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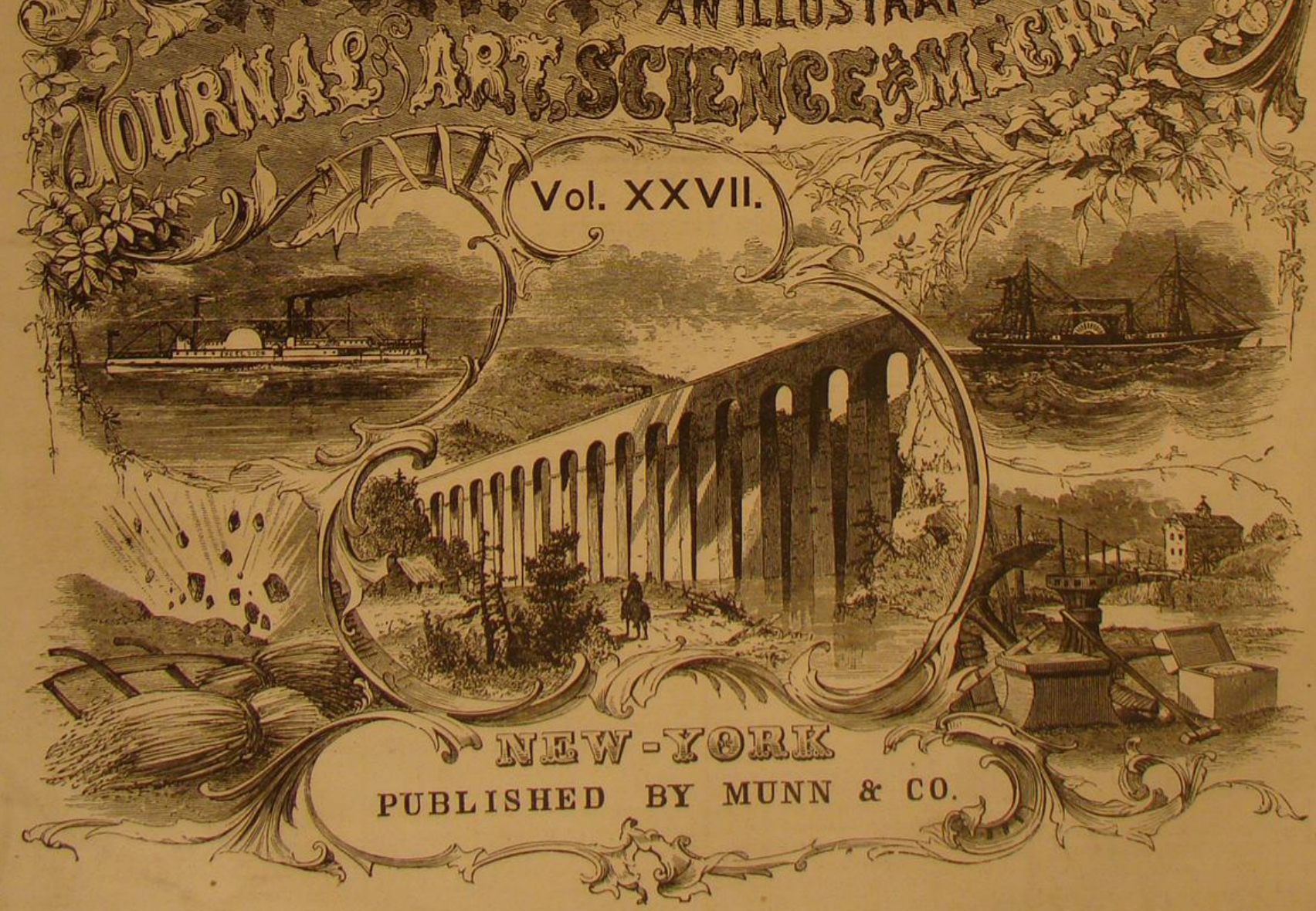

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SCIENTIFIC AMERICAN

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IMPROVED STEAM HEATER.

We this week illustrate Bosley's patent low pressure boiler for steam heaters. It is calculated to burn soft or hard coal, coke, or wood. It is built of horizontal cast iron sections, placed one above the other in any required number.

Fig. 1 represents the boiler with a portion broken out so as to show the internal arrangement. Fig. 2 is a perspective view of one of the sections. It will be seen to consist of an annular water space, A, and of cross tubes, B (which may be from three to five in number) connecting one half of the annulus with the other. The upper and lower sides are provided with perforations as at C, and are flanged in order to make the connections. The sections, after being planed smooth and even, are placed so that the upper one of each pair has its cross tubes at right angles with those of the lower one, and so that the perforations, C, in both, may come together. Other angles may be chosen if the latter condition is fulfilled. A lead joint is then made, and the opposing flanges bolted together. Fig. 3 shows, in vertical section, a pair of these sections thus arranged.

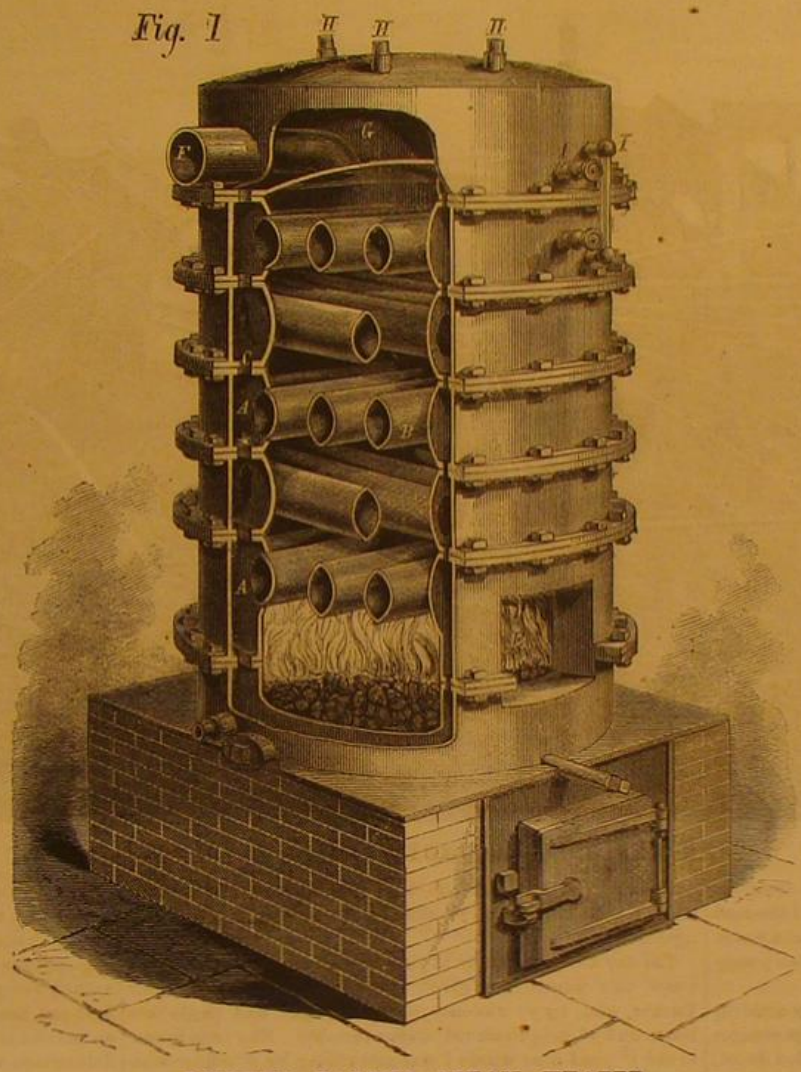
It will be observed that the tubes (as shown at B) incline from the horizontal to allow of free circulation of the water. The sections are now being made of either three or four feet diameter, and the capacity of the boiler is regulated by the number placed in pile.

With this explanation, the entire construction will be understood from Fig. 1, where D is the ash pit, E the fireplace, F the smoke pipe, and G the steam dome. H H H are steam pipe couplings, of which as many as are needed may be attached to the dome. At I are shown the water gage and try cocks. The lowest section of the boiler consists of the annulus only, without the cross tubes, which forms a water leg around the fire, end is provided with hand-hole plates for the removal of sediment. This boiler is stated to have a foot of heating surface to every three quarts of water, and to require a surprisingly small quantity of fuel to generate steam.

It is easily put up and is strong and durable, with no liability to burn out. It has been in successful operation for two years, and its perfect circulation proved by the absence of all tendency to foam.

There is no question that a boiler built on this principle would sustain more than all the pressure which would be required in heating a building by either high or low pressure steam or hot water; and no doubt as to its perfect safety, when employed for either of these purposes, need be entertained. A great advantage arising from the mode of construction lies in the perfect ease with which the size of the boiler can be adjusted to that of the particular building to be heated by it. The sections are simply connected in sufficient number to give the intended capacity, and the boiler is completed by the addition of the steam dome—no special alteration of its parts being needed in any case. The inventor states that its first cost is less than that of any other first class heating apparatus yet introduced, which, when taken in connection with its durability, becomes an important item. Further, the comparatively very small consumption of fuel in this boiler is greatly in its favor. Patented May 10, 1870. Further information may be obtained of Messrs. J. Weatherby & Sons, Nos. 11 and 13 North Liberty street, Baltimore, Md.

Fig. 1



BOSLEY'S PATENT STEAM HEATER.

Fig. 2

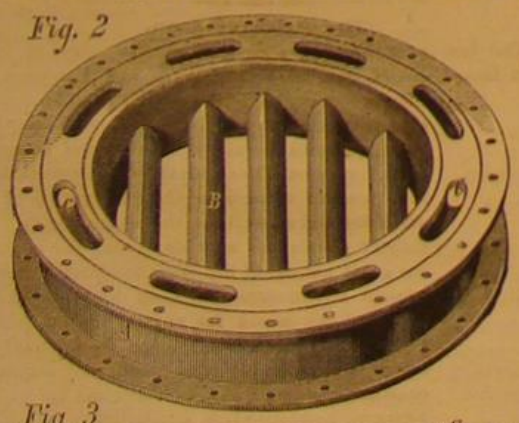


Fig. 3

Improved Blowpipe.

A common wide mouthed bottle is carefully fitted with a caoutchouc cork bored with two holes, into each of which passes a piece of glass tube bent at a right angle. On to one of these tubes is slipped the caoutchouc tube coming from an ordinary caoutchouc bellows, whilst the other is put in communication with the blowpipe nozzle by means of four pieces of caoutchouc tubing joined by three pieces of glass tube drawn to a fine point at each end. This forms the main peculiarity of the arrangement. When air is forced into the bottle by the blower in jerks, it finds a difficulty in escaping as fast as it comes in, on account of the six fine openings in the glass tubes that it has to pass through on its way from the bottle to the nozzle, and it thus acquires a certain pressure in the bottle and flows out toward the nozzle as a regular blast. The bottle may be about 6 inches high by 3½ inches wide, with a neck 1½ inches diameter; but of course the dimensions are of no great importance. On the whole, a somewhat large bottle is better than a small one. The pieces of glass tubing we use are 2 inches long by ¼ inch in diameter. The apparatus will be stronger if, instead of a glass bottle, a tin cylinder is used, about 4 inches high by 2 inches in diameter, with two tin tubes opening into its top. Small metal cylinders, with a fine hole at each end, may be used instead of the little glass tubes. A blowing apparatus constructed in this manner will deliver a perfectly regular blast, and will be of practical interest to those who are thinking of working in places where it is difficult or impossible to repair the ordinary instruments.

FEVER AND AGUE.—Some one thus describes it: "It comes creeping up a fellow's back like a tun of wild cats, goes crawling up his joints like iron spikes, and is followed by a fever which prohibits the patient from thinking of anything but the Independent Order of Good Templars. It isn't the 'every other day' kind, but gets up with a man at daylight, and sleeps in the small of his back all night. His teeth feel about six inches too long, his joints wobble like a loose wagon wheel, and the shakes are so steady that he can't hold any sort of conversation except by putting in dashes."

SHIVE'S WATCHMAN'S CLOCK.

Our engraving illustrates a watchman's clock and time detector, invented and patented April 19, 1870, by Mr. D. Shive, of Philadelphia. It is designed to obviate the inconveniences met with in using other devices of a similar nature, and is very simple in its construction, and can be sold very cheaply.

Fig. 1 shows the clock complete. At A is a small dial with an edge of slate, which is attached to the center post of the clock, and also by a wire to the hour hand. The wire is curved so as to allow free passage of the minute hand under it. It is represented as attached to the hour hand in Fig. 1, and is seen in detail in Fig. 3, which gives a back view of the dial, A. At B is shown a small hole made in the glass which covers the clock face in front of the slate edge of the dial, A. The operation will be readily understood: The small dial, A, revolves, with the hour hand, once in twelve hours, during which time it presents, successively, every portion of the slate edge or ring o the hole, B, and it is so set that the time kept by it, using the hole as an index, agrees with that of the clock. Now, if from time to time a pencil be passed through the hole and a mark made by it on the dial edge, a record will be kept thereon of the precise time when each mark is made. The watchman is directed to mark the small dial every hour, half-hour, or other period selected by his employer, and the apparatus faithfully records in what manner he performs his duty. In Fig. 1, marks are shown at each hour from six o'clock. Supposing the clock to be running, and the watchman now to mark the dial, it will record that he did so at half-past ten, which is also the time by the clock. If from any cause he should neglect to make the marks, their absence from the dial will reveal the fact. In order to prevent the clock being tampered with, the door is secured by a tumbler lock which cannot be readily picked, and no two of these locks are made alike. As the key never comes into the watchman's hands, he cannot duplicate it. The clock, which is a first class eight day timepiece and strikes the hour, is secured in position by screws driven from the inside, and cannot be removed without violence.

Fig. 2 is another style of marking dial, which is, however, used in the same manner as the dial, A. It is a paper dial contained in a thin brass case. These paper dials are changed every day, and can be filed away for reference if required. With the slate dial, all that is necessary is to wipe off the marks of the pencil daily.

Further information may be obtained of the Shive Governor Company, N. W. corner 12th and Buttonwood streets, Philadelphia, Pa., who are the manufacturers.

Fig. 1. *Fig. 2.*

ACCORDING to the last census, there are in the United States five millions of children, of school age, who never attend school!

LOCOMOTIVE BOILER EXPLOSION.

One of the most destructive boiler explosions which has recently come under our notice, our readers will find represented in the accompanying engraving, which is from a photograph furnished by our correspondent, Mr. Charles D Bingham. It seems that, on the 9th ult., the locomotive *Charles Millar*, of the Utica and Black River Railroad, while preparing to start out from the depot at Watertown, N. Y., suddenly exploded, the boiler being under a pressure of but 105 lbs. of steam.

The whole top of the boiler, weighing some 2,000 lbs., was projected into the air to a hight of at least six hundred feet, falling at a distance of a quarter of a mile from the engine. Other portions of the machinery were hurled nearly half a mile away, many tearing through roofs of houses, but providentially injuring no one. The smoke stack was thrown some two hundred feet, falling between a couple of freight cars. One of the heavy driving wheels was tossed ten feet away like a feather, and the steel connecting rod twisted out of all shape. The force of the explosion was terrific, shattering every window in the vicinity, and, as is shown in our illustration, expending itself on the forward portion of the locomotive. The apparatus in the interior of the cab escaped with but little damage, and its occupants at the time—the engineer and fireman—were, strange to say, unhurt.

No lives being lost, it is of course probable that the circumstance will, in course of time, be forgotten, and no official investigation made; but a mere superficial examination of broken portions of the boiler conclusively proves gross and criminal negligence on the part of the railroad company. Our correspondent informs us that the iron was corroded in places almost entirely through; that he saw a deposit of scale in a rust crack which extended within one tenth of an inch of the outside surface, and that the thickness of sound iron varied from one eighth to one thirtieth of an inch. The employees of the road state that the boiler had been in use for over seventeen years, and the condition of the pieces shows that it had been poorly cared for.

What the consequences would have been, had this accident occurred when the locomotive was attached to a passenger train in motion, or had it been stationary in a crowded depot, we leave our readers to conjecture. There are plenty of laws in our statute books which compel parsimonious corporations to manifest some regard for human life, and it is the duty of the government to enforce them. We have no doubt but that there are hundreds of locomotive boilers throughout the country which are in as bad a condition as this one was, and which may at any moment prove the means of a fearful calamity.

AN EXPLODED LOCOMOTIVE.—[From a Photograph.]

THE DUCKING STOOL.

From the tenor of some of the early colonial laws, the cold water cure was evidently an established institution, and, in 1634, applied especially in the healing of running tongues, with which the ladies were troubled. We are indebted to that excellent periodical, *The American Historical Record*, for the accompanying engraving of the Ducking Stool, a queer machine for punishment which was used in Virginia and other colonies, in early times. The *Record* also gives the following historical letter descriptive of the manner in which the machine was practically employed:

Hungar's Parish, Ackowmake, Virginia, June y^e 16th, 1634.

Hon^rd Sir,

Methinks I've been grately blest by Providence since coming into these parts, for I've been allowed, without let or hinderance, to see how y^e people deport themselves in their Families, their Churches, and their Courts.

It is undeniable y^t they endeavor to live amiably, keep y^e peece in families and communities, and by divers means try to have harmony and good-will amongst themselves and with Strangers who may sojourn among them. For this they use a device which they learned in England, they say, to keep foul tongues y^t make noise and mischief, silent, and of which I must faine tell you.

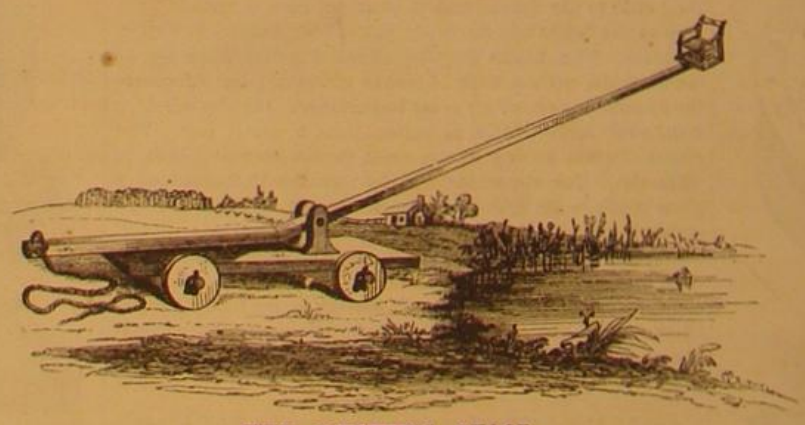
They have a Law which reades somewhat in this wise: "Whereas it be a sinn and a shame for scolding and lying Tongues to be left to run loose as is too often the way amongst women, be it therefore enacted y^t any woman who shall, after being warned three severall times by y^e Church, persist in excessive scolding, or in backbiting her neighbors, shall be brought before y^e Magistrate for examination, and if y^e offence be fairly proved upon her, shee shall be taken by an Officer appointed for y^e purpose, to y^e nearest pond or deepe streame of water, and there, in y^e presence of said Magistrate and of her accusors, be publicly ducked by said officer in y^e waters of s^d pond or streame until shee shall make a solemn promise y^t shee'l never sin in like manner again."

The day afore yesterday at two of y^e clock in y^e afternoon, I saw this punishment given to one Betsey, wife of John Tucker, who, by y^e violence of her tongue had made his house and y^e neighborhood uncomfortable. She was taken to the y^e pond near where I was sojourning, by y^e officer who was joyned by y^e Magistrate and y^e Minister, Mr. Cotton, who had frequently admonished her, and a large number of People. They had a machine for y^e purpose y^t belongs to y^e Parish, and which I was told had been so used three times this Summer. It is a platform with 4 small rollers or wheels, and two upright posts between which works a Lever by a Rope fastened to its shorter or heavier end. At y^e end of y^e longer arm is fixed a stool upon which s^d Betsey was fastened by cords, her gown tied fast around her feete. The Machine was then moved up to the edge of y^e pond, y^e Rope was slackened by the officer, and y^e woman was allowed to go down under y^e water for the space of half a minute. Betsey had a stout stomach, and would not yield until shee had allowed herself to be so ducked 5 severall times. At length shee cried piteously, "Let mee go! let mee go! by God's help I'll sin so no more." Then they drew back y^e machine, untied y^e Ropes and let her walk home in her wetted clothes, a hopefully penitent woman.

Methought such a reformer of great scolds might be of use in some parts of Massachusetts Bay, for I've been troubled many times by the clatter of y^e scolding tongues of women y^t like y^e clack of y^e Mill seldom cease from Morning till Night.

I expect to stay here about the space of a moon yet, when I shall go in a vessel from Jamestown to Salem, where I shall have y^e honor of saluting you and Mr. Williams, as y^r Humble, and most Ob^t Servant, THOMAS HARTLEY.

Governor ENDICOTT.



THE DUCKING STOOL.

Cement from Sewage.

A new method of disposing of sewage, by making it into cement, has been practically and successfully tested during the last six months at Ealing, a village to the west of London. Major General Scott is the inventor and patentee of the process. The principle of the process consists in mixing, with the sewage, quantities of lime and clay, the former ingredient combining with the carbonic acid of the fecal matters to form carbonate of lime, which is precipitated with the solid ingredients in the form of an impalpable powder. The lime and clay are preferably thrown into the main sewer some little distance before reaching the outlet, so as to insure a more complete incorporation of the different matters, while at the same time destroying the slimy glutinous character of the sewage "sludge," and keeping the drain clean and free from the festering and putrefying deposit which otherwise tends to choke it. The clay and the lime do not merely facilitate the deposition of solid matter, but, as is well known, they tend to purify the supernatant water. Now, lime and clay are the chief constituents of those limestones which, on calcination, yield the best hydraulic limes and cements; and it is claimed for this process that there is a sufficient gain of cement-making material abstracted from the sewage to make the operation profitable, independently of the advantages gained by thus deodorizing and defecating the excrementitious matters of towns, which must otherwise be disposed of in a manner more or less unhealthy, and very often at great expense.

The success of the new process depends in no small degree on the fact that the precipitated matter supplies to a considerable extent the fuel necessary for the burning operation. The sewage being allowed to settle in tanks and the supernatant water drawn off, it is found to be thoroughly deodorized and may be exposed to the drying action of the air for an indefinite period, without giving rise to any offensive or deleterious vapors. It is then dried on tiles, beneath which the heated gases of the furnace are made to pass, and is then calcined in the ordinary manner. The fecal matters which subside in the settling tanks are found to consist to a large extent of organic compounds, which, when dried and distilled, yield large quantities of inflammable gases; and although the proportion of carbon may be small, the hydrogen gives a most intense heat, the sewage thus supplying the greater portion of fuel required to turn it into cement.

The Price of Iron.

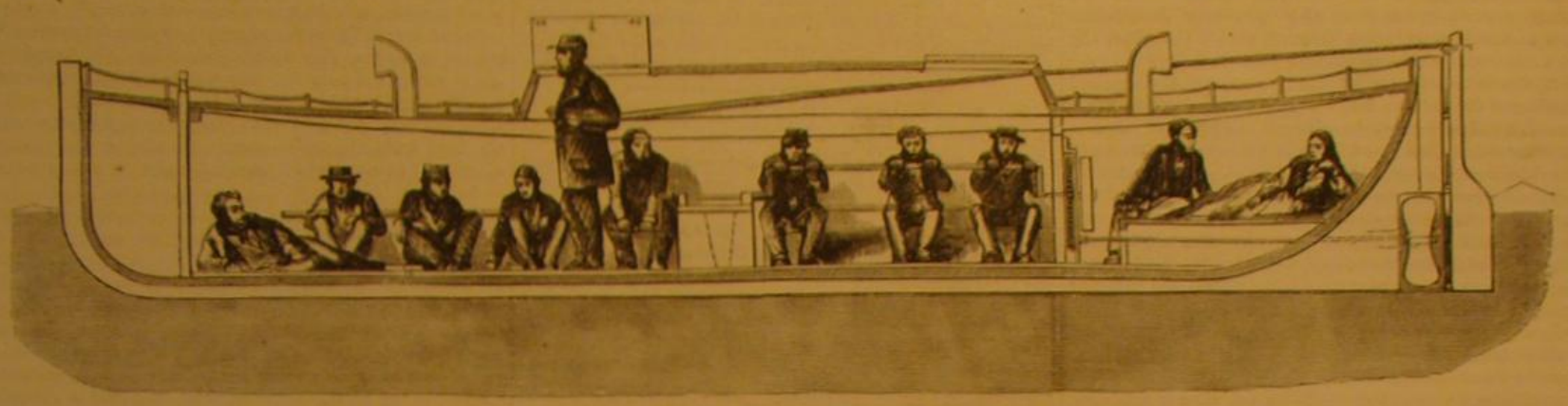
The last paragraph in a circular on the price of iron, just issued by Messrs. G. Bailey Toms and Company, of England, runs as follows: "It would appear that iron prices in all producing countries—Belgium, America, Germany, Sweden, and France—have risen *pari passu* with those of Great Britain, thus bearing witness to the universality of the great demand as well as the short supply. No sinister clouds are now darkening the horizon; the great nations of the West are bound over by present circumstances to keep the peace, and in the East the causes for anxiety are postponed: the value of money in London seems likely to recede, and the activity of trade will require a constant supply of new iron bottoms for its conveyance, however slack shipbuilding may have, for a moment, lately looked; consequently it does not appear to us over sanguine to indulge in cheerful views of the prolonged vitality of the trade in British iron."

IT is stated that specifications are at present in the hands of several Clyde shipbuilders for a new vessel for the National Steamship company. She is to run between Liverpool and New York, and is to be of gigantic proportions, second only to those of the Great Eastern. The dimensions are to be: Length over all, 576 ft.; breadth of beam 50 ft.; depth of hold, 35 ft. It is expected that this great steamship will make the voyage from port to port in seven days.

Screw Life Boat.

A very excellent arrangement for a life boat has been invented in England by J. M. Harris, which is shown in our engraving. The exposure of the crews of life boats, and of the persons rescued, to wet and cold is always exhaustive and perilous, and to prevent this is one of the objects of the present improvement.

This life boat is 36 feet long and 7 feet wide; it is constructed of wrought iron and is clothed in cork 5 inches thick. This greatly increases its buoyancy. Its peculiar characteristic consists, however, in the fact that it is entirely



HARRIS' IMPROVED SCREW LIFE BOAT.

enclosed. There are two chambers for passengers, one in the bow, the other in the stern. A third amidships holds the crew. These, four in number, propel the boat by means of a crank connected with a screw in the stern. The helmsman stands in the center and steers the little craft by means of ropes attached to the rudder; and to enable him to see, a little elevation is constructed above the deck, which is provided with glass windows. The chambers of the boat are provided with ventilation by means of pipes which protrude above the deck and catch the air and convey it to them below. The boat represented in our engraving is large enough to hold from twelve to sixteen persons besides the crew. The boat is at the same time very light, is easily launched, and can be drawn on wheels over the land by two horses or four men. The trials hitherto made by this boat have been very satisfactory.

ON THE MEASUREMENT OF MUSICAL INTERVALS.

M. Cornu and Mercadier have experimentally demonstrated that musical impressions are based upon several systems of musical intervals.

1. The musical intervals formed by the successive sounds of a melody without modulation belong to the Pythagorean scale, the degrees of which are represented by only the factors 2 and 3.

2. The intervals formed by the simultaneous sounds of the concords, which are the basis of harmony, belong to very different systems, depending upon the complexity of the cords. Those which form part of the simpler concords of two or three sounds, thirds, sixths, perfect concords, etc., may be included in the scale given in all treatises on physics, the degrees of which are represented by the factors 2, 3, and 5.

To demonstrate these propositions, several conditions require to be fulfilled.

In the first place, in the two scales above mentioned, the three different intervals, namely, the major third *do—mi*, the sixth *do—la*, and the seventh *do—si*, differ from one another by the interval called a "comma," the value of which is $\frac{81}{80}$, as will be found on dividing, one by the other, the fractions which represent these intervals on the two scales. Now this value of the comma is very small, though very perceptible to the ear; to demonstrate it we must, therefore, seek the assistance of skilled musicians, and employ apparatus of considerable delicacy.

A wire five, six, eight, ten, etc. meters long, suspended by narrow strips of caoutchouc, is soldered at one end to a small plate of brass, L, placed between the sounding board of a stringed instrument and the foot of the bridge, the other end being slightly clasped to a heavy stand S. Near the fixed point, a small piece of tinsel (*c*) is soldered on, and to this is attached a feather (*b*), by means of a little soft wax (by this arrangement a greater amplitude of vibration is attained than if the feather were directly attached to the wire). The musician stands in such a position that the wire may not impede the movements of his bow, and plays fragments of simple melodies in slow time (each note lasting at least a second). The vibrations of the strings are transmitted to the bridge, the metal plate, the wire, and, lastly, to the feather, which vibrates synchronously. It only remains to trace these vibrations.

The registering instrument is composed of a metal cylinder, M, the axis of which is furnished with a screw moving a double nut, firmly fixed to a table or to the wall. This cylinder is covered with a sheet of paper, which is blackened by making it revolve over the smoky flame of an oil lamp. A tuning fork, D, making from 300 to 500 double vibrations per second, and carrying a strip of tinsel to serve as an index, is firmly fixed in a vice or in the wall, and arranged so that its index may vibrate in the direction of the generating lines of the cylinder. These vibrations serve to mark the time, and the tuning fork serves as a chronograph, obviating the necessity of giving to the cylinder a regular and uniform motion. Further, the feather is moved forward so that its point may just touch the blackened paper, and that it may vibrate quite close to the index, and, like the latter, in the direction of the generating lines of the cylinder.

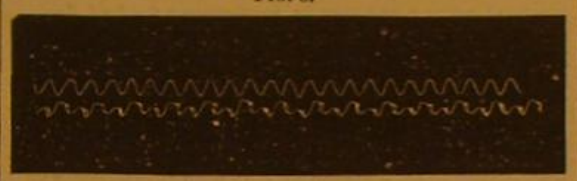
These arrangements being made, the tuning fork is set in vibration, either with a bow or by striking it with a stick covered with leather, and the musician plays, while the cylinder is turned at a suitable rate either by the hand or by any convenient motive power.

In this manner, a tracing is obtained like that of which a fragment is shown in Fig. 2, each note of the melody being represented by a form of vibration peculiar to itself. The number of vibrations for each note, corresponding to 100 vi-

FIG. 2.

brations, for example, of the tuning forks, is counted, and the ratio of the numbers thus obtained gives the values of the intervals. The vibrations are sometimes complicated with

FIG. 3.

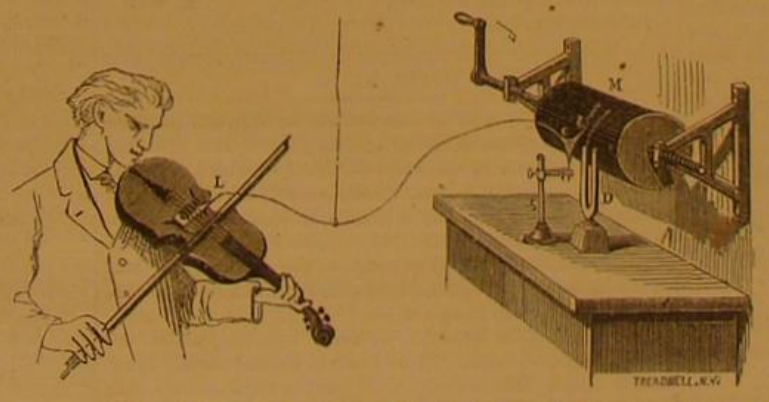


harmonics (Fig. 3), but they are almost always octaves, rarely fifths, very rarely thirds; moreover, it is not possible to make a mistake on this point

To preserve the tracing after it is detached from the cylinder, it is split longitudinally, and dipped for an instant into a 4 per cent solution of shellac in alcohol, whereby it becomes covered with a very thin layer of unalterable varnish.

If, instead of measuring intervals of melody, we wish to measure the harmonic intervals of two sounds, two strings of the instrument are tuned simultaneously (in the ordinary way), to the third, fifth, sixth, etc., till beats are no longer perceptible, and the ear is perfectly satisfied; the sounds of the two strings thus tuned are then separately traced.

FIG. 1.



Sewing Machine Patent Extended.

The Commissioner of Patents has extended the patent of Albert F. Johnson, of New York, for an improvement in sewing machines. This patent is for a rotating rack or hook cam for a chain stitch sewing machine. The extension was opposed by the Gibbs Sewing Machine Company, the question of priority of invention having been long and bitterly contested in the Patent Office. Over 3 600 printed pages and several thousand manuscript pages of testimony were presented to the Commissioner for his examination. In granting the application of Johnson for an extension of his patent, the Commissioner said: "This office cannot, on application for extension by the question of priority, neither can it in the time allowed, properly investigate the question of substantial identity. The question can be properly tried only on the Courts, and I think Johnson ought to have the right to go there. The extension will, therefore, be allowed. The above extension, it is understood, will be granted for the purpose of remitting parties to the Courts where the question if priority can be fully investigated, and is also understood to be adverse to the sewing machine combination.

Manufacture of Sewing Thread.

The cotton is received into the mill in the raw state in bales. The kind best adapted for making thread is that known as the "long fiber" or Sea Island, raised along the Southern and Eastern coasts of the United States; also a similar but somewhat inferior imported staple termed "Egyptian." This cotton is taken from the bales and passed through a machine called a picker, which separates it and passes it out in a downy sheet, and rolls it up into a snow like bundle. It is then taken to the carding machine, where it goes through another separating and refining process, and leaves this machine like a continuous untwisted rope, coiling itself round and round into a circular tin can placed to receive it. From thence it is taken to a French comber, an ingenious machine, the peculiar duty of which is to select or separate the long fibers and reject the short ones, as the long ones only are used in the making of thread. From this machine or comber, it is passed through other machinery or processes of uniting, drawing, reducing, and partially twisting, necessary to its preparation for the spinning frames, upon which it is finally adapted and placed. The spinning frames (or mules, as they are called) are self acting, drawing out the fibers and spinning them into a very fine thread or cord, six of which are twisted together to make the thread, and wind it, when spun sufficiently, upon small bobbins or cops. The spinning frames used in this mill are about 90 feet long, and spin about 900 threads at once. When these bobbins are full, they are taken to a winding machine, and two of these little threads are wound together upon a larger, bobbin. When full, these are taken to a twisting machine the two threads drawn off and twisted tightly together, and again wound upon cops or small bobbins.

This is the first process of twisting, and the second is similar to it, except that three of these twisted threads are wound off and again twisted together, thus making the six cords required to give the strength for which this thread is celebrated.

The thread thus made, says the *British Trade Journal*, is reeled off and tied into hanks or bunches and taken to the bleachery, where it passes through the several different processes of boiling, bleaching, washing, soaping, blueing, and drying; or to the dye house, where it is thoroughly boiled and prepared, and colored by various dyes, the colors being very rich and some of them very costly, the dyes being the aniline colors. When a number of these variously colored spools of this thread are placed together, they present every appearance of silk. After this process of bleaching or dyeing is completed, the hanks are again returned to the mill and wound upon large bobbins, and from these it is finally wound upon the small spools, where it remains until unwound by the busy fingers of industry throughout the world.

Before leaving this subject of thread making, it would be well to speak of the ingenious machines used in the final process of winding the thread upon small spools. These machines work automatically, or, in other words, go through all the motions necessary to wind the thread on the spool, cut the nick, insert and fasten the end of the thread, cut it off, draw off the spool, and drop it into a hopper, completed and well done. It also takes up the next spool, puts it on its spindle, and goes on with its winding. All that is required is simply to feed it with empty spools and collect them when wound. These machines each wind eight spools at a time, or eight spools in a little over a minute of time, or 300 dozen per day. These finished spools are passed through various departments, where they are ticketed, assorted, and placed in paper boxes, neatly labeled, or in larger quantity (assorted) in the drawers of handsome black walnut cabinet cases.

A VERDICT for $30,348 has been returned in the Supreme Court at Northampton, Mass., in favor of the Florence Sewing Machine Company against the Grover and Baker, Wheeler & Wilson and Singer Companies. Other cases, turning on the same question, are pending between these companies, involving about $150,000.

VENTILATION OF SEWERS.—With the view of ventilating the sewers of Glasgow, and destroying the foul emanations from them, the police board have resolved to connect them with several large chimneys throughout the city, including those of Messrs. Townsend, and Tennant and Co., the two highest in the world.

Correspondence.

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

Small Fast Steam Propellers.

To the Editor of the Scientific American:

The men in our shop were much interested in your account, of vessels of this class now in use in England, in your issue of the 15th inst., having just completed a small propeller which has proved to be very fast, an account of which may interest your readers generally.

The stock yards of this Company being across the Mississippi river, five eighths of a mile from the station, access to them is had with a small steam propeller, the *Robert Harris*, almost exactly like that described in your paper. She is built of oak, 50 feet long and 7 feet beam, and draws about 30 inches aft and a foot forward. She has a locomotive boiler 11 feet long, with fire box 2½ feet by 3½ feet with 27 two inch flues 7 feet long. She has two direct acting vertical engines, cylinders 5 inch bore and 10 inches stroke. Her screw wheel is forward of the rudder, and is 4 feet in diameter and has a quarter pitch. She has a small Seller's injector as well as a force pump. The engines are fitted with the circular slide valve, recently advertised in your paper, and work with extraordinary ease, power and economy of fuel. She will carry 20 to 30 passengers very comfortably.

Originally it was intended to use an upright boiler, such as is used by the steam launches in the United States navy, but the government inspector forbade its use after it was completed, and being pressed for time, a horizontal locomotive boiler was taken, with flues 3 inches apart as the law requires.

From the very limited fire surface and the very long time required to get up steam, an utter failure all round was confidently predicted by the knowing ones. On the contrary, however, our little vessel is a complete success. In speed, capacity, and economy of fuel, she cannot be excelled anywhere. A single shovelful of coal and a stick of wood will send her across the river in less than four minutes, and she will make ten miles an hour up stream or 15 miles down stream, all day, without any extra pushing. A few days ago, she ran a *full* mile with three shovels of coal and blew off at 100 lbs., as she landed with plenty of steam to carry her back to where she came from. The engineer reports that, though she is twice the size of the boat used last year, he can run her 50 miles with the fuel the other boat would burn in going 20 miles. To-day, interested by your paper, we timed her twice crossing the river. With 55 lbs. of steam and 104 revolutions, carrying 16 passengers, she crossed in 7 minutes. Coming back, with 90 lbs. of steam and 140 revolutions, she came over in 3½ minutes.

Here I would like to say a few words in favor of two excellent devices, the water injector and the circular slide valve. The former, though an old invention, is much less in use than it ought to be. Every locomotive ought to have a pair of them. With this most useful machine, water may be kept up in a boiler without working the machinery at all, and it is really indispensable in every well regulated establishment using steam power.

The circular slide valve is a most promising invention. Exactly what it will do, in gain of power over the common flat slide valve, has not yet been ascertained, but it will certainly do even more than the inventor promises, a gain of one third to one half. The pressure on the valve is completely removed by its use, and with it, the corresponding strain and friction on all the reciprocating parts. I have long been of the opinion that railway master mechanics have gone to a most wasteful extreme with their wide ports and huge barn door valves. If they really wish to know how much power and fuel they are wasting, and how much strain and friction they are thereby creating, for nothing except to make useless labor and expense, a trial of this device will both surprise and undeceive them.

I would like to inquire, of some of your experts in building and running propellers, if such a speed as you name, 600 revolutions, is usual, or if it can be maintained any length of time without rattling the machinery to pieces? High speeds and momentum in high pressure engines seem to be the tendency of the day, but of course there must be a limit somewhere.

Should any of your readers happen this way, I would cordially invite them to inspect our quick, efficient and powerful little craft, whose success has given us all such satisfaction.

A. GRAY,

Chicago, Burlington and Quincy Railroad, Locomotive Department, Burlington, Iowa.

