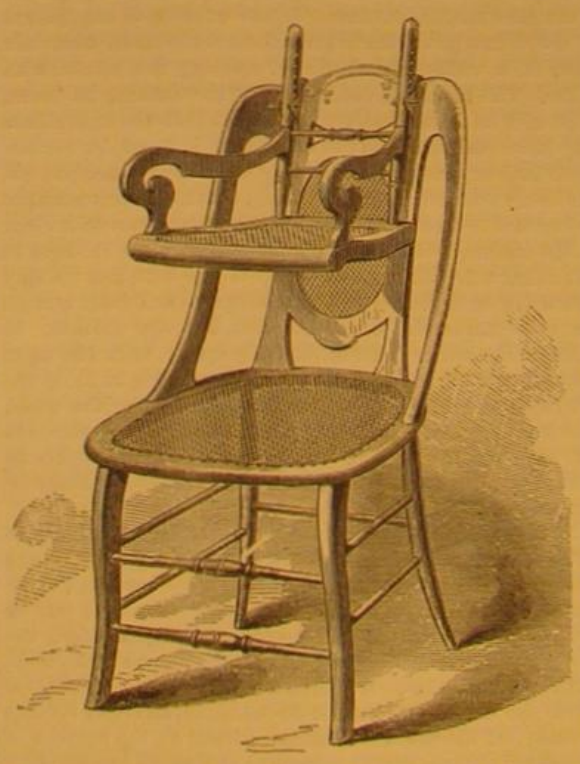
patented by him, June 18, 1867. It is a combined trunk and rocking chair. The rockers are made to fold into recesses, where they are retained by suitable appliances till wanted. The trunk being opened, as shown, forms a back to the seat, which is held by metallic braces. When closed, the whole presents the appearance of an ordinary trunk.

Cosmetics.

The extensive use of preparations for hiding nature's bloom on the human countenance, and presenting to our view a sort of metallic plaster, suggests the inquiry, "how are these pigments made?" Without going into an unnecessary analysis of the "Bloom of Youth," the "Rejuvenator," the "Corpse Decorator," or the other inventions for destroying the skin, with which the druggists' stores abound, we may state again the fact, always unheeded, that all the detestable compounds are injurious. They are nearly all metallic poisons, and, if there be any that are innocent of this charge, they are in every instance harmful to the health. The color and surface of the skin cannot be changed by any application which does not close the pores; the pores, which are so exquisitely fine that there are millions of them to the square inch, and which must be kept open if a healthy and cleanly body is to be preserved. There is more breathing done through the pores of a healthy person than through the lungs; and we need not remind our readers of a ghastly piece of cruelty once enacted in Paris (that of gilding the body of a child, for a triumphal procession, which killed the subject in two hours), to show that the stoppage, in any degree, of the natural functions of so important an organ as the skin, is injurious. The immediate effect of the use of such compounds is to destroy the vitality of the skin, and to render it, in appearance, a piece of shriveled parchment. We must warn our readers that a temporary and meretricious "bloom" can only be attained at the cost of future freshness and lively appearance, so that a year or two of "looking like paint" is followed by a long period of "looking like dilapidation."

SMITH'S INFANT DINING CHAIR.

The accompanying engraving illustrates a convenient and cheap infant dining chair, which can be attached to any of the ordinary chairs in common use.



It consists of a chair without legs, suspended by the posts of the back, as shown, on pins engaging with hooked bars, which are placed upon the back of an ordinary chair. The details of the device will be seen by a glance at the engraving. The chair is adjusted in hight by placing the pins in the proper holes in the posts made for this purpose.

For further information, address Smith, Hollenbeck & Co., Toledo, Ohio.

The Medicines of the Ancients.

At the recent commencement of the Homeopathic College in this city, Mr. S. H. Wales, of the SCIENTIFIC AMERICAN addressed the graduating class, and from his remarks, we quote the following:

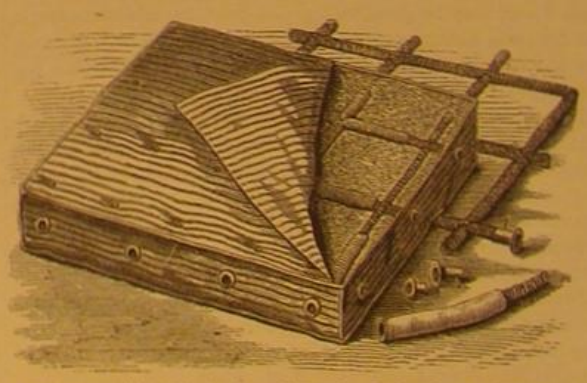
"Many writers of our time persist in regarding this, above all others, as the best period in the history of our race; and, doubtless, it is true in many important respects. But I cannot forbear the suggestion at this moment that there was a time in the history of the world when the science of medicine was unknown, when people lived to the incredible age of many centuries; and, even after the span of life had been reduced to threescore and ten, sickness was comparatively unknown. In ancient times, it was looked upon as a calamity, that had overtaken a tribe or people, when one of its members prematurely sickened and died.

"Other arts and sciences flourished in Rome long before medicine was thought of; and the historian tells us that the first doctor who settled in Rome, some two hundred years before Christ, was banished on account of his poor success and the very severe treatment applied to his patients; and it was a hundred years before the next one came. He rose to great popularity, simply because he allowed his patients to drink all the wine they wanted, and to eat their favorite dishes. Some writer on hygiene has made the statement that the whole code of medical ethics presented by Moses consisted simply in bathing, purification, and diet. This simplicity of life was not confined to the wandering tribes who settled in the land of Canaan, but was the universal custom of all nations of which history gives us any account. This simple arrangement for health was considered enough in those primitive times, when the human system had not been worn out and exhausted by depletive medicines. The luxuries of public baths, athletic sports and games were deemed ample, both to educate the physical perceptions and to prevent disease.

"All this wisdom, which had its origin in ancient games and sports of the field, led to the erection of extensive bath-houses, and the adoption of other healthful luxuries to which all the people could resort to recreate their wasted powers."

BARNES' VENTILATOR FOR MATTRESSES, ETC.

Many diseases are caused by the use of beds not properly aired; and it is difficult, if not impossible, to properly air, or ventilate, a mattress, made in the usual manner. If this could be done more thoroughly than it generally is, much sickness would be avoided.



To secure this object cheaply and efficiently is the design of the invention herewith illustrated. By it a complete circulation of air through the mattress is secured, which carries off all dampness arising from constant use. Thus the mattress becomes more healthy for sleeping purposes, more durable and better fitted for the sick room. The ventilators consist of coiled wire, covered with coarse cloth (to prevent the stuffing closing up the tube), running through the mattress in all directions. The ends of the coils are secured to the ticking by means of metal thimbles, inside of which are pieces of wire gauze, to prevent insects getting in, but which admit air freely. The cost of the ventilators is small, and they will last as long as any mattress. They can be applied to any bed at small expense.

This invention was patented through the Scientific American Patent Agency, January 10, 1871. The right to manufacture will be disposed of in any part of the country. Further information can be obtained by addressing the proprietors, Barnes & Allen, Hoosick Falls, N. Y.

THE third annual exhibition of the National Photographic Association takes place at Horticultural Hall, Philadelphia, June 6, 1871. Prof. Morton is to deliver two lectures on Light.

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.

VOL. XXIV., NO. 12 . . . [NEW SERIES.] *Twenty-sixth Year*

NEW YORK, SATURDAY, MARCH 18, 1871.

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A SCIENTIFIC AND TECHNICAL AWAKENING.

Our English cotemporary, *Engineering*, appears to have seriously exercised itself in the perusal of our good-natured article on "English and American Scientific and Mechanical Engineering Journalism," which appeared in the SCIENTIFIC AMERICAN, February 4th; at least, we so judge from the tenor of an article in response thereto, covering a full page of that journal. The article in question is a curiosity in literature. It deserves a much wider circulation than *Engineering* can give it, and we would gladly transfer it to our columns, but for its exceeding length—a serious fault generally, not only with *Engineering's* articles, but most other technical journals published in England. It would scarcely do for them to be brief in their discussions, and above all other things, spice and piquancy must always be excluded. *Engineering* evidently labors under the conviction that the heavier it can make its discussions, the more profoundly will it be able to impress its readers. Hence, we are equally astonished and gratified to find a gleam of humor flashing out from the ordinary sober-sided composition of our learned contemporary. The article came to us just as we were laboring under an attack of dyspepsia, and its reading fairly shook our atrabilious *corpus*. We said to ourselves, "can it be possible that *Engineering* is about to experience the new birth, to undergo regeneration, and a baptism of fire?" The article is really worth reading, and we begin to indulge the hope that at least one English technical is going to try to make itself not only useful, but readable and interesting. And what is most perplexingly novel in this new manifestation, is the display of a considerable amount of egotism, which we had always supposed to be a sinful and naughty thing in technical journalism. And, as if to magnify this self-complaisance, it actually alludes to its "*own extensive and ever-increasing circulation in America.*" Now to show how small a thing can impart comfort to the soul of our cotemporary, we venture to say that the circulation of *Engineering* in this country cannot much exceed three hundred copies per week.

It evidently amazes our English cotemporary that a journal like the SCIENTIFIC AMERICAN, which, according to its own notions, is chiefly the work of "scissors and paste," should circulate so widely; and it even belittles our weekly circulation by several thousand copies, in order to give point to its very amusing, and, we will also add, generally just criticism.

The writer in *Engineering*, whoever he may be, appears to be a sort of literary Rip Van Winkle, just waking out of a long sleep; and he cannot get the idea through his head that it is possible that a technical journal can become a vehicle of popular information to the mass of mankind, instead of being the organ of a small clique of professional engineers or wealthy manufacturers, such as seems to hold control of the columns of *Engineering*, and who use it either to ventilate their own pet schemes and theories, or to advertise, by illustration and otherwise, in the reading columns, a repetition of lathes, axle-boxes brakes, cars, and other trade specialities, which can lay little or no claim to novelty. It is, furthermore, a crying sin in the estimation of our English critic that American technical journals do not separate their advertisements from the subject matter; and he thinks that when Yankee editors learn that trade announcements are out of place in the body of a journal, they will see how to make their journals pay by making them higher priced. Now we venture to say, without intending to give offence, that Yankee editors understand their business quite as well as do English editors; and it is presumable, at least, that they know what suits their readers on this side, much better than do English editors. We venture to suggest—modestly, of course—that journalism in the two countries is not the same, and should the editor of *Engineering* undertake to transfer his system of intellectual labor to this side of the Atlantic, he would not be long in making the discovery that those wandering Bohemian engineers, who, he tells us, are in sorrow and heaviness over the short-comings of American technical journals, would turn out after all to be slender props for him to lean upon. We think it probable, however, that with a little more snap, a journal like *Engineering* might possibly attain a circulation, in this country, of 500 or 1000 copies weekly.

Why, American engineers have scarcely yet been able to organize themselves into an association for mutual advancement in their profession, much less to give the reading public the benefit of their experience and labors! This fact alone ought, of itself, to satisfy *Engineering* that no such journal could profitably exist in this country. Whenever our American engineers are ready to support such a journal, there will be no difficulty in finding a publisher.

Engineering, in its casual reference to the various technical journals of America, omits to name our leading scientific monthly, but introduces with just commendation a venerable cotemporary, now upwards of three score years of age. Now, it is no disparagement of this really modest monthly to say, that perhaps there are not sixty hundred people in the States who know it, even by name; and so far as the use of "scissors and paste" are made available in our technical journals, we venture the assertion that the editorial staff expenses of the SCIENTIFIC AMERICAN are as great, if not greater, than those of *Engineering*. The question, however, is not so much one of original outlay, but which of the two journals gives most for the money. In this very essential particular, and with no intention to depreciate the value of *Engineering*, we assert, with becoming modesty, that the SCIENTIFIC AMERICAN occupies a position which *Engineering* will never be able to attain.