The Open Polar Sea.

To the Editor of the Scientific American:

The subject of the polar sea is attracting much attention at this time, and I beg leave to submit the following as a scientific consideration:

The whirling of the earth, causing the polar indentations, also drives the water from the poles with a centrifugal force towards the equator; as water, poured on a whirling grindstone or globe, inclines towards the largest circle in the plane of rotation. And as the surface waters are less oppressed by weight above, as the lower waters are, they move more freely towards the equator than the under waters; and while they are passing towards the equator, it naturally creates a counter current towards the poles, for ever rising up at those points like some vast ocean spring, free from ice, till it meets the frozen circle, surrounding the open sea, on its way towards the equator again. Of course this surface current, as well as the under counter current, may be compared to an endless chain in a perpetual motion, for ever rising at the poles; which is, in my humble opinion, the great secret of the open polar sea.

Mr. Morton, of Dr. Kane's expedition, found, in latitude 83° N., open waters moving briskly southward; and the Dutch have lately found open waters warmer than the surrounding air. These facts induce the conclusion that the rapid whirling of the earth produces these two currents; and hence the open polar sea, or ocean spring, perhaps a thousand miles across.

The grand consideration that the whirling world so depresses the polar waters, producing these two wonderful currents and the open sea at the poles, commands our highest admiration and veneration for Him who made all things.

Paris, Texas. J. H. FOWLER.

Iron Ship Building in Wilmington.

To the Editor of the Scientific American:

In an article in your paper for this week, entitled "Iron Ship Building in Wilmington," you state that the Christiana creek is a wide and deep stream which forms a junction with the Delaware River at Chester. The above description is wrong, as the Christiana enters the Delaware River at not less than eleven miles below Chester City, and the yards you mention are several miles up the said creek. But at Chester we have the "Delaware River Iron Ship Building and Engine Works" (formerly the Reaney Engineering Company), now employing between 700 and 800 workmen, with four large iron ships on the stocks, and one just launched. Two are for the Pacific mail service. The yard is the largest in the country, and its business facilities are unequalled. It is situate directly upon the Delaware, having a river frontage of 65 feet. The Delaware is, at this point, one and one half miles from shore to shore. The principals are John Roach and Sons, formerly of New York.

Feeling great pride in our rapidly growing city of 12,000 inhabitants, we do not like to be confounded with Wilmington or Philadelphia; but being just between the two, we intend to stand on our own bottom and build iron ships against the world.

Chester, Pa. N. RULON.

Molasses or Hydrochloric Acid for Flowers.

To the Editor of the Scientific American:

Several years ago I became passionately fond of flowers, and I purchased a great many. I gave them all the attention I could possibly spare, and watched over them anxiously for a long time; but I found to my disappointment that before several weeks had passed, they all suddenly assumed a poor and dying appearance.

I changed the earth, enlarged the pots, and did everything imaginable, but they did not seem to improve at all. About this time, I removed the earth around the roots of a favorite geranium, and pouring molasses (the unrefined will serve the purpose well) around the roots, I covered it up with earth, and waited patiently for a change. You would have really been surprised to have seen the great improvement in the flowers. I tried several others with the same result.

If any one thinks that molasses is too expensive to be used for such a purpose, I would assure him that hydrochloric acid answers equally as well. It should be diluted in water (say one ounce of the acid to three or four quarts of water), and the flowers should be washed with it at the usual time. If these simple facts are of any value to lovers of flowers, I trust this will be made public. E. S. G.

Philadelphia, Pa.

HORSE HAIR.

Horse hair is brought to this country from South America, Siberia, and portions of Europe. The greater part of all imported comes from South America, being obtained from the immense numbers of horses, which, in a wild state, roam over the pampas of that continent. The manes and tails of horses which die in this country, although contrary to popular supposition, form but a small portion of the supply; the hair thus obtained is generally of poor quality, and unfit for use in the manufacture of hair cloth.

The material is imported in bales weighing about one thousand pounds each. These contain either "mixed hair," that is, hair of different lengths, or else are filled entirely with long hair. The former variety is the cheapest, costing in the bale from thirty-five to forty cents per pound in gold; the latter averages about seventy cents. As the material in its raw state is in a tangled and dirty condition, the first process through which it passes is sorting, during which the different colored hairs are placed in separate heaps. This work is done by boys, and its object is to facilitate the subsequent dyeing, as the black stain used is much more readily imparted to hair that is naturally of a dark color than to that of the lighter shades.

The bundles of sorted hair are then hackled, by which process the hairs are made straight and the foreign substances and dirt mingled with them removed. During the hackling, great care is taken not to break the hair, as upon its length its value depends—long hair being much more scarce than the shorter varieties and consequently far more costly.

A number of tufts of hackled hair are next placed between the teeth of a couple of cards. The latter, as our readers are doubtless aware, consist simply of flat pieces of tough wood on which pointed spikes of steel of about three inches in length are inserted. One of these cards is placed on its back on a table and the bundles of hair laid side by side between its teeth; when this card is full, the other one is placed upon it, points down, so that the bundles are firmly held by the double set of spikes. The hair, it must be remembered, is still of different lengths, and it is the object of this carding to arrange the long and short hairs in separate bundles.

The workman, therefore, begins by pulling out, from the bundles between the cards, all of the long hair in the ends nearest to him, and then keeps on removing more and more, until the set of extremities at which he is working are perfectly even, no one hair projecting more than another. Then he fastens the ends, removes the upper card, reverses the bundles and repeats the same process with the other extremities. When he finishes, the hairs between the cards are all of exactly the same length, and the separate tufts are now ready either to be made into curled hair, to be sold to the brush makers, or to be woven into hair cloth.

Curled hair is the material generally used for stuffing mattresses, cushions, etc. Other substances are occasionally employed for the purpose. Moss, sponge, sisal, (a species of Manilla hemp), African fiber, excelsior, (a fancy name applied to a preparation of wood shavings), tow, and a vegetable fiber from California known as eureka, are the most common; but none is as durable, cleanly, or elastic as pure curled hair.

The process of curling is begun by making the lengths of hair which are found to be too short for other uses into a rope. The workman, taking a bundle of loose material in his hand, attaches it to a revolving hook and, walking backwards, continually adding more hair, spins a long, tight strand. Two of these strands are twisted into a cord which, when finished, is reeled up into large coils. It is then boiled and immediately afterwards baked, this process setting the "kink" in the hairs, rendering them thoroughly elastic. In this condition, curled hair is sold to the trade; it only remains to untwist and pick out the rope by hand to obtain the desired quantities. The present price is for the pure material from forty-five to sixty cents a pound, according to quality. In the manufactory, one workman can make up from two hundred to two hundred and fifty pounds of curled hair per day.

Hair cloth, principally used for covering furniture, is manufactured from the longer and better qualities of hair. The bundles of hair, destined to be made into cloth after being carded in the manner above described, are removed to the dye house. There they are attached to a large iron grating which, when filled, is lowered into a vat of boiling dye, in which it remains for about five hours. The hair is then detached, and is ready for weaving.

This work is done by girls. The warp of the cloth is of black cotton thread. Linen thread is a better material, but makes a stiffer and harsher fabric, less suited for upholsterers' uses.

The hair composes the weft, and its length depends upon the width of cloth to be made, the usual proportion being a thirty-five inch hair to a thirty inch cloth. Each hair is introduced separately, being caught in a long shuttle or rod, the end of which terminates in a catch hook. The shuttle enters the shed of the warp, and the weaver, with her left hand, hooks the hair into the catch hook which draws it through to the other side. The batten is then driven home, and a new shed opens. These movements are made with great rapidity; and as the threads of hair must be fastened to the shutter bar with mechanical regularity, it is only after long practice that the requisite skill is attained. Formerly, two weavers were required to every loom, one to hand the thread and the other to fasten it to the shuttle; but the improved machines at present in use are easily managed by one person. We learn that still further improvements have been lately made, so that one workman can attend to six machines, the thread being attached to the shuttles, and the other work now done by hand accomplished entirely by automatic appliances.

After leaving the loom, the cloth is pressed between hot metal plates, and afterwards rubbed to give it the necessary polish. As furnished to the trade it is generally black, and its principal use is, as we before mentioned, for covering furniture. A very fine variety is sometimes made for sieves, and another quality is used by ladies in order to give volume to certain portions of their attire.

In price, hair cloth averages about one dollar per yard, varying from forty-five cents to two dollars and seventy-five cents. In width, it is manufactured in all sizes between fourteen and thirty-two inches. It is largely imported into this country, although it is estimated that the home manufacture amounts to over 20,000,000 yards, yearly.

A Lecture on Thomson's Galvanometer.

DELIVERED TO A SINGLE PUPIL IN AN ALCOVE WITH DRAWN CURTAINS.

The lamp light falls on blackened walls,
And streams through narrow perforations;
The long beam trails o'er pasteboard scales,
With slow decaying oscillations.
Flow, current! flow! set the quick light spot flying!
Flow, current! answer, light spot! flashing, quivering, dying.

O look! how queer! how thin and clear,
And thinner, clearer, sharper growing,
This gliding fire, with central wire
The fine degrees distinctly showing.
Swing, magnet! swing! advancing and receding;
Swing, magnet! answer, dearest, what's your final reading?

O love! you fail to read the scale
Correct to tenths of a division;
To mirror heaven those eyes were given,
And not for methods of precision.
Break, contact! break! set the free light spot flying!
Break, contact! rest thee, magnet! swinging, creeping, dying.

$\frac{dp}{dt}$ *in Nature.*

EXTENSIVE deposits of crystalized sulphur have been discovered in the Beaver Mountains, three hundred miles from Salt Lake City.

NITROUS OXIDE OR LAUGHING GAS.*

Aeriform or gaseous substances were not recognized as material bodies until the middle of the 17th century, and it required the lapse of another 100 years, together with the discovery of the barometer by Torricelli and of the air pump by Guericke, before the fact of their materiality was accepted. Since that time, the vaporous and gaseous bodies have occupied a most important position among the forms of matter presented to the chemist for investigation.

Nitrous oxide was discovered by Priestly in 1776, and was minutely examined by Davy in 1805.

It may be prepared by two or three processes, the easiest of which is by heating nitrate of ammonia, $NH_4 NO_3$, which is, by the action of heat, entirely split up into nitrous oxide and water, thus: $NH_4 NO_3 = N_2O + 2 H_2 O$.

The salt puts on the appearance of boiling, this being due to the continuous evolution of gas in the form of small bubbles. In preparing nitrous oxide by this method, care must be taken that the temperature does not rise too high, not above 240° C., or other compounds will be formed, particularly nitrite of ammonia, $NH_4 NO_2$, this taking place sometimes with explosive violence. Another method of preparing the gas is by acting upon zinc with very dilute nitric acid, when the acid is reduced at the expense of the zinc, and very pure nitrous oxide is slowly evolved.

Nitrous oxide will not support combustion, but as it is decomposed by a moderately strong heat if a combustible be introduced into it in the state of strong ignition, decomposition of a portion of the gas will ensue, and the liberated oxygen will continue to support the combustion.

Thus the feebly luminous, not over hot flame of burning sulphur is extinguished on introduction into an atmosphere of nitrous oxide, but burning phosphorus or a glowing splinter of wood, having a higher temperature, not only continues to burn, but burns with considerably increased brilliancy, owing to the freeing of the oxygen.

In the same way, the gas will not support life, although it may be breathed for a short time, as first shown by Davy, producing thereby a stimulating effect upon the system, which originated its name of laughing gas.

Nitrous oxide is further remarkable for its extreme density, being half as heavy again as atmospheric air, and possessing a specific gravity identical with that of carbonic acid gas, the choke damp of mines.

The gas may be poured from one vessel to another through the air as a liquid, or it may be baled, or siphoned, or otherwise transferred, in very much the same way as a liquid. A layer of a lighter gas will remain on the top of it for a considerable period with very little mixture, and for this reason it may be collected by what is called displacement, the tube, delivering the gas, dipping to the bottom of the collecting vessel.

Nitrous oxide is not a permanent gas—that is to say, does not remain gaseous in all circumstances; under extreme pressure, it gives way and becomes a liquid. No doubt this is true of all gases whatsoever, and our present limitation is due only to our inability to carry our experiments sufficiently far; but be this as it may, there are at least six gases that have up to the present time resisted all efforts to convert them into the liquid state. They are:—hydrogen, oxygen, nitrogen, carbonic oxide, marsh gas, and nitric oxide, and these are therefore called permanent gases.

Gases may all be looked upon as the unsaturated vapors of liquids, having their boiling points very far below any ordinary temperatures; as these boiling points are approached, they become more and more nearly saturated, until a point is reached at which a further reduction of temperature or increase of pressure will cause a condensation of some portion of them to the liquid state.

To illustrate this, we may refer to the case of ordinary water gas or steam, where, by the boiling of water, a vapor is given off; and so long as the vapor is kept above the boiling temperature, it exhibits the properties of a true gas, but the moment the heat falls below this point, or what comes to the same thing, external pressure is applied, a portion or the whole of the steam returns to the liquid state.

With respect to water, this may be rendered perfectly evident, but with other bodies, with much lower boiling points, extreme pressure and sometimes great cold have to be applied in order to obtain any condensation to the liquid state. Ether boiling at about the temperature of the body exists as vapor in the tropics, which may be liquefied by a pressure of one atmosphere (in excess of the ordinary atmospheric pressure) or an additional 15 lbs. per square inch.

Sulphurous acid gas requires a pressure of four atmospheres or 60 lbs. per square inch in order to liquefy it at ordinary temperatures (about 15° Cent.).

Cyanogen.....	6 atmospheres	or	90 lbs	per	square inch.
Ammonia.....	8 "	"	120 "	"	"
Carbonic acid..	36 "	"	540 "	"	"
Nitrous oxide..	40 "	"	600 "	"	"

This condensation of nitrous oxide was first effected by Faraday, who compressed the gas into a glass tube by means of a condensing syringe.

The boiling point of the liquid was determined to be —125° Fah., or very nearly as far below the freezing point of water as the boiling point is above it.

A clear mobile liquid of slight refractive power is the condensed nitrous oxide.

Its liquefaction is now carried out on a somewhat extensive scale since its introduction into surgery as an anæsthetic. For this purpose steam power is found requisite, and the gas is compressed by well made very strong forcing pumps, into specially made wrought iron bottles.

During its compression much heat is evolved—squeezed, so to speak, out of the gas—the heat required to maintain any gas in the gaseous condition being very much in excess of that necessary to maintain it in the liquid state.

When liquefied on the large scale, the receivers have to be kept cool by the external application of ice cold water, in order to prevent the vessel heating to a dangerous extent.

Upon its re conversion into the gaseous form by simply removing the pressure, this heat is re-absorbed from surrounding objects and from the air, thus giving rise to an intense degree of cold—a cold so great as to be far below the recordings of any trustworthy thermometer,

No gas has yet been solidified by direct pressure, but this has been accomplished in many cases by cold. Sometimes, as in the case of carbonic acid gas, the evaporation of a portion of the liquefied gas, on relieving the pressure, reduces the temperature of the remainder of the liquid to such an extent that it freezes readily. The frozen carbonic acid is a snowlike porous mass, passing directly into the gaseous state without becoming liquid. Nitrous oxide can only be solidified under the greatest difficulty, and when frozen presents the appearance of a glassy mass of solid ice, rather than that of snow.

Mercury, freezing at a temperature of —40° Fah. is readily solidified in quantity by the liquid nitrous oxide.

Water possessing a high specific heat, dropped into the liquid, occasions a kind of explosion on account of the liquid's very sudden conversion into gas.

Ignited charcoal may be placed upon the surface of the liquid with impunity, when it floats about burning vividly in the decomposed gas; this phenomenon is explained by the fact of the liquid being in the spheroidal condition, and thus preventing the ignited mass from coming into contact with itself by maintaining a layer of gas between them.

When liquid nitrous oxide is mixed with bisulphide of carbon to promote its evaporation, the lowest known temperature is obtained, namely —220° Fah.; at this temperature, alcohol, although not frozen, becomes so viscid that the vessel containing it may be inverted, the alcohol remaining attached to the interior.

The physiological action of nitrous oxide has been purposely left out of the foregoing observations; sufficient is not at present known even to give rise to an acceptable theory.

It would seem, also, that before any investigation could be entered upon, with any hope of success, with regard to the action of anæsthetics, it would be necessary to demonstrate how and in what manner sensations are transmitted along the nerves.

A suggestion here occurs as to the possibility of these transmissions taking the form of undulations or vibrations of extreme rapidity; and if this be the case, it is quite conceivable that two or more vibrations, proceeding at unequal rates, may so interfere as to give rise to a partial or complete suspension of the sensations: just as in the analogous cases of light and sound, waves proceeding at different rates will so interfere or neutralize each other, as to result respectively in a period of darkness or an interval of silence.

The part then played by an anæsthetic would consist in setting up these counter vibrations, whereby the pain-producing undulations would be neutralized or quenched.

*From a paper read by Francis Woodhouse Braine, F.R.C.S., before the Odontological Society, London.

Educated Railroad Men.

If a lawyer's argument is fallacious, says the *Railroad Gazette*, the opposing counsel is very apt to show it up with disagreeable clearness; a merchant's views of justice are tempered by the claims of those he deals with, and an editor's opinions, if assailable—or even if they are not—are sure to be attacked. A master mechanic's opinions are, however, seldom questioned. Those under his authority are usually anxious to obtain his good will, and therefore do not venture to dissent. The men whom he meets in the transaction of business are only too anxious to produce in him a feeling of complacency, so that often, year by year and quite unconsciously, such a person acquires the habit of esteeming his own opinions, and attributing an absolute authenticity to them. Most of us who have any considerable acquaintance with master mechanics, or other railroad officials occupying similar positions, know such men—men whose minds are as impervious to the absorption of a new idea from another as a cabbage leaf is to the morning dew.

Now the surest preventive of this condition is a liberal education. No man can acquire the mental training which a liberal education implies without constantly assuming an attitude of submission to the ideas of others in the attempt to make them his own. Let any person try to comprehend a difficult book, and he will find that, to do so, he is obliged, for the time, to a greater or less extent, to suspend, as it were, his own intelligence, and submit his mind to the influence of the writer of the book he is reading. The constant habit of doing this finally becomes a sort of constitutional mental habit, and becomes the distinctive mental difference between educated and uneducated people.

For this reason, an educated person is almost sure—other things being equal—to take broader views than the man whose opinions are limited by his own observation. This fact is beginning to be recognized more and more by people who have money to invest or expend in engineering projects, and one of the leading and most successful engineers and manufacturers in Philadelphia not long since told the writer that it has been found, among manufacturing engineers, that establishments and firms which employed educated men for managers succeed, and those who employed men who are not educated did not. The Pennsylvania and some other railroad companies have adopted the policy of placing a number of educated young men in subordinate positions, so as to give them opportunities of acquiring the practical experience which will fit them for those which involve more responsibility. In other words, they find by experience that men with a good scientific education make much better executive officers than those without, who are only practical men.

Of course, it would be utter folly to assume that practical experience is not necessary. Of the two, we believe it is more requisite than purely theoretical knowledge, and that an engineer without it is simply no engineer. What we are contending for is the combination of the two.

In this connection, it is to be regretted that there is not some systematic effort at co operation between the scientific schools and railroad companies. Let it be known that a student who graduated high in his class would be sure of remunerative employment, either on a railroad or in some engineering establishment, and such appointments would become prizes which students would strive to deserve. It would thus be distinctly understood that the study at the school is only preparatory to the actual experience and work, and in no sense enables a young man to do more than make a fair start in his profession. We doubt whether any of our railroad companies could do a more effectual thing to improve their service than to make a standing offer to employ, each year, from one to a dozen of the best graduates of any of the technical schools of the country, with remunerative compensation. The conduct of the student while at school should, of course, be part of the test, as well as his acquirements.

Of the class of men who pride themselves most on being practical and ignorant of theory, there is of course no hope, nor is there any danger of giving them offense; because such will not read what we write, or anything else. They rest entirely satisfied with their own opinions and knowledge, and there we must leave them; but to young men who started in the world with few of the advantages which a liberal school education can give, we can only say that it is not the school which makes the teaching valuable, but the knowledge gained. There is no high tariff on knowledge in this country and you at liberty to "stake off" as big a "claim" and work just as deep in any vein of it as you choose. That from which you have most to fear is indifference. So long as you do not care whether you are learning or not, your case is hopeless.

Preparing Telegraph Poles.

When the telegraph system of England was transferred to the Government, arrangements were made with various contractors for providing the trees necessary for supplying the demand of the prospective increase of telegraphic communication. In the North of Ireland, Messrs. Hamilton, of Cookstown, were the contractors, and a glance at their process of manufacture may not be uninteresting. The preparation of the trees which are to serve as telegraph poles is under the superintendence of a Government official, and a large staff of workmen are engaged in the process. The manufactory, as it may be termed, is situated in the middle of an extensive field, and consists, in the first place, of a quadrangular structure, four strong poles, some 60ft. in hight, forming the angular points. Within 6ft. of the top is a platform, on which are two or three vats, each capable of containing 200 gallons. In the bottom portion of this structure are pumps for the purpose of forcing a liquid, chemically prepared, into the vessels above. The principal ingredient, besides water, is sulphate of copper. From these vessels, two systems of tubing are carried downwards to the ground, and continued along the surface forward to a distance of a couple of hundred yards, in a direction at right angles to the front of rectangular structure already mentioned. Raised at a slight elevation from the ground and placed at right angles to these tubes, lie the trees to be operated upon, with their thicker ends inward; at intervals of 12in. or 15in. in this horizontal tubing is placed a series of taps, each connected by a short india rubber tube to the end of a tree, to which it is secured by means of cramps and screws, and rendered watertight by a sort of nozzle. By means of cocks at the upper end of the horizontal piping, the solution in the vats is permitted to descend. The pressure exerted from above forces it into the pipes through the india rubber tubing and into the trees, traversing them in the direction of their fiber. In a short time, the sap and a portion of the chemical solution are seen to ooze slowly from the smaller end of the tree, where they fall into a sort of wooden gutter, inclined at such an angle as causes them to run back to a cistern near to where they had been originally prepared. After undergoing some filtration here, it is placed along with the yet unused liquid, and again performs the circuit of the vats above and trees below. The time necessary for the complete saturation of the trees varies from ten days to three weeks, according to their quality and age. In this way, an application of the principles of hydrodynamics, combined with what is little more than a mechanical chemical knowledge, enables the manufacturer to provide poles for telegraphic purposes which will resist the action of the atmosphere for at least five times as long as the telegraph poles formerly in use.—*Engineer.*

In the New England States, as appears from carefully prepared official statistics, eighty per cent of the criminals have little or no education; eighty to ninety per cent never learned a trade or understand skilled labor; seventy-five per cent of the crimes are committed by persons of foreign extraction; eighty to ninety per cent of the criminals are intemperate; ninety-five per cent of the juvenile offenders are the offspring of idle, ignorant, vicious, and drunken parents.

In Australia, spring begins August 20, summer, November 20, autumn, February 20, and winter, May 20

BERRYMAN'S FEED WATER HEATER.

One of the *desiderata* in the economy of the steam engine is the utilization of the heat which is ordinarily carried off by the exhaust steam and wasted. Of many inventive efforts in this direction, we know of none which promises success in so high a degree as the feed water heater which our engravings illustrate. It is the invention of Mr. R. Berryman, of Hartford, Conn., and was patented by him April 9, 1872. It has been in practical use for more than a year in various manufactories where its good qualities have been fully tested, and Government has lately ordered one to be furnished for the purpose of investigating its merits.

Fig. 1 represents the heater with a portion of the shell broken away so as to show the position of the steam pipes within. A is a cylinder which contains the feed water, B being the induction, and C the eduction pipe. The exhaust steam enters one side of the chamber, D, through the pipe, E; it is thence conveyed by the tubes F to the other side of the chamber, and passes out through the pipe, G. H is a blow off cock connected with the feed water cylinder, and at I are two drip pipes, each of which is connected with one side of the exhaust chamber, D. The construction of the water cylinder, which is made strong enough to withstand the working pressure of any steam boiler, will be understood readily from the engraving; that of the steam apparatus we now proceed to explain. Fig. 2 shows the tubes connected with the tube sheet, J. The tubes used are seamless brass of the best quality. They do not pass through the sheet, but rest upon a shoulder formed in boring it, and are there expanded or set up as shown in detail in Fig. 3. A sufficient number of tubes are employed in each heater to obtain an area, in the aggregate, twenty per cent greater than that of the exhaust pipe of the engine for which it is intended. The exhaust chamber, D, is formed by joining the flanges of the tube sheet, J, and plate, K, which latter forms the bottom of the chamber. These two flanges are again joined with the flange on the lower end of the water cylinder, and the three are securely bolted together in the manner shown in Figs. 1, 4 and 5. This exhaust chamber is divided into two spaces by a partition shown in Fig. 4, which is formed by a rib cast on the under side of the tube sheet, and a corresponding rib which projects from the upper side of the bottom plate. In Fig. 5, which is a sectional view taken at a right angle with Fig. 4, are shown the two divisions made by the ribs, and the course (indicated by arrows) which the steam is thereby compelled to take. It will be observed that the tube sheet, J, forms also the bottom of the water cylinder, and that it is made concave on its upper surface. By this construction, the deposits made by the feed water tend to collect at the center, and can readily be blown off from the cock, H, which is connected with the water cylinder by a pipe passing through the exhaust chamber and shown in Figs. 4 and 5. During working hours, the blowing off may be advantageously effected by the pressure exerted by the feed water while being forced through the heater. At other times a hand hole, seen in Fig. 1, can be opened and the bottom cleaned out. The water formed by the condensation of steam in the tubes is carried off by the drip pipes, I, and is not used again under any circumstances on account of the grease contained in it. In some heaters, the feed water is brought into direct contact with the exhaust steam, and, in consequence, becomes charged with the grease employed to lubricate the cylinder. This, when carried into the boiler, has been known to cause burning by allowing the metal to become overheated, besides giving rise to a large consumption of fuel. Further, the steam generated from such water proves very injurious in many branches of manufacture. In woolen mills and dye houses, for this reason, the heater now described is very valuable.

Two heaters may be used, if desired, in combination; in which case the first could be employed solely to heat the feed water for the boilers, and the second to condense the surplus exhaust steam which would pass into it; sufficient water, of course, being drawn from the second heater to keep the temperature low enough for condensation.

Among the advantages claimed by the inventor for this form of heater are the following: The ability of the steam tubes to expand and contract with varying temperatures without causing the damaging strains to which heaters that are constructed with tubes fastened in both heads are subject; the capacity of the heater for containing a large quantity of water, which insures sufficient time for it to become settled and thoroughly heated before being fed to the boiler; the arrangement of the supply pipe and feed pipe (the first being near the bottom of the heater, but far enough distant from the constantly collecting sediment to create no disturbance in it, and the second near the top) which results in supplying the boiler with pure water at a maximum heat; and the facilities for cleansing the heater. He states that the feed water reaches the boiler at a temperature of 212° F., and that this high result is consequent on the large amount of heating surface obtained and the constant passage of the exhaust steam through the tubes, which takes place whether the boiler is being fed or not. There is no place in which the water of condensation can lodge in the tubes, and there is, therefore, no loss of power, which would otherwise be incurred in driving it through them. He thinks the employment of the heater on river and coast steamers, where steam at a high pressure is used, would greatly increase the safety of the boilers, while its application to the low pressure condensing engine will supply a long felt want. An engine of this character was supplied with one which was placed between the cylinder and the condenser, and the feed water was heated by the exhaust steam nearly to the boiling point before the latter entered the condenser. Generally a great saving in fuel and repairs is expected to be gained by the use of the heater.

Mr. Berryman is the inventor of other well known machines devised in view of the safe and economical working of steam boilers, some of which have previously been illustrated in the SCIENTIFIC AMERICAN.

Further information may be obtained of the Berryman Manufacturing Company, Hartford, Conn., or at 36 Cortland street, New York city, where the heater may be seen in operation.

Fig. 1

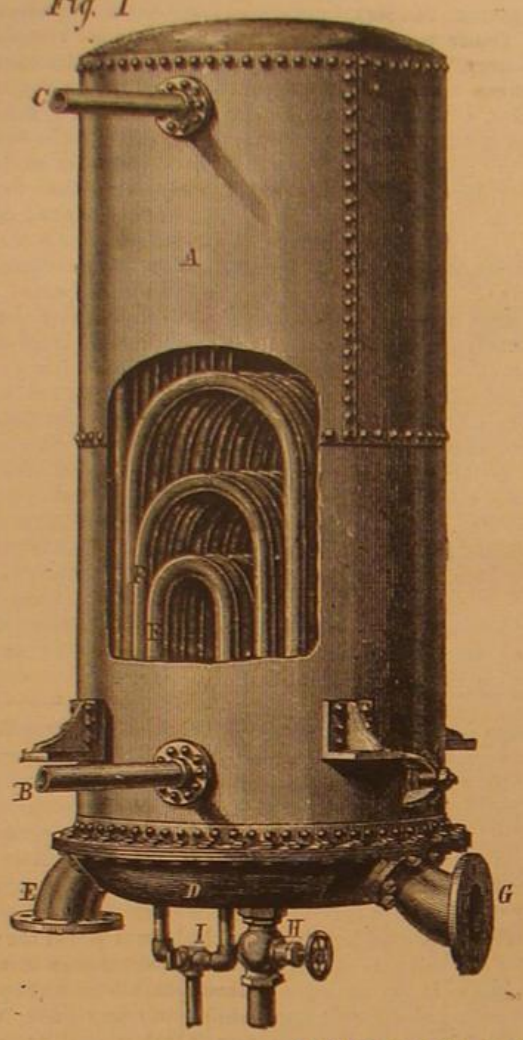


Fig. 2

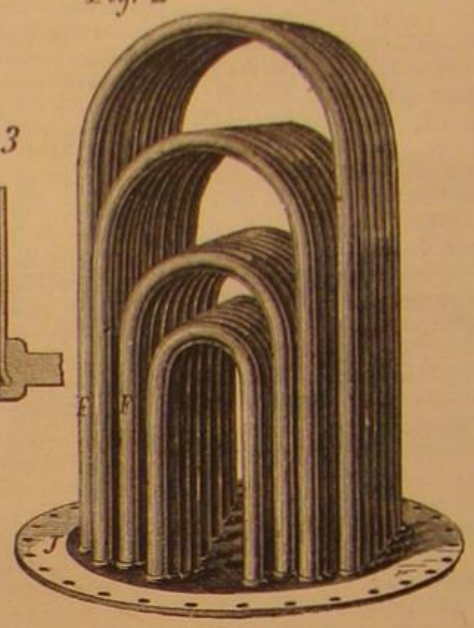


Fig. 3

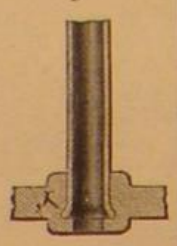


Fig. 4

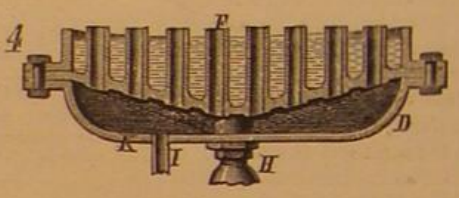
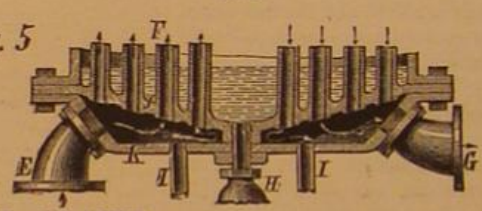


Fig. 5



ICE PRESERVER.

This invention consists of a cylinder which may be placed over a pitcher or other vessel which it is derived to keep cool.

It is made of straw, woolen or cotton felt, or kindred material, and lined within and covered without with flannel. The inner lining is preferably of white. The top is made of wood to give form to the cylinder, and has a handle for convenience in raising it. Previous to lining with flannel the felt or kindred material, of which the cylinder is made, is coated with shellac or varnish, by which the pores are closed and its utility is increased. A rubber tube around the bottom is an advantage, as it adapts itself to the inequalities of the surface upon which it rests and excludes the air.

Mr. James Dunning, of Bangor, Maine, is the inventor of this improvement, which makes its appearance in good time for the summer demand. There is no doubt its use would prove very economical in the preservation of ice, and water taken from springs or wells, cold enough to be used without ice, might be kept cool much longer by its employment than when exposed in an open vessel. The invention will also serve to keep hot the heated contents of vessels, where it is desirable to apply it to such a purpose.

Volta-Induction.

1. In a secondary closed circuit, the excited induction current is proportional to the current strength in primary circuit.

2. The induction currents arising from the action of a galvanic current upon itself are, both on breaking and making the circuit, equally great, so long as the inducing current strength remains equal.

3. When a metallic closed circuit and a conductor through which an electric current is circulating are either brought nearer each other or separated, a current is induced in the metallic closed circuit. This current is in the reverse direction to that which would have been necessary to effect the approach or separation of itself.

4. The electromotive force which a magnet excites in a helix of wire is, *ceteris paribus*, proportional to the number of convolutions of the wire.

5. The electromotive force which a magnet excites in a surrounding helix is equal, whatever may be the radius of the coil. Therefore, the currents induced in the different rings of wire are inversely proportional to their diameters.

6. The electromotive force excited by a magnet in a helix of a given number of turns is the same, whatever may be the thickness or conducting power of the wire.

7. The strengths of the induction currents in different spirals of equal number of turns are proportional to their conducting powers.

8. The longer the connecting wires are, so much more numerous should be the convolutions in order to obtain a maximum current.

9. The more turns which can be put next to each other close by the magnet or magnetized armature, the fewer turns will be necessary to give a maximum current.

10. The maximum of an induction current is proportional to the strength of the inducing magnet.

11. The retardation of the development of magnetism, in soft iron cores which are wholly covered by helices, depends principally upon the opposite currents induced in the helices themselves. The magnetism of the simultaneous currents induced in the periphery of the core, and the coercive force of the iron, are of less influence.

12. The retardation of the disappearance of the magnetism, from soft iron cores which are wholly covered with galvanic helices, depends, however, principally upon the formation of currents in the periphery of the soft iron cores.

13. The retardation of development and disappearance of magnetism, in soft iron cores which are only partially covered with helices, depends principally upon the magnetic inertia of the iron.

Hydro-Electric Submarine Cable.

M. Ferdinand Tommasi, 69, avenue de l'Alma, Paris, an engineer and inventor of considerable eminence and repute, has just perfected an invention under the above title, which is attracting attention and likely to excite considerable interest. He proposes to employ it for submarine telegraphy, and to substitute, for the ordinary electric conductor, the cable, a simple tube of copper, containing as it were a thread or column of water, which is stated to transmit effectually and instantaneously every impulse communicated by pistons, and not only that, but to permit such impulses to be transmitted in opposite directions at the same time. M. Tommasi's experiments have been conducted upon a limited scale, but he affirms that he can absolutely obtain the following results:—1. A speed of transmission of 600 signals per minute, even at 4000 kilometers distance (nearly 2,500 miles English). 2. Simultaneous exchange of correspondence, any number of despatches being effected at once by the same cable. 3. Adaptability to any recording instrument whatever, the dial, Morse, printing, etc., quite automatically. 4. Economy in first cost, durability, and increase in returns.

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WEIGHT, PRESSURE, FORCE, POWER, ENERGY, WORK.

We have, in our last number, page 415, considered the difference between the conceptions formed from the first three of these names; we will now devote a few remarks to the latter three.

Weight and pressure, when expressed in numbers of units, can, as we have seen, represent strictly nothing but an amount of matter; in order to pass to a higher conception—force—another element must be introduced, that of space, in which matter may move; if this space is measurably large, and the molecules move in mass, we have what we commonly call motion; if the space is immeasurably small, and the molecules move separately, either in vibratory, oscillating, rotating, or any other hidden motion, we have one of the so-called imponderable forces, heat, electricity, etc., which are only different active conditions of ponderable matter.

In order, now, to pass to a still higher conception—power—we must introduce again another element, that of time. To express, for instance, a so-called horse power, it is not enough to state that it is equal to 33,000 foot pounds, or 33,000 lbs. lifted one foot high against gravitation. A man may do this by means of proper contrivances, or simply by subdividing the 33,000 into 300 separate pieces of 110 lbs.; and if employing two seconds for the lifting of each, it will then take him 600 seconds or 10 minutes to raise the whole 33,000 lbs. one foot; but he could not possibly perform this job in one single minute, even with the most ingeniously contrived mechanical arrangements. Experiments have shown that an average horse can do this, and therefore the formula has been adopted that a horse power is equal to lifting 33,000 lbs. one foot high in the time of one minute, or 33,000 foot pounds per minute. We see thus that, for the conception of power, in the most commonly accepted sense of the word, we want the three elements, weight, space, and time, combined.

It is evident that the heavier the moving mass and the greater the space through which it moves, the greater is the power; but also that, inversely, the shorter the time is, the greater is the power, and this exactly in the inverse ratio. So 60 horse power can raise 33,000 lbs. one foot in one second, and 7×60, or 420 horse power in one seventh of a second. If the hight is increased, the time must be increased in the same proportion in order to perform the work with the same amount of power. Suppose, for instance, that we wish to lift 33,000 lbs. of water 170 feet high; we must multiply the time with 170, which, in the latter supposed case of 420 horse power, would give 170×$\frac{1}{7}$ of a second, or 24 seconds, nearly; 420 horse power will thus lift 33,000 lbs. 170 feet high in 24 seconds, or 150×33,000 lbs. in 150×24 seconds, which is 4,950,000 lbs. per hour, and 237,600,000 lbs. in 48 hours. If this weight is water, it is very near 30,000,000 gallons, and is exactly the duty performed by the lately built steam engine at the Ridgewood waterworks, in Brooklyn, which is of 420 actual horse power, and lifts, every 48 hours, 30,000,000 gallons of water into the reservoir 170 feet above the lake from which the water is raised.

The water thus raised is a power stored up, a potential energy, if we wish to use a learned expression introduced in the mathematical considerations of mechanics; in common language, it is work performed, and we may again get work out of it, as is done in a few churches in Brooklyn, where the pressure of this very same water works the bellows of the organ, and thus dispenses with the blower—a very proper improvement, as the blowing of an organ is a very unsuitable work for a man, especially on a hot Sunday.

To recapitulate: Weight and pressure are nothing but the results of a certain amount of matter acted on by gravitation, the latter giving the means of measuring it; another measure of matter could be founded on the space which the bulk of the matter occupies; but, as this is exceedingly variable for the same amount of matter, we are compelled to resort to gravitation, and the resultant weight is the most absolute of material measurements. Besides, no stereometric instrument (that is, one by which we determine the bulk of any substance) can compare at all in delicacy and accuracy with the balance by which we determine weight.

Force, if we wish to give only a single meaning to this word, and the one most in accordance to its etymology, is the product of mass or weight with space. It is very unfortunate that this word has been introduced in the treatises on mechanics in a not properly defined manner, mostly as identical with weight, as evidenced from the method of measuring force by weights or pressure, and speaking, for instance, of a force of 50 lbs.; at another time force is called "the agent which drives machinery." Neither of these should be called force. In the first case, we should say "of a weight or pressure of 50 lbs.;" in the second, we should speak of the "power driving the machinery."

In defense of the method of measuring force by weight, it may be said that weight or pressure is not matter, and this is true; but it is simply a result of a certain amount of matter acted on by terrestrial gravitation, and as such is dependent on matter, namely: first, on the mass itself; next, on the mass of the Earth; and, finally, on the distance from the Earth's center. If, now, gravitation produces motion in a body, we have force; if not, we have not an actual force, but we have force stored up, or potential energy. Such is the case with the planets, revolving around the sun and kept at their respective distances by the tendency of matter to move in a straight line, very improperly called centrifugal force. If the latter agency ceased, the gravitation would act freely and produce an accelerating motion toward the sun; and finally, when this motion of the masses ceased by reaching the sun, it would be converted into molecular motion, heat, raising the sun's temperature still higher. No doubt that the sun's present heat once originated in the same manner, and is thus a result of gravitation.

The cause that our mechanical text books, the best in existence not excepted, do not give properly defined meaning to the words in question is that mechanical science is much older than the true conception of what really constitutes force. The attainment of this conception was reserved to quite recent times; and it is amusing to see how many, even at the present day, envelope themselves mentally in a fog by their inability to ascend to the modern conception of force as matter in motion, still clinging to the old idea that it is something etherial, independent of and separate from matter. It is not surprising that, in that period of time when all the functions of life were not yet biologically proved to depend on the transformation of matter and the motions inherent in matter, investigators were led to the acceptance of a separate so-called "vital force;" it was indeed the easiest way to dispose of the phenomena of life. However, strictly speaking, it was no explanation whatsoever, but merely the invention of a word, referring all unexplicable phenomena and results to the mysterious entity supposed to be represented by that word.

The same irrational method is still adhered to by many physicists who have not yet risen to the full comprehension of the doctrine of the conservation of forces and the mechanical equivalent of heat; they speak still of a caloric fluid, an electric fluid, a luminiferous ether, an electric ether, a magnetic fluid and even a psychic fluid for the phenomena produced by the supposed psychic force. All such hypotheses will remain acceptable as long as minds are educated in our schools in such a way as to be satisfied with taking mere words for things and empty phrases for rational explanations.

PROGRESS OF THE EIGHT HOUR STRIKE.

It seems to be an impossibility for the workmen enlisted in the eight hour movement to comprehend that, although they have a perfect right to demand as much wages as they please, to talk as loud and as long as they like, or to strike as often as suits them, they have no authority to interfere with the rights of others, or to destroy the property of employers who refuse to accede to their demands. The record of events of the past week in this city shows a series of attempts on the part of the strikers to compel, by sheer brute force, all other workmen to yield to their views. As a natural consequence, they have come into collisions with the officers of the law, which have invariably resulted in their discomfiture and defeat. Apart from the loss of public moral support caused by such reckless violation of the law, the eight hour movement has been still further weakened by being abandoned by large numbers of its adherents, while among those who still hold out, in spite of their continual reinforcement by bodies of men who have become dissatisfied with terms to which they at first agreed, there seems to be a large decrease in confidence in the ultimate success of the strike.

The first overt act of riot was committed by a gang of strikers at Steinway's pianoforte factory, on the morning of the 15th ultimo. There being some five hundred and forty men still at work in the building, the strikers gathered in a mob and started, according to their own representation, merely to present to the operatives a copy of resolutions which had been recently passed by the eight hour league. This, however, is hardly credible, because they undertook to charge upon and force an entrance into the building, and when ordered by the police to disperse and clear the street, they refused to obey the command. A charge by the police followed, which resulted in the scattering of the crowd and the severe clubbing of about a dozen of the strikers—a proceeding which occasioned the greatest excitement among the supporters of the movement generally, and brought down on the police condemnation, from several of the daily journals, for resorting to unnecessary violence. We cannot for our own part see what excuse our contemporaries can find for such acts as attempts to break open factories or raise riots, nor can we perceive with what shadow of justice the police have been made the objects of animadversion because they did their duty in protecting private property and dispersing a lawless mob.

The heaviest blow which the movement has received has been the resumption of work under the old system by all the coach makers, including the painters, body makers, and trimmers, in the carriage trade. The collapse of this branch of the strike is due to the action of the employees of Messrs. Brewster & Co., numbering some three hundred men. We commented in our last issue on the folly of the course taken by these workmen in breaking up the industrial association by which they were governed. It seems, however, that at present, after becoming convinced that they had caused a loss to the firm of over twenty thousand dollars, besides forfeiting all the dividends due them, they have concluded that they were in the wrong, and, after considerable discussion have abandoned the strike and returned to work at the old hours and old prices.

Among the iron and metal workers, there are still 1,150 men on strike; 2,500 are at work on the eight hour system, and are taxed two dollars per week for the support of those who are still unemployed. It is reported that this branch of trade is supported by English associations. At the Metropolitan Gas works, where a little more than a week ago a reduction to eight hours labor was granted to the employees, the strike has again broken out. On account of the reduction of the number of hours, three gangs of workers were organized instead of two as heretofore. This necessitated the employment of new men, who were immediately made the objects of persecution by the old hands. Some of the latter, having been discovered in attempts to get the new comers discharged for bad work, were themselves dismissed, whereupon the entire gang struck, refusing to work until the offenders were reinstated. The company has declined the demand, and has returned to the twelve hour system with twenty five per cent advanced wages, carrying on their works with a new set of men.

At Charles Durant's sugar refinery in Brooklyn, another collision occurred between the police and some four hundred strikers, who were trying to force an entrance into the buildings. The latter were very roughly handled and forced to disperse. There seems more justice in the demands of this body of men than in those of any other trade. They receive only from $1.60 to $2.50 per day for working fourteen hours in rooms heated to 80° or 90° Fahrenheit. What they now ask is a uniform rate of $2 50 for ten hours' work, and twenty-five cents an hour for extra labor. The refiners on their side state that many of these men were getting much greater wages than they now demand, and that, if the pay of all be equalized, the absurdity will be presented of workmen striking for a lower instead of a higher rate of remuneration. Thirteen refineries are on strike, but as the employees appear to be slowly returning to work under the old system, a speedy resumption of business is anticipated. On the New York Central and Hudson River Railroad, it is reported that the workmen are joining the movement along the entire route. In the piano factories, two thirds of the men have resumed work under the old system; no advance in wages has been accorded except at Steinways', where ten per cent has been allowed.

At a meeting of employers recently held, in which were represented many of the largest establishments in the city, concerted action was agreed upon and the views of several leading manufacturers fully expressed. Speeches were made by Mr. Britton, of Brewster & Co., Mr. A. S. Cameron, Mr. John Roach and others, detailing their past experience of the strike. The following resolutions were adopted as the ultimatum of the employers of the city:

Whereas, We, the undersigned employers, representing the general manufacturing interests of the city of New York, have been called upon by our employees to reduce the hours of labor from ten hours to eight; and

Whereas, We have given the subject our most careful and serious consideration, and we find that labor has cost more in New York than at any other point—a fact which has driven a large number of manufacturing concerns from our city—and as a reduction of the hours of labor would increase the cost of living, it would be necessary, in order that mechanics might live as comfortably as heretofore, to pay them more for eight hours' labor than we have been accustomed to pay them for ten—increased cost of production being a direct tax on the producer—and having been sorely pressed heretofore by close competition outside of our city, we find that we are entirely unable to meet this demand; and we have, therefore,

Resolved, That we will hereafter pay our workmen by the hour, and we will only employ such as are willing to work ten hours per day and we will close our establishments, if necessary, and keep them closed, until we can employ workmen on this basis. And as the "trades' unions," "societies," and "leagues," so called, have, by their unreasonable and arbitrary demands, done much to destroy the relations between employer and employed by forming combinations to secure the same rate of compensation for inferior as for superior workmen, by dictating to employers the condition under which they will be permitted to conduct their business, in some cases imposing heavy fines on such employers as infringe the regulations laid down by their workmen; and, considering such tyranny incompatible with the best interests of both, we have therefore further

Resolved, That we will not hereafter retain in our employment any workman guilty of any act looking to the arbitrary

establishment of relations between the employer and employed.

And, in conclusion, we earnestly call upon our mechanics individually to exercise their own good sense in the present emergency, and to avoid evil counsels.

When trades' unions, as in the case of the iron molders, go so far as to attempt to regulate the number of apprentices a shop shall contain, to prevent whom they please from earning his daily bread, to fine men for trying to get work save through their agents, and to deliberately resolve that owners of works shall not "presume" to control their own business, we think it high time for employers to join in combination and refuse all society men admittance to their shops. Such associations are productive of no benefit to the working man, and if he individually cannot resist their power, it is the duty of the employer to afford him every protection against them.

POSTAL REFORM.

As a means of disseminating useful information through the medium of cheap literature to the masses, as an aid in promoting social intercourse, as a facilitation of business enterprise, as a help to self education through increased letter writing, and as affording fuller and freer interchange of ideas, our postal system is of the utmost national importance; and the acquisition of such reforms as will insure its greatest efficiency at the lowest possible cost is a subject interesting to every individual able to read and write. The success attending the use of postal cards in England affords evidence of the favor with which any step in the direction of cheap postage is popularly regarded; and the large increase of matter passing through the mails of that country since the introduction of the system proves that the people gladly welcome any project tending to decrease the expense of intercommunication.

There is no question but that at the present time a necessity exists for still further modification of our postal laws, in accordance with the growth of the nation in territory, population and commercial prosperity. The day when every letter was accompanied on its journey by a regular bill of lading which had to be checked at each post office through which it travelled is past: but the labor of transportation, assortment, and delivery, although materially simplified, is not reduced to the lowest possible expenditure, nor has the service in general that completeness and uniformity of organization adequate to the proper fulfilment of the work it is called upon to perform.

Transportation, cost of stamps, salaries of employees and rent of buildings are the elements which make up the sum total of our postal expenses. So far as the transportation of letters themselves is concerned, their actual weight is of but little moment. It is rarely that an ordinary communication weighs half an ounce, the legal rate, so that double or even quadruple the number of letters might be carried without producing any material difference in the expense arising from the mere heaviness of the mails. But there is other and far bulkier material than prepaid letters to be forwarded. The free exchange of periodicals and the abuse of the franking privilege necessitates the transmission of a vast quantity of matter which, from its nature, constitutes the bulk of the mails, and on which no tax is levied. As a result, letter postage is placed at a figure sufficiently great to meet the deficit thus incurred, so that, virtually, the people at large have to pay for the tuns of Congressional documents and transient publications which are yearly sent on private business between private parties. Taking all this dead-head matter into consideration, in connection with the cost of its transportation over the great distances separating points on our territory, it is plainly evident that, so long as the present state of affairs exists, postage as cheap as that of Great Britain will be an impossibility; nor can any reduction of the sum at present paid for letter postage be effected until a uniform rate be established, taxable on every particle of matter forwarded and based upon weight, or on weight and distance sent, combined.

In the city of New York, it costs as much to send a letter across the river to Brooklyn as to San Francisco, and yet it can hardly be urged that the expense is as great to transmit that letter to one city as to the other.

For other matter than letters, an equalization of charges is even a greater necessity. We see no reason why the publisher of a weekly journal should, in case he desires to forward fifty-two copies of his journal at one time to a non-subscriber, be compelled to pay one dollar and four cents postage; while if, to a subscriber, one number of the paper be sent weekly for fifty-two weeks, the charge for the entire year is but twenty cents. In both instances the number of copies sent is precisely the same; why then should wholesale rates be paid in one case and not in the other? What is needed is a fixed uniform rate of newspaper postage, sufficiently low to make it no great burden if imposed on exchanges or on publishers who forward large quantities of matter, and which, if collected on every periodical or package passing through the mails, would yield an income sufficient to counterbalance the reduction of letter postage to one cent per half ounce. The franking privilege is simply a crying evil, and we trust that the day of its total abolition is not far distant.

The new postal rates, which have lately come into effect, are more valuable on account of their opening the way toward future and greater reductions than for the saving of postage in which they may at present result. Postal cards, for correspondence or for printed circulars, similar to those already in use in England and other European countries, have been authorized. The card will bear a one cent stamp and will be imprinted with lines for the address. The back will be ruled for the letter. The price for both card and stamp will be one cent. As the plates for printing are not yet prepared, it will probably be three or four weeks before the cards will be ready for issue. The charges on circulars are reduced from two cents to one cent for every two ounces or fraction thereof. Transient newspapers, pamphlets, magazines, etc., are also to pay one cent for every two ounces or fraction, instead of two cents for every four ounces or less as under the old law. On books, the postage is two cents for every two ounces or fraction, the weight being limited to four pounds; and on samples of merchandise, etc., the rates are the same as for books, with the limitation of weight to twelve ounces.

The cost of labor in our post office system can only be lessened by a thorough remodelling of the various departments, and by doing away with much unnecessary and useless work which tends but to make their interior machinery complicated and unwieldly. There is very little value in the stamp of date and locality usually imprinted on the exterior of the envelope. It is almost invariably illegible and might easily be dispensed with on ordinary letters; though if its use were required by the sender, means should be provided and a charge made for affixing it carefully and properly. A contemporary suggests that stamped envelopes should be more generally employed for drop letters; and by this mode, the time and labor of obliterating the postage stamp would be saved, as the mere writing of the address on the exterior would be a sufficient cancellation.

A thousand million letters yearly pass through our mails, and yet the statistics of the Post Office Department show that the country suffers a deficiency, and that, instead of being a means of revenue, our postal arrangements are a source of expense. This, by proper organization, judicious retrenchment, and a uniform low rate of postage honestly enforced, can be eventually remedied; and although the various innovations and improvements will doubtless in the beginning prove expensive, still in the end we believe they will become self supporting by the postal increase they will produce.

THE TARIFF AND TAX REDUCTIONS.

The bill providing for a reduction of fifty-three million dollars yearly of government revenue from taxes and tariffs has at length passed both houses of Congress. The substance of the act is as follows: The present duties on cotton goods, wools, metals, glassware, paper (except sized printing paper, which is made twenty five per cent *ad valorem*), leather and books are reduced ten per cent. The addition of ten per cent *ad valorem* on indirect shipments of East India products is revived. Hides are placed on the free list, and important reductions are made in the duties on salt and coal. Inventors will be interested in Section 6, which provides that, for a term of two years from and after the passage of the act and no longer, machinery and apparatus designed for or adapted to steam towage on canals and not now manufactured in the United States may be imported by any State or by any person authorized by the Legislature of any State, free of duty, subject to such regulations as may be prescribed by the Secretary of the Treasury. The free importation of steam plows is is also permitted for the same period of time and under the same restrictions. Shipbuilding material for use in vessels engaged in foreign trade is exempt from duty, but vessels receiving the benefit of this provision cannot engage in the coastwise trade for more than two months in a year without the payment of the usual tariff. Salt to be used for curing fish is also made free. Extensive alterations are made in the mode of collecting revenue from distilleries, and voluminous instructions are given for the conduct of their business. The tax on distilled liquors is consolidated, but no actual reduction is made. On tobacco, the tax is equalized at twenty cents per pound, instead of sixteen and thirty-two cents a formerly. The standard of vinegar, according to which import duties are to be collected, is fixed at a strength which requires thirty-five grains of bicarbonate of potash to neutralize one ounce troy of vinegar. The tax on gas made from coal, wholly or in part, or from any other material, is repealed.

The stamps on legal papers, stock sales, foreign bills of exchange, merchant notes, etc., are abolished after October 1st. The stamp duty on friction matches is retained, and also the two cent stamp on checks, drafts and orders for money. Informers' moieties are rescinded, and an appropriation of one hundred thousand dollars made to cover the expenses of bringing to punishment persons violating the revenue laws. The internal taxes against shipbuilders for sales of vessels are remitted.

Before the 1st of January, 1873, the President is directed to reduce the revenue districts to eighty in number. One collector and one assessor in each district are all the officials hereafter to be appointed by the President, and their appointees are to be reduced to the lowest possible number. This provision necessitates the removal of about two hundred and eighty office holders, and is the most important, in an economical point of view, in the entire act.

With the exception of tea and coffee, which were made free from July 1st, under a previous act, and the revised whiskey and tobacco taxes, which take effect from the same date, the alterations and reductions provided for by the bill go into operation on the 1st of August next.

RAPID TRANSIT IN NEW YORK.

At the recent session of the New York State Legislature several projects for securing rapid transit in this city were passed, but only two of them have been approved by the Governor. Of these, the most prominent is the charter granted to the millionaire Vanderbilt, giving him authority to construct an underground steam railway, in connection with the existing Harlem railway, commencing on Fourth avenue at 59th street, and extending southwardly, through Fourth avenue, the Bowery, Bayard, Park, and Center streets into the City Hall Park, at a point near Broadway between the City Hall and the Post Office. The expenses of construction will be very heavy, but it is stated that it will be soon commenced and rapidly built. We hope that this statement will prove to be correct, for the citizens of New York are subjected to great inconvenience for lack of the means of rapid transit, while the owners of property are compelled to lose the benefits of the increased valuations which would be theirs were the city limits rendered more accessible and more fully inhabited. The privileges granted to Vanderbilt are in some respects remarkable. It would naturally be supposed that both the Legislature and the Governor would take care, as far as possible, in the wording of the grant, to protect the inhabitants of the city from all unnecessary nuisances, either in the construction or the operation of the road. As the latter is to be laid underground, beneath some of our best streets, and is to be operated by steam locomotives, it might have been expected that the company would be compelled to provide for the necessary ventilation, by side shafts and chimneys built on their own property so as not to incumber or impair the public streets. But no such provision was exacted. On the contrary, the bill gives the company permission to make openings for ventilation in the middle of the streets, the holes to be six feet in diameter, twenty feet apart, each surrounded by an iron railing. The two splendid and important thoroughfares under which the road runs are therefore to be occupied and disfigured by the railway corporation, while the air of both avenues is to be contaminated by the foul gases from the locomotives.

The project for the Broadway Underground Railway, known as the Beach Pneumatic Transit plan, which is admitted to have the best route and to be the most carefully prepared and most popular of any of the railway schemes ever presented to our citizens, passed both branches of the Legislature by large majorities, but failed to receive the Governor's approval. One of his principal adverse reasons was that a city engineer had officially reported to him as his opinion that the sewerage of Broadway would be interfered with, and that the work was impracticable; but many of our eminent engineers and architects had testified to him that the work was entirely practicable. The action of the Governor shows how deficient in practical information some of our prominent public men are, and how little they appreciate the public wants. Broadway is the backbone of Manhattan island. From it, the land slopes gently off to the rivers on each side. It is the grand thoroughfare of the city, the special objective or central line of business and travel, and the construction of a first class fast railway under its surface is urgently demanded for the public convenience. It is generally conceded that the existence of such a railway under Broadway would greatly increase the traffic of the street and augment property values. The Beach Transit bill provided for the construction of ventilated tunnels, built on the most approved plans. The bill lacked one vote of a passage over the Governor's veto in the Senate, and will probably become a law at the next session. The company has spent a large amount of money in the perfecting of their plans and in the demonstration of their practicability. They have put a short section of their underground railway in operation under Broadway, between Warren and Murray streets, heretofore fully described by us. The route is from the extreme southern end of the city at the Battery, up Broadway to and under the Harlem river, with sundry branches.

In this connection, it may be stated that the expenses of constructing an underground railway through the heart of a city are necessarily very heavy, and in order to secure the success of such an enterprise the route adopted should be the one best calculated to accommodate the public and yield the largest local traffic. In New York, the Broadway route stands pre-eminent in these respects. Mr. John Fowler, Engineer-in-Chief of the London underground railways, testifying recently on the general subject of underground city roads before a Parliamentary committee, said that "the stations must be on the thoroughfare, and visible to the public." In other words, a city road must be located with special reference to the convenience of the people, or it will not be properly patronized.

The other rapid transit bill approved by the Governor is known as the Swain three-tier road. It provides for the construction of an underground railway, a surface railway, and an elevated railway, all on the same line. The route authorized is upon the west side of the city, commencing at or near the Bowling Green and running northwardly to and over Harlem river. The company is compelled for the most part of its route to buy its way through private property, and this cost, added to the expense of building the works, will, it is believed by many, be so great as to hinder the construction. But we hope not. In so large and prosperous a city as New York, there is room and need for several lines of rapid transit railways, and all of them would doubtless be well supported.

A MACHINE THAT TALKS.

There has lately been on exhibition, in one of the theatres in this city, an ingenious machine which counterfeits, with remarkable fidelity, the sounds of the human voice. It was invented some thirty years ago by Professor Faber, of Vienna, and was, as we learn, exhibited shortly afterwards in this country. Recently, however, the apparatus has been so much altered and improved by a son of the inventor that at present it bears but little resemblance to the original, and may, for all practical purposes, be considered an entirely different machine.

Although the mechanism is constructed to imitate as closely as possible the simple working of the human vocal apparatus, yet it is so intricate in detail that an attempt to describe accurately the functions of its many tubes, levers,

wires, and springs would only serve to confuse and mislead the reader. We therefore content ourselves with a general outline of its working parts. The machine consists of the mouth and larynx, the bellows supplying the current of air to the latter, the treadle which works the bellows, and finally, the various levers which move the mechanism producing the different sounds. The larynx is made of india rubber, and the part corresponding to the glottis in the human throat is constructed of strips of ivory. The lower jaw is movable, and is made of gutta percha. The upper jaw is stationary, and is formed of wood. The upper lip is of leather, and the roof of the mouth, gutta percha; the soft palate is omitted, and the tongue, which is of rubber, is made flexible, and is so arranged as to press against the back of the throat or against the hard palate. A thin strip of metal falling from above the upper lip is made to close the mouth and so supply the place of the teeth in producing the dental sounds.

A great deal of ingenuity is manifested in the manner of imitating the varied intonations of the voice. By combining the fourteen sounds (*a*, *e*, *i*, *o*, and *u*, vowel, and *g*, *b*, *d*, *f*, *j*, *sh*, *w*, *l*, and *r*, consonants), the words of any language may be pronounced. The principal deficiency in articulation, however, seems to rest in enunciating the sound of *d*, which is made to resemble that of *th* and sometimes *l*. The nasal accents of *m* and *n* are made by closing the lips as for *b* or *p*, and causing the air to pass through a small tube which leads from the larynx beyond the vocal cords. *R* is pronounced by the dropping, into the blast of air passing to the glottis, of a small revolving wheel which produces the rolling sound.

The bellows, worked by the treadle pressed by the foot of the operator, take the place of the lungs and force the air either in a strong or mild current. The pitch of the voice can be made high or low as may be desired. The articulation is quite clear, but the sentences are all uttered in a dismal monotone, which to a nervous individual would doubtless prove peculiarly depressing. There is not the least rising or falling inflection to the voice, except when the operator permits the last word of a sentence to die away in a doleful wail.

When exhibited in public, the machine generally begins its performances by the repeating of such words as "Alexandria, Maria, Lucia," and the like, which contain many vowel sounds. Then sentences are attempted, the last and parting remarks of the machine being pronounced somewhat as follows: "*Gootah nai-te laythees anner-r-r-r jantlermn. Ai ope eeu air-r-r sah tees faithe oueethe umeeee.* (Good night, ladies and gentlemen. I hope you are satisfied with me.) If the reader will enunciate the above as written, remembering to keep his voice to a high tenor note (the A above the middle C, for instance), and to let the last sound *e* die out in a squeak, he will obtain an excellent idea of the conversational powers of the machine.

Of the three languages spoken, German is pronounced much the best, the gutturals and aspirates of that language being delivered with great clearness. For conversing in French, a mask of rubber is fitted over the mouth of the apparatus and the sound forced through passages in the nose, thus producing the nasal accents peculiar to that language.

A vast amount of time and labor has doubtless been spent in perfecting this intricate piece of mechanism, which, now that it is completed, is of little practical value. We can think of no particular use to which it can be applied, unless perhaps some ingenious Yankee can improve on it by adding a barrel and clockwork like a music box, which, when wound up, would act on the levers, causing the machine to deliver a fixed speech. This would be useful in numberless ways, in stumping the country, for instance, during the coming Presidential campaign, or for repeating sermons of popular clergymen while their reverend authors are enjoying their six months' vacation in Europe. Manufacturers and inventors might avail themselves of its most persuasive tones to describe the varied excellencies of their productions or patents to would be customers; or perhaps some good Samaritan will devise a small portable form of the apparatus which can be wound up to utter such words as "We don't want any matches—or suspenders—or our boots shined," etc., and which can be set automatically in motion and so prevent the infesting of our sanctums by those ubiquitous scourges, the peddlers and bootblacks.

SCIENTIFIC AND PRACTICAL INFORMATION.

EMBALMING BODIES BY INJECTION.

Les Mondes reports that the system of M. Gannal, of embalming bodies by injection, which was effected by opening the jugular vein or the carotid artery, is probably to be superseded by M. Audigier's plan, in which the preserving fluid is introduced through the mouth and the larynx. About six ounces of the fluid is sufficient for the purpose, and the body should be covered with some vegetable powder soaked in the same liquid. The body is by these means completely preserved, and is entirely "mummified;" it acquires a durability equal to that of wood or stone, and the facial color remains as it was at the moment of decease. The most eminent physicians, surgeons, and anatomists in France have testified to the efficacy of the system, which has, in addition to the advantages already mentioned, that of perfect innocuousness and complete disinfection. The liquid, we presume, is carbolic acid. The mode of application is the same as that devised by Professor Charles A. Seeley, of this city, and by him very successfully applied to the preservation of bodies at the hospitals here.

KEEPING NUTS.

Mr. J. B. Winder, of Birmingham, England, writes to say, in reply to H. J. S.'s letter to the Oneida *Circular*, published on page 304 of Vol. XXVI., that he has, for ten years, practiced a method, of keeping nuts in store, more efficient than either the earth or dead leaves treatment. He selects walnuts of good flavor, not gathered till ripe, that the shells may be strong and well filled; he prefers Dutch or Belgian walnuts to English, as the shells are better matured. "They should be placed in large jars, holding four, six, or eight gallons each, the tops of which should be covered with plates or saucers. They are in proper condition when they are just damp enough to peel the skin off easily. If they get too dry, sprinkle them with water; if too wet, place them on trays to dry. If wanted to keep till June or July, keep them just dry enough not to peel easily, and damp a few up, when wanted for use, in a smaller jar. I have now (June 1st) good walnuts. Filberts and other nuts can be kept two years on this plan, walnuts being the most difficult. If very damp, they will grow during the last weeks in March." Mr. Winder concludes: "I have great satisfaction in offering you the information, having derived much pleasure from reading the SCIENTIFIC AMERICAN."

EARTH POULTICES.

The value of earth as a disinfectant and deodorizer is well known; and the treatment of ulcerated sores and gangrenous wounds with it is becoming very general. A new application has lately been described by Dr. E. S. Bunker, who states that he has recently used clay as a dressing for the face in two cases of confluent small pox, dusting it, in fine powder, over the faces of the patients as soon as the pustules become fairly developed. This formed a clean, dry, wholesome scab, absorbing the infectious material, and scaled off during convalescence, leaving the underlying skin in its natural and normal state. The painful itching, which is one of the worst characteristics of the disease, was entirely abated. The earth used was fine pipe clay.

SUPERIORITY OF THE RIGHT OVER THE LEFT HAND.

Dr. William Ogle recently read a paper before the Chirugical Society of London, in which he stated his belief that the superiority of the right hand, in works requiring strength and skill, is not due only to custom and usage. His reasons for this view are that the superiór power of the right side is not confined to the arm but extends to the leg, and that it commences in the arm before use or education begins, and continues in spite of all efforts to resist or divert it. This superiority has a resemblance to some malformations, inasmuch as it is hereditary and is met with more frequently in the male sex, not only in men, but in apes and parrots. The author further asserted that the left side of a right handed man is greater than the right, and *vice versâ*; and he cited seven cases of aphasia, among left handed people, accompanied by hemiplexy of the left side. He concluded by asking: What is the cause of this greater development of the left side? And he suggests that it is originated by the greater quantity of blood which it receives.

A VALUABLE PATENT.

We have recently received a pocket box, for friction matches, made of iron; it is in size 1¼×1×⅝ of an inch, and has a spring to keep the lid either open or shut, as may be desired. It is the invention of M. Trottier, of Paris; and he has recently sold his patent for £1,500 ($7,500 gold) to Messrs. Bryant and May, London. This is one of those small inventions, which, although apparently unimportant, is what everybody wants, and the patent is thereof of much value.

DRUNKENNESS IN RUSSIA.

Every individual found, in the streets of the cities and towns of Russia, in a state of intoxication is compelled to work at sweeping the streets during the whole of the following day. The rigor and impartiality, as to nation, sex, or condition, with which this rule is carried out is worthy of imitation by many more civilized nations.

THE ROMANCE OF PHOTOGRAPHY.—We often take a picture of a young man, then of a young lady, sometimes a group of two; then the bride in her wedding dress with its long train, then in due time the baby, first in its long clothes, then in its short ones, then in his first pants, then as he goes away from "ma" to boarding school, when he comes home in his school uniform, when he cultivates his first moustache and whiskers, and again his girl, and again on through the same routine. So you see the romance.

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.

Dry Steam, dries green lumber in 2 days; tobacco, in 3 hours; and is the best House Furnace. H. G. Bulkley, Patentee, Cleveland, Ohio.

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. 61 Nassau st., New York.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin. $4 00 a year. Advertisements 10c. a line.

Patent for Sale—Moulding, Burnishing, and Varnishing Machine, the whole or single States, by J. Gschwind, Hudson Avenue, Union Hill, N. J. Or, a Partner wanted.

For the simplest, cheapest, and best Rotary Pump in use for thick or thin liquids, send for circulars to Hersey Brothers, So. Boston, Mass.

Wanted, Patent Glove Clasps made. J. L. Weir, Dresden, Ont.

Wanted—Iron Planer, of 5 to 6 ft. square by 12 to 16 ft. long, capacity. Must be new, or as good. Will exchange for some choice selected lands situated within 5 to 10 miles of Rail Roads in Northern Iowa. John Cooper & Co., Mount Vernon, Ohio.

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies, see Manufacturing News of United States in Boston Commercial Bulletin. Terms $4.00 a year.

The best Bolt Forging Machines are those that work vertical, and forge Bolts any length horizontally. For such, address John R. Abbe, 39 Charles Street, Providence, R. I.

Glass—True Cylinders. T. Degnan, 115 Milk St., Boston, Mass

Imperfect machines, Ideas, if practicable, which can be put into shape by careful and skillful workmanship, long and severely tested experience as inventors and a thorough knowledge of mechanics should be submitted to Koch & Brass, 59 Scholes St., Brooklyn, E. D.

To Capitalists—Two valuable Patent Rights for Sale or exchange for other property. For particulars, address John J. Baringer, Germantown, Columbia Co., N. Y.

Upright Drills—The best in the world. Built by Hawes Machine Co., Fall River, Mass. Send for Circular.

Wanted—One Pattern Maker. Apply to A. Leitelt & Bro., Grand Rapids, Mich.

For the most beautiful Site, Building, and Water Power for manufacturing purposes, address Harris Brothers, Newport, N. Y.

For Machinists' Tools and Supplies of every description, address Kelly, Howell & Ludwig, 917 Market Street, Philadelphia, Pa.

Three fourths saving of fuel, by the Ellis Vapor Engine (Bisulphide of Carbon) is running the Haskins Machine Co's Works, Fitchburg, Mass. To whom apply.

Old Furniture Factory for Sale. A. B., care Jones Scale Works, Binghamton, N. Y.

Write for Chemicals, Crude Materials, and Drugs for Manufacturers' use, to L. & J. W. Feuchtwanger, 55 Cedar Street, New York.

Steel Castings to pattern, strong and tough. Can be forged and tempered. Address Collins & Co., 212 Water street, New York.

The Waters Perfect Steam Engine Governor is manufactured by the Haskins Machine Co., Fitchburgh, Mass.

Wanted—A first class Sewing Machine Repairer. T. Shanks, Baltimore, Md.

Galvanized Slating Nails, Stove Reservoirs, and Hollow Ware. Address Cleveland Galvanizing Works, Cleveland, Ohio.

Portable Baths. Address Portable Bath Co., Sag Harbor, N.Y.

Standard Twist Drills, every size, in lots from one drill to 10,000, at ¼ manufacturer's price. Sample and circular mailed for 25c. Hamilton E. Towle, 30 Cortlandt st., New York.

For hand fire engines, address Rumsey & Co., Seneca Falls, N.Y.

If you want a perfect motor, buy the Baxter Steam Engine.

Machinery Paint, all shades. Will dry with a fine gloss as soon as put on. $1 to $1.50 per gal. New York City Oil Company, Sole Agents, 116 Maiden Lane.

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

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

For Tri-nitroglycerin, insulated wire, exploders, with pamphlet, as used in the Hoosac Tunnel, send to Geo. M. Mowbray, North Adams, Mass.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N.Y.

In the Wakefield Earth Closet are combined Health, Cleanliness and Comfort. Send to 36 Dey St., New York, for descriptive pamphlet.

If you want to know all about the Baxter Engine, address Wm. D. Russell, office of the Baxter Steam Engine Co., 18 Park Place, N.Y.

Presses, Dies & all can tools. Ferracute Mch Wks, Bridgeton, N. J. Also 2-Spindle axial Drills, for Castors, Screw and Trunk Pulleys, &c.

The Patna Brand of Page's Patent Lacing is the best. Orders promptly filled by the Page Belting Co., No. 1 Federal St., Boston.

Absolutely the best protection against Fire—Babcock Extinguisher. F. W. Farwell, Secretary, 407 Broadway, New York.

"Anti Lamina" will clean and keep clean Steam Boilers. No injury to iron. Five years' use. J. J. Allen, Philadelphia, Pa.

Williamson's Road Steamer and Steam Plow, with Rubber Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1309.

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

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

Belting as is Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

The Baxter Steam Engine is safe, and pays no extra Insurance.

Better than the Best—Davis' Patent Recording Steam Gauge. Simple and Cheap. New York Steam Gauge Co., 46 Cortlandt St., N. Y.

"What I know about Machinery," especially Engines, Pumps, and Machinists' Tools, which I sell at 93 Liberty Street, New York. S. N. Hartwell, late agent for L. W. Pond.

The most economical Engine, from 2 to 10 H.P., is the Baxter.

Over 800 different style Pumps for Tanners, Paper Makers, Fire Purposes, etc. Send for Catalogue. Rumsey & Co., Seneca Falls, N.Y.

Facts for the Ladies.—Mrs. Coyne, Richmond, N.Y., has used her Wheeler & Wilson Lock-Stitch Sewing Machine since September, 1857, for the work of a large family; learned to use it without any instruction, and in three days has made 3 shirts, hemmed 3 table cloths and 6 towels. It is the only machine that does work nicely enough for her; her little daughter learned to use it in one afternoon, and can run it as fast and do as good work as any one. See the new Improvements and Woods' Lock-Stitch Ripper.

"Whitcomb's Remedy cured me of Asthma."—CALVIN DIBBLE, Pataskala, Ohio.

Save Money.—It is well worth saving, and you can save it in buying a Sewing Machine, and get one of the best and most perfect machines in existence. The New Wilson Under-Feed Sewing Machine has reached a point of excellence and perfectness equalled by no machine in use, and the constantly and rapidly increasing demand, which is almost beyond their manufacturing capacity to supply, is convincing evidence that the merits and cheapness of this machine are being appreciated by the public. Salesroom, 707 Broadway, New York; also for sale in all other cities in the U. S.

GRANT AND WILSON.

We have engaged the services of Mr. A. H. Ritchie, of world-wide reputation as an artist, to produce for THE INDEPENDENT, as speedily as possible, and for our exclusive use, a superb STEEL ENGRAVING of Hon. Henry Wilson, a companion picture to that of President Grant, already known to tens of thousands of our subscribers in every section of the country. This new and magnificent engraving—size 19 by 24 inches—will be ready for delivery during the coming month. On and after this date, therefore, we will *present* these two fine steel engravings of Grant and Wilson for every *new* yearly subscriber sent us, with the money—$2.50. They will be delivered at our office, or sent by mail, postage paid, at the option of the subscriber. These engravings are printed on separate sheets of fine pasteboard, suitable for framing. They will be carefully rolled on wood, warranted to arrive in good order and to give entire satisfaction, or they may be returned and the money positively refunded.

Let every true hearted Republican, every friend of Grant and Wilson, and every political organization in the country, promptly send to us for these beautiful and desirable pictures, produced by one of the most celebrated artists in the world—the author of the "Emancipation Proclamation" and "Authors of the United States," etc. Engravings of this class sell at the print stores at from $2 to $5 each. Both will be *given away*, together with THE INDEPENDENT for one year, to any person who will, as before stated, send us the name of one new subscriber and $2.50. We shall register the names and deliver the engravings in the order in which they are received. Books are now open. *Any person may act as agent.* Address HENRY C. BOWEN, Box 2787, New York City.—*Advertisement.*

Notes & 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.]

1.—MILK SOURED BY A THUNDERSTORM.—Can any one give me the scientific reason why milk turns sour during a thunderstorm?—H. C. R.

2.—PHOTOGRAPHS FINISHED IN OIL.—How shall I prepare the surface of a photograph on plain paper to prevent the sinking in of oil colors?—G. W. T.

3.—TORPEDOES.—How are the toy torpedoes, in balls of paper, made?—L. C. T.

4.—WELDING STEEL AND COPPER.—Is there any process by which steel and copper can be united, as steel and iron are united in cutting tools, etc.?—J. F. S.

5.—STANDARD MEASURES.—What is the exact length of an inch? Barley corns are not all one length.—P. E. McD.

6.—PICTURE CLEANING.—What kind of a wash or preparation should I apply to oil paintings for the purpose of cleansing or regenerating them?—C.

7.—COOLING WATER.—I wish to know of a simple method of cooling lake water (heated daily by the sun) without the use of ice, for drinking, also the best method of purifying it.—J. A. C.

8.—ADULTERATION OF TURPENTINE.—I sold a customer some spirits of turpentine to paint with. He insists that benzine is mixed with it. I never heard of such an adulteration. How can it be detected by any means other than trying the specific gravity?—G. B.

9.—TAR FLOORS.—I wish to know how to remove the unpleasant smell arising rom a basement floor that has been laid (for over two years) with a composition of coal tar and sand.—H. P. T.

10.—BACK GEARS.—I am making a lathe, with a 2 feet bed, 6 inch swing, and mandrel five eighths inch in diameter. I wish to know the proportions of back gear, and how to make it for a lathe of the size mentioned. The cone pulley on the mandrel is 1¼ and 3 inches. The band wheel is to be 2 feet in diameter to the 1¼ inches. How large should it be to the 3 inches to keep the belt tight?—F. H. J.

11.—CASE HARDENING IRON.—In case hardening iron with bone and leather shavings, should the shavings be used more than once? Should acid (vinegar) water, salt water, or clean cold water be used to cool the articles in?—R. K.

12.—BLASTING UNDER WATER.—How can I protect powder from the wet in blasting under water? I wish to make a few blasts where the water is from 10 to 18 inches deep.—A. A. P.

13.—LEAD IN WATER.—There has been a great deal said in your paper about water being poisoned by passing through lead pipe. Cannot it be obviated by substituting rubber tubing in many instances? Will some one who knows, give us his ideas on the subject, and tell us if the use of rubber would be practicable for wells and cisterns?—J. M.

14.—PHOSPHIDE OF CALCIUM.—Can some of your readers inform me of a cheaper and more convenient way of preparing phosphide o calcium than that described by J. S. on page 286 of Vol. XXVI?—X. R. C.

15.—CASE HARDENING MALLEABLE IRON CASTINGS.—Can some one tell me the best method of case hardening, by the quantity, malleable iron castings about one inch square? I want to harden one sixteenth of an inch deep if possible. How long ought they to stay in the fire?—W. A. S.

16.—UNITED STATES COINAGE.—When did the issue of the series of large United States coppers and of the United States half cents begin and cease, and what were the years in which they were not coined, if any? When did the circulation of the small United States cent with an eagle on one side begin, and for how many years was it coined?—F. R. E.

17.—CANARIES AND VERMIN.—I wish to know how to get rid of lice or vermin in canaries, without injury to the birds.—D. F. W.

18.—MIRROR.—Is there any solution or composition, which can be put on tin or any similar substance, that will not blister or crack if brought within two inches of the blaze of a lamp, and at the same time will reflect the light?—G. L.