THE SHERMAN PROCESS.

When people boast of extraordinary successes in processes the details of which are kept profoundly hidden from public scrutiny, and when the evidences of success are presented in the doubtful form of specimens which the public has no means of tracing directly to the process, the public is apt to be skeptical, and to express skepticism often in not very complimentary terms.

For a considerable time, the public has been treated to highly-colored accounts of a wonderful metallurgic process, whereby the best iron and steel were said to be made, from the very worst materials, almost in the twinkling of an eye. This process has been called after its assumed inventor, or discoverer, the "Sherman Process." The details of the process are still withheld, but we last week gave an extract from an English contemporary, which throws a little light upon the subject.

The agent relied upon to effect the remarkable transformation claimed, is iodine, used preferably in the form of iodide of potassium, and very little of it is said to produce a most marvellous change in the character of the metal.

A very feeble attempt at explaining the rationale of this effect has been made, in one or two English journals, which we opine will not prove very satisfactory to chemists and scientific metallurgists. The *Engineer* has published two three-column articles upon the subject, the first containing very little information, and the second a great number of unnecessary paragraphs, but which gives the proportion of the iodide used, in the extremely scientific and accurate formula expressed in the terms "a small quantity."

Assertions of remarkable success have also been given. Nothing, however, was said of remarkable failures, of which there have doubtless been some. A series of continued successes would, we should think, by this time, have sufficed for the parturition of this metallurgic process, and the discovery would ere this have been introduced to the world, had there not been some drawbacks.

We are not prepared to deny *in toto* that the process is all that is claimed for it; but the way in which it has been managed is certainly one not likely to encourage faith in it.

The very name of "process" implies a system perfected, and if it be still so far back in the experimental stage that nothing definite in the way of results can be relied upon, it is not yet a process. If, in the use of iodine, in some instances, fine grades of iron or steel are produced, and in as many other experiments, with the same material, failures result, it is just as fair to attribute the failures to the iodine, as the successes. A process worthy the name is one that acts with approximate uniformity, and when, in its use, results vary widely from what is usual, the variation may be traced to important differences in the conditions of its application.

On the whole, we are inclined to believe Mr. Sherman's experiments have not yet developed a definite process, and we shall receive with much allowance the glowing statements published in regard to it, until such time as it can face the world and defy unbelief.

The patents obtained by Mr. Sherman seem to cover the use of iodine, rather than the manner of using it, and throw no light upon the rationale of the process.

A patent was granted by the United States Patent Office, Sept. 13, 1870, to J. C. Atwood, in which the inventor claims the use of iodide of potassium in connection with the carbons and fluxes used in making and refining iron. In his specification he states that he uses about *fifteen grains* of this salt to eighty pounds of the metal. This is about $\frac{1}{3}\frac{1}{3}$ of one per cent. He uses in connection with this exceedingly small proportion of iodide of potassium, about two ounces of lampblack, or charcoal, and four ounces of manganese, and asserts that steel made with these materials will be superior in quality to that made by the old method. These claims we are inclined to discredit. Certainly, we see no chemical reason why this small amount of iodide should produce such an effect, and the specification itself throws no light upon our darkness.

If the experiments in these so-called processes have no better basis than is apparent from such information as at present can be gathered respecting them, it is probable we shall wait some time before the promised revolution in iron and steel manufacture is accomplished through their use.

RUBBER TIRES FOR TRACTION ENGINES.

When it was first discovered that a smooth-faced driving wheel, running on a smooth-faced rail, would "bite," the era of iron railways and locomotive engines may be said to have fairly commenced. The correction of a single radical error was, in this case, the dawn of a new system of travel, so extensive in its growth and marvelous in its results, that even the wildest dreamer could not, at that time, have imagined the consequences of so simple a discovery.

A popular and somewhat similar error regarding the bite of wheels on rough and uneven surfaces, has also prevailed. We say popular error, because engineers have not shared it, and it has obtained, to any notable extent, only among those unfamiliar with mechanical science. The error in question is, that hard-surfaced wheels will not bite on a moderately rough surface, sufficiently to give an efficient tractile power. It seems strange that this error should have diffused itself very extensively, when it is remembered that a certain degree of roughness is essential to frictional resistance. The smoothness of the ordinary railway track is roughness compared to that of an oiled or unctuous metallic surface; and it has been amply demonstrated that the resistance of friction, of two bearing surfaces depends, not upon their extent, but upon the pressure with which they are forced together. A traction wheel, of given weight, resting upon two square inches of hard earth or rock, would develop the same tractile power as though it had a bearing surface of two square feet on similar material.

On very rough and stony ways, however, another element practically of no importance on moderately rough ways, like a macadam surface or a concrete road, where the prominences are nearly of uniform hight, and so near together as to admit between their summits only very small arcs of the circumference of the wheel; comes into action. This element is the constantly recurring lifting of the superincumbent weight of the machine. Even this would not result in loss of power, could the power developed in falling be wholly applied to useful work in the direction of the advance of the engine. The fact is, however, that it is not so applied, and in any method of propulsion at present known to engineering science, cannot be so applied. Above a certain point, where friction enough is developed to prevent slip, the more uneven the road surface is, the greater the power demanded for the propulsion of the locomotive. And this will hold good for both hard and soft-tired wheels.

What then is the advantage, if any, of rubber-tired wheels? The advantages claimed may be enumerated as follows: Increased tractile power, with a given weight, secured without damage to roadways; ease of carriage to the supported machinery, whereby it—the machinery—is saved from stress and wear; and economy of the power, expended in moving the extra weight required by rigid-tired wheels, to secure the required frictional resistance. The last-mentioned claim depends upon the first, and must stand or fall with it. The saving of roadway, ease of carriage, and its favorable results upon the machinery, are generally conceded.

A denial of the first claim has been made, by those interested in the manufacture of rigid-tired traction engines, and others, in so far as the rubber tires are employed on comparatively smooth surfaces; although the increased tractile power on quite *rough* pavements and roads is acknowledged.

This denial is based upon results of experiments performed on the streets of Rochester, England, between the 9th October and the 2nd November, 1870, by a committee of the Royal Engineers (British Army), with a view to determine accurately the point in question.

Care was taken to make the circumstances, under which the trials took place, exactly alike for both the rubber and the iron tires. The experiments were performed with an Aveling and Porter six-horse power road engine, built for the Royal Engineers' establishment. The weight of the engine, without rubber tires, was 11,225 pounds; with rubber tires, it weighed 12,025 pounds. Without rubber tires, it drew 2·813 times its own weight up a gradient of 1 in 11; with rubber tires, it drew up the same incline 2·763 times the weight of engine, with the weight of rubber tires added showing that, although it drew a little over 2,200 pounds more than it could do without the rubber tires, the increase of traction was only that which might be expected from the additional weight.

It is claimed, moreover, that the additional traction power and superior ease of carriage on rough roads, secured by rubber tires, is dearly bought at the very great increase of cost, of an engine fitted with them, over one not so fitted.

This is a point we regard as not fully settled, though it can not long remain in doubt. There are enough of both classes of wheels now in use to soon answer practically any question of wheels now in use to soon answer practically any question there may be of durability (upon which the point of economy hinges), so far as the interest on the increased cost of the rubber tires, is offset against the greater wear and tear of iron rimmed wheels. It is stated, on good authority, that a rubber tired engine, started at work in Aberdeen, Scotland, wore out its tires between April and September, inclusive; and when it is taken into consideration, that the cost of these

tires is about half that of other engines, made with solid iron rimmed driving wheels, it will be seen that, unless very much greater durability than this can be shown for the rubber, the advantages of such tires are very nearly, if not more than, balanced by their disadvantages.

The fact that one set of tires wore out so soon does not prove a rule. There may have been causes at work which do not affect such tires generally, and it would be, we think, quite premature to form favorable or unfavorable judgment, of relative economy from such data as have been yet furnished.

The difference in the current expenses of running the two most prominent types of engines, with hard and soft tires, now in use, does not affect the question of rubber tires, unless it can be shown that these tires necessitate, *per se*, such a form of engine as requires a greater consumption of fuel, and greater cost of attendance, to perform a given amount of work.

CENTRAL SHAFT OF THE HOOSAC TUNNEL.

As many of our readers have evinced much interest and ingenuity on the question of the propriety of placing reliance upon the accuracy of dropping a perpendicular from the top to the bottom of a shaft 1,030 feet in depth, by means of an ordinary plummet, we take the earliest opportunity of settling the matter beyond dispute, by reporting the results lately obtained, through a series of experiments by the engineers in charge, for the ultimate purpose of laying down the correct line for the tunnel.

The perpendicular line has, of course, been dropped many times, and the main result taken. The plummet used is made of steel, properly balanced and polished, in shape something like a pineapple, and of about the same size, weighing fifteen pounds. It was suspended, with the large end downwards, by a thin copper wire, one fortieth of an inch in diameter, immersed in water; and, after careful steadying with the hand, occupied about an hour in assuming its final position or motion, which, contrary to the expectation and theories of many, resulted in a circular motion around a fixed point, the diameter of the circle being a mean of one quarter of an inch. The suspending wire in these operations was not quite the entire length of the shaft, being only 900 feet; and before the plummet had settled, the wire had stretched nearly twenty feet.

The suspension of the plummet in water was not considered necessary for any other reason than that water was continually trickling down the wire, and dropping on the plummet. The experiments so far have not been of the perfect character it is determined to attain, when the final allignment is made, as, until the headings east and west of the shaft have advanced to a considerable distance, any slight error would be of no account.

A neat and ingenious instrument has been constructed for determining the variation of the plummet, and will be used when great accuracy is desired; the plummet will also be suspended in oil.

The bearing of the tunnel is about S. 81° E.; but, independently of its near approach to the line of revolution described by the earth, it is not considered necessary to take into account any motion it may derive from this cause. In fact, the opinion is, that the motion of the earth will not practically have any effect.

On the whole, after the still imperfect experiments which have been made, enough is established to show there is no difficulty to be encountered, other than the accurate and delicate manipulation of the plummet and its attachments.

The shaft headings are progressing favorably. The rock is not so hard or varied as that met with at the west end workings. Already nearly 300 feet have been taken out, and, with the proved energy of the contractors, this great work will doubtless be prosecuted steadily and surely to completion, within the contract time expiring March 1, 1874.

A MUSEUM OF ART AND NATURAL HISTORY.

Our recent articles on "Scientific Destitution in New York" and "The Scientific Value of the Central Park," have called forth numerous letters from correspondents, and have been extensively noticed by the press. We now learn that the Legislature of the State has taken the matter in hand, and there is some prospect, with an honest administration of the appropriations, of something being done to relieve our city from the opprobrium that rests upon it. A bill is pending, before the Senate, authorizing the Park Commissioners to erect, equip, and furnish, on Manhattan Square, or any other public square or park, suitable fire-proof buildings, at a cost not exceeding $500,000 for each corporation, for the purpose of establishing a museum of art, by the Metropolitan Museum of Art, and of a museum of natural history, by the American Museum of Natural History, two societies recently incorporated by the Legislature. This is a million dollars to begin with, and an ample site, without cost, to the aforesaid corporations.