19.—TAKING IMPRESSIONS BY RUBBING.—I want to know how to make impression paper. I have seen some by which one may take the picture of a leaf, by just rubbing the leaf on it and then rubbing the impression on paper or stone.—S.

Answers to Correspondents.

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. B., of N. C.—We publish three of your queries. The others are business enquiries. See notice at the head of this column.

PRESERVING NATURAL FLOWERS.—L. L., of Mass., is referred to pages 201 and 281 of volume XXVI. The last method is an excellent one.

REMOVING INK STAINS.—W. W. R., of N. Y., has omitted to send his recipe.

BURNING GLASS QUERIES.—E. E. S. will not gain any warmth by concentrating the sun's rays and then dispersing the heat through a current of air. The answer to the second query will depend on the size of the glass, the power of the sun, and the temperature of the atmosphere, none of which can be predicated.

ELECTRO-CHEMICAL TELEGRAPHY.—In your issue of May 25, on page 347, I find an interesting description of an electro-chemical copying press, the invention of Signor Zuccato, of Padua, Italy. Now I would like to ask you and the readers of your paper if the principle of that press cannot be used to transfer *fac simile* telegraphic messages? Let the varnished steel plate or writing tablet have inserted, vertically within it, from beneath, the ends of a multiplicity of wires separately insulated; the finer the writing, the finer and more numerous the wires should be; then let these wires, bound together as a cable or in the most suitable manner, be the conductors of the electricity to the sheets of copying paper specially prepared and damped with a solution of prussiate of potash. Would not any writing made by removing the varnish upon the tablet be represented in dotted lines upon the copying paper, at the distant station, immediately upon the occurrence of the electrolytic action communicated by the wires? The greatest objection to which this would be liable would probably be the cost of the connecting wires. Will not some inventor immortalize himself by removing this objection, and give to the world an instantaneous copying telegraph?—J. W. K., of Col. Ter. Answer: The plan of telegraphy above suggested is very old. It was, we believe, first put into operation by Alexander Bain.

L. S. H., of La.—The apparatus you designate "a pump or ram" is neither the one nor the other. According to your drawing and description, it is simply an apparatus for obstructing the flow of the water in its passage from the upper pipe to the lower one. It would not work automatically, for the reason that the escape of water from the bottom of a vessel does not produce a vacuum in the upper part.

TEACHING CHILDREN THE ALPHABET, ETC.—K. is informed that his idea is already in use, apparatus of the kind being for sale in every toy store.

WATERPROOFING MUSLIN.—W. H. J., query 11, page 385, Vol. XXVI., can obtain the material for a light waterproof tent of the American Waterproofing and Manufacturing Company, 176 Broadway, N. Y.

POWER FOR SEWING MACHINE.—W. W. S., of Miss., should know that the power requisite to drive a machine depends on the material being sewn; and the machines of different makers all vary as to the power required.

WATERPROOFING MUSLIN.—Query 11, page 385.—W. H. J. will have some difficulty in finding a means of thoroughly waterproofing his tent without adding much to its weight. Two recipes for processes applicable to muslin are given on page 105 of your volume XXVI., but none of the alum solutions will continue to resist long and heavy rains. The India rubber treatment described on page 266 of Vol. XXIV. is effective, but it will increase the weight of the cloth.—D. B., of N. Y.

PHOSPHORESCENT OIL.—Query 5, page 385.—H. W. B. should put a piece of phosphorus, the size of a pea, into a white glass vial, and pour in boiling olive oil till the vial is one third full, and cork up. When light is required, remove the cork for an instant. The air entering will cause the phosphorus to burn and a light will be obtained. As it fades, admit more air. This vial will last for six months without requiring any more phosphorus. I have seen this contrivance used, in depots of inflammable commodities and explosives, in Paris, and light sufficient for the use of keepers, warehousemen, and others is afforded by it.—D. B., of N. Y.

FUTURE HUNTING PROSPECTS.—At present it would be hard for O. K. to make his living out West by his rifle; if there are no laws against hunting, it is to be hoped that fifty years hence men will not be so cruel as to hunt and fish for amusement. The birds have been killed so that in many places the trees are being destroyed by worms. O. K. will be much more likely to know what the West is in half a century if he will exchange his rifle for a spade and pick.—L. S., of the West.

ACETIC ACID.—To F. O. R., query 8, page 370.—Put a quantity of acetate of soda or acetate of potash into a retort, and thereon pour its own weight of sulphuric acid diluted with twice its bulk of water. Connect retort with a receiver, which keep cold by water flowing over it, or in some other way. On heating the retort by a spirit lamp or gas flame, the acetic acid will soon begin to distil nearly quite pure.—E. H. R., of Mass.

OXYGEN IN SULPHURIC ACID.—To J. T., query 4, page 370.—One ounce or 480 grains of sulphur requires 1,800 cubic inches, or a little over one cubic foot of oxygen for its oxidation in forming sulphuric acid.—E. H. R., of Mass.

FORCE OF FALLING BODIES.—To J. E., query 12, June 8.—The hammer will strike with a momentum of 160,164·5472 pounds. The formula is

$$\text{the square root of } (4 \times 64{\cdot}33) = 16{\cdot}0312 \text{ velocity.}$$

Then

$$4{\cdot}426 \times 6000 \times 160312 = 160164{\cdot}5472.$$

Or, multiply the fall in feet by 64·33; the square root of the sum is the velocity; and multiply the weight in pounds by 4·426 and that by the velocity, and you have the momentum.—E. E. W., of W. Va.

FLAVORING EXTRACTS.—To E. R. T., query 9, page 370.—Powder the vanilla pods in a mortar with a quarter of a part of white lump sugar; then digest for a day or two with strong alcohol. Pour off the clear essence, and place the mud in a funnel whose stem is loosely closed with cotton wool; now pour over it alcohol until the whole flavoring principle is extracted. Mix the liquors together and you have the essence or extract of vanilla. Extract of lemon may be made by dissolving one part of essential oil of lemon in eight parts of alcohol; or by macerating the thin outside yellow rind of lemons in alcohol and then filtering.—E. H. R., of Mass.

TRANSFERRING MOTION.—I would say, in answer to W. F. W.'s query, June 8, page 385, Vol. XXVI., that a belt run with a half twist from a vertical to a horizontal shaft will answer the purpose; but he should have a flange on the lower end of the pulley on the vertical shaft to keep the belt from slipping off when loose. He may have some trouble at first in getting the pulley on the vertical shaft to the right hight; but if he fastens the pulley with a set screw, he can move it up or down as the running of the belt will indicate.—H. C. R., of O.

HYDROGEN LAMP.—C. C. W., of Ill., having read the many inquiries, on this subject, which we have published, forwards us the following excellent directions: Use chemically clean sulphuric acid and pure water—one pound of water to one fourth pound of acid. Put the water first in a clean bottle or jar, and drop the acid into it very slowly, shaking it at intervals to mix it. Let the mixture get cold before putting it in the jar, as the mixing of the two generates heat. Hang the cone of zinc, by the brass wire, inside of the inner glass vessel, which is the gas receiver; then pour the mixture in the jar. Never put in at one time any more than the occasion calls for. Unscrew the gas ejector on top, and by holding the lever down, permit all the air to escape out of the gas receiver; and as soon as the air escapes, the acid rises and fills the space, and at once commences to act upon the zinc; and as soon as the acid commences to act on the zinc, let the lever back and screw on the gas ejector. Always keep the sponge in the thimble protected while the air is being let out of the gas receiver. As the gas forms, it drives the acid down until, getting below the zinc, action ceases. As fast as the gas is let off, the mixture, which has been displaced, rises, and again coming in contact with the zinc, evolves a fresh supply of gas. Light the gas, first time, till the sponge in the thimble glows red hot. Afterwards it will ignite of itself. Never use sulphur or potass matches, but a slip of wood or paper. To get a light: Wait until the gas has lighted and then light the wood or paper. If the small hole where the gas issues becomes clogged clean it with a stiff bristle. After long use, if the acid does not attack the zinc, it needs a new supply of mixture. If the zinc has disappeared, renew that. The sponge in the thimble must be kept well protected all the time. The arch shape must be preserved, not broken or pressed down. When it wants renewal, remove the wire ring in front which keeps the sponge in its place. By actual test, one fourth pound of acid and one pound of water is mixture enough to make gas for 10,000 lights. One cone of zinc will last long enough for 20,000 lights; and the sponge in the thimble will last long enough (if not broken or pressed down) for 40,000 lights.

NEW PATENT LAW IN CANADA.

By the terms of the new patent law of Canada (taking effect September 1st, 1872) patents are to be granted in Canada to American citizens on the most favorable terms.

The patent may be taken out either for five years (government fee $20), or for ten years (government fee $40) or for fifteen years (government fee $60). The five and ten year patents may be extended to the term of fifteen years. The formalities for extension are simple and not expensive.

In order to apply for a patent in Canada the applicant must furnish a model, specification and duplicate drawings, substantially the same as in applying for an American patent.

American inventions, even if already patented in this country, can be patented in Canada provided the American patent is not more than one year old.

All persons who desire to take out patents in Canada are requested to communicate with Munn & Co., 37 Park Row, N. Y., who will give prompt attention to the business and furnish pamphlets of instruction free.

Messrs. Munn & Co., have had twenty-five years experience in the business of obtaining American and Foreign Patents for inventors; they have special agencies in nearly all countries where patents are granted. Moderate charges and prompt attention may always be expected.

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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.

MANUFACTURE OF SIRUPS.—Joshua C. Wood, Larissa, Texas.—This sirup is made from what is known as mustang or post oak grapes, sugar and water being added to the juice, and a certain mode of treatment pursued to insure the best results.

COTTON PRESS.—Wm. Bradley, West Point, Ga.—1st. The invention consists in combining with a screw press and follower, an arch thrown diagonally above the top of press, so as to allow the follower to be turned transversely thereacross and thus afford free entrance, on each side, to the ingress of cotton. 2nd. It consists in combining, with a laterally adjustable press follower, a gage guide which gages the distance to which the rotating follower may go, then arrests it, and finally guides it down into the press box.

RAILROAD GATE.—Hiram Conrad, New Columbia, Pa.—The invention consists in causing a projection from car or truck to strike a bar, turn a rockshaft and cause a weight to release a lever. The weight then falls and raises the gate by a projection on its rear. The wheel now forces down a pivoted bar and causes the weight to rise, while the next car that passes strikes the opposite bar, releases catch, and allows gate to fall by its own gravity. This device is applicable to a carriage or wagon road with but little change.

MEANS FOR FEEDING AND GIGGING BACK THE LOG CARRIAGE OF CIRCULAR SAW MILLS.—Allan Talbott, Richmond, Va.—The invention consists in improved means for feeding up and gigging back the log carriage of circular saw mills, whereby springs, catches and other contrivances are rendered unnecessary. This causes the machine to be much less liable to get out of order and enables the sawyer to control the carriage with equal facility from either end of the mill.

ELASTIC WASHER.—Caspar Dittman, Leacock, Pa.—The invention pertains to improvement in the construction of elastic washers of the class wherein the rubber for other packing is enclosed so as to be protected from injury by reason of the torsional action of the nut. The invention consists in the arrangement of a face plate or follower, having a radial tube to receive the screw bolt, in connection with a socket, for holding the elastic packing, whereby the packing is preserved from injury.

SOLDERING IRON.—Nathaniel G. Numsen, Baltimore, Md.—The invention consists in making a soldering iron in three parts which consist respectively of a tube, cap, and holder, arranged so as to form a new and improved article of manufacture.

AERATED WATER FOUNTAIN.—John C. Johnson, Louisville, Ky.—This invention consists of a crystal fountain for mixed water and air jets, in which a hollow water cylinder and air compression chamber for supplying the motive power, together with an air pump for compressing the air, are combined with the air mixing pipes and cocks and other apparatus of the fountain, and all inclosed in an ornamental case, which is adapted to be moved from place to place without incurring any disturbance or the necessity of changing the water connections. It also comprises a cluster of bent pipes of glass to be used in place of the jets commonly discharged into the air, through which the mingled water and air are forced alternately up and down, producing scenic effects of great beauty.

GRAIN DRYER.—Frederick H. C. Mey, Buffalo, N.Y.—This invention furnishes an improved apparatus for drying grain, which takes the wet grain, dries it by the application of hot air in such a way that it cannot burn or scorch it, and then cools it by the application of cold air, delivering the grain dry and cool, ready for storage or shipment. It consists in the combination of a peculiarly constructed drying chamber, through which the grain is made to pass while exposed to currents of heated air, a cooling chamber, in passing through which the grain is exposed to a blast of cold air, and a furnace. Fan blowers, elevators, and other adjuncts are also employed to effect the operation.

MOWING MACHINE.—John Clarridge, Mount Sterling, Ohio.—In this invention the driving shaft carries a wheel in the face of which is formed a zigzag groove. In this groove is placed a friction roller, which is attached to one end of a sliding bar in such a manner that the bar is made to slide backward and forward longitudinally as the wheel is turned. The motion thus set up in the sliding bar is conveyed by means of a pivoted lever to the pitman which drives the cutter bar. The sliding bar is made with a joint, so that it may be bent aside and thereby disengage the roller from the groove. This joint is opened and closed, and the bar held in place horizontally, by a slide which is controlled by the driver. The bar is held in place vertically by being made to slide between friction rollers.

INSIDE BLIND.—James Wright and Thomas Thompson, Elizabeth, N. J.—This invention consists in the employment of a jamb, hinged at one or more joints so as to fold over a pocket or chamber, into which all the slats of the blind, after being folded upon one another in the usual manner, are turned. By this construction the blinds are not only folded and turned into a pocket, as is usually done, but, being covered and protected by the jamb, are not subject to defacement by the deposit of dust and other causes. The size of the room is not appreciably affected by this construction, as the jamb need only extend one inch beyond the plane surface of the walls.

WHIFFLETREE FASTENING.—Charles Ahrenbeck, Navasota, Texas.—The invention relates to the means by which single trees are attached to a double tree, and consists in hinging two hooks to a staple that is attached to one end of a double tree, while said hooks are held together at their bases by a recessed and intermediate guard plate.

PROTRACTOR AND PARALLEL RULER.—William L. Apthrop, of Tallahassee, Florida.—This invention relates to a new instrument which is convenient for draftsmen, surveyors, etc., for laying out angles of suitable degree, and providing parallel lines of any desired inclination. It consists, principally, in an ordinary semi-circular protractor which is provided with a detachably pivoted radial arm carrying a vernier at its further end which nicely fits the convex edge of the protractor. A ruler is provided with a longitudinal slot, so as to slide along the arm. By the use of certain rods and cross bars, the instrument is converted into a parallel rule.

HOSE CART.—William E. Shaw and Charles A. Ashley, of Stockton, Cal.—This invention comprises numerous improvements in the construction of hose carts, by which they are rendered lighter, simpler in construction, and consequently less expensive to build. The improvements are so valued in their nature (occupying seven claims in the patent) that we cannot afford the space necessary to allude to them in detail.

PUMP.—Charles Wilson, of Bridgeport, Conn.—The object of this invention is to combine the advantages of a submerged with those of an elevated pump. A pump of suitable construction is supported within a reservoir of cylindrical or other shape. This reservoir is firmly secured upon the cover of the well. A pipe extends from the cover down to the lower part of the well into the water contained therein, and is provided with a check valve at its top. The reservoir is made of metal, glass, or other material so as to be practically air tight. As the pump is worked a partial vacuum is first created within the reservoir and water drawn into the same from the well until it has risen to the bottom of the pump. The water is then drawn into the pump and discharged in regular streams from its spout.

SASH BALANCE.—Benjamin Frazee, of Newark, N. J.—This invention consists in an improved method of balancing sashes, which is substantially as follows: But one sash line is used for both sashes; one end of the line is attached to one side of the lower sash and the other end to the upper side of the upper sash; the line is carried vertically up from either sash and passed over pulleys fixed in the top of the window frame in such a manner that the bight of the line hangs down in a cavity in the wall on one side of the frame. A pulley, to which is attached the balance weight, is hung in the bight and completes the arrangement.

CHAIR BACK AND CRADLE END.—Thomas W. Moore, of New York city.—The object of this invention is to form a chair back or cradle end without connecting rounds, either vertical or horizontal, and it is accomplished by constructing it of horse shoe like parts which are bent over and made to overlap, or interlace, or both, before their two ends are securely connected with the back rail of the chair or end rail of the cradle.

EXTENSION TABLE RAIL.—Lorenz Lotz, of Brooklyn, N. Y.—In this invention, the extension rail is composed of two or more sections, the upper and lower one of which are attached to the ends of the table in the usual manner. Where the sections slide one over the other, they are formed with longitudinal grooves over which are laid iron plates so as to form longitudinal recesses partially covered. In these grooves and partially covered recesses, lips and hooks projecting from transverse plates attached to the opposing sections are made to slide. The sections are thus guided and held in place to slide freely, and the wood rails are prevented coming in contact.

PLOW.—John S. Hall, of Pittsburg, Pa.—This invention furnishes an improved hill side plow, which is simple in construction and convenient in use, being easily and quickly adjusted as a right or left hand plow, and securely and firmly held in place when adjusted. The plow point is made triangular in its general form; two of its sides are made flat to serve alternately as a base and landside; the third side is concaved to adapt it to serve as the forward part of the mold board in either adjustment. An angle plate is formed upon or attached to the rear end of the point at the angle between its plane sides, the wings of which plate serve alternately as base and land side. The standard has a brace formed upon or attached to it, which projects to the rearward and curves downward. The lower ends of the standard and brace are pivoted to a rod, the forward end of which is attached to the rear part of the point near the angle between the plane sides thereof. The rod extends back along the angle of the base plate, and its rear end is attached to a transverse plate or flange. The mold board, which is double, is hinged to the forward edge of the standard. An angular bar is secured by the ends to the mold boards. The upper edge of the end parts of the bar is made straight and horizontal to receive and fit against a shoulder formed upon the rear edge of the brace. Upon the lower edges of the end parts of the bar are formed recesses to receive the corners of the flange. Lever latches are pivoted to the rear side of the bar near its ends, in such positions that when either wing of the double mold board is moved up against the side of the brace, the end of a latch takes hold of the edge of the shoulders of the brace, and locks the various parts of the plow securely together. By this construction, by raising the free end of the latch, the parts of the plow will be released, so that it may be conveniently turned or adjusted to turn the furrow in the other direction.

FILTER.—James Brady, of New York city.—This invention consists of a cooler and filter in which a vertical division of a cylindrical vessel is made to provide an ice chamber alongside the water chambers. It is constructed of sheet metal or other suitable material, with an upright partition forming the ice chamber alluded to, and is open at the top. A pan, of about half the depth of the water space, is let in at the top of the vessel, and a second pan, half as deep as the first, is set in that—dividing the water space into three chambers. The upper part has a fine wire filter in its bottom through which the water passes into the lower one; this is provided with one or more sponge filters, and from them the water drops into the lower part of the vessel, from which it is withdrawn by a cock.

EASY CHAIR.—Dexter S. Rice, of Portland, Me.—This invention relates to a new manner of locking the hinged back of an easy chair in a suitably inclined position, and also to a novel arrangement of the foot rest for the same. It consists in a hinged back to which the arms are pivoted, and slats in the side chair rails in which the lower parts of the upright arm posts can be fixed, by pins, at various distances from the front of the chair. The arms are thus made to support the back at any required inclination. The foot rest is composed of several boards hinged together, with the top board hinged to the front of the chair. It can be set in any desired position by means of braces, and can be folded away when not in use.

INDIA RUBBER PISTON PACKING.—Isaac B. Harris, of Edinburgh, Scotland.—Piston packing formed from canvas coated with india rubber has hitherto been manufactured by rolling strips of it into straight flexible cords or ropes, either round or square. From these straight lengths pieces are cut off of varying lengths, as required, and bent round to form rings to embrace the piston rod. This mode of fitting in or applying the packing is very troublesome, and it is often put in unequally tight, and afterwards unequally crushed. To avoid these inconveniences is the object of the present invention, which consists in coiling the lengths of packing (prepared as heretofore, and while in a soft, uncured, or unvulcanized state) upon mandrels, each into a spiral (like bell pull springs), and submitting them, while retained in that form by bands or otherwise, to vulcanization. This operation gives the lengths a permanent spiral or helical set. The advantages of this form are important; for a piece of several convolutions can be cut off and expanded into fewer convolutions, or into a single ring; or a single convolution may be contracted into a greater number of convolutions, always retaining the circular form, and thus the packing will always be ready to be formed into rings to fit piston rods of various sizes more perfectly, and with more smoothness and regularity than heretofore.

FOLDING CHAIR.—John C. Compton, of Clarksville, assignor to himself and Baltus Pickel, of Trenton, N. J.—This invention relates to a new arrangement of folding chair, whereby, without increasing the cost of manufacture, the chair may be folded together for transportation, and still be sufficiently strong and durable when in position for use. The invention consists in connecting the front legs, by means of pivoted arm rests, with the chair back, and in locking the parts in position by means of an overlapping ledge on the front of a folding seat.

ANIMAL TRAP.—Lewis E. Ingersoll, of Columbus, Pa.—The invention consists in forming a trap for animals with two reception rooms, in each of which one animal may be alternately caught and delivered into a rear chamber, while the trap is set automatically and alternately, in each room, a given number of times, or until the tension of a spring and cord have been exhausted.

PORTABLE STORE COUNTER.—This invention furnishes an improved store counter, which is so constructed that, while it serves all the ordinary uses of a counter, it may be opened out to receive goods, to enable them to be readily removed from the store in case of fire or for other purposes. The base of the counter is a box about eight or ten feet long and from three to three and one half feet wide. It is made with an open top, and with close bottoms, sides, and ends. The top of the counter is made with downwardly projecting moldings around the edge of its lower side, so as to fit upon the top of the base. To the bottom of the base, legs are hinged, of such a length as when extended to raise the counter to a suitable hight. To the bottom are also attached pivoted rollers, upon which, when the legs are folded, the counter may be supported and rolled from place to place. To the upper parts of the ends of the base are attached by hinges peculiar combinations of hinged boards, the nature of which will be best understood from the use they are put to. When employed as a counter, the boards are folded down into the base, the cover is put on, and the hinged legs are extended. When, in case of fire or other cause, the goods are to be removed, the boards are unfolded and form a receptacle in which the goods to be removed are packed. The counter is then rolled away.

BOTTLE HOLDER.—William O. Pond, of Mobile, Ala.—This invention relates to an improved box for holding bottles which are intended for transportation or preservation. It consists in making the box with wooden or metallic sides and ends, and with wire top and bottom, the wires being so stretched that the necks of the bottles fill smaller openings in the lower part, while the bases of the bottles fit larger openings in the upper part of the receptacle. By this arrangement, all kinds of bottles and jars can be closely packed and securely held in position without danger of breakage, the wires being sufficiently elastic to preserve the bottles from injury, even if the box is exposed to jars or rough treatment.

BOILER TUBE SCRAPER.—Jacob Hobday, Jr., of Ansonia, Conn.—The object of this invention is to lessen the difficulty of removing dirt and incrustations from boiler flues. It consists of an improved scraper of the following construction: A spring, triangular in cross section, is bent spirally into the form of a double cone and ingeniously attached to the end of a rod which passes through it. The spring forms the scraper, and a handle of any required length may be screwed on to the rod.

BORING TOOL.—Frank S. Allen, of New York city.—This invention consists of a boring tool with cutting parts of two different sizes, for "double boring" brush blocks; it is particularly devised with reference to cutting with the least possible friction, so as to allow of running a great number in a gang together for boring all the holes of a block at once without overstraining the block or the driving gear. It consists also in the mode of construction employed. A round rod of steel is taken and milled down at one end to the intended size of the smaller boring part. A longitudinal groove is cut by a milling tool from the point as far up as may be necessary, and the lips of the larger boring part are then swaged out by a suitable tool which is forced into the groove while the bit is laid in a die of suitable shape.

BEE HIVE.—Jonathan B. Staunton, of Ellicottville, N. Y.—This invention relates to an improvement in the class of hives which are constructed with a view to controlling the formation of new colonies of bees as to time and numbers, which obviates the necessity of swarming by forming new colonies, without removing the comb frames or disturbing the bees, without danger from their stings, and without in effect changing their habitation; it consists in the construction and arrangement of certain parts by which a uniform diffusion of temperature, sound, and odor is secured throughout the entire brood chamber, together with thorough ventilation.

POTATO DIGGER.—DeWitt C. Thomas, of Easton, N. Y.—The invention consists in spading the potatoes from a row, together with their surrounding soil, and transferring both dirt and potatoes over an axle and upon a rotating sieve, by which they are separated and the potatoes emptied in the rear, or into a receptacle there placed to receive them. 2d. It consists in combining with a rotary digger a subjacent plow that mellows the ground in advance of the spades. 3d. It consists in mechanism by which all the parts are raised, lowered, locked, or unlocked, simultaneously and by the driver. 4th. It consists in side guards to retain the potatoes on the sieve and compel them to be discharged in a straight line behind the digger.

CONDUCTOR'S PORTABLE FARE AND CHANGE BOX.—James S. Hagerty, of Baltimore, Md.—The invention consists in a fare box with a safety chamber from which the fare cannot be removed when it has been dropped thereinto; it is carried on the left arm, whose hand easily manipulates the valve; it has separate and separately covered chambers for receiving different sized packages of tickets, and is also provided with chambers for the convenient location of money. In a word, it meets a want which has been long felt by the city railroad men, and they will doubtless quickly avail themselves of a portable fare box so ingenious and calculated to be so useful.

MACHINE FOR TURNING CARRIAGE AXLES.—Jonathan Grundy Aram, of Cordova, Ill., assignor of one half his right to Robt. S. Williams, of same place.—This invention consists in the use of a cutting tool, a reciprocating carriage or fulcrum, a screw shaft and ratchet mechanism, arranged in connection with a suitable pattern in such a manner that the figure of the pattern is made to control the operation of the cutting tool and thereby produce the shape required in the axle.

CHEMICAL COMPOUND FOR DESTROYING NICOTINE IN TOBACCO.—Samuel O. Bentley, of Canton, Ohio, assignor to himself and J. C. Kelly, of same place.—This invention furnishes an improved chemical compound for destroying the nicotine in cigars and smoking tobacco so as to make them non-poisonous, and at the same time to improve them by making them mild and pleasant to the taste. In preparing this compound, are taken tannic acid, one ounce; granulated nitrate of potash, one dram; powdered English valerian root, one dram; powdered nutmeg, one dram. These ingredients are thoroughly mixed, and to the mixture is added half a pint of pure water or sufficient water to case one hundred cigars. It is designed to be sprinkled upon the tobacco.

EXTENSIBLE AXLE BOX.—Charles Ahrenbeck, Navasota, Texas.—The Invention consists in forming an axle box with an adjustable tube which may take up the wear on its ends and enable the wheel to be always and easily retained in its true relative position to axle. It is found by coach makers and those who let vehicles for hire that there is great end wear on the axle box, and that unless this play is quickly remedied the wheel is caused to wobble, subsequently to wear the box unequally, and in a short time to make it practically worthless. By the use of the extensible box this difficulty is obviated, while the axle box is made to last much longer and the wheel to run always with a uniform friction.

WIND WHEEL.—Newell P. Mix, of Columbus, Ohio.—This invention has for its object to improve the construction of wind wheels, so as to enable them to be more conveniently controlled, and make them more reliable in operation. A horizontal shaft, to which the sails are attached, is provided with gearing in the ordinary manner for transmitting the motion to the machinery to be driven. To the outer end of the shaft are attached wings, six, more or less, in number, and one of which we describe. Two radial arms are securely attached to the end of the shaft, and to the outer ends of the arms are pivoted the ends of a bar, to the forward edge of which are attached the fans or sails. The pivots of the bar are arranged at the rear edge of the ends, so that the centrifugal force engendered by the revolution of the wheel may tend to throw the wings out of the wind. To the inner side of the pivoted bar, near its forward edge, is attached a short arm, to the outer end of which is pivoted the outer end of a connecting rod, the inner end of which is pivoted to the outer end of a short arm, attached to a hub which oscillates upon the shaft. A spring is placed within the hub and one end connected with the hub. The other end of the spring is attached to the shaft, around which it is coiled in such a direction that its tension may tend to hold the sails to the wind. By this construction, by turning the hub toward the tension of the spring, the sails will be turned from the wind. A bent lever is pivoted at its angle or bend to the side of the hub. The outer end of the lever passes through an eye bolt or staple attached to the side of the end of the shaft which serves as a fulcrum. The inner end of the lever is inclined in such a direction that, when pressed toward the outer end of the shaft, it may turn the hub in such a direction as to turn the wings from the wind, the wings being again turned to the wind, when the lever is released, by the tension of the spring.

GRAIN SEPARATOR.—David Y. Milligan, of Shelbyville, Ill.—This invention prevents the fan in a grain separator from driving the dust and chaff back to the conveying spout and thereby defeating the purposes of the machine. It consists in the interposition of a protecting cap between the fan and conveyer spout, and in the application of a reactionary fan which drives the light matter upward and away from the conducting spout; also in the use of an adjustable slide for regulating the opening to the second fan. The invention is applicable to such separators as are connected with thrashing machines.

THILL COUPLING.—William Bailey, of Utica, N. Y.—In this invention the thill is coupled to the two jaws of the draw iron, between which it is placed, by means of a pin. This pin is square in cross section, and passes through one of the jaws and into the other, and through a box in each jaw, and also through the thill. The boxes are round, so that they readily turn in the jaws. As the thill is raised or lowered, the boxes turn in the jaws and receive the wear. A cover is confined to the side of the jaw through which the pin passes by a pivot on which it turns, and by a dovetail fastening at the end of the jaw. When the cover is closed, it effectually shuts in the pin and keeps it in place. When the cover is raised, the pin may be removed by means of a nail or a wire inserted in a hole in the opposite jaw: but it cannot come out when the vehicle is in use, and only when the thills and the cover are in a particular position.

GAS MACHINE.—Joseph Kaufman, of Jackson, Miss.—This invention relates to a new machine for generating illuminating gas from a mixture of hydrogen and carbon; and consists in a novel general arrangement and distribution of parts of which the following are the most prominent: A convenient vessel is filled with diluted sulphuric acid, and a gas holder is suspended above by a crane so that it may be raised or lowered into the vessel. This holder is weighted by an inner perforated tube which contains iron filings or shavings. Upon the holder being let down, and the air expelled, the production of the gas commences. As it is formed the weight of the holder forces it through a pipe into a gasoline holder or carburetter and, thence, through a condenser to the service pipe.

HOPPER FOR BLAST FURNACE.—Dennis Bauman, of Parryville, Pa.—This invention consists in a hopper provided with a double inclined valve, movable thereunder, so as to feed the fuel simultaneously to the circumference and intermediate space of the fire box. The hopper is constructed so as to present an annular opening at its bottom. This opening is closed by an annular valve suspended from an overhanging lever. The valve is formed of two circular inclined planes, the inner one of which slopes toward the center and the outer toward the circumference. Upon lowering the valve, the fuel is fed by the outer inclined plane to the circumference of the fire box, and by the inner to the central space.

WASHING MACHINE.—John P. Packer, of Flemington, Pa.—This invention furnishes an improved washing machine which is simple in construction, inexpensive in manufacture, convenient in use, and effective in operation. It may be conveniently applied to an ordinary wash tub. It consists of a board or frame which lies on and is attached to the bottom of the tub. In the center of this board is hinged or pivoted a broad lever which is pierced with holes and terminates in a handle at the top. On one side of this lever is hinged an ordinary corrugated wash board, and on the other a plain wash board. They lean against opposite sides of the tub. The washing is effected by moving the lever from side to side so as to press the clothes against one or other of the two boards, squeeze the water out of them, and allow them to fall back again into the water to become saturated.

PITMAN CONNECTION FOR HARVESTERS.—Hiram Howe, of Houston, Minn.—This invention furnishes an improved device for connecting the pitman to the cutter bar of harvesters and mowers, which is so constructed as to almost entirely prevent friction and wear, and which, should there be any wear, will allow of ready adjustment. The end of the pitman (or a short bar welded to it) is formed like a cross. An arm attached to the cutter bar is formed like the letter T, and notched in the center of the top. The side arms of the T are knife edged gudgeons. The connection is made thus; The notch is placed so as to rest against the end of the cross, and eye bolts are placed on the gudgeons and fastened with nuts to the side arms of the cross on the end of the pitman.

STOVE PIPE COUPLING.—James T. McKim, Remington, Ind.—The invention consists in dispensing with wire or rivets and facilitating the putting together and taking apart of stove pipes by combining a draw band with a pivoted strap and disk. It is not only extremely simple and therefore little liable to get out of order, but is singularly effectual for the purpose intended.

HYDRAULIC CEMENT.—David O. Saylor, Allentown, Pa.—This invention relates to a new manner of treating the argillo-magnesian limestone, which is found along the Appalachian range of mountains and is used for manufacturing hydraulic cement. It consists in the mixing of raw stone, which has been reduced to an impalpable powder, with said material after the latter has been burnt; by which means several of the valuable ingredients lost in the limestone during the burning process are restored to it, and valuable properties of which the raw stone is possessed are added.

WINDOW SHUTTER.—Henry Besse, Delaware, Ohio.—In this invention the window shutters are arranged to slide laterally either in recesses in the walls, or on the outside of the walls. A screw shaft is provided for each tier of shutters. These shafts may have a continuous screw thread from end to end, or a thread for each shutter separate, screw nuts thereon being so constructed that they may be attached to the shutter and be made to engage with any part of the screw shaft. They are supported on journals at their ends and on intermediate bearings if necessary. The shutters are suspended on the screw shafts, and supported and guided by grooves at the bottom. The screw shafts are revolved by means of pulleys and cords connected with a drum. This drum is so constructed and arranged that it receives the cords from any required number of screws—say for two or more stories or tiers of windows—and by revolving it, by means of a crank or otherwise, all the screw shafts are revolved, and all the shutters moved simultaneously.

WHIP.—Alfred B. Kiersted, New Haven, Conn.—This invention produces an economically manufactured whip stock, of improved elasticity, strength and durability, which is especially adapted to jointed or socket whips in which the parts are united by screw joints. A skeleton whip stock, made by firmly connecting the weighted handle with the screw tip by means of a steel core, is filled out and completed by surrounding or filling the space between the handle and the tip of the stock with suitable filling material, such as rubber, whalebone, rattan, or wood, or by a combination of some or all of these substances, the parts composing the filling being united by cement or attached to any other suitable manner. When thus filled, the whip stock is finished by weaving upon it an exterior envelope of fibrous material.

WHEEL PLOW.—Wells C. McCool, Guthrie Center, Iowa.—This invention furnishes an improved sulky or riding plow which is simple in construction convenient in use, inexpensive in manufacture, and may be readily adjusted to cause the plow to run deeper or shallower, or to take more or less land, as may be desired. It consists principally in a draft bar or equalizer of peculiar construction, which is connected with the front cross bar of the sulky, and, also, with the plow beam, as follows: The cross bar has numerous holes formed in it to receive the bolt by which the rear end of the draft bar or equalizer is connected with it, so that the bolt may be conveniently shifted to cause the sulky to run more to the right or left, as may be desired. The equalizer is bent at right angles, and in its free or upright arm are formed several holes to receive the bolts by which a clevis and hook, either or both, are secured to the arm for the attachment of the draft, so that it may be regulated at will. The clevis and hook are bolted to the side of the upright arm, so that by changing them from one side to the other the draft may be adjusted to cause the plow to take more or less land. To the forward end of the plow beam is attached a clevis which is connected with the equalizer by a swivel, so that the plow may be drawn directly from the equalizer entirely independent of the sulky, and so that it may be turned about freely without interfering with the equalizer or sulky. To the plow handles is attached a rest to receive the driver's feet when required to assist in steadying the plow. By this arrangement the driver, by simply moving forward upon his seat, causes the plow to run deeper in the ground, and by moving backward he makes it run out of the ground.

Practical Hints to Inventors.

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How Can I Obtain a Patent?

is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

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Preliminary Examination.

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To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention, if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

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Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]
From May 24 to June 5, 1872, inclusive.

AIR BRAKE, ETC.—G. Westinghouse, Jr., of Pittsburgh, Pa., London, Eng.
BALE TIE.—E. J. Beard, St. Louis, Mo.
BUSTLE.—A. W. Thomas, Philadelphia, Pa.
COLORING APPARATUS.—D. Bly, Rochester, N. Y.
COMBINATION TOOL.—D. Heaton, Providence, R. I.
ENGRAVING MACHINE, ETC.—T. W. Minter, New York city.
IRON AND STEEL APPARATUS.—T. S. Blair, Pittsburgh, Pa.
METALLIC PACKING.—F. W. Campbell, I. Saunders, Chicago, Ill.
PAVEMENT, ETC.—J. C. Tucker, New York city.
PERMANENT WAY, ETC.—J. L. Boone, R. Herman, San Francisco, Cal.
PLAYING CARDS.—W. S. Gottsberger, J. W. Tappin, New York city.
PRESSURE REGULATOR.—N. C. and A. C. Locke, Salem, Mass.
RAILWAY RAILS, ETC.—J. A. Woodbury, Boston, Mass.
RAILWAY SLEEPERS, ETC.—A. B. Tripler, Pennsylvania, Pa.
SAFES, DOORS, AND LOCKS.—A. C. Hobbs, of Bridgeport, Conn., J. M. Hart, London, England.
SAFETY ROLLING MILL.—J. Sullivan, Boston, Mass.
SAFETY VALVE.—C. A. Trowbridge, New York city.
SEED OIL MACHINERY.—W. M. Force, A. Judson, Newark, N. J.
SPARK ARRESTER.—W. Brindle, Philadelphia, Pa.
TREADLE AND CASTER.—G. K. Proctor, J. C. Osgood, Salem, Mass.
WHEELS, ETC.—J. A. Woodbury, Boston, Mass.

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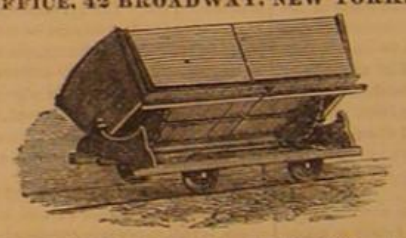

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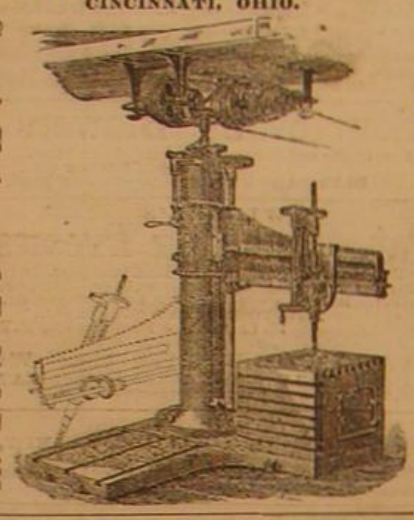

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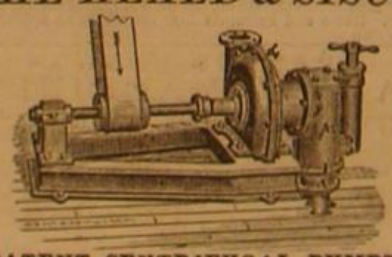

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SCIENTIFIC AMERICAN

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

Vol. XXVII.—No. 2. [NEW SERIES.] NEW YORK, JULY 13, 1872. [$3 per Annum. IN ADVANCE.]

IMPROVED CANAL BOAT.

We have already illustrated in the SCIENTIFIC AMERICAN several proposed improvements in the construction of canal boats designed for steam propulsion, which had not then been put to practical trial. Conjecture, only, could therefore be made as to their fitness for the intended purpose. We now place before our readers engravings of a newly invented boat which has been subjected to actual trial on the Erie canal. It is the invention of Mr. Frank M. Mahan, of Memphis, Tenn., and was designed by him in view of meeting the conditions imposed by the State act of last year, which offered to reward the profitable introduction of some motor, for canal boats, other than animal power.

The bow of the boat is shown on the left in Fig 1. It is shaped somewhat like a funnel, so as to cut the water with its outside edges and throw it into and through a channel or water way formed in the boat from stem to stern. The nature of this channel will be better understood by referring to Fig. 2, which is a longitudinal section of the boat. Here A is the channel or water way, which passes along the bottom of the boat in the middle. It is shown in cross section in Fig. 3. It maintains this form of cross section uniformly until near the stern, where the channel is enlarged sufficiently, as shown in Fig. 2, to admit the wheel, B. It is afterwards contracted, somewhat, to form the outlet shown at the stern. This outlet may be seen also in the right hand boat in Fig. 1, where the dotted lines indicate the course of the channel and the position of the wheel. The wheel, B, which is the propelling instrument, is constructed with vertical buckets, so as to economize power and prevent backwater. It was invented and patented by Captain Prime Emerson, of Memphis, Tenn., in 1868.

The power employed is steam, and the boat is steered by the rudder shown in Fig. 1.

In propelling the boat, the action of the wheel tends to produce a vacuum in the front portion of the channel, A, and causes a current of water right through it in the direction indicated by the arrows in Fig. 2. The shape of the bow, which is the reverse in form and effect of that of a clipper ship, prevents the escape of the displaced water laterally, and throws it all into the channel; and it has been demonstrated by experiment that it passes so much more rapidly through the channel than the boat does through the water as fully to insure the passage through the channel of all the water displaced by the bow. In this way, the banking up of the water and consequent side swells, which are caused by the common bluff bowed boat, are entirely avoided. A high rate of speed is therefore attainable without giving rise to the ordinary attendant heavy swells. This boat does not "bury" or settle down in the water while running with a heavy load, as is the case with the boats used hitherto, but, on the contrary, the faster it is driven through the water the more buoyant it appears to become. The channel or water way makes but little difference in its capacity for freight carrying. The disposition of the freight around the channel is shown in Fig. 3.

The boat *Port Byron*, from which our engravings are made, was built last fall at Rochester. She carries 210 tuns and her fuel. She took a load at Buffalo, but was too late to get through the canal, and was frozen in at Rome. In spite of the disadvantages attending the use of old engines and boiler on this trial, she made four and a half miles an hour. She is now having new boiler and engines put in at Albany.

MAHAN'S CANAL BOAT

The inventor states that she will be able to take in tow one or two boats of 150 tuns burden, built with water ways through them and coupled together like a train of cars, and then make from three to six miles an hour.

The invention was patented July 25, 1871, and is the property of Toof, Phillips & Co. and Captain Prime Emerson, of Memphis, Tenn., either of whom may be addressed for further information.

Fig. 2

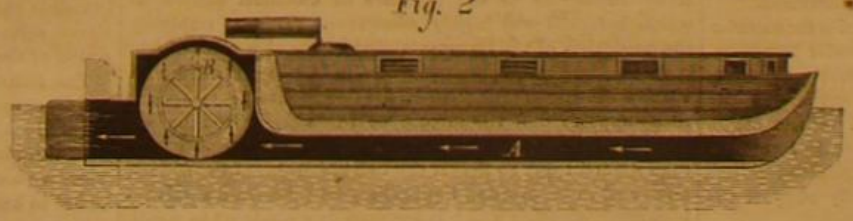


Fig. 3

Ozone.

Everybody has heard of ozone, a subject of research by the ablest chemists and physicists. Ozone, it is known, is oxygen which has its properties exalted; it emits a sensible odor, oxidizes silver, and decomposes almost instantaneously iodide of potassium, on which common oxygen has not any action. About 1785 a physicist in Holland, Von Marum produced ozone by electrization. Van Marum was forgotten, with his experiments; but in 1840 a celebrated professor in Basle, M Schönbein, renewed the discovery, and immediately gave it great importance by demonstrating the presence of ozone in atmospheric air.

One readily understands the immense interest that attached to this fact. The question arose: What was the action of ozone on organized beings, and what effect had it on the salubrity of the air we breathe? Many difficulties connect themselves with this research. Ozone cannot be obtained in a pure state; it is in some sort deluged by ordinary oxygen; and such, nevertheless, is the energy of this odorous oxygen that even in infinitely small proportions it produces very distinct effects of oxidation. For ascertaining the presence of ozone, and its variations, M. Schönbein proposed to employ a very sensitive test, —paper impregnated with starch and iodide of potassium.

It was found, however, that the test was affected by other substances in the same way as by ozone.

An eminent member of the Academy of Rouen, M. Houzeau, has largely extended our knowledge on this subject. Ozone had been produced by electric sparks in the air; M. Houzeau obtained it by a purely chemical process, the action of hydrochloric acid on binoxide of barium. A sure test of ozone in the atmosphere was still a desideratum; M. Houzeau appears to have met this want.

He found that paper, rose colored by litmus and coated in part with iodide of potassium, was not acted upon by the substances, other than ozone, which disturbed M. Schönbein's experiments. With this test, then, he examined the influence of ozone in the atmosphere. The results are briefly these: Odorous oxygen exists in country air in its normal state, reaching, at its maximum, the proportion $\frac{1}{148000}$. From day to day the quantity varies in one locality, and its quantity is different in different localities. Ozone may be found frequently in small towns, but it is almost entirely absent from great centers of population. In spring, it appears very abundant; in winter, it shows very little action. From violent motion of the atmosphere in storms, ozone accumulates to a prodigious extent. One must exercise reserve in drawing conclusions; but it seems very probable that ozone is the cause of the salubrity of country air. A recent experiment comes in to throw new light on its properties. By a simple apparatus, the Rouen chemist has obtained in a liter of common oxygen from 60 to 120 milligrammes of odorous oxygen. In such proportion, ozone has no longer those beneficial effects which are seen in Nature to result from its minute distribution; when concentrated, it is dangerous for respiration, burns the organic tissues, blackens and corrodes silver, and has even greater discoloring power than chlo-

rine. On contact with it, a mixture of equal parts of phosphureted hydrogen and oxygen explodes with violence. It is hoped that ozone will yet become of important use in industrial pursuits.

PAPIER MACHE FOR INTERIOR DECORATION.

It seems hardly possible, when admiring the rich bas reliefs or the delicate moldings which ornament the proscenium or boxes of our principal theatres, to believe that these beautifully designed decorations are merely a hollow sham, and really nothing more than shells of common brown paper. Such, nevertheless, is the fact, and we hope to convey to our readers some idea of how this most prosaic of materials is, by the molder's skill, transformed into objects of art and beauty.

Prior to the days of Queen Elizabeth, in England, those heavily fretted and vaulted ceilings, found in old English residences, were made entirely of hard stucco and modeled by skilled artists. These last mentioned individuals were, or rather esteemed themselves to be, very important personages, for history tells us that they went to their work in gold laced garments, with rapiers at their sides, and altogether led a free and easy sort of a life, laboring when they chose, asking what they pleased, and always getting the entire amount of their demands. The people, however, eventually grew tired of the extortionate prices of these gentry, and a desire arose for cheaper work and less expensive material, resulting in the invention of a rude kind of papier maché composed of coarse pulp mixed with plaster. This was the first introduction of the material which, at the present time, after having undergone countless improvements and changes in its composition, is now gradually superseding plaster for interior decoration.

Several different methods are practiced for manufacturing the paper and for causing it to assume the required forms. In England, a mold made of brass or type metal is first oiled and its interior covered with a thin coating of gilder's composition, a mixture of whiting, resin, glue and oil. Over this, coarse paper pulp is poured, and the whole is forced into the minute indentations of the mold by a strong screw press. Small objects, ornaments, snuff boxes, etc., are made from a fine quality of pulp, the surface of which, on drying, is rubbed with pumice, colored, varnished with shellac, and heated to a temperature of 280°, when a brilliant surface is obtained by polishing with rottenstone or by hand rubbing. For large works, the mold is covered with powdered talc and the paper in sheets is pressed in by means of the fingers or small tools. Another English process is to mold the paper into thick blocks or slabs, from which the articles are carved or turned, the same as from wood.

The newest and most improved method of manufacture of papier maché is that introduced by a well known decorative artist in this city. The first step in this process is to carve the required object out of plaster, the utmost care being taken to make the lines of the work perfectly sharp and delicate. From this model, a plaster mold is made in several pieces, so as to render it easily taken apart or put together. Into this mold a thin layer of the finest paper pulp is poured, care being taken that every portion of the mold is thoroughly covered. To back this thin covering a thick pulp, made from cane fiber, generally bamboo, is employed. This substance is used because it is perfectly homogeneous and sets firm and hard in the mold. So strong are the casts thus made that they can be constructed as thin as canvas in pieces of twelve feet square. Whole ceilings, cornices, and sides of rooms can thus be made of any degree of elaborate ornamentation, and apartments completely finished without the use of plaster, the paper being attached to the walls by ordinary nails and screws. Besides being used for ceilings and cornice work, this material has been found to answer every purpose as an imitation of heavy carvings on furniture. A curious bed of decayed vegetable matter, somewhat resembling peat, has lately been discovered in a forest near Paterson, N. J., portions of which, when mixed with the cane fiber pulp, give the composition, on its becoming hard, the exact color and appearance of black walnut, resembling the wood so closely as to require careful inspection to distinguish it therefrom.

For delicate tracery in cornices, papier maché is far superior to plaster, on account of its strength and superior lightness. Mixed with clay, glue and an alkali, it is perfectly fireproof, and the addition of silicates renders it impervious to the action of moisture. It is in use, as we stated in the beginning, in many of our finest theatres; and even in churches, it is largely employed to imitate the stone capitals of pillars or the heavy groined arches which apparently support the roof.

CRACKERS AND THEIR MANUFACTURE.

Not many of our readers are, we think, aware of the large scale in which the manufacture of so simple an eatable as the ordinary cracker is carried on in this city. In their own homes, the article is perhaps but little used, but if they visit the hold of a vessel fitting for a voyage, or glance into the commissary store room of any army post, they will see heaped up tiers on tiers of barrels packed with the hard tack which serves, to the sailor or soldier, as a substitute for the ordinary home made or baker's loaf.

The process of manufacture is accomplished almost entirely by the aid of specially devised machinery. The flour is first hoisted to one of the upper floors of the factory and then emptied into a large bin; thence it passes to an elevator which carries it to a revolving sieve. Here it is thoroughly sifted of its impurities, and then allowed to fall through a shoot leading into the mixer. The latter consists of a cylinder containing a rotary axle on which knife blades are fastened. At the opposite end, from that at which the flour enters, is an opening through which the mixed dough is pushed out of the machine by the action of the revolving blades. The flour, on entering the mixer, is immediately moistened by a stream of water pouring in from above.

Except for the fancy varieties of crackers, flour and water constitute the sole ingredients, not even salt being added, as it is considered that that substance renders the biscuits liable to spoil. As fast as the dough is pushed from the mixer, it is received in large masses by a workman who passes it through a machine technically termed the "breaker." This is nothing more than a pair of heavy metal rollers, which squeeze the dough into a kind of thick sheet. Still further rolling follows until the material is made into sheets of about one half an inch in thickness. The dough is now ready to be made into crackers. Once more it is rolled to bring it to the exact thickness required, and then, from between the rollers, it travels under a set of dies which, working very rapidly, stamp out the crackers in quantities at a time. As fast as the latter are cut, they slide along on a sheet of canvas, one workman removing by hand the dough from between them, while another, as soon as a sufficient number are completed, passes a flat tray under them and places them in the oven.

This last mentioned receptacle is arranged in a very peculiar manner. It consists of a huge brick compartment heated from below by large furnaces. Within is an iron wheel resembling the paddle wheel of a steamer, trays, however, which are so arranged as lie always horizontal, taking the place of the buckets on the latter. This wheel revolves, bringing each of the trays, of which there are twelve, in turn before the open door. Upon these trays the unbaked crackers are placed, and those already finished being removed, each batch travels once around the oven, the time occupied in so doing being sufficient to admit of their becoming thoroughly cooked. They are then packed in boxes, barrels, or tins, and are ready for the market.

A single oven of the kind above described will bake one hundred barrels of flour made into dough in ten hours; and we are informed that, with three such ovens in operation, as many as eight thousand barrels have been made into crackers in the space of three weeks.

The quality of crackers varies according to the materials used in them. Some are made of simple flour and water, others contain lard, sugar, or flavoring extracts, while others again are leavened with ammonia. For the cheaper biscuits, the ordinary grades of flour are used. The price of crackers depends upon the market value of the grain; at present they vary from four to twenty-five cents per pound, according to quality.

Curious Facts about Iron.

It is well known that nitric acid in a diluted condition attacks the metals more energetically than when concentrated; the red fuming liquid containing hyponitric and other nitrogen oxides is here excepted. With this fact, some curious results are connected.

If iron is immersed in concentrated nitric acid (the pure monohydrated acid answers best), it will be momentarily attacked, as will be evinced by the evolution of gas bubbles from its surface; this, however, very shortly ceases, and no further action is visible.

If a similar piece of iron is immersed in the same acid diluted with an equal bulk of water, chemical action at once ensues and continues with energy until either iron or acid is exhausted. So much for the relative oxidizing effects of concentrated and diluted acid. Let the experiment be varied as follows:

Prepare two glasses, the one containing the monohydrated, the other the diluted, acid. Plunge into the latter a rod of iron, which will be vigorously dissolved. Remove it now into the first glass, and the dissolving action will almost instantly cease; return it after a few moments to the diluted acid, and it will remain there entirely unaffected.

The contact with the concentrated acid appears, therefore, to have so altered the surface of the metal as to render it entirely indifferent to the presence of chemical agents, to which before it was highly sensitive. Without implying the possibility of the transmutability of the elements (which, it may be incidentally remarked, seems far less absurd with our present knowledge than it did twenty-five years ago), it really appears that the surface of the altered iron has acquired the properties which render it more electro-negative than normal iron; so that if the two are brought in contact, immersed in an exciting liquid, they will generate a galvanic current, an effect which is universally considered to predicate the contact of two unlike elements. The liberation of hydrogen *in statu nascendi*, on the surface of the altered metal, appears, however, to have the effect of bringing it back again to its normal condition; for the current shortly ceases to flow. To illustrate the foregoing, the following experiment will suffice:

Let the altered rod, which remains unaffected in the diluted acid, be touched for a moment with a rod of iron which has not previously been immersed in concentrated acid, and it will instantly be attacked; or, dip such a rod, after immersion in a mono-hydrated acid, into a copper salt solution, and it will be found to remain entirely free from copper (a proof, it would seem, that the altered surface is electro-negative even to copper); remove it now and touch it for a moment with a piece of normal iron, and it will instantly coat itself with copper, reducing the thin film of the salt remaining on its surface. Upon the explanation above mentioned, which may or may not be correct, the contact of the two pieces of metal generates an electric current; hydrogen is liberated on the negative or altered iron, converting again to its ordinary state. The moment this takes place, the diluted acid, in the first case seizes upon it; or, in the second, the copper salt is reduced.

Sponge Fishing.

From the account given by Vice Consul Green, of the Tunisian sponge fishery in his report to the Foreign Office, which has lately been issued, it would seem that to fish for sponges requires as much if not more skill than to fish for salmon. The sponge fishery, is most actively carried on during the three months of December, January, and February, for at other seasons the places where the sponges exist are overgrown with seaweeds. The storms during November and December destroy and sweep away the thick marine vegetation and leave the sponges exposed to view. The fishery is divided into two seasons, namely, summer and winter; the former commencing in March and ending in November, and the latter as noted above. But the collection of sponges is not very productive in summer, as it is confined to the operations carried on with diving apparatus, which can only be used on rocky and firm bottomed places, or to the success of native fishermen, who wade along the shores and feel for sponges with their feet among the masses of seaweed. The sponges thus collected by the Arabs are also of an inferior quality, owing to the small depth of water in which they have grown. As nevertheless, calm weather and a smooth sea are essential for the success of the fishermen, the winter season, although lasting three months, does not generally afford more than forty-five working days. The Arab inhabitants of the coast, Greeks, principally from Kranidi, near Nauplia, (Napoli de Roumania), and Sicilians, are chiefly employed in the sponge fishery, the Greeks, however, being the most expert fishermen, while the Arabs are the least skillful. Sponges, says the *Pall Mall Gazette*, are obtained by spearing with a trident, by diving with or without the assistance of an apparatus, or by dredging with a machine somewhat similar to an oyster dredge. The Arab fishermen, principally natives of Markenah and Jerbah, employ boats called sandals, manned by from four to seven persons, one of whom is the harpooner, while the others manage the sails, etc. The spearman watches for the sponges from the bows of the sandal, and the boat is luffed round on his perceiving one, so as to enable him to strike it. The depth of the sea in which the Arabs fish is from fifteen feet to thirty-five feet. Although the Greeks are most expert divers, the majority of them use the spear. They employ small and light boats, just sufficient to carry a spearman and an oarsman. The boat is rowed gently along, while the spearman searches the bottom of the sea by means of a tin tube of fourteen inches in diameter by nineteen inches in length, at one end of which is placed a thick sheet of glass. This tube is slightly immersed in the water, and enables the fisherman to view the bottom undisturbed by the oscillations of the surface. The spears used by the Greeks are shorter than those employed by the natives and Sicilians, but with wonderful adroitness they are enabled to reach sponges covered by sixty feet of water. They hold in their hands from three to four spears, and dart them so quickly and with such precision, one after the other, that before the first has time to disappear under the surface the second strikes its upper extremity, and thus gives it additional impetus to reach the sponge aimed at. The Sicilians, also, fish with a spear and in small rowing boats, but do not understand the employment of the tube, and have not acquired the knack of the Greeks in using three or four spears; they consequently seldom secure an equal quantity of sponges, although they are always more successful than the Arabs. The produce of the fishery is, it is stated, susceptible of considerable augmentation by an increase in the number of fishermen, and a new sponge is reproduced within a year wherever one has been removed.

Reducing Powers of Hydrogen and Phosphorus.

When a jet of cold hydrogen gas is directed against a paper that is impregnated with any of the salts of the oxide of silver—such as the phosphate, nitrate, arsenite, sulphate, sulphite, carbonate, acetate, oxalate, etc.—the silver is reduced to the metallic state and blackens instantly. Invisible characters traced upon the paper with any of the above salts are immediately rendered visible under the action of the gas.

The same, however, is not true of the chloride, bromide, iodide, cyanide, or sulphocyanide of silver, provided these be pure. Iodide of silver prepared with commercial iodide of potassium in general blackens because the salt is not pure. Thus we have a test for the purity of our chemicals. Do we desire to know whether an emulsion film of collodio-bromide contains free nitrate or not, submit it to a jet of hydrogen and the question will be answered at once, the amount of darkening showing the quantity of free nitrate present.

If we make a drawing upon a paper which has been impregnated with nitrate of silver, by means of a pen or brush dipped in a solution of chloride or bromide of ammonium, and then submit it to a jet of hydrogen, we shall obtain a white drawing upon a black ground.

For hydrogen may be advantageously substituted nitrogen or carbonic acid, which have been passed through a tube containing fragments of phosphorus. This gas, then, blackens not only salts of the oxide of silver, but also those of mercury and of copper. Proofs may thus be obtained upon paper impregnated with carbonate of copper. Hydrogen thus charged with phosphorus is more energetic upon the salts of silver than either of the other gases.

A COMMITTEE of the American Railway Master Mechanics' Association are of the opinion that back flue sheets of locomotives should be of $\frac{1}{4}$ inch iron or $\frac{7}{16}$ steel, and front flue sheets of $\frac{7}{16}$ iron or $\frac{1}{2}$ steel.

THE PROGRESS OF FISH CULTURE IN NEW YORK.

From carefully conducted experiments, made during the past few years, it has been determined that fish may be transported, acclimatized and bred, and thus supplied in increased numbers for the use of mankind with as much facility as animals existing on the land. With a view toward popular benefit from these discoveries, the Commissioner of Fisheries of New York State were authorized by the Legislature some two years ago to build a hatching establishment for the purpose of breeding the better kinds of fish for distribution throughout the public waters of the State. This building, which was erected in the summer of 1870, is practically the most efficient and the most productive of results of any in the world. The water is introduced in the ordinary way through a number of flannel sieves, and is led into 24 troughs, which are sixteen feet in length by fifteen inches in the clear in width. These troughs are raised about two feet from the ground, so that a person sitting on a stool alongside can readily examine the condition of the ova during the period when they are hatching. The lower ends of the troughs is an inch lower than the upper ends, so as to give a gentle motion to the water that is introduced into them. The water flows from a spigot about an inch in diameter and through another flannel screen, which is an additional protection against the accumulation of sediment.

The troughs stand in pairs, so that the workman can easily overlook them by passing on each side through a passage way left for that purpose. They are divided into compartments at every two feet, and at first, when the eggs are being hatched, the water running through them is only about half an inch deep. The moment however, the fish are out of the egg, screens are introduced at each compartment and, a piece of board being put across the lower end of the trough the water is raised to about three inches in depth. The hatching house is located at Caledonia, N. Y., and is situated on a brook the water of which is very peculiar, remaining at substantially the same temperature throughout the year, never growing warmer in summer or colder in winter. Every stick and stone that is covered or washed by the water is alive with caddises, and every bunch of moss or piece of wood is filled with fresh water shrimps or other minute insects. The stream even in its natural condition, without the assistance of any artificial propagation, has produced enormous numbers of trout; and at the present moment, although it has been greatly fished, it is fairly alive with them.

The fourth Annual Report of Commissioners of Fisheries for this State furnishes us with much valuable information relative to the general progress that has been made in fish culture during the year 1871. On the Hudson River, the operations for augmenting the supply of shad have been more successful than heretofore. Owing to the large increase of that fish in the Connecticut river, in which some millions of young fry had been placed three years before, the market in New York and other adjacent cities was supplied so abundantly as to seriously reduce the profits of the fishermen on the Hudson; so that it became a necessity to take measures to restore the fisheries in this state and to protect the persons, deriving their livings therefrom from ruin, and 8,295,000 eggs were placed in the Hudson during the year. These, it is believed, will greatly increase the yearly yield which at present does not exceed one million mature shad, and it is estimated that in a few years the fisheries will be so improved that 500,000,000 fry will be artificially hatched.

Another experiment was made, at the expense of the State of California, to introduce shad into the Pacific Ocean, where they had hitherto been utterly unknown. Mr. Seth Green, a gentleman already celebrated for his discoveries in the art of fish culture, was employed for carrying out the purpose, and the fry were taken out of his establishment on the Hudson. The undertaking was generally pronounced to be hopeless. Three thousand miles of land had to be crossed, mostly over a section of country nearly destitute of water, It was a trip by railroad with little opportunity to stop for a resting spell if that were necessary; and all this with a fish so exceedingly delicate that it can hardly be kept in confinement. Mr. Green's report states that he started on his journey with 12,000 young shad, placed in four eight gallon milk cans. He deposited about six hundred fish in different bodies of water along the route, and finally, after surmounting apparently overwhelming difficulties in the shape of impure water and dearth of any water at all, he placed 10,000 living shad in the Sacramento river. The attempt, as he states, seemed desperate, but contrary to all expectations, it resulted in triumphant success.

During the year, the State hatching house, before alluded to, has been greatly enlarged, and operations for the winter hatching of fish commenced on an unprecedented scale. Millions of the spawn of salmon trout were taken there from the great lakes to be distributed through the States, or to be developed and then distributed. It is much less expensive and easier to distribute the ova than the young fishes. The ova may be transported anywhere during the month of December, but no later.

Notices have from time to time been published in the papers authorizing parties to send for as many eggs or fry as they needed for stocking public waters, and all who have applied have been accommodated.

The Report before us contains detailed accounts of various other operations which have been performed. The Commissioners pride themselves upon not only building the cheapest and largest fish breeding establishment in this country or in the world, but also in building one that has in every way proved an entire success, and which is capable of supplying all the public waters in this State with all the salmon tribes of fish.

The Action of Quinine on the Blood.

The nature of the influence exerted upon blood by quinine has recently been the subject of a fresh investigation by Schulte. Its extraordinary power of stopping fermentation and putrefaction by destroying low organisms, such as bacteria and fungi, has been before pointed out. It is supposed to diminish the formation of pus in inflammation, by arresting the motions and preventing the exit from the blood vessels of the white blood corpuscles, the accumulation of which, according to Conheim, constitutes pus. By depriving the red blood corpuscles of the power to produce ozone, it diminishes the change of tissue in the body, and therefore lessens the production of heat. Ranke and Kerner have shown that the waste of tissue is reduced when large doses of quinine are administered, as indicated in the smaller proportion of uric acid and urea excreted.

With the object of ascertaining whether this effect is referable to the direct influence of quinine on oxidation in the blood or to its indirect influence through the nervous system, Schulte employed a method based upon the changes occurring in the alkalinity of the blood observed by Zuntz, who had noticed that a considerable formation of acid takes place in freshly drawn blood, and continues in a less degree till putrefaction commences. The amount of acid formed was estimated from the diminished alkalinity of the blood, as comparatively shown by the quantity of dilute phosphoric acid required for exact saturation. A sufficient quantity of chloride of sodium was added to the phosphoric acid to prevent the blood corpuscles from being dissolved and interfering with the reaction by their coloring matter. The point of saturation was fixed at the transient reddening of carefully prepared test paper by carbonic acid. Schulte has thus been enabled to confirm the experiments of Kuntz and Scharrenbroich, showing that quinine and berberine lessen the production of acid, and that quinine can stop it both before and after coagulation; that sodium nitropicrate has an action similar to, and nearly as powerful as, quinine; while the action of cinchonine is much less energetic. Harley has shown that while quinine lessens oxidation in blood, some substances, such as snake poisons, increase it. Binz found that when putrid fluids were injected into the circulation of an animal, the temperature rose, but that this increase of temperature could be more or less prevented by the addition of quinine to the putrid liquid, or the simultaneous injection of the quinine.

With respect to the influence of quinine on the change of tissue, Schulte gives the result of some careful experiments made by Zuntz, who found that, after taking three 0·6 gramme doses of hydrochlorate of quinine for two days, the amount of urine he excreted was increased by one third, and then decreased as much, the specific gravity falling from 1·018 to 1·012; the urea also showed a marked decrease.

The Production of Chlorine and Hypochlorites.

We give the details of the method recently patented by M. Tessié du Motay. According to that distinguished chemist, the processes hitherto employed to produce chlorine continuously, by means of oxygen or of air and hydrochloric acid in the presence of certain metallic peroxides or dehydrating salts, have never given practically valuable results, because the excess of oxygen or air and nitrogen, mixed with the chlorine generated, partly prevents the condensation of this chlorine or its combination with the alkalies and alkaline earthy bodies intended to produce hypochlorites suitable for practical use in bleaching. The object of M. Tessié du Motay's process is, while wholly or partially utilizing the hydrochloric acid employed, to generate pure chlorine in an isolated state which can combine without waste with the alkaline or alkalino-terrous bodies in the form of bleaching chlorides; and to accomplish this, the inventor has discovered two methods:

1. Into a retort heated to a deep red, containing peroxide of manganese or a mixture of peroxide of manganese and lime, a current of hydrochloric acid is caused to pass; chlorine and steam are produced and disengaged, and there remain in the retort non-decomposed peroxide of manganese and chloride of manganese, and chloride of calcium. The chlorine is collected in the water or led away into a chamber for the production of dry hypochlorites. Over the mixture remaining in the retort, a current of air or oxygen of the same temperature is caused to pass, which, in the presence of peroxide of manganese decomposes at once the chloride of manganese alone, or the chlorides of manganese and calcium regenerated from the sesquioxide of manganese alone into sesquioxide of manganese mixed with lime, and sets at liberty the chlorine contained in the chlorides. This chlorine mixed with air and azote or oxygen is led into vats containing a mixture of lime and protoxide of manganese which has been previously produced by the decomposition of chloride of manganese by an excess of lime, the soluble chloride of calcium produced in this reaction having been previously run off. In presence of the oxygen of the air and of the chlorine, it produces immediately sesquioxide of manganese and hypochlorite of lime, which in reacting upon the sesquioxide produces finally the hydrate of peroxide of manganese and chloride of calcium. The excess of lime remaining, having no longer to act upon the sesquioxide, remains in the state of hypochlorite of lime. Upon this mixture, composed of hydrate of peroxide of manganese, chloride of calcium, and hypochlorite of lime, liquid hydrochloric acid is made to react in the ordinary manner. Chlorine is at once disengaged by the reaction of this acid, on the one hand upon the hydrate of peroxide of manganese, and on the other upon the hypochlorite of lime. This chlorine is led into the chamber for the production of hypochlorites. After this reaction, it remains in the vats of the chlorides of manganese and calcium. Upon the chlorides of manganese and calcium, an excess of lime is again caused to act, which reproduces the mixture of protoxide of manganese, chloride of calcium, and lime already referred to. The soluble chloride of calcium is then run off, and there remains in the insoluble state a mixture of protoxide of manganese and lime, which will serve for other similar operations by repassing under the action of chlorine and air to the state of hydrate of peroxide of manganese, chloride of calcium, and hypochlorite of liquid lime.

It therefore follows, first, that by the reaction of gaseous hydrochloric acid upon air and oxygen, in retorts heated to redness containing peroxide of manganese or a mixture of peroxide of manganese and lime, a first quantity of pure chlorine is produced, which is led away into condensing chambers, and for the production of hypochlorites; secondly, that by the decomposition by means of air or oxygen of the chloride of manganese alone, or the chlorides of manganese and lime contained in the said retorts, gaseous compounds are produced containing at once oxygen and chlorine. These compounds in their passage across the vats containing the protoxide of manganese and liquid hypochlorites of lime produce pure chlorine by the action of liquid hydrochloric acid, the chlorine in its turn being led into the chambers for the production of dry hypochlorites. Instead of the mixture of protoxide of manganese and lime in excess, over which the chlorine mixed with air and oxygen is caused to pass just as it comes from the retorts, a milk of lime may be employed, which is transformed into hypochlorite of lime. This hypochlorite, as well as the mixture of hydrate of peroxide of manganese and hypochlorite of lime treated by liquid hydrochloric acid, regenerates pure chlorine suitable to be taken to the chambers for the production of dry hypochlorites.

The chloride of calcium remaining from the operation is collected in vessels wherein carbonate of magnesia, or magnesia and carbonic acid, are caused to react simultaneously, carbonate of lime and chloride of magnesium being produced. This distilled chloride of magnesium regenerates the hydrochloric acid, which is again employed for the production of a fresh quantity of chlorine. The magnesia remaining serves again for another operation. Thus the reactions which constitute the process are shortly as follows: 1. The oxides of manganese serving for the production of chlorine are ceaselessly regenerated; 2. The hydrochloric acid is utilized completely for the production of chlorine; 3. All the chlorine generated is in a pure state, and consequently suitable for the production of dry hypochlorites.

2. The second method only differs from the one just described in the substitution of magnesia for lime, the chlorides of magnesia produced being without transformation, and capable of re-engendering hydrochloric acid by simple distillation.

NEW METHOD OF REPRODUCING DRAWINGS.—According to M. Rénault of Paris, if a drawing be made on strong glazed paper with glutinous ink, and the lines be afterward covered with a metallic powder (the bronze powder of commerce) and if the drawing thus prepared be pressed upon a sheet of sensitized paper, the lines of the original drawings are reproduced in black by the chemical action of the pulverized metal upon the sensitive paper. By softening the ink with the vapor of alcohol and renewing the bronze when it is exhausted, many impressions may be produced.

PAPER AS A MEANS OF DEFENSE.—Colonel Muratori, says *Engineering*, has made a successful application of paper as a defensive material in the construction of a cuirass which, weighing the same as the ordinary service cuirass, is capable of far greater resistance. It will turn a regulation pistol bullet fired from a distance of 3 feet, and is equally capable of resisting a bayonet thrust. The inventor claims that the fabric can be used for armor plating ships of war, and is especially suitable for covering bottoms of vessels to protect them from explosions of torpedoes.

BEER DRINKING IN THE UNITED STATES.—From the report of the proceedings of the Brewers' Congress lately, held in this city, we learn that the amount of fermented liquors brewed during the year ending June 30, 1871 was 7,159,740 barrels, being an average of 52 glasses each to every man, woman and child in the country. Assuming the beer to have been consumed in the State in which it was manufactured, each individual in New Jersey averaged 202 glasses, in New York 261 glasses, in Maine, probably on account of the liquor laws, 7½ glasses, and in Texas but 5 glasses. These data may be of value to our Teutonic fellow citizens in finding their choice as to the States in which they may in future locate their beer manufactories.

DR. ANGUS SMITH gives a good rule for ascertaining the amount of carbonic acid in the air of houses: "Let us keep our rooms so that the air does not give a precipitate when a 10½ ounce bottleful is shaken with half an ounce of clear lime water," a sanitary regulation which can easily be carried out.

IRON ship building is becoming an important industry in Denmark. At present several vessels of 1,000 tuns are being built, and one of these, it is stated, will be employed in laying down the telegraph cable between China and Japan. Two steamers, the *Rolfe* and the *Thorwaldsen*, have lately made the passage to this city, and are the first iron vessels built in Denmark that have ever entered the port.

THERE are about four hundred species of minerals known; but the varieties of these species are almost infinite. For example, carbonate of lime exists as chalk, marble, spar, lithographic stone, etc.

FIG. 1.—THE MALE MOSQUITO.

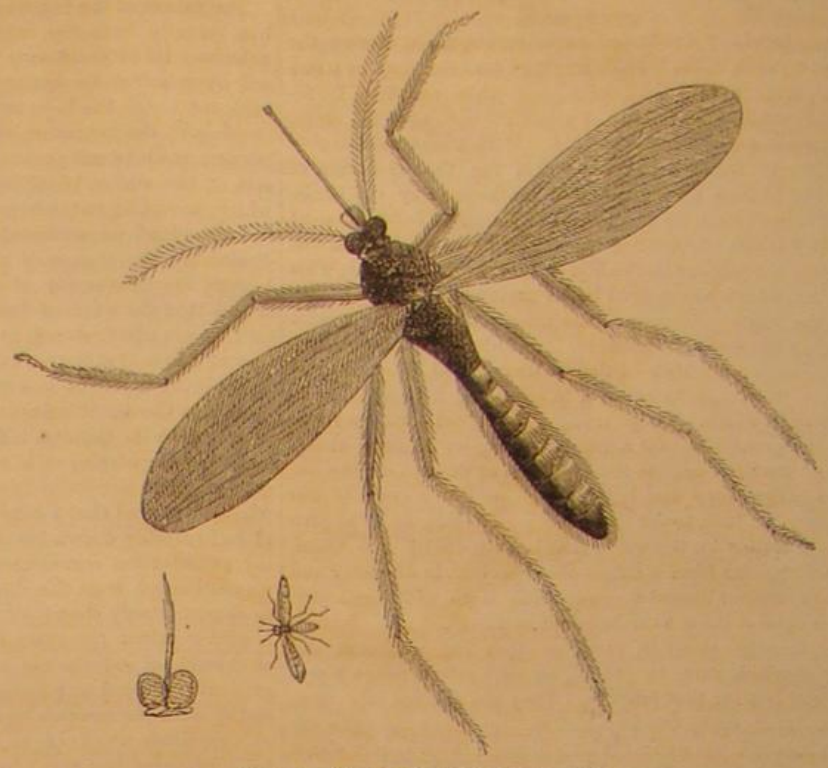


FIG. 2.—THE FEMALE MOSQUITO.

THE MOSQUITO ILLUSTRATED.

"Mosquito" in the United States, "cousin" in France, nd "gnat" in Great Britain, are the names commonly giv- n to the family *culicidæ*, of the proboscidean division of the rder *diptera*, or two-winged insects. The family is large, nd is at present but little understood. Our own mosquitoes belong to several genera, among which is the *culex pipiens* (humming gnat). This is a native of Great Britain and the north of Europe and Asia, and must be considered the type of the family here. It is common with us only in the extreme Northwestern States and in high situations in the Middle and Southern States; while the genus *megarrhina* (Linn.), with innumerable subgenera, must be held to compose our largest portion of the family.

Figs. 1 and 2 are representations of the male and female of this genus. It will be seen that the male has tufts and plumes not found in the female; his body is not so thick as hers, but longer, and his proboscis is slightly recurved or thrown back, while hers is carried straight forward. The female stings, while the male merely brushes with his plumes as he flies by; the organs of his mouth being too weak and too few in number to do any harm.

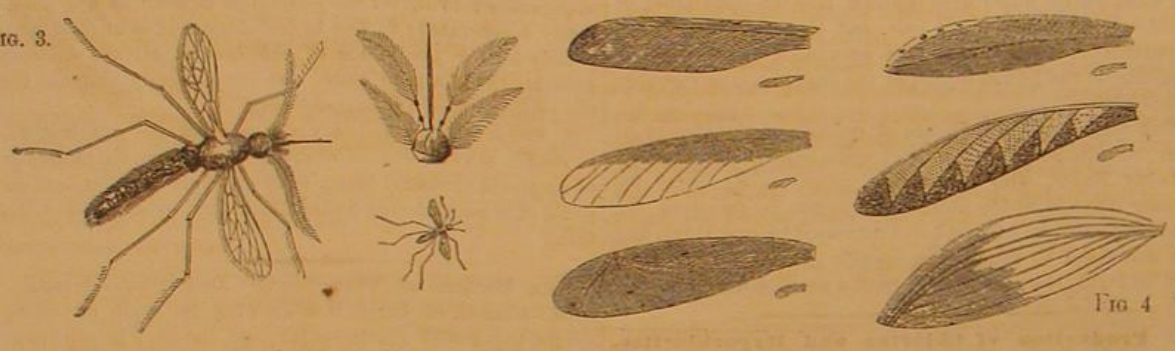


FIG. 3.

FIG. 4

they are always alike in general appearance, a close examination of specimens reveals endless novelty in details.

Fig. 4 shows various wings belonging to several specimens collected at one time, and which were very beautiful objects under the microscope, and shone with all the tints of the rainbow. We shall not therefore attempt to make our readers acquainted generally with this multitudinous family, but will at once introduce them to some of its members, who have been studied, and their habits.

The male mosquito, during his short life, subsists on the contents of the flower cups of various plants, preferring that of the tall white lily; and after the performance of his natural functions, his life is brought speedily to a close.

With the female it is otherwise. She has work to do and proceeds about its accomplishment thus: She selects some quiet, cool eddy in a brook, crosses her hind legs (as shown in Fig. 5), and builds a boat of eggs (Fig 6). When finished, this boat contains sometimes more, sometimes less, than three hundred eggs; but it is always of one form. The eggs near the ends contain males; those in the middle, females. It cannot be upset or filled by any effort, and pouring gallons of water on it will not sink it. Neither can any weather affect it. It may be frozen in solid ice, then thawed out and exposed to a June sun, and in time larvæ will make their appearance.

But they do not all build this boat; the females of several varieties have their eggs strung (see Fig. 7). A spot of the mucus, full of eggs, was transferred from a rain water tank, with some of the water, to a breeding glass. In five days, exposed to the warmth of the sun, the larvæ began to come forth, as shown in Fig. 8. When six days old they could be seen lazily floating about, some with two eggshells, some with three, and one with four attached to the extreme hairs of his body, as at Fig. 9. As their movements were unaccountably slow and lifeless, they were separated from the unhatched eggs and placed in fresh water; when, after sinking to the bottom, they discarded the eggshells and rose rapidly to the surface. The experimenter concluded that the shells had acted as buoys in the stagnant water.

The large mosquito of the Southern swamps sinks a hole in the soft mud with the end of her body, and hangs the eggs upon a foot stalk, as in Fig. 10. When the larva comes out, there is always water at the bottom of the hole, ample for its sustenance until it sinks into the mud to undergo its transformation into the perfect insect.