Manhattan Square extends from Seventy-seventh to Eighty-first streets, and from Eighth to Ninth avenues, and contains about eighteen acres. Until it was set apart by the late Board of Commissioners, for the purposes of a Zoological Garden, it was proposed, by a number of enlightened citizens of New York, to devote it to the uses of four of our leading corporations, giving to each one a corner, and an equal share in the allotment of space. The societies were, "The Academy of Design," for art, "the Historical Society," for public records and libraries, "the Lyceum of Natural History," for science, and "the American Institute," for technology. These have been incorporated for many years, and are known to include the leading artists, men of letters, science, and the arts, of the city, on their lists of members. The committee went so far as to have plans of the building drawn by competent architects; but, like many other well-meant schemes, want of money compelled the originators of the plan to abandon any further attempts. In the meantime, the Legislature chartered the American Botanical and Zoological Society, and gave the Commissioners of the Park authority to set apart a portion of it, not exceeding sixty acres, for the use of the Society, for the establishment of a zoological and botanical garden. This society was duly organized under the act, and Mr. Hamilton Fish was made its president, and considerable sums of money were subscribed. But, according to the sixth annual report of the Board of Commissioners, "the society never manifested its desire for an allotment of ground." It appears to have died, and made no sign. Some of our citizens, fearing that the Central Park would go the way of every other public work in the city, made strenuous effort to revive the Zoological Society, for the purpose of obtaining a perpetual lease of a suitable site, on which to establish a zoological garden, similar to those in London, Paris, Amsterdam, and Cologne. Their object was to remove this part of the Park beyond the reach of political intrigue. Subsequent events have shown that the fears of these gentlemen were well founded. The Legislature of the State, on the 25th of March, 1862, gave ample powers to the New York Historical Society to establish a Museum of Antiquity and Science, and a Gallery of Art, in the Central Park. They have submitted designs for a building, but, for some reason, no decisive steps have been taken towards its construction.

The Lyceum of Natural History was also negotiating with the Commissioners, for the use of the upper rooms of the arsenal for its collections, and there is no doubt that an arrangement to this effect would have been made, if a fire had not destroyed the entire collections of the Lyceum. The Lyceum made great effort to raise money to purchase a new collection, but without avail; and, although this is the oldest scientific society in New York, and has inrolled in its list of members, nearly every professional scientist of the city, it is probably the poorest, in income and resources, of any academy of sciences in the world. We do not know that the Academy of Design has ever applied for a home in the Central Park; and we cannot speak for the American Institute, nor for the Geographical Society, in this particular. As we stated in our former article, the old Board of Commissioners appears to have become weary of the unsuccessful attempts on the part of numerous societies to divide up and apportion the Central Park, and they applied to the Legislature for authority to conduct matters in their own way. An act was duly passed, authorizing the Board "to erect, establish, conduct, and maintain, on the Central Park, a Meteorological and Astronomical Observatory, a Museum of Natural History, and a Gallery of Art, and the buildings therefor, and to provide the necessary instruments, furniture, and equipments for the same."

Here would seem to be ample power for the establishment of museums of science and art, but nothing is said about the manner of raising the money. One would suppose, however, that, by means of the "Central Park Improvement Fund," abundant means could have been raised. The bill now before the Legislature puts matters in a new light. If it does not conflict with previous enactments, nor destroy vested rights, it has the appearance of being a thoroughly practical way of solving the question of art and science for the city. The Metropolitan Museum of Art and the American Museum of Natural History are in the hands of the most respectable citizens of New York. It would not be possible to find a body of men of more unimpeachable integrity and greater worth, than the gentlemen who have founded these two societies. It is impossible that they should lend their names to anything that will not bear the closest scrutiny; hence the proposition, now before the Legislature, to put up buildings for them, at a cost of a million dollars, must attract unusual attention. If the State would appropriate the money to these corporations, giving them the control of its expenditure, we should have considerably more confidence in its honest administration than, we are grieved to say, we can feel under the present circumstances; and if we knew what other institutions are to have the remaining portions of Manhattan Square, it would be a great relief to our minds.

"We fear the Greeks bringing gifts," but are willing to accept the gifts, if the officers of the two organizations are certain that it is all right.

The need of a Museum of Natural History, and of a Gallery of Art, in New York, is so pressing that there is some danger of our accepting the appropriations without a proper regard to consequences. The Court House is not yet finished, and the foundations of the Post-office are scarcely laid.

REPORT OF THE JUDGES OF GROUP 1, DEPARTMENT V. OF THE EXHIBITION OF THE AMERICAN INSTITUTE FOR 1870. THE ALLEN ENGINE.

The labors of the judges in this department were much lighter in the last exhibition than in the preceding one, and we are happy to say, were, in our opinion, so far as the award of premiums is concerned, much more fairly performed. The award of two first premiums to two competing engines could scarcely be repeated this time, as there was in reality no competition. The Allen engine was the only important one entered, and of course received the first premium. The engine is, however, one that evidently could have competed favorably with those previously exhibited.

We are in receipt of advanced sheets of the judges' report pertaining to the critical examination of this engine, being a record and account of experiments performed under the supervision of Washington Lee, C. E. The experiments were very comprehensive, and comprised approved tests, of each important detail, usually made by expert engineers.

The report is too voluminous for reprint or even for condensation in our columns. In looking it through, we are satisfied that the experiments were accurately made, and that the engine exhibited great working efficiency and economy.

As the engine has been recently illustrated and described in our columns, we deem it unnecessary to dwell upon the details of its construction. The water test of the previous exhibition was employed, the water being this time measured, with indisputable accuracy, in a tank, instead of by a meter as before.

The voluminous comparison of this engine with those previously exhibited, seems unnecessary, and we think not in good taste in such a report, however much it may possess of scientific interest. Moreover, the circumstances under which the trials were respectively performed, render the comparison difficult, if not unfair.

Mr. Lee concludes his report with a thorough endorsement of the theory of Mr. Porter upon the action of the reciprocating parts of engines, as set forth by the last named gentleman in recent articles in this journal. He says:

"Under the resistance of 128·375 horse powers at the brake, the motion of the engine was remarkably uniform; not the least diminution of speed in passing the centers could be detected, illustrating very satisfactorily the value, in this respect, of the speed employed, and of the action of the reciprocating parts of the engine in equalizing the rotative pressure on the crank through the stroke. The governor was, during the trials and through the exhibition, nearly motionless, while the load remained constant, and instantaneous in its action on changes of resistance, maintaining a steadiness of running which left nothing to be desired."

The judges—Prof. F.A.P. Barnard, Thos. J. Sloan, and Robert Weir—speak in their report as follows:

"The performance of this engine has exceeded that of the two fine engines which were on trial here last year. The results seem to be without precedent in such engines. The engine ran from 11 to 12 hours repeatedly without showing a sign of a warm bearing, displaying thorough perfection in all its parts. In all respects the engine is first-class, and from the fact of its presenting weight with speed, as a requisite for perfection in steam engines, it has opened a new era in this necessary branch—its economy having been clearly demonstrated in the careful trials, which ought to be published in full."

LYCEUM OF NATURAL HISTORY.

There was an unusually large attendance of members at the meeting of the Lyceum of Natural History, on Monday evening, the 6th inst., to listen to an address by Professor B. Waterhouse Hawkins, on the progress of the work of the restoration of the forms of extinct animals in the Central Park. Mr. Hawkins gave an account of the difficulties he encountered at the outset, in finding any skeletons of animals in New York, with which to make comparisons, and he was finally compelled to go to Boston and Philadelphia for this purpose. After much study and many delays, the casts of the *Hadrosaurus* were completed, and numerous smaller skeletons prepared. At this stage of the proceedings an entire change in the administration of the Park took place, and the newly appointed Commissioners decided to suspend the work upon the Palæozoic Museum, and they dismissed Mr. Hawkins from their service.

The announcement that an end had thus been summarily put to one of the most important educational projects ever started in this country, was received by the Lyceum with profound surprise. For a few minutes after the close of Mr. Hawkins' report, no one felt disposed to make any comment, but as the truth of the great damage became apparent, there was considerable disposition manifested to have the Society give expression to its sense of the value of Mr. Hawkins' services in the cause of education, and their regret that so important a work should be suspended at this critical period. Remarks were made by Dr. Newbery, Professor Joy, Mr. Andrew H. Green, Professor Seely, Dr. Walz, Mr. E. G. Squier, and others, and the following resolutions were unanimously adopted:

Resolved, That the Lyceum of Natural History, in the city of New York, has learned with deep regret of the temporary suspension of the work of restoration of the forms of extinct animals, as hitherto prosecuted in the Central Park, under the able superintendence of Professor Waterhouse Hawkins.

Resolved, That the Society considers the proposed palæozoic museum not only a valuable acquisition to the scientific treasures and resources of the city, but also as a most important adjunct and complement to our great system of public education.

WARMING AND VENTILATING RAILROAD CARS.

There has been enough of denunciation against the present general method of warming and ventilating railway cars. It produces no effect on the corporations who could, if they would, adopt appliances that would not burn people to death in cases of accident, nor regularly and persistently poison them with bad air.

There is no lack of ways and means; the problem is simple and easily solved; nay—a not very extensive search through the Patent Office records will show that it has been solved already; perhaps not in the most practical and perfect manner, but still solved so well, as, were it not for corporation cupidity, would greatly add to the comfort and safety of passengers.

The real problem is how to compel corporations to recognize the fact that the public has rights they are bound to respect. It is the disregard of these rights that fills our cars

with smoke, dust, and exhalations, and puts box stoves full of hot coals in the corners, ready to cook the human stew whenever a frisky car shall take a notion to turn a somersault. The invention needed is a conscience for corporations—an invention, by the way, scarcely less difficult than the one advertised for in our last issue, namely, a plan for preventing the sale of intoxicating liquors and tobacco in New Jersey.

The *Railroad Gazette*, imitating the English ideal of prolixity in discussion, for which *Engineering* has recently patted it on the back approvingly, treats us, in its issue of February 11th, to a page article, to be continued, under the title of "Warming and Ventilation of Railroad Cars." In this article the writer takes the ground that people in general are ignorant of the effects of pure air, and not being able to "*see* the foulness," they "therefore do not believe it exists." It is quite possible they may not be able to see the foulness, but if in the majority of railroad cars run in this country, they are not able to feel it in gritty, grimy accumulations on skin and linen, and smell it in suffocating stenches which serve, with sneeze-provoking dust, to stifle anything like comfort, their skin must be thicker, their linen more neglected, and their noses less sensitive than those of the majority of fellow travellers it has been our fortune to be cooped up with for a day's railroad journey.

The *Railroad Gazette* makes this wholesale charge of ignorance and insensibility the excuse for an essay on the physiology of respiration, mostly extracted from Huxley's "Elementary Lessons in Physiology," and therefore excellent in its way, though having a somewhat remote bearing upon the subject as announced in the title of the article. We trust that before this journal concludes its series of articles thus commenced, it will tell how to breathe into the breasts of the corporations which choke us in their human packing boxes, something resembling the soul which they are universally acknowledged to be destitute of. When this is done, carbonic acid, ammoniacal smells, organic exhalations, smoke, and dust, will be invited to shun the interiors of railway cars, and comparative comfort will descend upon the perigrinating public.

THE MINERAL RESOURCES OF MISSOURI.

The incalculable wealth, which lies hid in the bosom of Mother Earth, in our vast possessions of the West, is undoubtedly centered in the State of Missouri; and the development of this fund of riches must add to the national prosperity, not only by its immeasurable intrinsic value, but by its affording occupation to armies of laborers, the latter being the highest and most important consideration.

In 1852-3, a geological survey of the State was wisely decided upon, and a liberal provision for its execution made. Two valuable reports, by Professor Swallow, have been printed, in the year 1855, but the notes of his subsequent investigations have not been made public.

In the session of 1869-70, further action, in this important public work, was taken by the State legislature, and arrangements made for a still more accurate and detailed examination, under the direction of Professor A. D. Hager, of Vermont.