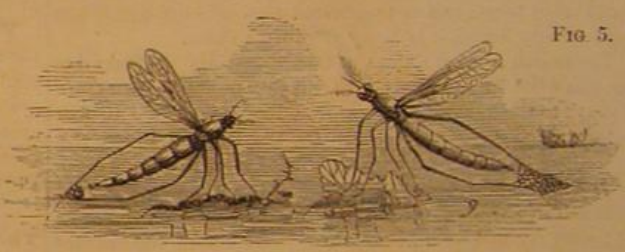


FIG. 5.

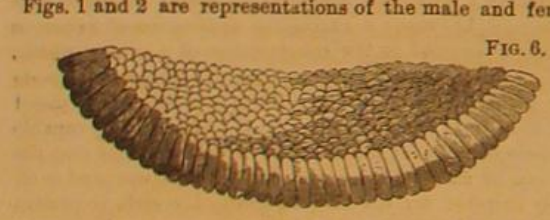


FIG. 6.

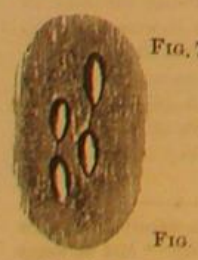


FIG. 7.

FIG. 8.

FIG. 9.

FIG. 10.

Fig 3 illustrates the other genus named, and the difference in the wings will be apparent on comparison. They distinctly differ in their nervures, and the prismatic colors are deeper on the edges in one specimen than in the other. It would be an easy way to class these insects by the wings, but for the endless variety. No two years bring back the same subgenera; and though

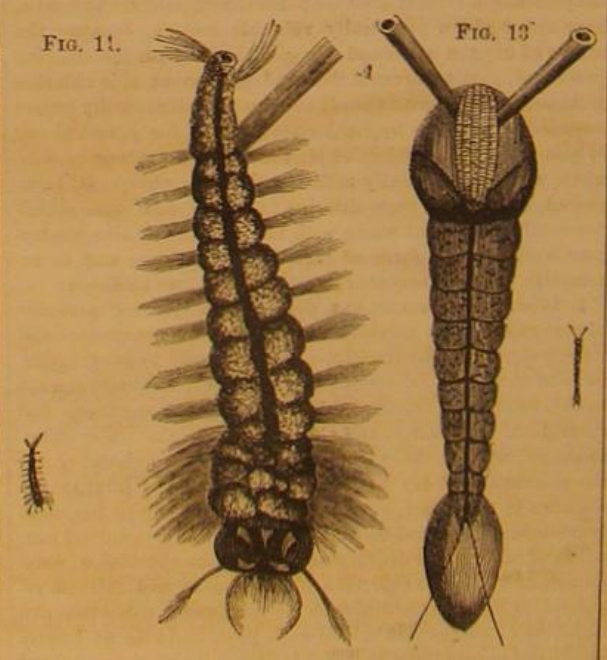


FIG. 11.

FIG. 13.

The large mosquito of the dry, sandy pine barrens of the Carolinas and Georgia selects a spot exposed to the sun, and drops her eggs among the grains of the sand. The proceedings and habits of the larva are unknown; but in twelve or fifteen days the metamorphosis is complete. This variety is exceedingly venomous.

Fig. 11 represents the full grown larva from the egg of the boat; and A will direct attention to the respiratory tube of hairs. The larvæ float with their heads downwards, dive on being disturbed, and carry down enough air in the closed tubes to last them until they come up again. They remain in the larvæ state from five to fifteen days, casting their skins thrice, or oftener, and then enter the pupa state. The position is now altered, and the breathing tubes are kept up in the water. The change can be seen in Figs. 12 and 13. The pupa becomes less active and seems to scull along with the paddles at the end of the tail. Five or ten days more, and it bursts on the back, and the mosquito, as in Fig. 14, rises from the opening. This feat is accomplished with difficulty, and not a thousandth part of all that burst the case escape. Using the empty case as a raft, the insect plants two legs firmly on the water and waits until the wet wings get separated; then another pair of legs are disengaged, the body elongates, and the wings begin to unfold, as presented in Fig 15: finally, the last pair of legs are drawn forth, the body poised, the wings elevated, and the fly stands on the water (Fig. 16), ready for flight.

FIG. 14.

FIG. 12.

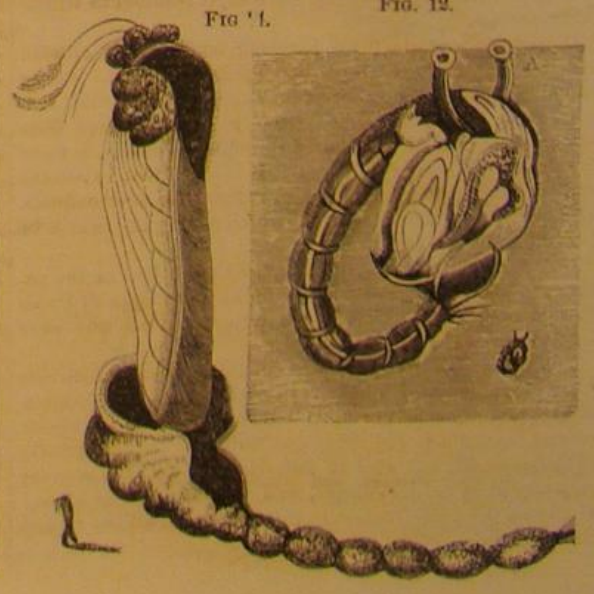


Fig. 17 is the fully developed female of a night mosquito found at the extreme north down to Florida. Her congener of the day resembles her closely, except that her body, when empty, is of an apple green color, and turns to dark amethyst after a meal, which are marks of all the day *culicidæ*.

Fig. 18 shows the dissected body of a mosquito, on which were discovered numerous parasites (*acari*) seen at A.

FIG. 15

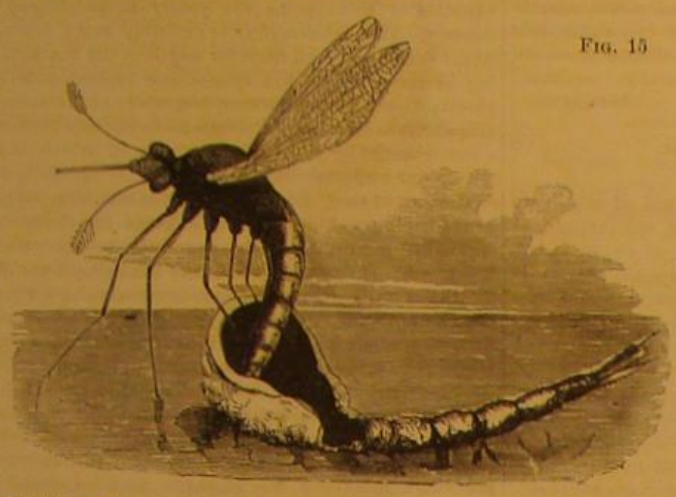


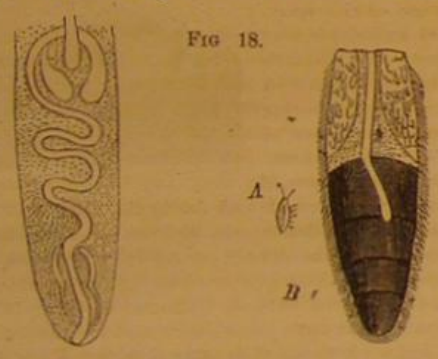
FIG. 17.

Figs. 19, 20, and 21 are stings of several kinds. Authors are not agreed as to the number of parts composing the sting; it appears to vary according to the genus. Several prickers can be felt in the large northern mosquito, and a dozen lancets are found in the southern. After the tubes are separated from the sheath, the lancets can be separated also. The two side tubes serve probably to aid suction, and to support the head, but eventually are employed as an outside protection to the lancet case. There will be noticed quite a hollow in the sheath, into which the blades of the lancets fit; then these join over them, and the sheath is complete. In some the proboscis is not hairy, but smooth and polished. In biting, it seems that the hollow extremity of the sheath is in-

FIG. 16.

troduced into the wound made by the lancets, and by its means the gnat sucks the blood while the lancets keep the wound open. The mosquito has not always a thirst for blood, but often sucks up other liquids, particularly those with spirits in them. In this case the sheath is extended in front of the lancets. The pain of the wound made by the bite is attributed to the irritating action of a fluid retained in the

FIG 18.

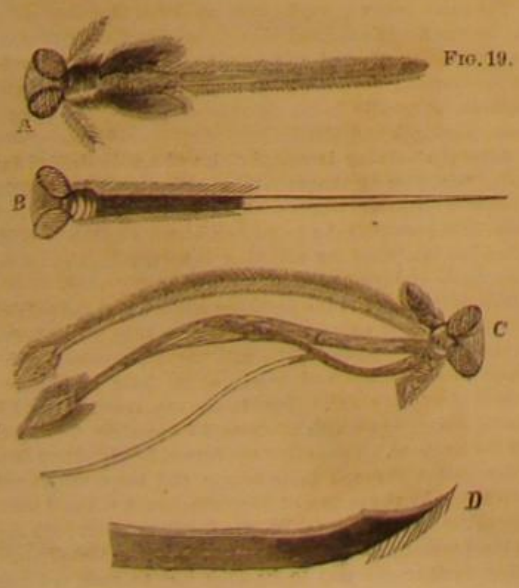


sheath to keep its parts in working order. It is not poisonous alike to all persons.

Figs. 22 and 23 will show how the sting is applied.

The humming noise of these insects is supposed by some to be made by the rubbing of the wings on the chest; by others, by their beating against the air; and some think it proceeds from the proboscis.

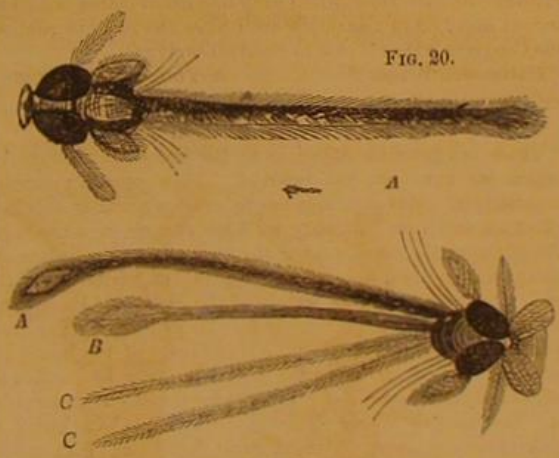
FIG. 19.



The eye of the day mosquito is a most brilliant object. The facets are very thickly placed, and from each one springs a small sharp cornea; these catch the rays of light and cause the eye to scintillate with various shades of color. We give a drawing of the eye at Fig. 24.

The metamorphoses we have described, which are common to all gnats, are rendered the more interesting by means of the ease with which they may be witnessed and studied. There is a fresh progeny of these insects every month, and their total production is so numerous that it has been held by some writers that the very air would be darkened by them were it not for their natural enemies devouring great numbers. (These latter are various kinds of birds and several carnivorous insects). Wet summers are found most favorable for their production, while in dry seasons their numbers are less unlimited. This no doubt arises from the standing waters and marshy spots, in which the insect passes the first stages of its existence, being dried up in many places before the contained larvæ reach maturity. There is not much probability, in view of the foregoing, of the student ever lacking specimens; but should such a contingency arise, the exposure in an open place of a vessel of water will, in the summer time, almost surely result in providing him with a good

FIG. 20.



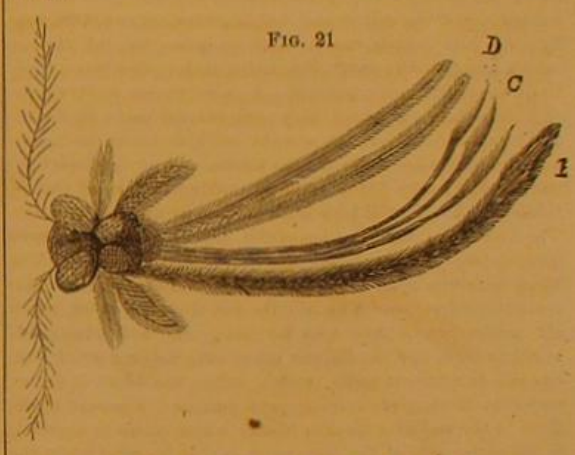
supply of wigglers, or gnat worms, as the larvæ are sometimes called. These, from their transparency, require no preparation for examination by the microscope, for which instrument they form excellent objects. The insect and its transformations have always presented a most interesting subject for observation to the naturalist and the ordinary observer, and the interest is by no means diminished by modern investigation.

Nearly a hundred years ago, James Barbut, in writing of the mosquito, said with enthusiasm, "it is impossible to behold and not admire the amazing structure of its sting. One undergoes with pleasure a puncture that enables us to observe how this piece of mechanism acts."

FIG. 22.

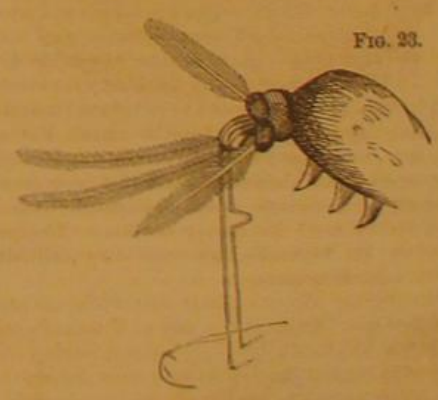
Lately, microscopic research informs us that the rapidity with which the gnat vibrates its wings—fifty times in a second—depends on the peculiar form of muscle which produces the movement. This muscle is composed of little disks which are kept apart and are yet connected by fibers in between them; these fibers pull the disks together on one side while they are relaxing their hold on the other, and, by alternating the movement, give rise to the rapid motion in the wings.

FIG. 21



We doubt if any of our readers would be as willing as the author just quoted to sacrifice themselves in the cause of science, but the question would, no doubt, be speedily decided by the effect of a mosquito bite on the particular individual bitten. In some cases and perhaps also under peculiar circumstances, the bite is attended with but little if any virulence; generally obstinate itching arises from it, and frequently redness and swelling of the adjacent parts; in rare cases, irritable ulcers are the result. The preparations of ammonia will remove the itching, and rubbing at night with fuller's earth and water is recommended by some writers to allay the pain and lessen the inflammation. It is also stated that if the part is scratched and washed with cold water im-

FIG. 23.



mediately after the bite is received, a cure will be effected; but the operation must not be delayed, as a little while later it would only increase the itching and swelling.

Contemptible as these small insects may, at the first glance, seem to be, their greedy attacks upon man and beast and the prodigious swarms in which they sometimes appear have made them formidable enough to cause extraordinary measures of defense to be taken against them. They are nowhere more troublesome than in Lapland, where the natives are compelled to anoint themselves with grease and to drive off with smoke the almost incredible numbers by which they

FIG. 24.

are assailed. During the short summer of northern Asia, mosquitoes and other insects so abound in the woody tracts of Siberia, near the Ural Mountains, that the peasants burn fires constantly before their cottages to ward off their attacks. Within the tropics, a bed of sand is resorted to as a

means of defense against their assaults, and in more temperate and civilized regions, curtains of gauze and other material are used as barriers against the foe. Essential oils have also been employed to drive them away from particular localities, but with only partial success.

Correspondence.

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

Factories in the Wyoming Valley.

To the Editor of the Scientific American:

I have just returned from a delightful morning ride up the Wyoming valley, a forenoon ramble along the Oatka, and a visit to two somewhat peculiar and interesting manufacturing establishments.

Two miles above the beautiful thriving village of Warsaw is the factory of Martin & Co., devoted exclusively to the manufacture of map rollers and moldings, of which they turn out about 250,000 sets per annum. Much of the machinery used has been invented or improved by Mr. Martin, the senior partner, to whose kindness I am indebted for the privilege of inspecting the machines and operations.

The rollers are turned by a self acting lathe. A square stick of the required size is moved forward and guided by three pairs of feed rollers, or wheels, with grooved edges. In the first pair, the grooves are angular to fit the square stick. By this pair, the stick is driven forward through a hole in the center of a wheel, on the inside of which the knives are set. This wheel is driven by a belt. The stick is turned as it passes through the wheel, being guided and drawn through by two pairs of feed rollers with curved grooves in the edges. The map rollers are next smoothed by being run through emery faced blocks. The painting and varnishing of the rollers and moldings are very rapidly done by a machine which causes them to pass through the can which contains the paint, the holes in the sides being made to fit the stick to be painted. A wire frame receives the painted rollers, on which they are carried aside by dozens and stacked until dry. A simple machine turns the tenons and the rollers are ready for the knobs. The contrivance for turning the knobs is the most interesting feature of the establishment. It will turn from four to five thousand a day. The knobs are turned from cubic blocks which have been soaked two or three days and bored half through. The block is driven upon a mandril at the end of a shaft. This mandril projects over a table. On the table is a block about six inches square and two feet long, one end being made small to serve as a handle, the other turning on a pivot. On one side is a curved knife, which, when the block is drawn up to the knob, gives it its general outline. A second knife, fixed in the end of a smaller block, which slides in a groove in the upper side of the larger one, is then brought up to the knob by means of a short lever, and gives the knob the required shape. No peculiar machinery is employed in the manufacture of moldings, unless a planer, which smooths the four sides of a strip at once, be peculiar. After planing, the strip is split diagonally so as to make two moldings, which are next shaped by a small planer with a knife of the requisite shape. Rollers and moldings are made of bass wood, knobs mostly of soft maple. The establishment has been in operation 19 years, and is thought to be the only one in the country doing a large business solely in this line.

Two miles farther up the stream, in a most romantic glen, is the factory of the Warsaw Furniture Company, their finishing and salesrooms occupying a fine four story block with French roof, in the village. The machinery is driven by a turbine water wheel, which communicates with the main shaft of the factory through an endless wire cable 480 feet in length. The company use no machinery invented here; but I understand that they intend to introduce a machine for fitting joints, the invention of the foreman. For curved sawing, they use an endless belt saw about 20 feet long, which runs over two wheels and through a table on the descending side. The frame which supports it resembles an enlarged Wilcox and Gibbs sewing machine. The company manufacture, for wholesale and retail trade, all kinds of house and office furniture.

The water of the Warsaw village waterworks has just been put to a new use. By means of one of Stannard's cold water hydraulic engines, a half inch stream having 260 feet head is made to print the Wyoming County *Democrat* at the rate of 1,000 impressions per hour. C. H. DANN.

Warsaw, N. Y.

British Patent Reform.

To the Editor of the Scientific American:

I notice in a recent number of the SCIENTIFIC AMERICAN that the patent laws of Great Britain are, in all probability, going to be rearranged, and that it is proposed to add a new clause to the effect that "letters patent, which have been granted for any invention which has not, within a fair and reasonable time (to be arranged), been brought into active use, shall be declared to have expired."

This, in my opinion, is an excellent suggestion, and one which would operate with great fairness to inventors in this country. Here is an instance: A few months ago I applied at Washington for letters patent for an invention, in connection with railroad operation, which was, by many practical men, considered to be of considerable value, both with regard to saving of expense and obviating danger. My application was, however, refused, on the ground that it interfered with an invention of ten years back, which I know has never been brought into active use, and is patented only in England. Again, not long ago, I applied for letters patent for another invention, also in connection with railroads. Result, another refusal, as conflicting with English patents No. —— and No. ——, of, respectively, 1847 and 1861. Neither of these, to the best of my knowledge, have ever been brought into active use, and I know England well, the railroad world not less than any other.

Here, therefore, is a clear instance of the justice with which this new proposed clause in England would operate with us here. If you will be kind enough to publish this letter, it may draw forth some expressions of opinion on the subject, and be of interest to inventors generally.

INVENTOR.

An Optical Experiment.

To the Editor of the Scientific American:

A microscope is any instrument by the aid of which we can subtend the angle of vision. Is there any instrument which will enable us to subtend the angle of vision indefinitely? I think that the ordinary photographic camera is such an instrument. The following experiment would soon demonstrate the correctness of my deduction: Photograph the palm of a human being, say eighteen inches in diameter. Cut a circular inch from the center of that photograph and mount it upon cardboard. Mark it number one. Take an eighteen inch photographic copy of number one. Subject the copy to the cutting process and mark that circular inch number two. Copy number two and cut out number three, and so on until you obtain many circular inch photographs. Spread the last copy taken on the table. Put the original palm under the best microscope you are able to use and compare results. Lunar and solar investigations can be carried further, by the above described method, than by any other with which I am acquainted. Warren De la Rue has published excellent photographs of the moon, which are just the things to cut the second hole into.

New York city. R. B. S.

A Machinist's Query.

To the Editor of the Scientific American:

On page 349 of your volume XXVI, is an article headed "Sorry he didn't learn a trade;" now I have learned a trade, and I am not sorry for it, but it is hard to know that after serving four years apprenticeship to my trade, I can get only $3.50 a day for building and repairing an engine, while a man who has served no apprenticeship, and is ignorant of the working of the engine, gets $4.50 for running it. This I think, is alike an injustice to the machinist and to the public who risk their lives by the incompetence of these men. If an accident occurs, the public clamors to hang the poor ignorant wretch who caused it; but an ounce of prevention is better than a pound of cure. Is there no way to prevent railway officials from filling such important places with ignorant men? Ask the public who have the risk to run, or the Congress which is said to right all wrongs.

Galveston, Texas. A YOUNG MACHINIST.

The Steam Jacket.

There is a practical objection to the use of the jacket to which we have not yet referred. High pressure steam, especially if quite dry, appears to exert a peculiar solvent effect on cast iron. Already we hear rumors in numerous directions of the rapid wear of the high pressure cylinders of compound engines, an evil which grows in proportion with each augmentation of the weight of the casting. It appears to be fortunate that the remedy for this evil affords the best possible method of applying the true theory of the jacket in practice. In certain cases the jacket is made by putting a thin steel tube into a cast iron cylinder bored out to receive it. The Reading Works Company, for example, have brought this system of construction to great perfection, with excellent results. How far the scheme is applicable to marine engines, we are unable to say. We suggest that, especially in marine engines, instead of steel—notably an uncertain material—hard brass, or more strictly speaking gun metal, liners should be used for the high pressure cylinders. Properly made, the material is much harder than cast iron, and will take a beautiful surface; while the material, being an excellent conductor, would comply with one of the fundamental conditions of eminent success in using the jacket. The idea is a mere extension of the system of lining air pumps. We do not claim it as original, but we believe this is the first time the scheme has been mentioned in any journal; and it appears to us to be well worth the consideration of engineers engaged in the construction of large steam engines working with considerable pressure.—*Engineer.*

Locomotive Boiler Incrustrations.

At the recent meeting of the American Railway Master Mechanics' Association, they expressed the belief that the boiling of the water previous to its use in locomotives would separate the sediment from the water, and obviate, in a large degree, the trouble now felt from incrustrations. On some of the western railroads, the loss by these incrustrations was no less than $75,000 per year for each one hundred locomotives. Mr. Coleman Sellers, of Philadelphia, called attention to the fact that the entirely pure water was more injurious to boilers than that which was slightly impregnated with salts or some foreign substances, and stated that on one occasion the boiler of a steamer which used distilled water was nearly ruined in one trip thereby.

"Is there any material or device more economical for packing stuffing boxes than hemp?" Hemp is considered the best, as no danger from fire is felt, this material standing 500 degrees of heat, while ordinarily steam reaches only 343 degrees.

SOMETHING ABOUT PIPES.

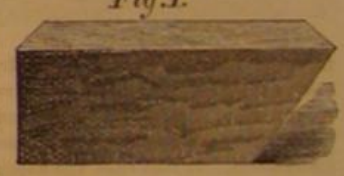
It is an interesting fact, particularly at the present time when resolutions, at the Convention of the Young Men's Christian Association at Lowell, Mass., condemning the use of tobacco, have been made the subject of considerable comment, that over *nine millions* of pipes made from different varieties of wood alone are yearly manufactured in this country. The wooden pipe is probably more distinctly national than any which finds its way into the market. Ranging in cost between the aristocratic meerschaum and the plebian clay, it is rarely expensive, while at the same time its manufacture calls into existence an industry which develops a raw material by far the largest part of which is obtained within our own brokers.

The root of the "Briar Ivy" is the substance most generally used for pipe making, it being selected for the purpose on account of durability, hardness, and the bright polish which it is capable of taking. It is found throughout the Southern States generally—the best qualities growing in Virginia—and is sent to the market in large pieces which vary in size from that of a man's fist to the dimensions of a good sized keg. It costs the manufacturer from thirty to forty dollars per ton, the price depending upon the quality of the wood.

The above information was imparted to us by one of the manufactures of pipes in this city, while wending our way from his office to the cellar underneath the factory, where the rough briar root was stored. As we entered the last mentioned apartment, we noticed, heaped against the walls, the odd shaped pieces of the wood. Some had just been received, for a workman was busily engaged in throwing them into an oven which, heated by steam pipes, served to dry out all sap and moisture the wood might contain. In the middle of the cellar, a circular saw was in motion, cutting the dry pieces into slices of about two inches in thickness, which as soon as finished were received by boys and piled in regular heaps. From this underground apartment, the slabs are sent to a drying room on one of the upper floors, where they are kept heated at a moderate temperature for six months, during which time the wood becomes thoroughly seasoned.

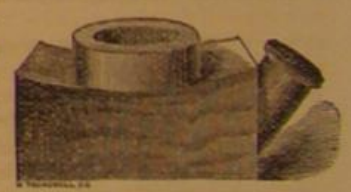
Following our guide, we next entered the workshop. Here the clatter of innumerable wheels and the buzzing of saws and lathes rendered speech out of the question. Picking our way over heaps of wood and edging between countless belts, we were at length arrested before a workman who, sitting on a bench in which revolved a circular saw, had at his side a pile of the slabs which we had already seen cut, down in the cellar. Taking one piece at a time, he pressed it against the blade and in a few seconds it was divided into several smaller blocks of the shape of Fig. 1.

Fig. 1.



The blocks vary in dimensions according to the size of pipe to be made. Very little of the wood is wasted, the odd pieces being all worked up into stems or small pipes.

Fig. 2.



The blocks as soon as cut are passed over to the turners. Standing beside one of the workmen, we watched him as he placed the piece in the lathe chuck. A pressure of the boring tool, and the interior of the bowl of the pipe was excavated, then a part of the exterior was turned; and finally the block was reversed and, in a few revolutions, the end for the stem completed. The entire operation did not occupy more than ten seconds, the pipe, when thrown to one side, appearing as in Fig. 2. Still it was far from finished. It had to be carved into shape, and, to witness the process, we were conducted to another part of the room where the filers were at work. Each operative had before him a revolving disk, one side and the edges of which were cut coarse or fine, like files. This instrument removes the wood in either large or small quantities as may be desired. If the pipe is to be ornamented, the finer files are used to cut away minute portions. The workmen are all well skilled, and reproduce apparently intricate designs with wonderful accuracy.

The most delicate work, such as faces, flowers, etc., are cut by hand. We noticed that, in carving heads, it was evidently the intention of the manufacturers to meet the fancy of the German portion of our population, as there appeared to be an unusually large number of profiles of King William, Bismarck and Moltke.

After the carving is completed and a hole drilled for the stem, the pipe is thoroughly sand papered by holding it against a revolving wheel covered with that material. This done, it is passed to the burnisher where a brilliant polish is given to the wood by allowing it to rest against a rotary disk made of layers of chamois leather.

We next passed to the finishing room where, seated at long tables, we found a number of workmen engaged in fastening to the pipes the pewter tops and covers, together with the small bits of chain and bands which hold the stems and mouth pieces in place. The latter are manufactured from the tips of horns which are brought from the comb makers for the purpose. These tips are turned to the shape desired, holes drilled through their length, and then they are bent into shape by the action of heat and finally colored black by a peculiar kind of dye. When completed, they are carried to the finishing room and there attached to the pipes. Nothing further remains to be done but to pack the finished

pipes in boxes, label and mark them, and they are ready for the market.

The factory which we have described manufactures over one hundred and fifty gross of pipes weekly. Other woods beside briar root are used, none, however, equaling it in durability and beauty. Among these are apple, cherry, mahogany and poplar, which are made into the cheaper pipes, which cost from nine to twelve dollars per gross. The most expensive articles are made from the briar root and carved by hand, costing some twelve dollars per dozen.

THE ENGLISH BUILDING TRADE LOCK-OUT.

As we chronicle the latest phases of the eight hour uprising in this city, the cable brings us the news of the great lock-out which has lately taken place in the English metropolis. Twenty thousand workmen, mostly belonging to the building trades, having struck for reduced hours and increased wages, have been thus retaliated upon by their employers, and have consequently been thrown into idleness and forced to rely upon the societies and unions for their daily support.

The agitation for less hours of labor was commenced in London in 1853. The masons were the first to make the demand, though they were almost immediately joined by the carpenters and joiners. Both trades eventually agreed to a proposal made by the masters, by which, although the number of working hours was not diminished, their wages were increased sixpence a day. In 1858, the nine hour question again came up, and in 1859, under the leadership of George Potter, a noted agitator, the bricklayers, masons, and carpenters united in the formation of trades' unions in support of the movement. In July of the last mentioned year, the operatives in one of the largest establishments in London struck, a proceeding which was promptly met by a grand lock out of some 24,000 workmen by 224 of the principal manufacturing firms. After a struggle of nearly eight months in duration, a reconciliation was effected by the masters agreeing to withdraw a certain document, whereby they pledged themselves not to give employment to union or society men.

The nine hour movement was thus virtually abandoned, only, however, to appear again in 1871 when a general uprising of the engineers took place throughout the kingdom. Long and bitter controversy ensued, resulting in the yielding of the masters and a concession of nine hours as a day's work to this branch of trade.

Encouraged and emboldened by this victory, the carpenters and joiners recently revived the question and demanded that a day's work shall consist of nine hours labor, except on Saturdays, when they shall only be required to work six hours and that their wages shall be increased to nine pence, or eighteen cents of our money, per hour—a change amounting to the reduction of the number of hours per week from fifty-six to fifty one, and an augmentation of their weekly wages of about seven pence or fourteen cents in our currency. The masters refusing to accede to these terms, the workmen of two of the principal firms struck and left work.

The employers then threatened a general lock-out, but mindful of the heavy losses which they would necessarily be compelled to undergo, and at the same time not wishing to resort to such an extreme measure without giving their men time to deliberate on the consequences thereof, they proposed an appeal to arbitration, and named the Earl of Derby and the Marquis of Salisbury as their representatives. This overture was rejected by the strikers, and the menaced lock-out was enforced. Not only have the carpenters and joiners—the originators of the movement—been thus served, but the masons, bricklayers, and all others employed in the building business have been summarily ejected from the factories and workshops.

The general tone of the London masters is that they consider this action of their men as capricious, "and that the time has not yet arrived when they can reasonably or fairly be expected to yield the nine hours demand with increased pay." The employers also assert that though the general effect of the strikes during the past twenty years has been to raise wages some fifteen per cent, yet this increase has been more than balanced by the large numbers of men thrown out of employment and the suffering and privations which their families have been forced to endure. Lock outs as a means of retaliation or coercion are not approved except as a last resort, but the present one is deemed justifiable in order to support the firm and unwavering resistance with which the masters declare they will oppose this outbreak.

The workmen, on their part, say that the cost of living in London is greatly increased, and they complain that they are obliged to waste much valuable time, for which they receive no remuneration, in traveling to and from their places of labor. The masons, especially, are dissatisfied with their wages, which are now eight pence (sixteen cents) per hour, making their compensation for nine hours work amount to $1.44 in our money.

In reference to this uprising, the London *Building News* is of the opinion that the workmen are much stronger than they were in 1859, that they have more money and a more perfect organization at their command, and that "if defeated now, the ultimate victory of the men is next to certain." The same journal further says that, as the prices of the necessaries of life have greatly increased, "it is not unnatural that the men employed in the building trades in London should either demand increased pay or diminished hours of labor; and so far as we can learn from personal intercourse with them, they are much less interested in increased pay than they are in shorter hours. They are determined to have shorter hours, whether they have decreased or increased pay. They say that one man out of ten is out of work, and they prefer to divide the work now done by nine men among ten men."

The London *Times* editorially considers that a vast loss will result to Great Britain from these strikes, owing to the great enhancement which will take place in the price of the products with which England supplies the world. Coal and iron will be much dearer, and as a consequence England will lose her present advantages in her resources for industrial production.

Uses of Blast Furnace Slags.

Professor Egleston says that Mr. Sepulcre, a Belgian engineer, was one of the first who successfully transformed the slag into a stone which could be generally used. This he effected by causing the slag channels to terminate in an excavation whose sides had an inclination of about 30°, and whose capacity varied from a half to ten cubic meters. The very steep inclination of the sides causes the section of the pits to increase very rapidly, and this allows the solid crust, which forms on the surface of the liquid slag, to rise with it without becoming attached. The slag must flow continuously into the excavation, and if, for any cause, there is an interruption, the crust must be raised to allow of the liquid material flowing underneath. In this manner, the whole mass of slag in the pit is sure to be all liquid, and will solidify from above and under pressure. After the excavation is full, it is left for 5 to 10 days to cool, the only precaution required being to cover the top with ashes or sand to a sufficient depth to prevent the mass from cooling too rapidly. The stone so produced grows hard on exposure to the air. When first made, it can be easily broken into any required shape, but after exposure for a period more or less long, it becomes so much harder as to require double the number of tools to work it.

All kinds of slags are not suitable for this manufacture; those which contain too much lime fall to pieces on exposure. In general, it may be said that they should contain from 38 to 44 per cent of silica, and that the furnace should be working well.

Mr. Minary, Director of the Franche Comte Iron Company, conceived the idea of using the slags by granulating them as they flow from the furnace. To do this, the trough through which the slags run is made to terminate in a stream of water which has sufficient velocity to carry the grains of slag into a pit prepared for it, from which it is charged into wagons, without further expense, by an endless chain with buckets.

The granulated slag was first used as gravel in the works, and to make the bed of the casting house. It was found that, from such a casting bed, the pigs came out clean and bright, and were preferred by the puddlers even to those cast in iron molds. This method of using the slag is now of almost universal application in the Siegen district, in Prussia, where most of the furnaces run on spiegel.

As these uses consumed but a very small part of the slag, it was offered as ballast to the railroad companies on condition that they should remove it themselves. As the size of the grain can be easily regulated by the velocity and direction of the water, the railroad companies were not slow to avail themselves of these conditions, and soon were glad to pay for it, thus furnishing to the furnace company a revenue from what had previously been a source of expense. The granulated slag weighs 1,200 kilogrammes the cubic meter. Its cost in France, where it is used, is less than half the price of sand. It is exceedingly porous, so that it retains very little moisture, and yet packs sufficiently; the result is that it will bear transporting for long distances, as it is much cheaper than ordinary gravel and better adapted to the purpose of ballast.

The manufacture of bricks from this material immediately suggested itself. It is simply mixed with lime, pressed, and sun dried. It is very extensively used on the Rhine and in its vicinity. These bricks give a light cheerful air to the buildings, and make a warm and exceedingly comfortable house at a very small cost. It is remarkable what can be done when the necessity exists. I saw, at Kreuznach on the Rhine and in the Siegen district, bricks made from ordinary coal ashes mixed with lime and sun dried, which had stood, during several years of exposure, with no sign of deterioration. The manufacturer assured me that there were seven or eight large establishments for the manufacture of this coal ash brick in Germany.

By coating the surface of the unburned brick with granulated slag and then burning it, out of the direct contact of the coal, it was found to produce an enamel of different colors, varying with the composition of the slag. In making fire bricks, calcined sand is replaced by granulated slag. It is proposed to use this material in the manufacture of bricks for the puddling furnace.

Another application of the granulated slag is its use for agricultural purposes. The important part which carbonic acid plays in rendering soluble the different mineral substances which plants require for their growth is well known. The very fine state of division to which it may be reduced at a very small cost is favorable to its decomposition in the soil.

Blast furnace slags gelatinize in acids, and they are, therefore, very suitable for the manufacture of cement. Pélouse and Frémy, in the last edition of their work on general chemistry, cite them as being eminently fit for this purpose. In certain parts of Germany an artificial cement, equal in every respect to the best Portland cement, is manufactured from them at a price so low as to yield a large profit, and yet very much undersell the Portland. Very large works for the manufacture of this artificial cement are, during this year, to be constructed.

Considerable attention has been paid in Belgium and Germany to the use of the slags for the manufacture of chemical products. These were first salts of alumina, then salts of lime as an incidental product, and lately the use of the silica extracted for the manufacture of soluble glass.

In certain conditions of the furnace, the slag is spun by the blast into fine fibers, and makes a substance which is sometimes called "furnace wool." This material is a very bad conductor of heat, and it has recently been proposed to use it as packing, to prevent loss of heat about boilers, etc.

[We have in our possession samples of this wool. It resembles ordinary white cotton in appearance.—EDS.

Chromic Acid.

Chromic acid occurs in brilliant crimson needles, which deliquesce by exposure to the air. When pure, it is almost odorless. Its aqueous solution has a sour metallic taste, and a rich amber or reddish brown color. It is very soluble in water, sparingly soluble in chloroform, insoluble in the fixed oils and fats. As an antiseptic, disinfectant, and preventive of germ growth, chromic acid stands "second to none." So says Professor Dougall, in the London *Lancet*.

The coagulating power of chromic acid in albuminous solutions has been compared with that of most metallic salts, various acids, etc., and found to exceed them all; for example, it has about ten times the coagulating power of carbolic acid, fifteen times that of nitric acid, twenty times that of bichloride of mercury, and a hundred and fifty times that of chloralum, etc.

Chromic acid coagulates, hardens, and oxidizes decomposing organic matter. It combines simultaneously with ammoniacal products and with nascent sulphuretted hydrogen, reducing the latter to water and free sulphur. Added to putrid blood, flesh, pus, urine, or fæcal matter, the offensive odor is soon absolutely removed, the mixture remaining fresh for an indefinite time. Dr. R. A. Smith found that bichromate of potassium surpassed thirteen other of the most energetic antiseptics, including carbolic acid, in preventing the evolution of sulphuretted hydrogen in a mixture of equal parts of blood and water. This salt has a coagulating power near that of nitric acid, that is, fifteen times weaker than that of chromic acid.

As a preventive of germ life, chromic acid surpasses sixty-six other chemical bodies consisting of irritant, narcotic, and narcotico-irritant poisons, including all the known antiseptics and disinfectants, except two or three substances, with which it has not yet been compared. In this respect it greatly excels carbolic acid, the average preventive strength of which, in three aqueous solutions of hay, urine, beef juice, and egg albumen, is only 1 to 400, while that of chromic acid is 1 to 3,300.

Earth Poultices.

In further illustration of the value of earth for external application, mentioned on page 9 of our last number, a correspondent, Mr. H. Gallup, of Norwalk, Ohio, sends us the following:

"As the season of bites of reptiles is near, I send you a simple and easily obtained remedy for stings or bites. It is a plaster of clay, or, instead of clay, common swamp or gutter mud, applied as soon as possible to the wound. I have tried it on myself. In one case, I was stung, by a numerous swarm of the yellow hornets, in many places in my neck and arms. I went to a swamp near, the poison being so severe that my sight was much affected. I immediately applied the mud, and, in half an hour, I went to mowing again, with only a small sore lump round each sting. I knew a neighbor who was bitten by a rattlesnake some miles from home; his companion left him and went for help as fast as possible, it being just night. He was not able to return until morning. When going, he met the man returning, with the poison conquered. He had got to a swamp, dug a hole with his tomahawk, inserted and buried the bitten place in the mud. That was all."

Increase of Tea Drinking.

A late member of the London *Grocer* publishes the tea statistics of the United Kingdom for the past seventy-one years. In 1801, the quantity of tea consumed was 23,730,150 pounds, the average price of which was four shillings two pence half penny per pound. The population then numbered 15,828,000 souls, making the yearly amount of the beverage drunk by each person average one pound eight ounces.

In 1871, the consumption had risen to 123,401,889 pounds, but the price had fallen to one shilling, ten and a half pence per pound. The total population had grown in numbers to 31,513,000, and we judge that the taste for tea must have increased in the same ratio as its cost decreased, as in the last mentioned year the average of each individual was three pounds fifteen ounces.

WATER LEVEL INDICATOR.—M. Plaudié, an engineer in Imphy, has designed a new water lever indicator for vertical boilers, in which the water stands from 20 ft. to 25 ft. above the ground, and which is consequently difficult to observe directly. He obtains the indications of the level at a convenient hight by the difference in pressure of two liquid columns, the one having a fixed hight, and the other being variable according to the change of level in the boiler. These differences in the pressure are indicated by the movement of a mercurial column inclosed in a U tube, which communicates at each end with one of the tubes just mentioned. This apparatus works very well in the shops at Seraing and other establishments.

IMPROVED ELLIPSOGRAPH.

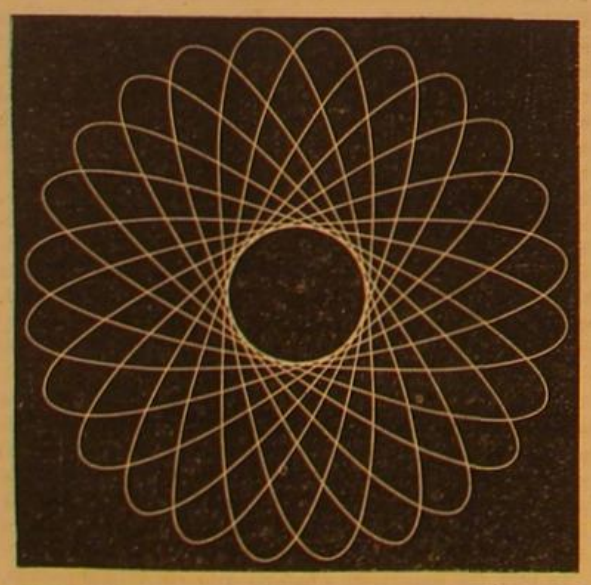
We have pleasure in laying before our readers the accompanying engraving and description of a very beautiful instrument for describing ellipses, invented by Mr. Arthur W. Browne, of Bloomfield, N. J. It is correct in principle and perfect in operation.

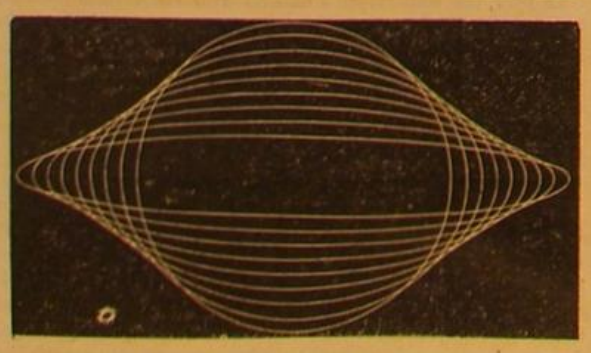
Fig. 1 represents the instrument standing in position to describe the elliptic outline partly shown; and from this figure, a general idea of the operation may be at once conveyed.

A is the fixed center upon which the instrument is worked; B is a revolving center which has a planetary motion round A, and C is the pencil point which moves, like a satellite, round the center, B. It will require no explanation to show how these compound motions compel the pencil point to travel in an elliptic path. We will proceed to explain how they are produced. D is a geared wheel attached to the central upright standard. E is a sleeve from which projects an arm carrying the axis, F, on which the loose intermediate gear, G, runs. To the lower part of this axis is adjustably attached the arm and sleeve, H. Within the sleeve, H, is placed the shaft which carries the revolving center, B, to which the adjustable arm carrying the pencil is attached. This shaft is rotated by the small gear, I. The operation is as follows: The central standard is held firmly in position while the sleeve, E, is revolved by means of the thumb wheel shown in Fig. 1. Motion is thus communicated through the arms to the center, B, which is carried round A in a circle. Motion is also caused in the intermediate gear, G, by which it is conveyed to the small gear, I, and the pencil is consequently carried round the center, B, while B is being carried round A.

In Fig. 2 are shown a pen, which may be used in lieu of the pencil seen in Fig. 1, and arms of varied length on which either may be carried; also a gage, J, the use of which will be explained hereafter.

The instrument can be made to describe ellipses of any given diameters (within, of course, its compass) with either of their axes on any given line. To adjust it for size and form, the long and short diameters of the required ellipse are added together and divided by four, which gives the distance at which the centers, A and B, should be set; the short diameter is then subtracted from the long and the remainder divided by four, which gives the distance at which the pencil point should be set from the center, B. To describe the proposed ellipse with its long diameter on a given line, the gage, J, is placed on the three points of the instrument shown at A, so that the star marked on each may coincide. The center, B, and the pencil point are both brought to its edge, and the three points at A are pricked upon the given line, while the edge of the gage is perpendicular to it. The gage is then removed and the ellipse described.





The instrument will, no doubt, prove very valuable for various uses. Figs. 3 and 4 are diagrams made by it which illustrate its capability very forcibly.

It was patented May 14, 1872, and further information respecting it can be obtained of Mr. C. P. Ladd of the Ridgewood Works, Bloomfield, N. J.

Increase of Invention in Belgium and Italy.

We have noticed of late a large increase in the number of new inventions both domestic and foreign patented in Belgium and Italy. The "*Bulletin du Musée de l'Industrie*," an excellent scientific monthly published in Brussels, Belgium, contains a list of over 160 patents issued in that country for the latter half of the month of April, and also presents illustrations and a translation of the description of Jewell and Steele's high pressure boiler alarm, obtained from the columns of the SCIENTIFIC AMERICAN.

From Italy a new periodical comes to us entitled "*Le Industrie e le Privative Industriale*" in which we find a full description, accompanied by engravings, of Massey's rotary engine, for which due credit is given to our journal. For the month of May, 50 patents were issued by the Italian Government.

This increase of inventions argues well for the future progress of both countries, and the promptness with which their industrial journals republish novel and valuable American labor saving devices proves that the latter are as gladly welcomed and the genius of their inventors as fully appreciated by the people of Europe as by the public of the United States.

Fig. 2

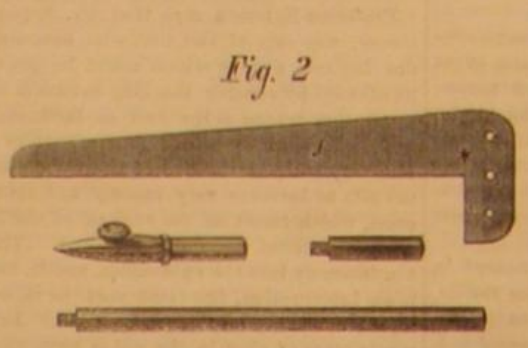
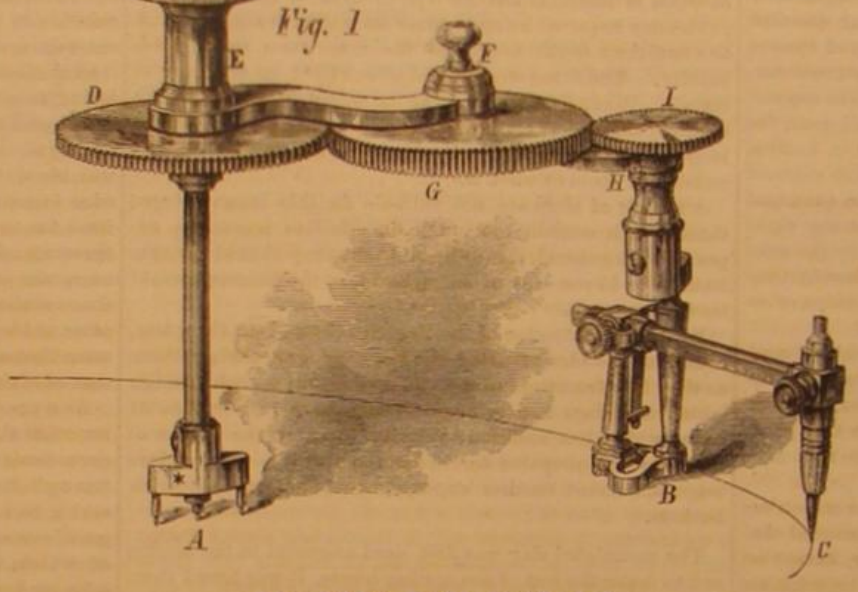


Fig. 1

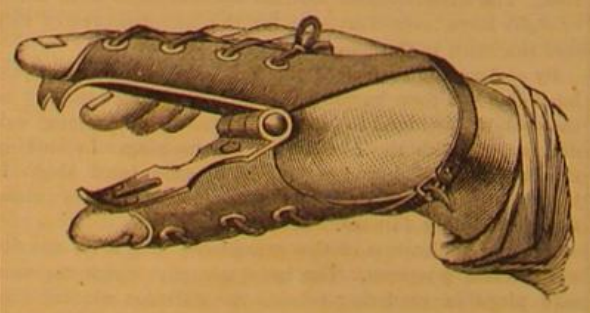


BROWNE'S ELLIPSOGRAPH.

CORN HUSKER AND PICKER.

The device we illustrate is designed to afford protection to the hand while picking or husking corn, and is claimed by the inventor to be effective and to render these operations very easy to the person performing them. Its construction and operation will be readily understood on reference to our engraving.

Two metal plates, about an inch wide, are hinged together at their inner ends. Their outer ends are bent inward and fashioned into teeth in such a manner that, when the jaw thus formed is closed, the plates are nearly parallel, and the under tooth fits closely between the two upper ones. The plates are respectively fastened to a thumb and finger stall which are both joined to a wrist strap. In using the device, the



forefinger and thumb are inserted in the stalls, the hinged joint is drawn back so as to fit into the angle formed by them, and the wrist strap is fastened by a buckle. Thus armored, the ear of corn can be broken off from the stalk and afterwards husked without any chance of injury to the hand, for it is grasped by the metallic plates instead of the fingers, and that portion of the hand which would otherwise be most exposed is protected by them and by the finger stalls. The form of the teeth insures a very firm hold on that part of the husk seized by them and, altogether, hand husking is made so easy by the aid of this appliance that the inventor thinks the use of machinery for this purpose, with its attendant waste of fodder, may well be dispensed with.

A patent was granted May 7, 1872, to the inventor, Mr Samuel H. Mitchell, of Lacon, Ill. Further information may be obtained by addressing the Mitchell Manufacturing Company, as above.

Tea Drunkards.

Dr. Arlidge, one of the pottery inspectors in Staffordshire has put forth a very sensible protest, says the *Lancet*, against a very pernicious custom which rarely receives sufficient attention, either from the medical profession or the public. He says that the women of the working classes make tea a principal article of diet instead of an occasional beverage; they drink it several times a day, and the result is a lamentable amount of sickness. This is no doubt the case, and, as Dr. Arlidge remarks, a portion of the reforming zeal which keeps up such a fierce and bitter agitation against intoxicating drinks might advantageously be diverted to the repression of this very serious evil of tea tippling among the poorer classes. Tea, in anything beyond moderate quantities, is as distinctly a narcotic poison as is opium or alcohol. It is capable of ruining the digestion, of enfeebling and disordering the heart's action, and of generally shattering the nerves. And it must be remembered that not merely is it a question of narcotic excess, but the enormous quantity of hot water which tea bibbers necessarily take is exceedingly prejudicial both to digestion and nutrition.

The Development of the Lobster.

According to Mr. S. J. Smith, in the *American Journal of Science*, the first stage of larval life finds the little animal a free swimming schizopod, about a third of an inch long, without any abdominal appendages and with six pairs of legs, to which are attached powerful swimming organs. The eyes are bright blue, and the body is orange to reddish orange in color. The second stage show an increase in the size of the little animal, and a development of a portion of the abdominal legs, with other and less important changes. In the third stage observed, the animal has become half an inch long, the anterior legs have largelyi ncreased in size, the second and third pairs are furnished with claws, the abdominal appendages have become conspicuous, and the "pockets" have appeared, though they yet differ from those observed in the adult. The fourth stage finds the young lobster three fifths of an inch long. It has lost its schizopodal features and has become to all intents and purposes, an actual lobster.

It is still, however, a free swimming animal, moving through the water very rapidly by means of the abdominal appendages, and darting backward when disturbed, with the tail, frequently jumping out of the water like a shrimp. It is probable that there is yet another stage of development before the complete lobster is reached. From the data obtained, it is also probable that these changes all take place in the course of a single season.

COMBINED FLASK AND WHISK.

If, in his travels at night, the reader's coat and throat gets dusty, he now has the means supplied whereby the dust may be removed from both in the morning, and his wife be none the wiser, if he can manage to be absent minded enough to forget the customary kiss when he starts out to business after breakfast. While he is brushing his clothes, he may take a pull at the concealed flask in the handle of the whisk, thereby recovering his damaged appetite, without fear of a reproachful look from his better half. Porters in hotels and professedly temperate gentlemen, who wish a sly nip on their travels, will also see their opportunity in the present invention, but, it is to be hoped that Bridget, who presides in the kitchen, will not be equally perceptive.

The flask is made of tin, glass, or other material, of ordinary or special shape, and is concealed by wrapping to it the brown straw in ordinary manner, an elastic wrapping being interposed between the straw and the flask. The flask is provided with a stopper having a ring by which the whole may be hung up, in which case the device is probably the most innocent looking of any yet invented by bibulous mortals for the surreptitious concealment of fluids. This invention was patented Nov. 21, 1871, by Louis T. Pyatt, of Philadelphia, Pa., who, had he brought out his invention when the Maine liquor law was enforced in most of the States might have made his fortune.

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A PLEA FOR COMMON SENSE.

In our number of June 22, there is a communication entitled "A Plea for the Classics," in which the writer quotes the following sentence from our article of May 25: "Not only are physics and mechanics more pleasant studies than Latin, and chemistry more interesting than Greek grammar, but we assert that a man can make more money by applying a more superficial knowledge of that science than by a much more profound knowledge of the dead languages." On this our correspondent replies; "From the above, one would draw the conclusion that money making was the chief end of man. If that be so, the writer is correct. But man was born for a higher purpose than the simple attainment of wealth. I maintain that every man who comes into the world was put here to make humanity better," etc. This seems to be unfair dealing, as the paragraph preceding that about money making, which our correspondent does not quote, runs thus: "Scientific knowledge has its claims on us to be cultivated for its own sake, as well as literature, poetry, or music; we must not solely pursue it for the sake of money making, but first for its beauty and beneficial influence on our minds, and consider the profit, often the consequence of scientific investigation, as a secondary matter, but an important one at the same time, in which science has a decided advantage over literary and poetical pursuits." And further: "All the great agents which have reformed the modern relations of man are due, not to literary and poetical, but to practical scientific pursuits," etc. Our correspondent does not answer this, but comes only with the argument that, in scientific names, many words are derived from the dead languages; well, what of it? Science does not consist in words to be remembered, as our correspondent appears to suppose when he says that "the dead languages compel the mind to think correctly, to rely on judgment, not on memory, whereas mathematics and natural sciences give exercise only to the latter."

Every one who has studied mathematics and natural sciences as well as languages, knows that the reverse is exactly the case; there is no study in existence in which there is such a complete series of logical reasoning as in mathematics, and where memory alone without reasoning is totally inadequate; there is no science in which the practical judgment of men is more exercised than in the study of the natural sciences, that is, the study of Nature which surrounds us and of which we are ourselves a part. It is the study of God's handiwork, while the study of languages is that of mere human invention, the memorizing of mere words; as every language contains a few thousand of them, which have to be remembered before the grammar is of any use whatsoever, who can deny that it is exactly in the study of languages that the memory receives the most active training?

It is the misfortune of those who, like this correspondent, have received a one sided mere classical education that they foster the delusion that language and the study of grammar are the chief end of man, while in fact languages are only the vehicles by which knowledge of facts can come into our minds. We are much in favor of the study of languages, and it must not be confined to Latin and Greek, but include a few of the living languages of the nations foremost in civilization, not for the trifling and selfish satisfaction that we can enjoy the originals better than a translation, as this correspondent states in regard to Homer, but for the more rational reason that we will not be confined to those works which translators choose to publish in the English tongue, but be able to go to the original source, and get our treasures of information at first hand.

The statement of our correspondent that a man of the "most profound knowledge" on any science could not deliver a lecture on that subject without making some stupendous grammatical mistakes, if he is ignorant of the classics, is too strong an assertion. And if it were wholly true, his "profound knowledge" of his subject would be such a redeeming quality that a mere grammatical mistake would by no means make him "a laughing stock of the community." We suspect that those, if any, are becoming the laughing stock of the community whose training has been so one sided and neglected in the most essential branches that they have no knowledge of anything else but the classics and who suppose that this knowledge is everything in this nineteenth century, who are ignorant of the agencies which govern the world in which they live, or of the properties of the materials of which their own bodies are made, and who know nothing which can be of practical benefit to mankind.

Surely the chief end of man is not money making, but the first thing he must know is how to make a living for himself; if he cannot do that, how can he fulfil his purpose, which our correspondent states to be "to make humanity better for being in this world?" It is not the question: What may be good to know? but first: What is absolutely needful? And in order to fulfil what "society demands" so that man may be "prepared for the battle of life" in this nineteenth century, mathematics and natural sciences must be studied more, if possible, in combination with the classics, but if need be, at the expense of the classics. Have we not scores of eminent and highly successful men who never studied the classics, and do the latter in general make a man's life useful to his fellow men in the same degree as is the case when his study runs more on practical subjects?

The custom of a so called classical training is simply a relic from the middle ages, when there did not exist anything worth studying but the writings of the classical authors, when the languages spoken had no literature, and when no branch of knowledge was properly systematized except that of the dead languages. Cicero's expression, quoted by our correspondent, applies as well to a system of education based on scientific as to one based on literary training; and no doubt if Cicero, who possessed an eminently progressive spirit, could see the present condition of the branches of human knowledge, he would be foremost in recommending a thorough reform in our collegiate courses.

Many of our most eminent men, who surely cannot be suspected of underrating classical training, as they themselves received it most thoroughly, are of the same opinion, because by also studying sciences they became able to estimate all knowledge at its comparative value. We will only name one of those: President Barnard, of Columbia College, is also insisting on such a reform, and his influence on the venerable institution of learning under his charge will undoubtedly have the most benignant result on the future of its graduates.

LETTERS FROM PROFESSOR THURSTON.

Professor R. H. Thurston, of the Stevens Institute, Hoboken, N. J., has gone on a professional tour of observation among the iron and mining regions of the country. During his travels, he will make notes for the SCIENTIFIC AMERICAN, and the information thus placed before our readers will be found fresh, interesting and valuable. Professor Thurston is a clear and ready writer. The first of this series of letters will be found on another page of the present paper.

PROGRESS OF THE EIGHT HOUR STRIKE IN NEW YORK.

The excitement is dying out. The movement is a failure. Eight weeks of idleness are producing their effects, and the disheartened workmen, unable to make further sacrifices or to support their families on the pittances allowed them by the Unions, are slowly abandoning the movement and are returning to their labor at old hours and old wages.

The principal event of the past week has been the rapid growth, both in numbers and influence, of the iron and metal workers supporting the strike. During the fifth week of the movement, when its utter defeat seemed most imminent, one John Roach, a workman in Roach's Iron Works, gathered together half a dozen men and went around among his trade singing comic songs of his own composition containing humerous hits against the employers. As he travelled from one body of men to another, he organized meetings and finally succeeded in founding the present league of iron and metal workers, which now numbers several thousand men, has more money than any other union, and may be considered as leading the movement.

Numerous meetings of the different unions and societies have been held during the week, but nothing of importance has resulted from their deliberations. On the evening of the 21st ult., an indignation meeting was held at the Cooper Institute, during the progress of which several highly inflammatory speeches were made. One Mackey threatened revolution, and warned the employers to remember Paris in '93. "When the aristocracy of Paris refused bread to the working men, there followed a scene in which those same laborers revelled in the finest halls and palaces of the city." A set of resolutions of similar tenor was adopted, in which it was stated that such action as might be necessary would be taken to protect the workmen against the police, and to "resist any further acts of violence and brutality, on the part of them or any other tools of the enemies of the industrial masses."

A fiery individual by the name of Blessart who "had been ruled by British bayonets," remarked that he had never seen "such tyranny exercised over any people as that which seeks to crush down the New York working men at the hands of roughs clothed by a government of thieves." He concluded his bloodthirsty harangue by observing that he did not know much about this country, and that he did not wish to augment his stock of knowledge in relation thereto until it changed from a country of "thieves, murderers, and policemen."

The work of this meeting, however, was promptly disclaimed and repudiated by the large majority of the strikers the President of the Metal Workers' League saying that he was sure that the working men would frown down any attempt to draw them into scenes of outrage and riot. If they could not, by stout hearts and clear heads, gain the terms they demanded, they would bare their strong arms for work and not for war, and prove that they could manfully and hopefully bide their time."

On the 25th ult, the sugar refiners returned to their labor under the old terms. These men had more right on their side than any other trade on strike, and, next to the German and metal workers' leagues, they were the largest organized body of workmen in the city. The withdrawal of their support has been the most powerful blow the movement has yet received. The piano makers have also all succumbed, each man, it is estimated, having lost over a hundred and fifty dollars by the strike. In the shops of the New York Central and Hudson River Railroad, the movement is at an end, all the hands, with the exception of the ringleaders who were refused re-engagement, being at work under the old system. The men of the Delamater iron works and those of a large number of other factories throughout the city have recently surrendered, while those from similar establishments that still hold out are making overtures of compromise.

The New York *Tribune*, in a carefully prepared article, points out the cost of the movement, so far as could be learned from estimates gathered mainly from employers. The number of workmen employed when the shops are full is 82,938, of whom 61,050 have struck. 36,050 men are working under the eight hour system. Of this large number 3,500 are bricklayers, 10 000 are day laborers, 3,000 are carpenters, all of whom gained their demands at the beginning of the movement, and the balance is made up principally of workmen connected with the building business. The piano-forte makers, sewing machine makers, and brass founders have completely failed. 23,424 hands are working ten hours a day without advance of wages. 4,800 house painters also labor ten hours, but receive extra pay. 11,498 men are estimated to be still on strike, but this number has been largely reduced since the article was published. The loss to the employers is fixed at $2,043,550, and to the workmen in wages $1,674,950. These statistics cover about forty trades, there being of course others regarding which accurate information could not be obtained. It is believed that the figures here given as the amount of the losses incurred would extend over a period of one month, so that for a year the total direct loss to both employers and workmen would reach the sum of $41,814,000. Leading members of different trades state that if eight hours should be conceded as a day's labor, the effect would be as follows: Piano makers would raise their prices one third; carriage makers, 25 per cent; marble workers would be unable to continue business in the city; the furniture trade would increase their prices 25 per cent for fine furniture, 15 per cent for medium, and from 7½ to 10 per cent for cheaper goods. The cost of production to brass founders would be augmented 25 per cent. Clothing would advance 30 per cent. The great majority, representing all trades, unite in belief that, in case of their acquiescence to the demands of the strikers, outside competition would force them to abandon work in New York, an opinion the correctness of which is admitted by the workmen themselves.

As regards the indignation meeting above referred to, which had a fit sequel in the repudiation of its resolutions and the unhesitating acquittal of the policemen against whom charges had been brought, we can only express our surprise that American workmen should allow themselves to be influenced by such firebrands as Blessart and Mackey. The remarks of the former person on bayonets, standing armies, thieves, and murderers were out of place and absurd. These men are not Americans, nor do they know anything of our institutions. They merely rant communism and wild socialistic ideas here, as they would in any other country, simply to foment disorders and defy the authority of the law. The language of condemnation uttered by the metal workers is manly and sensible, and will win for them the respect and even sympathy of many who do not approve of the cause they support.

Our workmen lose sight of the fact that they are in every respect better off than their European brothers. Let them read the account of the great lock-out now taking place in England, and picture to themselves the misery that must ensue therefrom. While they are striking here for eight hours' labor and 25 per cent advance on wages that are already large, the English artisan is locked out because he ventures to demand nine hours as a day's work, with an increase of but fourteen cents a week—a mere pittance that an ordinary laborer would spend for beer in a single day. The American mechanic, if sober, honest and industrious, is the equal of the best in the land—the highest positions in the nation are open to him, and he is and should consider himself infinitely above the level of the degraded communists of France, or the uneducated hopeless drudges of other European countries.

There is a fair prospect, we are gratified to learn, of this dispute being settled by amicable arbitration, and it is reported that the Citizens' Association and the Commissioners of Emigration of this city have proffered their good offices in the matter. We thrust that this plan will be carried out, and that no obstructions will be opposed to it either by employers or workmen. It has been fully demonstrated that the eight hour system cannot be adopted at present, as its only effect would be to increase the cost of every product of our industries to such a degree as to render our competi-

tion with foreign labor impossible. Let the workmen, then, submit their views to arbitration peacefully and with moderation; and if the employers meet them, as we think they will, in a spirit of forbearance and reason, we have no doubt but that a compromise will be effected, satisfactory and honorable to both parties.

THE EAST RIVER BRIDGE.

The third Annual Report of the New York Bridge Company has recently been published and contains much interesting information relative to the progress in the construction of the great suspension bridge between New York and Brooklyn.

The tower on the Brooklyn side has been carried up to an elevation of 100 feet above high water and within 20 feet of the roadway. During the winter months, the old boom derricks have been removed and a new set of hoisting machinery placed in position.

On the New York side, the past eight months have been entirely occupied in sinking the caisson for the New York tower, an operation rendered especially disagreeable from he fact that the site selected had been, for some years past, a dumping ground for garbage and refuse, so that the mud was filled with decayed animal and vegetable matter. The total weight of the caisson is 7,000 tuns, and it is considered twice as strong as its counterpart on the Brooklyn side. At a depth of 18 feet and under a load of 53,000 tuns, not the slightest weakness or deflection of the roof could be observed even when the main frames and edges below were entirely dug out and not resting on the ground. Outside of the masonry, a coffer dam has been carried up to a hight of 25 feet. The chief benefit derived from this structure was that the masonry could be laid below the water level during most of the winter, and the work of sinking the caisson could therefore proceed without interruption. At present, the coffer dam has been designedly filled up with sand and forms part of the timber dock extending to the tower masonry.

Twenty-five courses of stone (granite and lime stone) have been laid on top of the timber reaching to a hight of 50 feet and amounting to 11,700 cubic yards of masonry. Sand was removed from the caisson by means of the air system, being discharged at a depth of 60 feet through a 3 1-2 inch pipe continuously, for half an hour at a time, at the rate of one yard in two minutes. This represents the labor of fourteen men standing in a circle around the pipe and shoveling as fast as their strength would permit. The material passes from the pipe with tremendous velocity, stones and gravel often being projected to a hight of 400 feet. In order to deflect the sand at the top of the pipe at right angles, both wrought and cast iron elbows were used, but as it was found that these were rapidly cut through by the blast, solid blocks of granite were substituted.

The concrete for filling the chamber in the caisson is all mixed above and let down through the supply shafts ready for distribution below. No brick pillars were used as under the Brooklyn caisson, the bearings of the frames being so wide as to be equal to all contingencies when once uniformly packed under with concrete. The stones, earth and sand, left in the caisson during the sinking, were sufficient to fill one third of the space; and since the concrete is going in at the rate of 80 to 100 yards per day, it is probable that the chamber will be filled in the early part of this month. Final exit will be had by the water shafts.

The effects of the compressed air in the caisson, on the workmen, were not so serious as at first anticipated, but two cases of death resulting directly therefrom. As the pressure increased, the working hours below were gradually reduced from four to two per day. An ingenious mechanical telegraph devised by Colonel Paine was used for keeping up communication between the upper and lower portions of the work. For illuminating purposes, ordinary street gas was used, sixty burners giving all the light required. It was noticed that in the compressed atmosphere all the gas lights became sensitive flames, answering to the stroke of a hammer on a piece of iron or even to the tones of the voice.

Chief Engineer Roebling, in concluding his report, recommends the early acquisition of the ground required for at least one anchorage, so as to make a beginning this season and utilize the coming winter by putting in the foundation.

Having proceeded thus far, the bridge company now ask the New York Board of Apportionment for more funds, requesting the sum of $300,000, being a 10 per cent instalment of the subscription of this city toward the expense of the structure. An inspection of the statement of receipts and expenditures in the report before us shows that the receipts of the company, from stock paid in, rent, sale of New York bonds, etc., amount to $2,923,624 26, while the expenditures reach the sum of $2,905,389.49, leaving a balance on hand of but $18,234.77. Consequently, from the original sum subscribed, $5,000,000—$1,500,000 from New York, $3,000,000 from Brooklyn, and the balance from private individuals of both cities—nearly $3,000,000 have been expended, and yet the structure is but little more than barely commenced. At war prices, the estimates of Mr. John Roebling, who planned the bridge, did not exceed $4,000,000 for the entire work.

A system of swindling and corruption has been proved to exist in the management of the affairs of the company which is simply disgraceful. The New York *World*, having made investigations into the matter, states the members of the New York and Brooklyn rings, who formed the majority of the private subscribers, have not paid in a cent of their subscriptions. The latter were shams, employed merely to hide the too palpable intention of defrauding the corporations of New York and Brooklyn. An individual by the name of William C. Kingsley, a corrupt and notorious member of the Brooklyn ring, holds the position of general superintendent. This man has been authorized to receive five per cent on the expenditures incurred in the work, so that for his proportion of the spoils he has secured $125,000 on disbursements of something over $2,000,000. Chief Engineer Roebling is the actual superintendent, and fulfils the requirements of the position; while Kingsley's duties seem to consist in selling material from his own mills to the company at an enormous profit, and then pocketing, in addition, five per cent of the expenditures therefor. So far from the cost of the entire structure being but four or five millions, it is evident that, unless some measures be taken to rid the company of such vampires as the Brooklyn ring, forty millions will not cover the amounts that will be squandered and stolen. The whole course of the management is an outrage upon the tax payers of both cities, and we trust that no further funds will be allowed until reforms are instituted.

We pointed out, when the question of a suspension bridge across the East River was first agitated, that the expense of such a structure in the location selected would be much greater than the estimates published. If such a means of crossing were absolutely necessary, it might as well have been thrown over near Blackwell's Island, where the stream is much narrower. In our opinion, bridges are not the most suitable means of transit that can be devised.

Tunnels can be bored under the bed of the river with the utmost facility. The present bridge will at a low estimate, even if honestly managed, cost at least twenty million dollars and will require several more years to be brought to completion. On the other hand, the same company that are making the excavations at Hell Gate, we are informed, offer to construct a tunnel under the river for one million dollars, and we have no doubt but that the work could easily be performed, with the aid of the greatly improved machinery now in use, within a year's time. In fact, for the amount which will be expended on this single bridge, at least six tunnels can be opened between different points of the two cities, thus affording much more extensive, effective and less costly means of intercommunication.

[Special Correspondence of the Scientific American.]

LETTER FROM PROFESSOR R. H. THURSTON.

PITTSBURGH, Pa., June 25th, 1872.

A visit to the iron and steel works at Trenton, N. J. Cutting iron beams with toothless saws. The Siemens furnace and the Martin steel. The eight hour strike. Iron ship building in Pennsylvania.

A professional tour of observation among the great iron and the most interesting mining regions of the country can hardly be made as comfortably, at this season, as a trip to the seashore; but, when engagements forbid attempting such an excursion in May or October, it may be still found quite profitable enough to justify an engineer in taking the summer months for it.

Leaving New York on such an errand a few days since, we made our first stop at Trenton for the purpose of visiting the works of

THE NEW JERSEY IRON AND STEEL COMPANY, AND THE TRENTON IRON COMPANY.

The first named, unfortunately, were not in operation on that day, and we were compelled to satisfy ourselves with an inspection of cold furnaces and of rolls at rest.

Between 600 and 700 men are usually employed at these works, in the production of 2,0000 tuns of iron and steel annually, of a quality that has made their proprietors deservedly celebrated. Many large iron beams and "channel bars" are rolled here, some of the former being fifteen inches in depth. We had the pleasure of witnessing the interesting and somewhat singular operation of sawing some of these immense beams to length, while cold, with a saw made of soft steel and without teeth. The work was done rapidly and well, and the edge of the saw, when its work was done, was left so cool that the hand could be placed upon it without great inconvenience, although the showers of burning iron torn from the beam during the operation had led us to suppose that the saw itself would become highly heated. The saw, we were told, wears well and saves considerable expense by enabling the beams to be cut to length when cold.

At these works a Siemens gas furnace is used in the manufacture of "Martin Steel" on the open hearth. The process consists simply in the reduction of the proportion of carbon in selected brands of cast iron, by adding to it, when melted, the necessary quantity of wrought iron, and working in spiegeleisen, as in the other methods of steel making, to correct any defects arising from the presence of impurities. It is beautifully simple, and when carried on in the Siemens furnace, where the flame can be made oxidizing, deoxidizing, or neutral, and where the temperature can be kept perfectly under control, it possesses many advantages over older processes, where it is worked with carefully selected stock. As the steel need not be tapped off until it is of the desired quality, the product may be made uniformly right.

We noticed here that all the heavy tools about the mill were driven each by its own engine, making them all independent of the main engine and saving the expense of driving heavy shafting many hours to do a few minutes work.

The Trenton Iron Company employ about 300 men, and produce the finest grades of iron wire in the market—hard and tough and wonderfully uniform in quality. Both of these firms have acquired this very great reputation by a constant and conscientious attention to quality of product even more than by their great enterprise.

A large number of men are employed in the iron works and the potteries of Trenton, but there seemed to be no indications of a desire to "strike." It is hardly probable, however, that it is because they have learned from that experience which has driven work from London within the past few years, and which has just seriously crippled many branches of trade in New York by driving business away to other parts of the country.

THE EIGHT HOUR STRIKE.

It is unfortunate that our people have yet to learn, by bitter experience probably, that if labor is worth fifty cents an hour, the great economical law which controls the relations of supply and demand will defeat the attempt of any combination of capital to get the hour of labor for less money, and that, if labor is worth but thirty cents an hour, no combination of labor and no amount of "striking" will secure more for it except by simultaneously raising the price of the necessaries of life in even higher ratio, thus leaving the working man worse off than before. They have, apparently, also still to learn that a reduction of working hours means a reduction of production and corresponding increase in price of all products of labor in full proportion. So long as these simplest laws of political economy are not taught in our common schools, it remains the duty of the press to teach conscientiously one of the most important lessons which our people have to learn, and to impress upon working men the fact that if capital receives more than its share of profit, a fair distribution can only be secured by the working men becoming capitalists, by combination and coöperation—the true object of "trades' unions," and the only way in which their members have been really and permanently benefitted.

IRON SHIPBUILDING IN PENNSYLVANIA.

From Trenton we went to Philadelphia, where we visited several very extensive ironworks, and where we were particularly interested in the iron shipbuilding yard of Messrs. W. Cramp & Son. This firm are building four large iron steamers for the American "Atlantic S. S. Company," and are employing upon them over 1,000 men.

These vessels are over 350 feet long, more than 40 feet wide, and, when laden ready for sea, will weigh about 5,000 tuns. Their hulls will probably weigh 1,600 tuns.

They will be driven by engines of 2,000 horse power, as measured by the usual engineer's standard, but the real power required to propel such vessels can be best imagined by those unfamiliar with such things when they are told that, to do the work of such steam engines as they do it, day after day and even week after week without stopping, would require a stud of nine thousand good draft horses, and such a number would make three "string teams," to work eight hours per day each, that would be more than four miles in length each, or if all driven together, would extend thirteen miles.

All of the materials entering into the construction of these vessels are American, and the iron of the hulls is of much better quality than that usually put into British built vessels. The workmanship is excellent. I have seen none better in the best shipyards of the Tyne or the Clyde. They have beautifully "fair" and graceful models.

COMPOUND STEAM ENGINES.

The engines are the most effective form of "compound" engine—the form which, it has been recently stated, could not be built in this country because, as alleged, our constructing engineers are unfamiliar with its construction (!)

I was kindly allowed to examine the drawings very minutely, and admired the neatness of their design, their excellent proportions, and the evident familiarity of their designer with the principles involved in this latest form of the marine steam engine.

It is singular that our builders are so slowly taking hold of this style of engine. They have seen it coming forward, steadily gaining ground, for many years past, as steam pressures have gradually risen; and in spite of occasional failures until within a few years, the introduction of surface condensation has removed the great obstacle to the use of high pressures, and has led the way to the adoption of the compound engine by the leading builders of the world.

The cause of our conservatism can hardly be a difficulty in finding engineers capable of designing such engines, for although it is true that it requires a more thorough acquaintance with principles and methods than the old engine, we still have many engineers who can produce quite as good designs as any found abroad.

Messrs. Cramp & Sons are among those who do not propose to be left behind in this matter. R. H. T.

DESIGN PATENTS TO FOREIGNERS.

Strenuous effort was made during the last session of Congress, by some of our large carpet manufacturers, to get the law allowing protection to foreigners for designs repealed.

The bill was not reached, therefore no action was taken before the adjournment; but we learn that it is contemplated, at the next session, to attach a repeal clause to other amendments of the Patent law which the Commissioner will recommend, and so cut all foreigners off from protecting their designs for carpet patterns and other fabrics. This will be a retrograde step, and Congress may as well go a step further and repeal all law for the protection of inventors from abroad.

But there is no knowing what these gigantic carpet corporations may not accomplish; therefore we advise all foreign manufacturers to avail themselves of the present law to protect their designs before the next meeting of Congress.

AMONG the best conductors of sound are iron and glass. Through them sound is transmitted at the rate of 17,500 feet, or over three miles, per second. But in air sound travels only 13 miles per minute, or 1,142 feet per second.

THE NEWARK INDUSTRIAL EXHIBITION.

The Industrial Exposition which is to be inaugurated on the 20th of August next in Newark, N. J., is to be similar in character to those which have proved so successful in Birmingham and Manchester, England. Its especial aim is to demonstrate that the population of Newark, numbering 115,000, bring forth products embracing almost the entire range of man's handicraft.

The example set by Newark in thus encouraging the industries within her limits is an excellent one, and deserves to be followed by all our manufacturing towns and cities. Such exhibitions if properly conducted are of the utmost value not only as a stimulus to the devising of new inventions, but also toward the carrying of those already in the market to a higher degree of excellence. A healthy competition and rivalry between producers is also engendered, and at the same time the business and consequent wealth of the locality is increased from the fact of the manufactures in which it excels being brought directly to the notice of the public at large.

The Time Planets would take to Fall into the Sun.

M. Flammarion makes the following remarks, on this subject, in *Les Mondes:*

Supposing the Earth to be arrested in its course, and the centrifugal force thus destroyed, the Earth, being left to the first force, would fall to the sun with a uniformly accelerated motion. It would take about 64 days in its fall, and would reach the sun with a velocity of 600,000 meters in the last second, or at the rate of about 360 miles for that second.

The following are the figures obtained from a calculation of the time the planets would take to fall to the center of the sun, supposing their motion to be arrested. (The calculations are based on the mean distance of each planet from the sun.)

Mercury	15·55 days.
Venus	39·73 "
Earth	64·57 "
Mars	121·44 "
Jupiter	765·87 "
Saturn	1901·93 "
Uranus	5424·57 "
Neptune	10628·73 "

Superior Safety of Paraffin Oils.