The distribution of metals all over the State will be seen in the following figures, taken from the St. Louis *Journal of Commerce*, which show the number of counties in which the various ores are found: Iron in 46 counties, lead in 43, coal in 36, copper in 24, marble in 11, zinc in 27, fire clay, in 16 barytes in 10, nickel in 6, granite in 4, tin in 4, plumbago in 3, gypsum in 2, alum in 1, antimony in 4.

There is probably no country in the world so endowed as this. Of iron alone, according to the State geologist's report for 1855, there is ore of the best quality, sufficient to furnish 200,000,000 tuns of iron; and this quantity lies in a small space, in the vicinity of Pilot Knob and Iron Mountain, and within 100 miles of St. Louis.

The quality of the iron is highly spoken of by the manufacturers, and the capacity of the smelting appliances has reached to over 150,000 tuns per annum. The coal is well suited for reduction of ores, either by hot or cold blast treatment. The Scotia Iron Co. commenced operations in January, 1870; and, although the materials for building blast furnaces had to be carried 80 miles into a desert, the first furnace was blown into blast in August, 1870. This furnace will run about 24 tuns per day. The company procures ore from a hill, near the furnace, in which there is an apparently inexhaustible supply of red oxide and brown specular. This ore yields 60 per cent of pure metal. The erection of mills for making wrought iron is contemplated, and the high quality and prodigious quantity of the raw material will justify and reward any outlay of capital in this direction.

The shipment of ore to other States goes on constantly, the last year's account showing that 246,555 tuns were dispersed over Indiana, Ohio, and others. The furnaces at Kingsland, South St. Louis, Lewis Iron Co.'s Works, Carondelet, and Maramec are all well situated as to coal and limestone, the Maramec Works having a most valuable waterpower. These latter works also ship about 40,000 tuns red hematite ore yearly.

SCIENTIFIC INTELLIGENCE.

According to *Petermann's Mittheilungen*, the new German empire, including Alsatia and Lorraine, will embrace 9,901 square miles, with 40,148,209 inhabitants. Russia alone will exceed it in extent and population, for Russia in Europe has 100,285 square miles with a population of 69,379,500. France, after the loss of Alsatia and Lorraine, will have 9,588 square miles of territory, with 36,428,548 inhabitants. Austria will number 35,948,592 inhabitants spread over a larger extent of country, namely, 10,580 square miles. Great Britain and Ireland has 5,732 square miles, with 30,838,210 inhabitants; and Italy, including Rome, has 5,376 square miles, with 26,470,000 inhabitants. In the order of population, the Governments will stand: Russia, Germany, France, Austria, and England; but in military power, the first position must henceforth be accorded to Germany.

AMERICAN INSTITUTE OF MINING ENGINEERS.

A circular has been issued by several mining engineers, proposing a meeting at Wilkes-Barre, some time in April or May next, of all persons interested in the general subjects of mining and metallurgy, for the purpose of establishing an association, to be called "The American Institute of Mining Engineers." The Institute will hold meetings periodically "in the great mining and metallurgical centers, when works of interest, such as mines, machine shops, furnaces, and other metallurgical works, can be inspected, and the members exchange their views, and consult, for mutual advantage, upon the difficulties encountered by each." There will be the usual publication of "Transactions" and "Proceedings."

The idea of forming an association of persons thus mutually interested in each other's occupations, is an excellent one; but it has been suggested by a number of scientific gentlemen that the American Association for the Advancement of Science offers every facility for the accomplishment of the objects set forth in the circular, while it affords the very great advantage of an assemblage of men learned in all departments of knowledge, whose acquaintance mining engineers would do well to make, and from whom they could learn much, while at the same time imparting of their own knowledge.

As a section of the American Association, the mining engineers would have more influence before the country, and it would perhaps be well for them to stop and consider before establishing a separate institute.

CONSUMPTION OF SUGAR, COFFEE, AND TEA.

E. Behm gives in his geographical year book, for 1870, the following estimate of the consumption of sugar, coffee, and tea, *per capita*, in various countries:

COUNTRIES.	Sugar, lbs.	Coffee, lbs.	Tea, lbs.
Great Britain	35·96	0·90	3·190
United States	24·63	5.68	....
Holland	14·86	7·03	0·800
France	14·30	2·32	0·018
Norway	11·04	6·92	0·060
Sweden	9·80	0·80	0·060
Switzerland	9·60	5·28	....
Germany	9·42	1·03	0·035
Denmark	9·00	3·40	0·400
Belgium	7·18	8·59	0·018
Portugal	6·33	0·69	0·040
Italy	5·20	0·90	0·020
Austria	4·93	1·30	0·012
Spain	4·23	0·01	0·040
Russia	2·40	0·007	0·160

The entire consumption of sugar in Europe, has averaged, during the last few years, three thousand four hundred and ten million pounds (3,410,000 pounds), and for the whole world it is set down at nearly twice that amount. It is estimated that three fourths of the sugar is made from cane, and one fourth from the beet.

The consumption of coffee has doubled in most countries during the last twenty years.

Unpleasant Discovery in the Patent Office--Levying Black Mail.

"The Patent Office has been, during the past week, in a high state of excitement, occasioned by the discovery of the operations of E. W. W. Griffin, clerk in charge of the draftsmen's division, who, it appears, has been levying black mail on the lady employés of the office, for nearly two years. During the administration of Colonel Fisher, late Commissioner of Patents, a large number of ladies were employed, for the purpose of recopying drawings, when ordered by the inventors, of patents already on file.

"These ladies were placed under charge of Griffin, with power to retain them in office so long as their services were satisfactory. It has been proved that Griffin hired the ladies at regular salaries of $1,000 per annum, the most of whom he blackmailed to the amount of $400 per year each. It is estimated that he has made $1,000 per month for the past two years.

"The matter was brought to the notice of Commissioner Duncan, and an investigation ordered, which resulted in the dismissal of Griffin.

"It is thought that there are other cases of this kind, and the Commissioner expresses his determination to ferret them all out, and make a clean sweep of all parties in his department engaged in swindling operations, against the government or against individuals.

"The Patent Office has for a long time been considered a rich field for operations of this kind, and investigations have often been suggested, but passed unheeded by the proper authorities.

"It is openly stated that an investigation into the relations existing between certain examiners of patents and certain patent agents, would disclose a more fearful state of blackmailing than exists in all the other government departments combined."

[We find the above sensational paragraph among the recent Washington items of the *Evening Mail*. We are in a position to say that "the high state of excitement" alluded to has existed only in the brain of the newspaper correspondent. The facts, in brief, are these: In July, 1869, a lady, and wife of one of the clerks in the draftsmen's room, made application to Commissioner Fisher for a position in the copying division of the same department; and, upon the urgent solicitation and recommendation of Mr. E. W. W. Griffin, chief of the division, she was appointed, and has held the position from that time until now, receiving as salary $1,000 per annum, which, with the full knowledge of her husband, she has divided with Griffin, in consideration of his services in procuring for her the appointment. About a month ago, one of the lady's friends got hold of the matter, and reported it to the Court, which resulted in an investigation and the subsequent dismissal of Griffin. This is the only case of the kind that we have heard of, and we have no reason to believe that there is any other, or that corruption exists in the Examining Corps, as alleged. —EDS.

A METHOD of testing the purity of samples of water, by watching the rapidity of its action on soap and similar compounds, has been introduced by the French *savants*, MM. Boutron and Boudet. The experiment tests, at the same time, the purity of the soap. Dissolved in water in which lime is held in solution, the soap is precipitated in hard white flakes. If the quantity of soap put in the lime water be noted, it will be found that the smaller the quantity producing precipitation, the purer the soap. The *Journal de Pharmacie et de Chemie* (of Paris) reports some experiments on this subject, by M. F. Schulze.

LOUISIANA STATE FAIR.—The fifth State fair of the Mechanics, and Agricultural Fair Association of Louisiana will commence in the city of New Orleans, on Saturday, April 8, 1871, and continue nine days. Over $20,000 in premiums are offered. Rules, regulations, and schedule of premiums may be obtained of the Secretary and Treasurer, Luther Homes, Esq., New Orleans, La.

KNITTED GOODS.—John Kent advertises, in this paper, valuable machinery for the manufacture of knitted goods, to which we invite the attention of all who are interested in this branch of industry. Mr. Kent has devoted many years to the perfection of these machines.

KAOLIN, a white clay, used largely in the adulteration of flour, starch, and candles, is found near Augusta, Ga., and is sent to the Northern States in large quantities.

WE are indebted to James Vick, practical florist, Rochester, N. Y., for a choice variety of flower seeds.

NEW BOOKS AND PUBLICATIONS.

A COMPLETE GUIDE FOR COACH PAINTERS. Translated from the French of M. Arlot, Coach Painter, for Eleven Years Foreman of Painting to M. Eherler, Coach Maker, Paris. By A. A. Fesquet, Chemist and Engineer. To which is added an Appendix, containing Information respecting the Materials and the Practice of Coach and Car Painting and Varnishing, in the United States and Great Britain. Philadelphia: Henry Carey Baird, Industrial Publisher, 406 Walnut street. London: Sampson Low, Son & Marston, Crown Buildings, 188 Fleet street. 1871. Price, by mail, to any part of the United States, $1·25.

This is another of the large number of practical works and industria treatises issued from the press of Mr. Baird. It is intended as a practica manual for the use of coach painters, and we must say, upon examination o its contents, that we think it admirably adapted to meet the wants of that class of artisans for which it has been prepared. There is perhaps no department of decorative art in which there is greater room for the display o skill and taste than in coach painting. This work, however, does not deal with the subject of art, to any great extent. Its aim is to give information in regard to colors, varnishes, etc., and their management in carriage painting in the plainest manner, and in this way it thoroughly fulfils the intention of the author.

ON THE GENERATION OF SPECIES. By St. George Mivart F.R.S. London: Macmillan & Co. 1871.

The Darwinian theory of the Origin of Species, has, perhaps, aroused more attention, excited more dispute, and won more converts in a shorter time among scientific and unscientific men, than any other of equal importance promulgated in the 19th century. It seems to be the rule either to swallow the theory whole, or reject it as unworthy of belief, and as conflicting with orthodoxy. The author of the work before us has, however, taken a middle ground, from which we opine it will be difficult to dislodge him, though it is within full range of the batteries of both the contending parties. While he admits the truth of Darwin's views regarding the operation of natural selection as a cause of the origin of species, he denies that it is the sole cause, yet maintains that if it could be demonstrated to be the sole cause, it would in no manner conflict with orthodox belief in the Scriptures as the revelation of God to mankind. The perfect candor of the author is one of the marked features of the discussion, and his style is a model of pure terse English writing, seldom, if ever, excelled by any scientific writer. The work is an octavo, most beautifully printed on tinted paper, and illustrated by many fine wood engravings.

THE ARCHITECT'S AND BUILDER'S POCKET COMPANION AND PRICE BOOK, Consisting of a Short but Comprehensive Epitome of Decimals, Duodecimals, Geometry and Mensuration; with Tables of U. S. Measures, Sizes, Weights, Strengths, etc., of Iron, Wood, Stone, an Various Other Materials; Quantities of Materials in Given Sizes and Dimensions of Wood, Brick, and Stone; and a Full and Complete Bill of Prices for Carpenter's Work; also Rules for Computing and Valuing Brick and Brick Work, Stone Work, Painting, Plastering, etc. By Frank W Vogdes Architect. Philadelphia: Henry Carey Baird, Publisher, 406 Walnut street. Price by mail, postpaid $2.

This is a small work, but printed in small type, and containing a large amount of useful matter, thoroughly indexed for reference; bound in morocco; and provided with a clasp, so as to be conveniently carried in the pocket.

GAS SUPERINTENDENT'S POCKET COMPANION for the year 1871. By Harris & Brother, Gas Meter Manufacturers, Nos. 1115 and 1117 Cherry street, Philadelphia. Philadelphia: Henry Carey Baird, Industrial Publisher, 406 Walnut street.

We find in this pocket-book much of interest to gas consumers, as well as to gas makers. The subject of meters is fully discussed. The work is bound in pocket-book style, in flexible morocco binding. Price, by mail, postpaid, $2.

Business and Personal.

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

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4 00 a year. Advertisements 17c. a line.

Half Interest for sale in established Machinery Depot, new and second-hand. Steam fitting connected. Small capital, with energy, required. Address T. V. Carpenter, Advertising Agent, Box 773, New York.

See advertisement of a Woolen Mill for sale. A bargain.

am active, have a clear record, and some capital. How can I make some money? F. Carmill, Box 1268, Boston, Mass.

Pattern Letters for Machinists, Molders, and Inventors, to letter patterns of castings, all sizes. Address H. W. Knight, Seneca Falls, N. Y.

Improved mode of Graining Wood, pat. July 5, '70, by J. J. Callow, Cleveland, O. See illustrated S. A., Dec. 17, '70. Send stamp for circular.

Can a round, spring-steel rod be drawn to any desired length, with a true taper to a point, with equal elasticity the whole length, and rolled temper? What is the price per hundred pounds, and where can they be procured? Answer "Sportsman," Malone, N. Y.

Manufacturers of Foot Lathes and other light machinery please address Geo. B. Kirkham, 167 E. 33d st., N. Y. city. Business of importance!

Safety Kerosene Lamps (Perkins & House's Patent). Explosion or breaking impossible; light equal to gas, and no odor. Families supplied and canvassers appointed, by Montgomery & Co., 42 Barclay st., New York, or Cleveland, O.

All parties wanting a water wheel will learn something of interest by addressing P. H. Walt, Sandy Hill, N. Y., for a free circular of his Hudson River Champion Turbine.

Ashcroft's Low Water Detector, $15; thousands in use; 17 year's experience. Can be applied for $1. Send for circular. E. H. Ashcroft, Boston, Mass.

Wanted.—Machines for manufacturing Pails, Tubs, and Matches. Also, competent man to superintend construction of buildings, and manage all parts of business when complete. Address, with descriptive circulars, price, etc., No. 266 Lexington avenue, New York.

Turbine Water Wheels, Portable and Stationary Engines, Gang and Circular Saw Mills, Rolling Mill Machinery, and Machinery for Axe Manufacturers, manufactured by Wm. P. Duncan, Bellefonte, Pa.

For best Power Picket Header in use, apply to Wm. P. Duncan, Bellefonte, Pa.

New Blind Wirer and Rod Cutter. B. C. Davis & Co., Binghamton, N. Y.

Self-testing Steam Gage. There's a difference between a chronometer watch and a "bull's eye." Same difference between a self-tester and common steam gage. Send for Circular. E. H. Ashcroft, Boston, Mass.

See advertisement of L. & J. W. Feuchtwanger, Chemists, N. Y.

$3.50. Stephens' Patent Combination Rule, Level, Square, Plumb, Bevel, etc. See advertisement in another column. Agents wanted.

American Boiler Powder Co., Box 315, Pittsburgh, Pa., make the only safe, sure, and cheap remedy for "Scaly Boilers." Orders solicited.

Belting that is Belting.—Always send for the Best Philadelphia Oak-Tanned, to C. W. Arny, Manufacturer, 301 Cherry st., Phil'a.

E. Howard & Co., Boston, make the best Stem-winding Watch in the country. Ask for it at all the dealers. Office 15 Maiden Lane, N. Y.

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

The best place to get Working Models and parts is at T. B. Jeffery's, 160 South Water st., Chicago.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro, 414 Water st., N. Y.

Improved Foot Lathes. Many a reader of this paper has one of them. Selling in all parts of the country, Canada, Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Peteler Portable R. R. Co. contractors, graders. See adv'ment.

E. P. Peacock, Manufacturer of Cutting Dies, Press Work. Patent Articles in Metals, etc. 55 Franklin st., Chicago.

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

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.

Steel name stamps, figures, etc. E. H. Payn, M'f'r, Burlington, Vt.

Cold Rolled-Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

Keuffel & Esser 116 Fulton st., N. Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves

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

For the best Self-regulating Windmill in the world, to pump water for residences, farms, city buildings, drainage, and irrigation, address Con. Windmill Co., 5 College Place, New York.

The Merriman Bolt Cutter—the best made. Send for circulars. H. B. Brown & Co., Fair Haven, Conn.

Taft's Portable Hot Air, Vapor and Shower Bathing Apparatus. Address Portable Bath Co., Sag Harbor, N. Y. (Send for Circular.)

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.

For Fruit-Can Tools, Presses, Dies for all Metals, apply to Bliss & Williams, successor to May & Bliss, 118, 120, and 122 Plymouth st., Brooklyn, N. Y. Send for catalogue.

2d-hand Worthington, Woodward and Novelty Pumps, Engines 25 to 100 H. P., 60 Horse Loc. Boiler. W. D. Andrews & Bro., 414 Water st., N. Y.

Agents wanted, to sell the Star Bevel. It supersedes the old style. Send for Circular. Hallett & White, West Meriden, Conn.

English and American Cotton Machinery and Yarns, Beam Warps and Machine Tools. Thos. Pray, Jr., 57 Weybosset st., Providence, R. I.

For small, soft, Gray Iron Castings, Japanned, Tinned, or Bronzed, address Enterprise Manufacturing Company, Philadelphia.

Conklin's Detachable Rubber Lip, for bowls, etc., works like a charm. For Rights, address O. P. Conklin, Worcester, Mass., or A. Dasl, Philadelphia, Pa.

To Ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's Manufacturing News of the United States. Terms $4 00 a year.

Facts for the Ladies.

In 1870, Mrs. W. made, with her Wheeler & Wilson machine, 2,255 vests, besider doing her family sewing for six persons.

The Pittsburgh, Pa., "Leader" says:

"The firm of Geo. P. Rowell & Co. is the largest and best Advertising Agency in the United States, and we can cheerfully recommend it to the attention of those who desire to advertise their business scientifically and systematically in such a way; that is, to secure the largest amount of publicity for the least expenditure of money.

After an exhaustive trial, at American Institute Fair for 1870, Pratt's Astral Oil was pronounced the safest and best.

Dyspepsia: Its Varieties, Causes, Symptoms, and Cure. By E. P. Miller, M.D. Paper, 50 cts.; Muslin, $1. Address Miller, Haynes & Co., 41 West Twenty-sixth st., New York city.

Vital Force: How Wasted and How Preserved; or, Abuses of the Sexual Function, their Causes Effects and Means of Cure. By E. P. Miller M.D. Paper, 50 cts. Address Miller, Haynes & Co., 41 West Twenty-sixth st., New York city.

Answers to Correspondents.

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

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

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

MIXING METALS.—All the hard gray American charcoal iron, of which car wheels and all such work are made, requires more heat and a longer time to melt than soft iron, especially Scotch pig, which is the most fluid and the easiest to melt of any iron. Consequently, unless the melter exercises good judgment in charging, the Scotch pig will melt and run off before the car-wheel iron is melted. If G. H. P. be particular in the quality and strength of his iron, he will make better results by using soft American charcoal pig, with old car-wheel iron. It will make stronger castings, mix better, and melt more uniformly; but he should always recollect in charging his furnace that soft iron will melt before hard in the same position, in the cupola. I also think he had better use a larger proportion of soft pig, as every time cast iron is melted it becomes harder, so much so that iron which can be filed and turned with ease, when re-cast will often be found too hard to work.—J. T., of N. Y.

HARDENING TALLOW.—If E. H. H. will use one pound of alum for every five pounds of tallow, his candles will be as hard and white as wax. The alum must be dissolved in water, then put in the tallow, and stirred until they are both melted together, and run in molds.—F. O. H.

L. L., of N. Y.—According to Ure, strass is made as follows: 8 ounces of pure rock crystal or flint, in powder, mixed with 4 ounces of salt of tartar, are to be baked and left to cool. The mixture is then poured into hot water, and treated with dilute nitric acid till it ceases to effervesce, and the "frit" is then washed in water till the water comes off tasteless. The frit is then dried, and mixed with 12 ounces of white lead, and this last mixture reduced to fine powder, and washed with distilled water; 1 ounce of calcined borax is now added to every 12 ounces of the mixture, the whole rubbed together in a porcelain mortar, melted in a clean crucible, and poured out into pure cold water. This melting and pouring into water must be done three times, using a clean, new crucible each time. The third frit is pulverized, five drachms of niter added, and then melted for the last time, when a clean, beautiful white crystal mass results.

C. M. S., of Wis.—There are no precise proportions observed in making the coal-tar and gravel walks of which you speak. The aim is to saturate the gravel with the hot tar without surplus. The interstices of the gravel are simply to be filled, and the amount required to do this depends wholly upon the coarseness or fineness of the gravel employed.

W. P. T., of Ohio.—Two teams of horses, of equal strength, pulling against each other, by means of a rope, would create the same tension in the rope, as one of the teams drawing against an immovable object.

W. H. B., of Va.—Ice can be made by compressing air, and, after it has radiated its heat, allowing it to extract the heat of water with which it is brought into contact. The temperature of air at 59° Fah., would be raised, by compressing the air to one fourth its original volume, to 317° Fah; and the air would radiate and absorb again, in expanding, about 190 units of heat.

E. T. H., of Ga.—The friable sandstone, a specimen of which you send us, may, we think, be rendered firmer by soaking it in a solution of silicate of soda, and allowing it to stand till dry.

J. A. V., of Ohio.—The use of steam expansively, by means of cut-off appliances, enables the expansive force of the steam to be utilized, which cannot be done when the pressure is maintained at one standard, and steam admitted through the full stroke. It takes no more power to do a given amount of work in one case than in the other, but more boiler capacity, and more fuel, as the working power of the steam is more economically applied when the cut-off is used.

Geo. F. R., of Ohio.—Type metal is composed of 3 parts lead and 1 part antimony for smallest, hardest, and most brittle types; 4 of lead and 1 of antimony for next grade; 5 of lead and 1 of antimony for medium sizes; 6 of lead and 1 of antimony for larger types; and 7 of lead and 1 of antimony for the largest.

E. J. M., of Texas.—The term "power of a boiler" means its evaporating power, and in that sense is proper. If its evaporative power be sufficient to perform a given amount of work, it is proper to estimate that work in horse power. Water can not be pumped out of a pipe from which atmospheric air is excluded. A pipe driven into a soil impervious to air, can never yield water unless the water is forced up by hydraulic power, as in the artesian system.

A. P. Y., of N. Y.—You will find descriptions of iron enamelling processes, on pages 297 and 408, Vol. XII. of this journal. It can be done in colors. See Ure's "Dictionary of Arts and Manufactures."

H. C., of Pa.—We do not think increasing the size of the journals of your car axles from 2½ inches to 6 inches diameter, would make them run lighter.

H. H. A., of N. Y.—The lining up of a beam engine, in a vessel, is a process for which no definite mode o. procedure is exclusively applicable. It is an operation to which common sense and judgment must be brought, and for which each engineer must be a law unto himself.

J. S., of Va.—The use of horizontal propellers to force balloons up or down is not a new suggestion. It has been tried, but, we believe, without much practical success.

J. T. S., of N. Y.—You will find further information on the subject of transmitting power by compressed air, in our editorial columns of last week.

APPLICATIONS FOR EXTENSION OF PATENTS.

HARVESTERS.—William T. B. Read, Chicago, Ill., has petitioned for an extension of the above patent. Day of hearing, May 17, 1871.

MODE OF FASTENING SHEET METAL ON ROOFS, ETC.—Asa Johnson, Brooklyn, N. Y., has petitioned for an extension of the above patent. Day of hearing, May 8, 1871.

METHOD OF PRINTING IN COLORS.—Rosalie Croome, Brooklyn, N. Y., has petitioned for an extension of the above patent. Day of hearing, May 3 1871.

MACHINERY FOR COMPRESSING GASEOUS BODIES.—William A. Royce Newburgh, N. Y., has petitioned for an extension of the above patent. Day of hearing, May 10, 1871.

PLOWS.—John S. Hall, Pittsburgh, Pa., has petitioned for an extension the above patent. Day of hearing, May 17, 1871.

CARRIAGE WHEELS.—James D. Sarven, New Haven, Conn., has petitioned for an extension of the above patent. Day of hearing May 24, 1871.

New Patent Law of 1870.

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FOR

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Recent American and Foreign Patents.

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

SELF-ACTING SHACKLE AND CAR BRAKE.—Lyman Alphonzo Russell, Shrewsbury, Vt.—This invention relates to improvements in self-acting shackles and car brakes, and consists in an improved connection of the brakes with the shackle, for automatic operation, whereby the connection may be readily so adjusted that the brakes will not be set in action as when required to back up the train.

FEED BAGS FOR HORSES.—W. A. Hough, South Butler, N. Y.—This invention relates to a new and useful improvement in feed bags for horses, and consists in making the bag self-supplying, by means of one or more reservoirs, the discharge orifices of which reservoirs are closed by a valve or valves.

TRUSS.—Adam Hinoult, Montgomery, N. Y.—This invention has for its object to furnish an improved truss, which shall be so constructed as to yield freely to the various movements of the body of the wearer, while holding the rupture securely in place.

GOVERNOR FOR STEAM ENGINES.—Charles A. Conde, Indianapolis, Ind.—This invention relates to a new method of regulating the movement of the balls of a steam governor, with a view of adjusting the same in proportion to the increased or diminished centrifugal force.

CIRCULAR SAW GUARD.—G. W. Shipman, Ischua, N. Y.—This invention relates to a new and useful improvement in means for protecting the operator and others, near running circular saws, from injury, and it consists in a movable guard, operated by means of the saw carriage, in such a manner that, during the period of danger (when the saw is not cutting), the guard covers the saw, and is thrown back from the saw when the latter is in actual use.

CARPET-CLEANING MACHINE.—J. C. Craft, Baltimore, Md.—This invention relates to a machine, through which a carpet may be passed, and so beaten and brushed, during its passage, as to come out of the machine thoroughly cleansed. The invention consists in the peculiar construction and arrangement of beaters and brushes for effecting this result.

COMBINED COTTON AND CORN PLANTER.—L. A. Perrault, Natchez, Miss.—This invention relates to improvements in machinery for planting seed, and consists in a combination, in one machine, of a seed-dropping apparatus, adapted for corn, and another adapted for cotton, in a manner to utilize one running gear for the two kinds of seed, and thereby save the expense of separate gear for each.

LIME KILN.—T. A. Kirk, Kansas City, Mo.—This invention has for its object to furnish an improved lime kiln, which shall be so constructed as to enable the kiln to be worked from the front, in firing and in drawing the lime and ashes, which will not allow cold or unburnt rock to pass through, and which will consume its own smoke.

CAR BRAKE.—S. D. Tripp, Lynn, and Luther Hill, Stoneham, Mass.—This invention relates to improvements in railroad car brakes, and consists in an arrangement, on the locomotive or tender, of a steam cylinder and piston, and the arrangement, on the cars, in connection with the brakes, of sliding rods, so that the rod of the car next to the engine or tender, being moved backwards by the piston rod of the above cylinder, will bring the brakes of the rear wheels down upon them, as well as the brakes of the tender, and slacken the speed thereby, so that the rear projecting end of the brake rod will come in contact with the rod of the next car, and set its brakes in action in like manner, and so on, throughout the train. The arrangement of the said brake actuating rods is such that no matter which end of the car is foremost, the wheels of one track will be acted on by the brakes.

COMBINED RULER, BLOTTER, AND PAPER CUTTER.—Hugh S. Ball, Spartanburgh, S. C.—This invention relates to a new and useful improvement in a combined ruler, blotter, and paper cutter, three articles indispensable for the desk, combined in one.

REED FOR ORGANS AND MELODEONS.—Augustus Newell, Chicago, Ill.—The object of this invention is to so construct the tongue-butts, or shanks, of musical reeds, that the same cannot, during the vibratory motion of the tongues, be raised from their seats.

ANTI-FRICTION COMPOUND.—Victory Purdy, Poughkeepsie, N. Y.—This invention relates to a new and useful compound for lubricating railroad car axle journals, and other journal bearings.

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.—EMERY WHEELS.—Can I make emery wheels similar to those used in a foot lathe, that will answer for sharpening fine tools, such as gouges, rounds, and hollows, and if so, how shall I proceed?—F. W.

2.—BOILER FURNACE.—I have two boilers, twenty-four feet long and four feet in diameter each, with five ten-inch flues. The fire passes under the boiler, and enters the flues at the back end, passes through the flues, and enters the smoke stack at the front end. I use hard pine wood or fuel. Will some of your many readers give me the best way of constructing the flue under the boiler, from the end of the grate bars to where it enters the flues at the back end, and also state the proper distance from the back wall to the end of the boiler?—N. H.

3.—MEDAL CASTS.—I have some medals which I should like to copy. Having tried several times, and failed, I thought that I would ask advice through your query columns. I do not know of what the medals are manufactured. They are, I suppose, made to imitate bronze. I have tried casting them in plaster of Paris molds, but have had very poor success, as the surface of the medals was covered with small holes. The metal used was lead and antimony, seven to one. I should like to know, if there be any metal that I can cast them of, and bring out the bronze color afterwards, or if there be any metal that I can cast them of, and afterwards color by some solution. Also, of what should I make my molds?—J. E. M.

4.—REMOVING THE TASTE OF TAR FROM RAIN WATER.—Will some of your correspondents tell me if rain water, which runs off a gravel roof, and tastes very strongly of tar, is unhealthy, and if there be anything that will prevent its tasting, as it is very disagreeable for cooking purposes?—C. E. H.

5.—SORGHUM MOLASSES.—How can I separate the molasses from the sugar, in sorghum sugar mush, to make a dry merchantable sugar?

6.—FLUX FOR ALUMINUM.—Will some of your readers tell me, through your columns, the best flux to use in melting and mixing aluminum and copper?

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

APPLICATIONS FOR LETTERS PATENT.

350.—BREECH-LOADING FIRE-ARMS.—Eli Whitney, New Haven, Conn. February 10, 1871.

352.—GOVERNOR.—Stilliman B. Allen, ——, Mass. February 10, 1871.

357.—WINDMILL.—A. P. Brown, New York city. February 11, 1871.

362.—FURNITURE CASTERS.—F. A. Gardner and H. S. Turrell, Danbury, Conn. February 8, 1871.

369.—WIRE FABRICS FOR MATTRESSES.—Samuel Rogers, New York city. February 9, 1871.

340.—SCREW PROPELLER CANAL BOATS.—Thomas Main, Pierpoint, N. Y. February 9, 1871.

362.—FLYER FOR SPINNING MACHINERY.—Thomas Mayor and Geo. Chatterton, Providence, R. I. February 14, 1871.

373.—TELEGRAPHIC APPARATUS AND DETECTORS.—W. B. Watkins, Jersey City, N. J. February 14, 1871.

381.—STEAM AND OTHER SAFETY VALVES.—Walter Dawson Scranton, Pa. February 15, 1871.

383.—IRON RAILS AND BARS, AND MODES OF MANUFACTURING THE SAME.—Eldridge Wheeler, Philadelphia, Pa. February 15, 1871.

Official List of Patents.

ISSUED BY THE U. S. PATENT OFFICE.

FOR THE WEEK ENDING MARCH 7, 1871.

Reported Officially for the Scientific American.

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112,309.—HOSE SPRINKLER.—William Anderson, San Francisco, Cal.

112,310.—LOCOMOTIVE SPARK ARRESTER.—J. G. Armstrong, New Brunswick, N. J.

112,311.—TOOL FOR CARRIAGE MAKERS' USE.—George Atkinson, San Francisco, Cal.

112,312.—POTATO PROBE.—John A. Beal, Waterford, N. Y.

112,313.—HINGE FOR CARRIAGE DOORS.—George W. Beers, Bridgeport, Conn.

112,314.—STOVE LEG.—James Birckhead, Jr., Baltimore, Md.

112,315.—CLOTHES PIN.—Orris A. Bishop, Chicago, Ill.

112,316.—MANUFACTURE OF ROCHELLE SALTS AND BORAX.—V. G. Bloede, Brooklyn, N. Y.

112,317.—BEEHIVE.—Felix Brewer, Waynesville, Mo.

112,318.—THILL COUPLING.—Theodore Burr (assignor to Allen Muir and Henry Muir), Battle Creek, Mich.

112,319.—EVAPORATING PAN FOR SACCHARINE LIQUIDS.—F. C. Butler, Bellows Falls, Vt., assignor to himself and James B. Williams, Glastonbury, Conn.

112,320.—DOOR SECURER.—William H. Caldwell, Wheeling, W. Va.

112,321.—TOE-CALK BAR.—R. B. Caswell, Springfield, Mass. Antedated March 2, 1871.

112,322.—GLASS FLATTENING FURNACE AND LEER.—James Clabby, Lenox, Mass.

112,323.—SPRING BED BOTTOM.—Alex. Cole, Manamuskin, N. J.

112,324.—WATER WHEEL.—E. E. Coleman, West Cummington, Mass.

112,325.—TOY HORSE AND CARRIAGE.—John B. Cuzner, Bridgeport, Conn.

112,326.—MACKEREL-LINE HOLDER.—E. L. Decker, Southport, Me.

112,327.—SEWING MACHINE.—J. William Dufour, Stratford, Conn.

112,328.—STEAM BOILER.—Edwards Evans, North Tonawanda, N. Y.

112,329.—MEDICAL COMPOUND FOR CURE OF CATARRH AND ASTHMA.—Erastus Field, Ostrander, Ohio.

112,330.—MACHINE FOR GRINDING THE CUTTERS OF MOWERS, ETC.—H. C. Fisk, Wellsville, N. Y.

112,331.—MACHINE FOR MAKING HOOKS AND EYES.—Jeremy T. Ford, San Francisco, Cal.

112,332.—CHURN.—Thompson Freeman, Westfield, Ill.

112,333.—ATTACHMENT FOR REVOLVING MOLD BOARDS FOR PLOWS.—J. S. Godfrey, Leslie, Mich., assignor to himself and S. M. Loveridge, Pittsburgh, Pa.

112,334.—GRAIN CLEANER AND FERTILIZER SIFTER.—J. A. Green, Mill Dale, Va.

112,335.—SCREW PROPULSION.—E. C. Gregg (assignor to A. H. Gregg and C. P. Gregg), Trumansburg, N. Y.

112,336.—SEEDING MACHINE.—P. M. Gundlach, Belleville, Ill.

112,337.—COMPOUND FOR KINDLING FIRES.—J. L. Hannum and S. H. Stebbins, Berea, Ohio.

112,338.—LAWN MOWER.—Benjamin Harnish, Lancaster, and D. H. Harnish, Pequea, Pa.

112,339.—COMPOSITION FOR PAVEMENTS.—C. B. Harris, New York city. Antedated February 25, 1870.

112,340.—SPRING FOR VEHICLES.—John R. Hiller, Woodland, Cal.

112,341.—HARVESTER RAKE.—S. T. Holly, (assignor to John P. Manny), Rockford, Ill.

112,342.—DOOR CLAMP.—Henry O. Hooper, Diamond Springs, Cal.

112,343.—TAPER HOLDER.—Thomas W. Houchin, Morrisania, N. Y.

112,344.—METALLIC GARTER.—Henry A. House, Bridgeport, Conn.

112,345.—BOBBIN WINDER.—Henry A. House, Bridgeport, Conn.

112,346.—METHOD OF KNITTING STOCKINGS, ETC.—Henry A. House, Bridgeport, Conn.

112,347.—APPARATUS FOR EVAPORATING AND CONCENTRATING LIQUIDS.—John Howarth, Salem, Mass. Antedated March 1, 1871.

112,348.—APPARATUS FOR EVAPORATING AND CONCENTRATING LIQUIDS.—John Howarth, Salem, Mass. Antedated March 1, 1871.

112,349.—APPARATUS FOR REMOVING OIL FROM VEGETABLE AND OTHER MATTERS.—Elias S. Hutchinson, Baltimore, Md.

112,350.—APPARATUS AND PROCESS FOR REMOVING OIL FROM GRAIN, SEEDS, ETC.—Elias S. Hutchinson, Baltimore, Md.

112,351.—CHANDELIER.—Charles F. Jacobsen, New York city.

112,352.—CULINARY VESSEL.—Carrie Jessup, New Haven, Conn.

112,353.—MACHINE FOR CUTTING LEATHER.—Aberdeen Keith, North Bridgewater, Mass.

112,354.—ATTACHING KNOBS TO THEIR SPINDLES.—John F. Keller and Nathaniel Schner, Hagerstown, Md.

112,355.—MITER MACHINE.—T. E. King, Boston, Mass.

112,356.—TAKE-UP FOR CORSET LOOMS.—Julius Kuttner, New York city.

112,357.—ELEVATOR AND CARRIER.—T. W. Lackore, Worth, Ill.

112,358.—APPARATUS FOR BURNING HYDROCARBON OILS.—James R. Lee, Grass Valley, Cal.

112,359.—BURGLAR ALARM.—Robert Lee, Cincinnati, Ohio.

112,360.—TELEGRAPH APPARATUS.—L. T. Lindsey, Jackson, Tenn.

112,361.—HARVESTER.—J. P. Manny, Rockford, Ill.

112,362.—HARVESTER.—J. P. Manny, Rockford, Ill.

112,363.—HARVESTER RAKE.—J. P. Manny, Rockford, Ill.

112,364.—CHEESE CURD SINK.—H. C. Markham, Collinsville, N. Y.

112,365.—MOWING MACHINE.—H. C. Markham and Dewitt C. Markham, Collinsville, N. Y.

112,366.—PROPELLER.—Alex. J. Marshall, Warrenton, Va. Antedated March 3, 1871.

112,367.—OILER.—Edward McDuff and E. D. Forrow, Warwick, R. I.

112,368.—WASH BOILER.—John McInnes, Oxford, Pa.

112,369.—PROPELLING CANAL BOATS.—H. B. Meech, Fort Edward, N. Y. Antedated February 25, 1871.

112,370.—WATER-PROOF COMPOUND FOR COATING CLOTH, WOOD, METALS, ETC.—Peter E. Minor, Schenectady, N. Y.

112,371.—COOKING STOVE.—W. N. Moore, Neenah, Wis.

112,372.—BORING MACHINE.—J. H. Pardieck (assignor to himself and S. M. Brown), Acton, Ind.

112,373.—VAPOR BURNER.—R. W. Park, Philadelphia, Pa.

112,374.—MACHINE FOR POINTING BLANKS FOR CULTIVATOR TEETH.—John Pedder and George Abel, West Pittsburgh, Pa.

112,375.—BALE TIE.—J. E. Perkins, San Francisco, Cal.

112,376.—LINING WALLS WITH FELT, ETC.—James Phillips, Chicago, Ill.

112,377.—COOKING STOVE.—Samuel Pierce, Boston, Mass.

112,378.—TACK.—A. A. Porter, New Haven, Conn. Antedated Feb. 25, 1871.

112,379.—MACHINE FOR SHAPING AND CUTTING GEAR CUTTERS.—F. A. Pratt (assignor to the Pratt & Whitney Company), Hartford, Conn.

112,380.—COMBINATION CAMERA AND DEVELOPING BOX.—E. C. Ratzell, Philadelphia, Pa.

112,381.—PUNCHING MACHINE.—J. C. Rhodes, South Abington, Mass.

112,382.—WASHING MACHINE.—J. W. Ricker, Chelsea, Mass.

112,383.—CURTAIN FIXTURE.—Charles Robin, Chester, Conn.

112,384.—MACHINE FOR MAKING PRINTERS' LEADS.—Isaac Schoenberg, New York city.

112,385.—SLIDE VALVE FOR STEAM RIVETING MACHINES.—Coleman Sellers (assignor to William Sellers & Co.), Philadelphia, Pa.

112,386.—MACHINE FOR POLISHING THREAD.—Samuel Semple, Sr., John Semple, Samuel Semple, Jr., and R. A. Semple, Mount Holly, N. J.

112,387.—PAINT BRUSH.—F. S. Shearer, Washington, Ill.

112,388.—BEE HIVE.—S. A. Short, F. J. Short, J. B. Short and Jasper Kile, Decatur, Ala.

112,389.—APPARATUS FOR REMOVING OIL FROM VEGETABLE AND OTHER MATTER.—Thomas Sim, Baltimore, Md.

112,390.—RETORT FOR PRODUCING BISULPHIDE OF CARBON.—Thomas Sim, Baltimore, Md.

112,391.—UTILIZING THE SILKY DOWN OF THE WILD COTTON.—M. H. Simpson, Boston, Mass.

112,392.—PRUNING SHEARS.—Frank Smiley, Batavia, N. Y.

112,393.—WATER-CLOSET VALVE.—A. J. Smith, San Francisco, Cal.

112,394.—GANG PLOW.—J. W. Sursa, San Leandro, Cal.

112,395.—GRINDING PAN AND AMALGAMATOR.—W. H. Thoss, West Point, Cal.

112,396.—STREET LANTERN.—Augustus Tufts, Malden, Mass.

112,397.—COOKING STOVE.—Alvin Warren, Swanton, Ohio.

112,398.—SAFETY BRIDLE.—James Weatherhead, San José, Cal.

112,399.—FIRE GRATE.—George Wellhouse, Akron, Ohio.

112,400.—HAY KNIFE.—G. F. Weymouth, Dresden, Me.

112,401.—CLAW BAR.—Charles Winter, Chillicothe, Ohio.

112,402.—STEAM GENERATOR.—J. C. Woodhead, Pittsburgh, Pa.

112,403.—ANIMAL TRAP.—W. D. Wrightson, Queenstown, England.

112,404.—BRUSH.—John Ames, Lansingburg, N. Y.

112,405.—CLOD FENDER.—F. L. Bailey, Freeport, Ind.

112,406.—RULER.—H. S. Ball, Spartanburg, S. C.

112,407.—FANNING MILL.—Benjamin Barney, Time, Ill.

112,408.—ICE-CUTTING MACHINE.—Lafayett Barnum (assignor to himself and A. R. Hale), Bridgeport, Conn.

112,409.—MANUFACTURE OF ICE.—T. J. Bigger, Kansas City, Mo.

112,410.—MACHINE FOR HEADING BOLTS AND SPIKES.—Reinhold Boeklen, Brooklyn, N. Y., assignor to himself and Henry Torstrick, New York city. Antedated Feb. 28, 1871.

112,411.—WASHING MACHINE.—Joseph Boswell, L. M. Boswell, Jonathan Palmer, and J. H. James (assignors to themselves and Thomas Starbuck), Wilmington, Ohio.

112,412.—WATER WHEEL.—E. C. Boyles, New York city.

112,413.—COTTON PRESS.—R. M. Brooks, Pike county, Ga.

112,414.—PAPER-CUTTING MACHINE.—Samuel Brown (assignor to himself and C. R. Carver), Philadelphia, Pa.

112,415.—GOVERNOR FOR DIRECT-ACTING ENGINES.—A. S. Cameron, New York city.

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112,417.—BUTT HINGE.—J. W. Carleton (assignor to the Union Manufacturing Co.), New Britain, Conn.

112,418.—MACHINE FOR CUTTING SHEET METAL.—C. R. Choate, East Saginaw, Mich.

112,419.—BIT BRACE.—William Cleveland, Lawrence, Mass., assignor to himself and James Swan, Seymour, Conn.

112,420.—STEAM ENGINE GOVERNOR.—C. A. Condé, Indianapolis, Ind.

112,421.—CARPET-CLEANING MACHINE.—J. C. Craft (assignor to himself and Antonio Rosello), Baltimore, Md.

112,422.—STEAM REGULATOR FOR PAPER DRYERS.—Daniel Crosby, Hampden, Me.

112,423.—METALLIC PISTON AND VALVE ROD PACKING.—G. M. Cruickshank, Providence, R. I.

112,424.—GRAIN-THRASHING AND SEPARATING MACHINE.—John Culham, Grand Rapids, Mich. Antedated Feb. 25, 1871.

112,425.—COOKING STOVE.—David Curtis, Mishawaka, assignor to himself and C. B. Graham, South Bend, Ind.

112,426.—LIGHTNING ROD.—S. D. Cushman, New Lisbon, Ohio.

112,427.—HOSE BRIDGE.—Patrick Daily (assignor to himself and J. J. Kehoe, New York city.

112,428.—COVER FOR OPENINGS IN SIDEWALKS.—William Dale, New York city.

112,429.—ROTARY PUMP.—F. O. Deschamps, Philadelphia, Pa.

112,430.—MACHINE FOR CUTTING FILES.—James Dodge, Manchester, England, assignor to David Blake, Spencertown, N. Y.

112,431.—COUPLING FOR RAILWAY CARS.—Henry Dubs and S. G. Goodall-Copestake, Glasgow, Great Britain.

112,432.—TOBACCO PIPE.—P. J. Dwyer, Elizabethport, N. J.

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112,434.—SULKY PLOW.—Milo A. Elliott, Stratford Hollow, N. H.

112,435.—STRETCHER FOR PAINTINGS.—James Fairman, New York city.

112,436.—BODY LANTERN HOLDER.—Samuel C. Fessenden, Satmford, Conn.

112,437.—STOVE LEG.—Amon L. Finch, Sing Sing, N. Y.

112,438.—PUMP PISTON.—John S. Follansbee and George Doolittle (assignors to the Forrester Manufacturing Company), Bridgeport, Conn.

112,439.—SHOE.—Samuel W. Francis (assignor to himself and W. H. Newton), Newport, R. I.

112,440.—GUARD-FINGER FOR HARVESTERS.—George Fyfe and Chester Hard, Ottawa, Ill.

112,441.—DINING TABLE.—S. R. Gardner (assignor to himself and S. M. Marquette), Independence, Iowa.

112,442.—STEP LADDER.—M. Boland Geary, New York City.

112,443.—OILCLOTH PRINTING MACHINERY.—Ebenezer A. Goodes (assignor to Philadelphia Patent and Novelty Company), Philadelphia, Pa.

112,444.—TENONING MACHINE.—Lyman Gould, Norwich, Conn.

112,445.—PRINTER'S CASE.—Wm. H. A. Gresham, Atlanta, Ga.

112,446.—LAMP CHIMNEY.—Geo. W. Griswold, Factoryville, Pa.

112,447.—GRAIN SEPARATOR.—Philander Griswold, Hudson, Mich.

112,448.—CLAMP FOR THILL COUPLINGS.—John W. Guider (assignor to himself and John Kiefer), St. Joseph, Mo.

112,449.—BIRD CAGE.—Gottlob Gunther, New York city.

112,450.—STOP COCK AND VALVE.—William Haas, New York city.

112,451.—VALVE FOR STEAM ENGINES.—Joseph L. Harley, Baltimore, Md., and Xaver Fendrich, Georgetown, D. C.

112,452.—METALLIC HUB.—John H. Harper, Pittsburgh, Pa.

112,453.—COMPOSITION FOR LUBRICATING MACHINERY.—E. Q. Henderson (assignor to John C. Burroughs and Richard A. Spriggs), Charlotte, N. C.

112,454.—POST-HOLE DIGGER.—Bryant B. Herrick, Decatur, Mich.
112,455.—DOOR CHECK.—Levi S. Hicks (assignor to himself, J. Perrin Johnson, and John Buell), Peoria, Ill.
112,456.—RAILWAY-CAR BRAKE.—Luther Hill, Stoneham, and Seth D. Tripp, Lynn, Mass.
112,457.—TRUSS.—Adam Hinoult, Montgomery, N. Y.
112,458.—FEED BAG FOR HORSES.—Walter A. Hough, South Butler, N. Y.
112,459.—SHADE HOLDER FOR LAMPS.—Mark W. House, Cleveland, Ohio.
112,460.—LAMP CHIMNEY.—Mark Wiggins House (assignor to the Cleveland Non-Explosive Lamp Company), Cleveland, Ohio. Antedated March 1, 1871.
112,461.—HORSE HAY RAKE.—James Howard and E. T. Bousfield, Bedford, England.
112,462.—TONGS FOR ROLLING BARRELS.—Mark W. Ingle, Indianapolis, Ind.
112,463.—PITMAN.—George W. Jayson, Lodi, Ohio.
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112,465.—TWINE HOLDER.—Edward M. Judd, New Haven, Ct.
112,466.—CLOTHES PIN OR CLASP.—Amos L. Keeports and William Yount, Littletown, Pa.
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112,489.—LUBRICATING COMPOUND.—Victory Purdy, Poughkeepsie, N. Y.
112,490.—FERTILIZER AND SEEDING MACHINE.—Archibald Putnam (assignor to Elizabeth Putnam), Owego, N. Y.
112,491.—ROTARY PUMP.—George W. Putnam, South Glens Falls, N. Y.
112,492.—HAT BRUSH.—Robert Dunbar Radcliffe, Palmyra, N. Y.
112,493.—REFRIGERATING SHOW CASE.—Thomas L. Rankin, Lyndon, Kansas, assignor to himself and D. W. Rockwell, Elyria, Ohio.
112,494.—DEVICE FOR STARTING AND STOPPING CARS.—Philip Rhoads, Carlisle, Pa.
112,495.—PIPE-MOLDING MACHINE.—George Richardson, Milwaukee, Wis.
112,496.—SULKY CULTIVATOR.—Richard B. Robbins, Adrian, Mich.
112,497.—HAND PLOW.—Nelson Rue, Harrodsburg, Ky.
112,498.—MECHANICAL MOVEMENT.—Edward G. Russell, Ravenna, Ohio.
112,499.—RAILWAY CAR BRAKE.—Lyman Alphonzo Russell, Shrewsbury, Vt.
112,500.—STOVEPIPE CLEANER.—David Sanford, Ashton, Ill.
112,501.—TWINE HOLDER.—Joseph B. Sargent and Purmont Bradford (assignors to Sargent & Co.), New Haven, Conn.
112,502.—DOVETAILING MACHINE.—James M. Seymour, Newark, N. J.
112,503.—WOODEN PAVEMENT.—Eaton Shaw, Portland, Me.
112,504.—GUARD FOR CIRCULAR SAWS.—George W. Shipman, Ischua, N. Y.
112,505.—BREECH-LOADING FIREARM.—Dexter Smith and Martin J. Chamberlin, Springfield, Mass.
112,506.—SPARK ARRESTER.—James Smith, Altoona, Pa.
112,507.—HORSE HAY RAKE.—Solomon P. Smith, Waterford, N. Y.
112,508.—PLOW.—S. M. Stewart, New Harrisburg, Ohio.
112,509.—MEDICAL COMPOUND FOR TREATING FEVER AND AGUE.—George E. Swan, Mount Vernon, Ohio.
112,510.—DEVICE FOR COOLING JOURNALS OF CAR AXLES.—Henry G. Thompson, Milford, Conn.
112,511.—COOLING JOURNAL OF CAR AXLES.—Henry G. Thompson, Milford, Conn.
112,512.—COOLING JOURNAL OF CAR-WHEEL AXLES.—Henry G. Thompson, Milford, Conn.
112,513.—DEVICE FOR COOLING JOURNALS OF RAILWAY CARS.—Henry G. Thompson, Milford, Conn.
112,514.—NON-HEATING HANDLE FOR SAD IRONS, ETC.—William H. Towers, Boston, Mass.
112,515.—LUBRICATOR.—John Erst Uhl, Renovo, Pa.
112,516.—COMBINED CORN PLANTER AND CULTIVATOR.—Franklin Underwood, South Rutland, N. Y.
112,517.—KING BOLT.—Wendel Vondersaar, Indianapolis, Ind.
112,518.—WHEAT ROASTER.—George W. Waitt (assignor to himself and Robert B. Fitts), Philadelphia, Pa.
112,519.—PLASTER SOWER.—Thomas J. West, Alfred Center, N. Y.
112,520.—TICKET HOLDER.—Henry Wexel, Providence, R. I.
112,521.—TOBACCO PRESS.—Abraham N. Zell, Lancaster, Pa.
112,522.—COMBINED BAG HOLDER AND SCALES.—William Zimmerman, Lebanon, Pa. Antedated February 25, 1871.
112,523.—BREECH-LOADING FIREARM.—James M. Mason, Washington, D.C.

REISSUES.

4,287.—TREATING FRUITS TO DRY, SACCHARIFY, AND PRESERVE THEM.—Charles Alden, Newburg, assignor of part interest to Alden Fruit Preserving Company, New York city. Patent No. 100,835, dated March 5, 1870; reissue No. 4,011, dated June 7, 1870.
4,288.—DEVICE FOR SECURING PULLEYS TO SHAFTS.—John H. Buckman (assignor to himself and Peter W. Reinshagen), Cincinnati, Ohio. Patent No. 98,144, dated December 21, 1869.
4,289.—SHAWL STRAP.—George Crouch, Westport, Conn. Patent No. 82,606, dated September 29, 1868.
4,290.—ATMOSPHERIC DENTAL PLATE.—Nehemiah T. Folsom, Laconia, N. H. Patent No. 60,871, dated January 1, 1867.
4,291.—PESSARY.—William R. Gardner, Leonardsville, N. Y. Patent No. 105,191, dated July 12, 1870.
4,292.—Division A.—SKATE.—James L. Plimpton, New York city. Patent No. 37,906, dated January 6, 1863; reissue No. 3,906, dated April 5, 1870.
4,293.—Division B.—SKATE.—James L. Plimpton, New York city. Patent No. 37,906, dated January 6, 1863; reissue No. 3,906, dated April 5, 1870.
4,294.—APPARATUS FOR PITCHING BARRELS.—Louis Schulze, Baltimore, Md. Patent No. 106,964, dated August 30, 1870.

DESIGNS.

4,694.—PICTURE FRAME.—John H. Bellamy, Charlestown, Mass.
4,695.—BELL CRANK AND ESCUTCHEON.—Pietro Cinquini, West Meriden, Conn., assignor to Parker & Whipple Company.
4,696.—PEDESTAL FOR A CAKE DISH.—George Gill (assignor to Reed & Barton), Taunton, Mass.
4,697.—TABLE CASTER.—William Parkin (assignor to Reed & Barton), Taunton, Mass.
4,698.—BUCKLE FRAME.—John E. Smith, Waterbury, Conn.
4,699.—BACK OF A CHAIR OR SOFA.—George Unverzagt, Philadelphia, Pa.

TRADE-MARKS.

182.—HAT.—Nathan A. Baldwin, Milford, Conn., James H. Prentice, Brooklyn, and John R. Waller, New York city.
183.—SPOOL COTTON.—Lewis Coleman & Co., Boston, Mass.
184.—SALVE.—Robert Dobbins, Binghamton, N. Y.
185.—SOAP.—Leberman & Co., Philadelphia, Pa.
186.—MEDICINE.—Ridenour, Coblentz & Co., Springfield, Ohio.
187.—PAPER.—Union Manufacturing Company, Springfield, Mass.

EXTENSIONS.

WAGONS.—Edgar Huson, Ithaca, N, Y. Letters Patent No. 16,648, dated February 17, 1857; reissue No. 2,500, dated March 5, 1867.
OPERATING VALVE OF STEAM ENGINE.—Samuel R. Wilmot, Bridgeport, Conn. Letters Patent No. 16,968, dated February 17, 1857.
HINGES.—John David Browne, Cincinnati, Ohio. Letters Patent No. 16,678, dated February 24, 1857.
KEEPER FOR RIGHT AND LEFT HAND DOOR LOCKS.—Calvin Adams, Pittsburgh, Pa. Letters Patent No. 16,676, dated February 24, 1857.
SOLAR CAMERA.—David A. Woodward, Baltimore, Md. Letters Patent No. 16700, dated February 24, 1857; reissue No. 2,311, dated July 10, 1866.
CAST SEAMLESS THIMBLE SKEINS FOR WAGONS.—John Benedict, Kenosha, Wis., administrator of Andrew Leonard, deceased. Letters Patent No. 16,688, dated February 24, 1857; reissue No. 575, dated July 27, 1858; reissue No. 1,229, dated October 8, 1861.
MODE OF CASTING SEAMLESS SKEINS FOR WAGONS.—John Benedict, Kenosha, Wis., administrator of Andrew Leonard, deceased. Letters Patent No. 16,688, dated February 24, 1857; reissue No. 575, dated July 27, 1858; reissue No. 1,228, dated October 8, 1861.
BREECH-LOADING FIREARMS.—William Cleveland Hicks, Summit, N. J. Letters Patent No. 16,797, dated March 10, 1857; reissue No. 1,952, dated May 9, 1865; reissue No. 3,798, dated January 18, 1870; reissue No. 3,860, dated March 1, 1870.
SEEDING MACHINE.—Lewis B. Myers and Henry A. Myers, Elmore, Ohio. Letters Patent No. 16,772, dated March 3, 1857.

DISCLAIMER.

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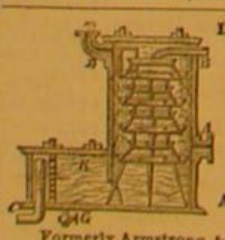

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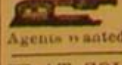
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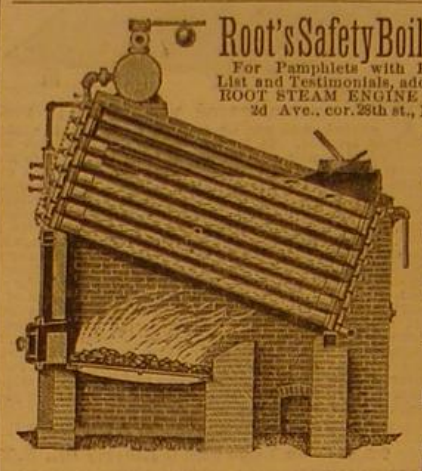
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