Dr. William Wallace, of Glasgow, communicates to the London *Grocer* the results deduced from a number of experiments made by him with a view of testing the applicability of heavy paraffin oils, better known as mineral lubricating oils, to the process of "batching" or preparing jute for spinning, and also for wool spinning, more especially with reference to the risk from fire supposed to exist in factories where these oils are used. He states that the flash points of paraffin oils vary from 293° to 338°, and as the lowest of the temperatures is far above the boiling point of water and any degree of heat to which any part of a spinning mill could possibly be exposed unless it were actually on fire, they appear to offer perfect safety to spinners of jute or wool. Fatty oils have a higher flash point, but the real danger consists in the generation of heat by the oxidation or insensible combustion to which all these oils are subject, although at different degrees. A rag of cotton waste, saturated partially with linseed oil, kept in an ordinary apartment, will sometimes break out into open combustion in the course of a few hours; and Turkey red dyed calico, prepared with olive oil, cannot be left for more than an hour in a heap without very serious risk of a conflagration occurring. The drying oils, such as linseed, are the most dangerous, and those which have the least tendency to become by exposure thick and rancid are the safest; Dr. Wallace considers that the paraffin oils are safer than any fatty oil because they have no tendency whatever to "heat" when in contact with fibrous materials.

"THE American Vacuum Brake," the invention of Mr. J. Y. Smith, of Pittsburgh, has been applied to cars at Boston, Mass. The time occupied, in bringing the train to a full stop at speeds from 25 to 30 miles per hour, varies from 26 to 30 seconds, and the distance from 672 to 1,152 feet. The general construction of the brake is analagous to that of the Westinghouse; the power employed, however, is the pressure of the atmosphere produced by creating a vacuum instead of that due to compressed air.

PUDDLING BY PETROLEUM.—It is asserted by the French technical journals that the experiment of using petroleum as fuel in the puddling furnace, which has been in progress at a large iron producing establishment during three months, has proved itself to be very successful. In point of convenience, efficiency and in the superior quality of the iron produced, it is asserted that petroleum affords the best fuel that has yet been employed.

IN the onion, there is found a peculiar oil containing sulphur, called the sulphuret of allyle. The odor of the breath after eating onions is caused by the presence of a small quantity of this oil, which is exhaled in breathing.

MERCURY is sometimes found in a pure state; but it generally occurs in the form of cinnabar, which is a red colored mineral composed of mercury and sulphur. In its pure state mercury is volatile, vaporizes at 662° Fah. and solidifies at 39° below zero.

Facts for the Ladies.—Mrs. S. D. Joyce, Kingston, Mass., has used her Wheeler & Wilson Lock-Stitch Sewing Machine since 1867, in general sewing, sometimes changing her silk or thread twenty or thirty times a day, working as easily as with hand needle. See the new improvements and Woods' Lock-Stitch Ripper.

Brilliancy of Complexion.—For its preservation Burnett's Kalliston is guaranteed.

"Our Favorite Sewing Machine."—The cheapest and best Sewing Machine now manufactured for family use is probably the New Wilson. We certainly would use no other. It works with equal facility on muslin, woolen, cloth, cambric, tarletan, flannel and leather. It does not paralyze the spine, or wear out the operator in any way, neither does it demand an incessant stoppage to find out where the difficulty is. There is no difficulty. It runs smoothly and evenly, hems, fells, tucks, gathers and binds. It does the finest and most beautiful work on cambric and linen. It also has the merit of being cheaper than any other first-class machine, as it can be purchased for $50. The feeding device is an improvement on all other machines, and a special patent of the Wilson. It does not get out of order, nor break needles, nor slip, nor pucker the cloth. So complete has the Wilson Sewing Machine been made, by a skillful combination of brain and muscle, that it has left nothing to be desired." Salesroom, 707 Broadway, New York; also for sale in all other cities in the United States.

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For Sale—To R. R. Contractors: Two second hand direct-acting Locomotives, 12 tons and 20 tons weight—in good running order. Address Grice & Long Loco. Works, 1340 Beach St., Philadelphia, Pa.

R. R.—The improved "Broughton" Lubricators, Oil Cups, and Oilers, manufactured by H. Moore, 41 Center St., New York, are decidedly the best.

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Walrus Leather for Polishing Steel, Brass, and Plated Ware. Greene, Tweed & Co., 18 Park Place, New York.

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Situation Wanted—To take charge of a Boiler Shop or turn Flanges. Is used to Marine and Locomotive Work. Address James T. Connelly, 443 N. 6th St., Philadelphia, Pa.

G.W. Babcock, Providence, R.I., wants a Watchmaker, of good habits, honest and faithful, competent to a nice job, without mutilation.

For Hydraulic Jacks and Presses, New or Second Hand, send for circular to E. Lyon, 470 Grand Street, New York.

For Marble Floor Tile, address G. Barney, Swanton, Vt.

Wanted—A 2d Hand Boiler of about 3 horse power. Whitney Arms Company, New Haven, Conn.

For Vertical Portable Engines and Saw Mills, apply to Griffith & Wedge, Zanesville, Ohio.

For the latest improvement in Stationary Engines and Saw Mills, write to Griffith & Wedge, Zanesville, Ohio.

Wanted—A situation under instructions in draughting room by a young man who is a machinist. Address J. S. C., care of B. F. C., Princeton, New Jersey.

Pattern Letters and Figures, to put on patterns, for molding names, places and dates on castings, etc. H. W. Knight, Seneca Falls, N.Y

For the simplest, cheapest, and best Rotary Pump in use for thick or thin liquids, send for circulars to Hersey Brothers, So. Boston, Mass.

Wanted, Patent Glove Clasps made. J. L. Weir, Dresden, Ont.

Wanted—Iron Planer, of 5 to 6 ft. square by 12 to 16 ft. long, capacity. Must be new, or as good. Will exchange for some choice selected lands situated within 5 to 10 miles of Rail Roads in Northern Iowa. John Cooper & Co., Mount Vernon, Ohio.

The best Bolt Forging Machines are those that work vertical, and forge Bolts any length horizontally. For such, address John R. Abbe, 39 Charles Street, Providence, R. I.

To Capitalists—Two valuable Patent Rights for Sale or exchange for other property. For particulars, address John J. Baringer, Germantown, Columbia Co., N. Y.

Persons in want of Portable or Stationary Steam Engines, or Circular Saw Mills combining the latest improvements, should correspond with Sinker Davis & Co., of Indianapolis, Ind.

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Three fourths saving of fuel, by the Ellis Vapor Engine (Bisulphide of Carbon) is running the Haskins Machine Co's Works, Fitchburg, Mass. To whom apply.

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Write for Chemicals, Crude Materials, and Drugs for Manufacturers' use, to L. & J. W. Feuchtwanger, 55 Cedar Street, New York.

Steel Castings to pattern, strong and tough. Can be forged and tempered. Address Collins & Co., 212 Wat., Street, New York.

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For hand fire engines, address Rumsey & Co., Seneca Falls, N.Y.

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies, see Manufacturing News of United States in Boston Commercial Bulletin. Terms $4.00 a year.

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Kelley's Chemical Metallic Paints, $1, $1·50, $2 per gallon, mixed ready for use. Send for cards of colors, &c., 116 Maiden Lane, N.Y.

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All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

Diamonds and Carbon turned and shaped for Philosophical and Mechanical purposes, also Glazier's Diamonds, manufactured and set by J. Dickinson, 64 Nassau st., New York.

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If you want to know all about the Baxter Engine, address Wm. D. Russell, office of the Baxter Steam Engine Co., 18 Park Place, N.Y.

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Tested Machinery Oils—Kelley's Patent Sperm Oil, $1 gallon; Engine Oil, 75 cts.; Filtered Rock Lubricating Oil, 75 cts. Send for certificates. 116 Maiden Lane, New York.

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

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Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $4. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

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The most economical Engine, from 2 to 10 H.P., is the Baxter.

Over 800 different style Pumps for Tanners, Paper Makers, Fire Purposes, etc. Send for Catalogue. Rumsey & Co., Seneca Falls, N.Y.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]
From June 7 to June 12, 1872, inclusive.

DIFFERENTIAL PULLEY.—T. A. Weston, Ridgewood, N. J.
FASTENING FOR REPORT LID.—G. Stancliff, J. R. Floyd, New York city.
INK FOUNTAIN.—Hopson and Allen, New York city.
LOCOMOTIVE ENGINE, ETC.—J. Harrison, Jr., Philadelphia, Pa.
LUBRICATOR.—J. S. Eggleston, Auburn, N. Y.
PERFORATOR.—G. Harrington, New York city.
SELF CANCELLING STAMPS, ETC.—C. G. Johnsen, New Orleans, La.
STAIR RODS, ETC.—E. J. Smith, Washington, D. C.
STEAM PUMP.—A. J. Reynolds, New York city.
STUFFING BOX GLAND.—J. N. Colby, of Mystic, Conn., Glasgow, Scotland.

FOREIGN PATENTS—A HINT TO PATENTEES.

It is generally much better to apply for foreign patents simultaneously with the application in the United States. If this cannot be conveniently done, as little time as possible should be lost after the patent is issued, as the laws in some foreign countries allow patents to any who first make the application, and in this way many inventors are deprived of valid patents for their own inventions. It should also be borne in mind that a patent is issued in England to the first *introducer*, without regard to the rights of the *real* inventor; therefore, it is important that all applications should be entrusted to responsible agents in this country, who can assure parties that their valuable inventions will not be misappropriated. The population of Great Britain is 31,000,000; of France, 37,000,000; Belgium, 5,000,000; Austria 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address

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NEW PATENT LAW IN CANADA.

By the terms of the new patent law of Canada (taking effect September 1st, 1872) patents are to be granted in Canada to American citizens on the most favorable terms.

The patent may be taken out either for five years (government fee $20), or for ten years (government fee $40) or for fifteen years (government fee $60). The five and ten year patents may be extended to the term of fifteen years. The formalities for extension are simple and not expensive.

In order to apply for a patent in Canada, the applicant must furnish a model, specification and duplicate drawings, substantially the same as in applying for an American patent.

American inventions, even if already patented in this country, can be patented in Canada provided the American patent is not more than one year old.

All persons who desire to take out patents in Canada are requested to communicate with Munn & Co., 37 Park Row, N. Y., who will give prompt attention to the business and furnish pamphlets of instruction free.

Messrs. Munn & Co., have had twenty-five years experience in the business of obtaining American and Foreign Patents for inventors; they have special agencies in nearly all countries where patents are granted. Moderate charges and prompt attention may always be expected.

MUNN & CO., 37 Park Row, N. Y.

Notes & 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.]

1.—SMELTING IRON WITH PETROLEUM.—Has petroleum ever been used as fuel in an iron smelting furnace, and can it be done with good economical results?—J. S.

2.—CARDBOARD SPOOLS FOR RIBBONS, ETC.—What varnish should be used in the making of cardboard winders for ribbons and aces? Shellac dissolved in alcohol is good, but it is too expensive.—A. R.

3.—COLORING IVORY.—I should like to learn, from some of your readers, the method of dyeing ivory billiard balls red.—E. S. H.

4.—FLEXIBLE MATERIAL TO WITHSTAND HEAT.—What flexible material will stand the action of fire and heat, the degree of heat not to exceed that of a stove pipe?—L. M. S.

5.—PROPORTIONS OF STEAM ENGINE.—In a condensing steam engine, what proportion should the condenser bear to the cylinder?—D.

6.—SHOEMAKERS' INK.—How can I make this preparation? The ink must be of a good black color, and must not thicken or mold. One that can be made easily will be preferred.—L. R.

7.—SOLUBLE GLASS AND THE TEREDO.—Will several heavy coats of soluble glass, applied to the bottom of a boat, be a sufficient protection against the worm in salt water that gives so much trouble?—A. L. S.

8.—THE SUN AND THE ZODIAC.—Considering the theories prevailing in regard to the earth's orbit, it is perfectly natural to presume that a line drawn from the first point of *Aries* to the first point of *Libra* would cut through the sun's center. Will some one inform me if observations have ever ultimately established the fact? If so, by whom taken, and where may I find an account of the same?—D.

9.—CONCRETE BUILDING.—Can any one give me information respecting concrete building? What proportion of Roman cement is used to sand, ashes, and stone? What is the average cost of such building per square foot? Would it be practicable for me to carry out such a building with the aid of day laborers only, with carpenters' aid for the woodwork? Are there any persons who make a specialty of such building?—R. W.

Answers to Correspondents.

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.

NICKEL PLATING.—C. A. S. will find a full description of a process on page 16 of Vol. XXVI. of the SCIENTIFIC AMERICAN.

MENDING BELLOWS.—W. S. H. should use the preparation described on page 138, Vol. XXV. of the SCIENTIFIC AMERICAN.

ICE MACHINES.—To W. A. C., of Ga.—We know of no small cheap ice making machines in this country.

INFLAMMATORY RHEUMATISM.—We could not send A. B. any advice on the subject of this complaint. A properly qualified medical man should be applied to, and nostrums and advertised specifics avoided

BOILER SCALE.—W. M. K., of Ill., does not name the mineral of which the scale consists. Different deposits require different remedies.

PHOSPHORESCENT LIGHT.—R. L. Y., of Kansas, will find directions for making a phosphorus light on page 10 of No. 1, Vol. XXVII. of the SCIENTIFIC AMERICAN. The cork must be removed occasionally, as the phosphorus will not burn without a supply of oxygen.—D. B., of N. Y.

OCEAN CABLES.—To H. F. H., query 2, page 416, last volume.—The Atlantic cables lay on the bottom of the ocean, which, along their whole course, is covered with a fine silt well adapted to preserve them from the action of currents which may exist, even at the enormous depth to which they are submerged.—D. B., of N. Y.

TEST FOR ZINC.—To J. B. query 10, page 416, last volume.—The salts of zinc are easily detected with a blowpipe flame. Evaporate some of the water and submit the residue to such heat, using carbonate of soda therewith, and burning them on a piece of charcoal. The metallic zinc will soon appear and will volatilize, becoming reoxidized on contact with the air, and a sublimate will fall on the charcoal. This deposit is yellow when hot, and turns white on cooling. The protonitrate of cobalt, when added, exhibits a fine green color.—D. B., of N. Y.

ELECTRO-SILVERING GERMAN SILVER.—Query 5, Vol. XXVI., page 401.—If J. H. will use a small or weak battery, so as to deposit the silver very slowly, it will be very soft and perhaps not need annealing.—S. G. S.

CONDENSER WITH RHUMKORFF COIL.—To S. G. S., query 18, page 385, Vol. XXVI.—I constructed a Rhumkorff coil with condenser, and had the same difficulty as S. G. S. I think it is caused by the platinum terminals being heated by the spark, and fine particles of platinum are detached and carried from one pole to the other, and the action of the hammer weids the two surfaces together. I would suggest to S. G. S. to make his spring stiffer at the point where the platinum plate is soldered.—F. M., of N. J.

FORCE OF FALLING BODIES.—If J. E., query 18, page 385, last volume, will multiply the weight of any falling body, in pounds, by the hight of the fall in feet, he will have the force of the blow in foot pounds. Leaving friction out of the question, the force of the blow of his hammer is precisely equal to the force expended in raising it, namely, 6,000 x 4 = 24,000 foot pounds. Converted into heat, this force would be competent to raise the temperature of one pound of water a little more than 31°, thus: 24,000 divided by 772 equals 31·09 units of heat.—W. H. P., of Iowa.

RECOVERING SILVER.—To C. O., query 1, page 385, Vol. XXVI.—Evaporate the solutions to dryness, burn the paper, and add the ashes; dissolve the lot in dilute nitric acid. Precipitate pure metallic silver by putting a piece of clean copper in the solution. Wash the powdered silver clean with rain water, and redissolve in only enough dilute nitric acid. Put the solution of nitrate to crystallize.—E. H. H., of Mass.

ACTION OF RUNNING WATER ON LEAD PIPE.—To G. G. E., quary 10, page 385, Vol. XXVI.—There is no probability that the water will be at all poisonous from taking up any lead from the pipe, especially if the water is hard.—E. H. H., of Mass.

PHOSPHORESCENT OIL.—To H. W. B., query 5, page 385, Vol. XXVI.—Cannot be done. Presence of the air is necessary to phosphorescence.—E. H. H., of Mass.

ECCENTRIC WHISKERS.—To A. S. R., query 4, page 385, Vol. XXVI.—These result probably from deficient nutrition, and possibly constitutional ill health. Where the general health is and has been good, the hair in any part does not usually suffer. Clip your whiskers occasionally, and do not use a very alkaline soap. Most, if not all, of the popular hair preparations and hair dyes are most pernicious, and ought to be driven out of the market.—E. H. H., of Mass.

SPECTACLES.—To J. Y., query 13, page 385, Vol. XXVI.—For short, long, or aged sight, spectacles should be of perfect material, ground to proper focus to suit the peculiar wants of the organ, and thoroughly polished. "Eye sharpeners," as they are called, should never be used without professional advice. The eye is too delicate to tamper with.—E. H. H., of Mass.

VACUUM IN CASKS.—In reply to X., I cannot see what "the screw motion of the liquor," or "terrestrial gravitation," or the "variation, from the perpendicular, of the plummet suspended from the collar of a deep shaft" have to do with the mere pressure of the atmosphere keeping water in the cask. Molasses having a greater specific gravity than water could not be raised to the same hight as water, nor could the liquid mercury rise so high as molasses. If X. takes a hollow hemisphere and fits (by grinding) to it a hemisphere of iron, and then cleans the surface of each, places them together so as to squeeze out the air, so that it cannot enter between the sides, he will find, on inverting the whole arrangement, that the pressure of the atmosphere will be sufficient to prevent the solid mass of iron from falling out of its cup. The force of gravitation would naturally make the lump fall, but it is overcome by the atmospheric pressure. So in the case of the glass of water with the paper over it; for convenience sake, we may say that the paper contributes to afford to it some of the properties of the solid iron—to wit, impermeability of the air and consequent suspension of the whole. The same principle is applicable to the cask; fill it with water, and have the bung hole accurately covered with thin paper, turn upside down, and the water will not flow out.—E. H. H., of Mass.

MOUNTING PRINTS.—To E. D. W., query 11, page 370, Vol. XXVI.—Make a thin size of fish glue or isinglass. Take a good sized flat varnish brush, wet the brush with the size just sufficiently to moisten the surface of the print to the extent of the width of the brush and the whole length of the print. Commence at one side and continue in this way until you have gone over the whole surface. Draw the brush with a light, quick stroke, as closely each time to the part previously wet as possible, without lapping or going twice in a place. When dry, go over it again in the same way, only at right angles to the first stroke. Let this dry, then proceed to mount as follows: Stretch as tightly as it will bear while tacking, to a frame of the required size, a piece of new, smooth fine muslin or factory cloth. Rub over the whole surface of this, with a good paste brush, a sufficient quantity, of well cooked paste made of equal parts of wheat flour and starch, to thoroughly wet the cloth. Lay the print on to it, and, with a piece of clean paper covering it, rub it down, on both back and front side, until smooth and fast. When thoroughly dry, varnish with white copal varnish.—G. W. T., of N. Y.

RECOVERING SILVER FROM WASTE SOLUTIONS.—To C. O., query 1, page 385, Vol. XXVI.—Burn the silvered paper in an iron kettle in the open air if no air is stirring, or elsewhere where there can be no danger from fire, putting it on to the flame a little at a time until all is burned. Carefully collect and save all the ashes, as they are precious. Pulverize and mix together 8 parts niter (saltpeter), 4 parts carbonate of soda, 1 part cyanide of potassium; and mix these with 32 parts of the burned paper ashes. Put this last compound, or any part thereof, into a crucible, place this into the fire of a blacksmith's forge, bringing the fire well up around the side of the vessel. Blow the fire carefully until the mass is brought to a boiling, red hot state, shortly after which take it from the fire and quickly invert it that the flux may all flow out before cooling. Pour it anywhere, on or about the forge, where there is dirt, sand, or ashes, so that, for the sake of convenience, the flux will not adhere to the brick or stone work. When cold, which will be in a very few moments, break, with a hammer, the flux away from the center, which you will find to be a button of pure silver. I have never tried the residues from silver washings, but have no doubt they can be reduced in the same way. I have a lot on hand, some precipitated with salt, some with sulphuret of potassium, and some with lime. I shall try these soon and, if desired, will report results. Old chloride of gold solutions, I precipitate with sulphate of iron, managing the residue in this why, often obtaining a button of pure gold as large as a robin's egg. All of these precipitates should be collected by filtration or other convenient method, and dried thoroughly before smelting.—G. W. T., of N. Y.

Recent American and Foreign Patents.

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

HANDLE FASTENING FOR TRAVELING BAGS.—Morris Sehwerin, of Newark, N. J.—This invention is an improvement on his handle fastener, patented July 4, 1871. It consists in forming the fastener of a hollow cylinder which is open at one end and outwardly flanged at both. A corrugated band is passed round the cylinder between the flanges, and its ends are brought together, passed through a slot in a small plate and bent outward. The plate is then riveted to the bag. The end of the handle is then inserted in the cylinder and fastened therein by a screw which is passed through a hole or slot in the band. The two ends of the screw, which goes completely through the cylinder, are allowed room for play either under the corrugation of the band, or in slots formed therein, as may be most convenient.

FASTENING FOR JEWELRY BOXES.—Henry Hoefer, of Brooklyn, N. Y.—This invention consists in improving the cushions or pads of jewelry boxes, and stands so that the wire of the article to be held is secured by a clamp instead of being stuck through the cloth covering. Any approved arrangement of spring jaws may be used for the purpose; that, however, being preferable in which the jaws are opened by pressure on the movable one towards the cushion to which they are attached.

SLED BRAKE.—Jonathan Moon, of Spring Valley, Minn.—This invention furnishes a simple, convenient, reliable, and automatic sled brake, which is so arranged as to apply the brake whenever the sled tends to move faster than the horses, with a force proportioned to the forward pressure of the sled; it consists mainly in the employment of a roller, which is made square, and to the diagonal corners of which are firmly secured two rods. The lower rod extends through the runners and eccentrically pivots the roller to the runners. The upper rod does not extend to the runners, and to it are pivoted the rear end of the tongue braces. To the upper rod, near its ends, is also pivoted the forward ends of the two connecting rods which operate the dogs or brakes. By this construction, when the sled tends to move faster than the horses, the forward pressure of the sled carries the lower angle of the roller forward, while the tongue presses its upper angle backward, causing the rods to operate the dogs and retard the sled. As soon as the horses again begin to draw, the reverse movements take place, and the dogs are again drawn up into the runners. By another ingenious arrangement, the dogs are held up while backing the sled.

STOVE PIPE SHELF.—John Hecker Betts, New Canaan, Conn.—This invention furnishes an improved support for stove pipe shelves, and consists of a base that stands on the top of the stove and supports a vertical bar which is hooped to the stove pipe. From this bar project at intervals short brackets which support pivots on their upper sides, and on these pivots the shelves are mounted.

DOOR LATCH.—William H. Mott, New York city.—This invention furnishes an improved latch, which consists of two overlapping and slotted bolts which are worked by pins and shoulders in connection with a lever of peculiar form so as to be drawn back by the key, and which are kept shut by a double wire spring. It may be placed on either the right or left side of a door which makes it a very convenient lock for cupboards etc.

MACHINE FOR MAKING WIRE TUBES.—William C. Edge, of Newark, N. J.—This invention relates to a new machine for manufacturing, from metal wire or links, continuous fabrics of tubular or other form on a small scale for jeweler purposes, or on larger scales for practical uses of various kinds. The principle of the invention consists in the arrangement of a reciprocating tool which expands the meshes that are put through completed loops of the fabric. By thus being expanded, the meshes become absolute and well connected parts of the entire fabric, and constitute loops for the reception of new meshes, to be expanded in turn. In this manner fabrics of various designs are rapidly and accurately made by automatic process, and cheaply produced. The invention consists, further, in various details such as the mechanism for shaping the wire on its way to the expander, the means of imparting the necessary motions to the several devices of the machine, the arrangement of spring jaws for the reception of the expander and other devices.

WASHING MACHINE.—Anton Hochweber, Troy, Indiana.—This invention furnishes an improved washing machine, which is so constructed that it washes the clothes quickly and thoroughly, and without injuring even the most delicate fabrics; it consists mainly of an oscillating box, to the inner ends of which are attached corrugated blocks. Between these is placed a beater formed of a series of horizontal boards, whose ends fit into the corrugations of the blocks. These boards are fastened to two upright boards, and rollers are attached for the beater to run on. In using the machine, the clothes to be washed are divided into two parcels, which are placed in the box upon the opposite sides of the beater. A sufficient amount of water and soap are then put in, and the box is oscillated upon its pivots, the beater passing from end to end of the box and compressing the clothes between it and the blocks alternately. As the beater moves in either direction, the water rushes through the spaces between the horizontal boards upon the clothes in the rear of the beater, and assists in washing them.

TOP FOR HEATING STOVE.—Harry Whittingham, New York city.—This invention has for its object to supply cylindrical and other stoves with ornamental sheet metal tops, and thereby reduce their expense and weight without in the least diminishing their usefulness or durability. Heretofore, cylindrical and other stoves with ornamental tops had them made of cast iron. The improvement consists in making such tops of sheet metal, and stamping or spinning the same into the requisite raised or ornamental form.

CAR COUPLING.—Horace W. Barnum, Omaha, Nebraska.—This invention furnishes an improved car coupling, which will couple itself as the cars are run together, and uncouple itself should one of the cars turn over in either direction; it will couple cars of different hights with the same facility as though they were of the same hight, and admits of their being coupled with the ordinary coupling link and pin when required. The details of the construction would not be understood from a verbal explanation.

CAR COUPLING.—Charles Layton, Matawan, N. J.—This invention relates to a new and useful improvement in couplings for railroad cars, and consists in the construction following: Under the draw head of the car truck projects a hanger, to which is pivoted at its center a cross bar or lever. To the forward end of the lever is pivoted the coupling pin, and to the rear end the uncoupling box. Both pass upward through the draw head—the pin sufficiently far to engage with the coupling link, and the bar right through so that it may be operated from above. A spiral spring is attached to the lever and draw head in such a manner as to hold the coupling pin in place when in use. The coupling link is simply a bar with holes to receive the coupling pins. When the cars are uncoupled, the bar is held up by means of a notch therein, which hooks on to the top of the draw head. When two cars come together to be coupled, the end of the coupling link strikes the bar and forces it from the top of the draw head, when the coupling pin is thrown up by the recoil of the spring and the cars are coupled automatically.

EYE GLASS.—John Cadman, Chatham Village, N. Y.—This invention relates to a new manner of arranging the springs on eye glasses, with the object of introducing a more rational mode of holding them to the nose than is at present in vogue. It consists in setting the glasses at nearly a right angle to the spring, so that the latter clamps the nose directly between the eyes at the thin part, and not at the lower fleshy part, as heretofore, which more or less interferes with the process of breathing.

SHIELD FOR CORNS.—Benjamin Brandreth, Sing Sing, N. Y.—This invention relates to a new arrangement of a plaster for application to corns or bunions; its object is, by a judicious combination of parts, to obtain the requisite soothing or curative and adhesive properties. It consists in the combination of an annular or other shaped porous or healing plaster with an adhesive plaster, the latter serving to retain the former in place and insure its effectiveness.

STEREOTYPE BLOCK.—William A. Pinnell, New York city.—This invention furnishes an improved block for stereotype plates, which is so constructed as to avoid the loss of time now unavoidable in making up a form of plates on a printing press, on account of the irregularity in the thickness of the plates. The block is so constructed that the plates, of whatever size, can readily be secured to it by means of swiveled screw clamps and catches, or screw hooks which are screwed into holes in the face of the block as may be necessary to conform to the size of the plate. Under the block are placed wedges, which are worked by screws, and by means of which the plates are leveled.

PISTON ROD PACKING.—John W. Lynch, Richmond, Va.—This invention furnishes an improved packing which is adaptable to new engines or to those now in use. It is formed by two sets of conical sectional rings of metal, hard wood, or any other suitable substance. The sections overlap so as to make steam tight joints, and one of the sets is smaller than the other, in advance of which it is kept by projecting studs. In fitting new engines, the stuffing boxes may be bored conically to receive the packing; and in applying it to those in use, a bush provided with a conical bore is fitted into the stuffing box. The division between the sets of packing forms a steam tight oil space, into which oil may be poured through a hole in the stuffing box.

HORSE STALL FLOOR.—George W. Gordon, of Charleston, Mass.—This is an improvement on the stall floor of Z. G. Garlick, which was patented July 21. It consists, mainly, in so arranging the secondary floor as to constitute a close box or framing for the hinged part, thereby facilitating the cleaning of the stall, preventing draft of air upon the animal, and producing other advantages.

BEDSTEAD FASTENING.—Leander May, Columbus, Ga.—This invention consists in an improved method of connecting the rails and posts of bedsteads. The end of the rail is provided with one or more hooks of peculiar formation, which are let into mortises in the rail and project about an inch from the end. These mortises are covered by pieces of wood which are glued to the rail. The face of the post has a mortise for each hook of sufficient size to admit the projecting hook or the rail and allow of a downward movement after its insertion. A fastening plate is placed in each mortise of the post. These plates are made of iron, with a mortise or slot of a length equal to or about equal to the mortise in the post, and of a breadth at one end equal to the post mortise, and less at the other end, so that, when it is placed in the mortise, a part projects into the mortise in the post. It is with this part that the hook of the rail engages. The plates are inserted into the posts through slots cut (by a circular saw or otherwise) on the inside at right angles to the mortises. When they are inserted the slots may be filled with strips of wood to exclude vermin.

SEWING MACHINE COVER.—Dorcas C. Junett, Troy, N. Y., assignor to herself and Henry J. Swart, of same place.—This invention furnishes a new oil protecting cover for the Wheeler & Wilson sewing machine. The improved cover is made S shaped in cross section, and its front edge bears against the back edge of the sewing machine top plate. The back part of the cover is raised and arched so as to fit over the working rock shaft of the machine. At the under side of the cover are projecting legs which support it on the table on which the machine is secured. These legs have inwardly bent lower parts which fit against the lower plate of the machine. A ledge at the side of the arched upper part of the cover supports it on an end pin. By means of these supports the cover is made self sustaining, and, when applied, it at once fits its proper place. A spout or nozzle projects forward from its upper part at the right hand side to guide the thread and prevent it falling against the oiled part of the shaft.

SPOOLING SILK.—Henry L. Brown, of Middletown, Conn.—In spooling sewing silk for market it has been the practice to estimate the weight, of the silk on the spools, by judging the size and by weighing batches of the spools from time to time, and taking the average; but the most skillful persons fell considerably short of that accuracy which ought to be attained in this matter, for it is highly desirable that each spool s all have exactly the quantity, by weight, it is designed to have, and no more. In this invention this object is attained by employing a counterbalance in connection with the spooling apparatus. In one pan are placed the bobbins from which the silk is to be drawn; and in the other a sufficient number of weights, each of which is equal to the weight of silk intended to be wound on each commercial spool, is placed to balance it. One of the weights is now removed and the silk wound off one of the bobbins on to the commercial spool until the remaining weights balance the remaining silk. The spool, which now has its proper weight of silk, is removed, and another weight is withdrawn, when the process is repeated with another spool. This is continued until the silk is all wound off the bobbins.

ELECTRIC CLOCK.—Vitalis Himmer, of New York city, assignor to himself and Gustave Antcarieth, of same place.—This invention relates to several improvements in the mechanism for actuating clockwork by electricity, and is a perfection of the principles developed in the invention patented by him January 4, 1870. It consists, first, in an improvement of the mechanism for regulating and sustaining the pendulum vibration, secondly, in a new means of converting the vibratory motion of the pendulum into rotary motion; thirdly, in a new attachment to the arbor of the second hand of the clock, whereby, once during every revolution of said arbor, or at shorter intervals, metallic connection is established between two conductors of electricity that lead to a second or secondary clockwork, actuating the same when the circuit is established, and finally, in the arrangement of the secondary clock, and in a new pawl mechanism for insuring exactness of motion.

FASTENING FOR RETORT LID.—George Stancliff, of New York city.—This invention provides a means for securely fastening the lids of gas retorts by which the closing can be rapidly effected. At present the lids are usually closed by means of screws. Considerable time is required in opening and closing them, and more or less gas is consequently lost. In this improvement the retort lid is provided with two ears that project from its ends. For the support of one of the ears a fixed hook is secured to the mouth of the retort, while a sliding hook for the support of the other ear is fitted through the flange of the retort, and provided with a cam lever at its inner end. When the lever is swung to bear with its eccentric part against the flange, the hook is drawn back and firmly holds the lid against the retort. When the lever is swung up the lid will be instantaneously loosened, and can be removed.

LATHE FOR TURNING IRREGULAR FORMS.—Eli K. Wisell, of Warren, Ohio.—This invention relates to certain improvements on the spoke machines for which patents were granted to the inventor 3d of March, 1863, and 14th of January, 1868. The object of the present invention is, first, to provide adjustable rests for the spoke or things under operation in such a manner that the same are only supported behind the cutter head in whichever direction they may be moved longitudinally. It consists in providing two vibrating supports—one on each side of the cutter head—and in connecting their ends with a pivoted beam, which is oscillated to raise the supports alternately, and thus insures the aforementioned object. Another object is to provide a balance for the adjustable reciprocating pattern frame, whereby the same is held horizontally to keep the pattern and spokes or things under operation in the right position, and is also eased off the pattern to prevent the rapid wear of the same and of the roller with which the pattern is in contact. This second object is attained by the arrangement of a horizontal rail, which supports the front of the pattern frame, and is secured at the ends to levers that always keep it in a horizontal position, but are weighted to crowd the rail upward whenever there is an opportunity for so doing, by the elevation of the pattern frame.

GRADING PLOW.—Adam P. Hopkins, of Bentleyville, Pa.—This invention consists in a triangular grading or scraping plow with certain attachments, by means of which it is readily shifted to the right or left, or left to turn both ways alike. A long bar is pivoted to the scraper at the apex of the inner angle formed by the two sides, and extends rearward a considerable distance beyond the base, where it is provided with a star or other wheel, with points adapted to roll along the ground. This bar may be shifted from side to side of the scraper, and held at either side by a pin. Each of the rear corners of the scraper has a hook attached, and a draft chain is provided which is attached by one end to the apex of the scraper and by the other to either corner when required. If it is desired to turn the earth to the right, the chain is hooked on to the right side, and the bar adjusted to the left. By reversing the chain and bar, the plow turns the furrow to the left. To have the plow turn both ways, the chain is not engaged with either hook and the bar is allowed to hang by the pivot at the angle of the sides.

WATER WHEEL.—Walter Forward, of Battle Creek, Cal.—This invention furnishes an improved water wheel which is so constructed as to utilize almost the entire power of the water. The wheel is attached to a shaft which passes out through the side plates of the wheel case, and is supported and connected with the machinery to be driven in the ordinary manner. The face of the wheel is channeled or has flanges formed upon its side edges to form a passage way for the water. Buckets, two or more of which may be used, are placed in radial slots in the wheel, which slots extend out through the flanges so as to fully support the ends of the buckets. The escape of water through the slots of the flanges around the ends of the buckets is prevented by the plates, which are attached to the flanges in such a way as not to interfere with the movements of the buckets and not to prevent their ends being fully supported. Upon the rear ends of the end edges of the buckets are formed projections or pins, which project at the sides of the wheel and enter grooves in the inner surfaces of the side plates. The grooves upon the forward side of the wheel, where the buckets are exposed to the full action of the water, are curved upon the arc of a circle. The grooves upon the rear side of the wheel, where the water is received, are curved upon the arc of an ellipse, the entire grooves forming a continuous curve, so that the projections or pins of the buckets move smoothly and easily through them. By this construction of the grooves, as the buckets leave their discharge opening they are drawn inward, so as to pass the projecting bottom of the water box, when they are again projected to receive and be acted upon by the water. The water is confined in the channel of the wheel from its entrance to its discharge points, by a curved plate or casing, so that the buckets are under the full pressure of the water from its entrance to its discharge. The forward edge of the water box bottom is so formed as to fit into the channeled face of the wheel, and the wheel is so arranged in connection with said bottom as to receive the water upon the rear side of the wheel, above its center, so that the wheel is always operated under the full pressure of the head of water.

MACHINE FOR POLISHING THE EYES OF NEEDLES.—Rosewell Thompson, of Waterbury, Ct.—In this improved needle eye polishing machine, a series of threads is drawn from spools on a spool stand through a guide plate, and two clamping bars hold the threads from unwinding further from the spool till required, and also hold them at the proper distances apart. A large quantity of needles are then strung on these threads from which to draw from time to time the batches to be polished, which consist of one on each thread. When one batch is selected and moved forward on the threads to where they are to be worked, a second clamp is applied to the threads, between them and the reserve stock behind, to keep them separate, to keep the threads parallel, and also to hold the threads in case any break while the polishing is going on, and thus prevent the reserve stock from escaping off the threads, as would be the case if the threads were allowed to fall in case of breaking. The ends of the threads extend considerably beyond the clamps and pass through a notched guide, which keeps them parallel, and beyond this they are temporarily secured in a detachable clamp. The row of needles to be polished hang downward from the threads, and are confined at their lower ends in a clamp, which is connected to a reciprocating frame, worked by hand or other power, which moves the eyes back and forth along the threads. The threads are charged with the emery or other polishing medium, and the clamp has a handle by which it is taken in the hand to manipulate it while in motion so as to cause the polishing threads to act on all parts of the oval end walls of the eyes. The work is thus accomplished as well as when all the motions are imparted by the hands.

PLOW.—Henry Gillette, of Millville, N. Y.—In this invention improvements are made in the mode of attaching subsoil plows to the surface plows by which the depth of cut of the lower plow is readily controlled and adjusted. The subsoil plow is arranged at the lower end of a vertical bar which has a series of notches in its upper front side, and an eye on the top. These notches are made of a size to engage with a cross bar, which is made fast to the handles of the surface plow. When the bar is adjusted to the required notch, the two are held together by means of an arm which is linked to the bar below the notches and fastened in the eye on the top by means of a pin.

HARVESTER.—Christopher Lidren, of La Fayette, Ind., assignor to himself and R. Jackson, of same place.—The improvements of the present invention are applicable to the reaper which was patented by the same inventor March 30, 1869, and to the mowing machine which was patented by him September 29, 1868. They can also be applied to reapers and mowers of other construction, and appear to be of a valuable nature. They relate to the balancing of the frame, etc., the adjustment of the cutter bar, the method of working the rake automatically, and various other matters which would require too much space to explain in detail.

STEM-WINDING WATCH.—Jules A. Borel, Paul Courvoisier, and Jean Courvoisier, of Neufchatel, Switzerland, assignors to Florian Quinche and Charles L. Krugler, of New York city.—This invention relates to a new arrangement of stem winding watch, whereby the setting apparatus is automatically thrown out of gear whenever the face of the watch case is closed or the stem pushed inward. It consists in the arrangement of a peculiar slide, which actuates the clutch lever for throwing the winding or setting mechanism into gear and which has a wedge shaped attachment for contact with the fastening catch of the case. When the catch is crowded in, either by the closing of the case or by the pushing in of the stem, the slide is moved and the spring clutch lever liberated to connect with the winding mechanism.

DESK LID PROP.—Henry R. Russell, of Woodbury, N. J., assignor to himself and Isaac S. Russell, of New Market, Md.—This invention furnishes an improved prop for the desk lids of school and other desks. The prop, which is pivoted both to desk and lid, consists of two arms joined by a pivot running in a slot, and is so arranged that when pulled out straight by raising the lid it becomes fixed in that position by the engagement of a notch in one arm with a pin on the other. By the construction, when the lid is raised to its full extent and lowered quickly, the pin drops into the notch and securely supports the lid. If the lid be raised sufficiently to relieve the catch, and lowered slowly, the inclination of the prop will allow the attraction of gravity to act upon the arms and cause them to drop or bend so much that the pin will not set itself in the notch, which allows the lid to be lowered or closed. The prop thus works automatically and enables the lid to be operated with one hand, leaving the other hand free.

SHAFT HANGING.—William J. Kennedy, of Victory Mills, N. Y.—This invention relates to a new self adjusting shaft hanging, which is of such construction that the shaft is held secure and prevented from falling if one of the supporting pivots breaks. It consists, principally, in extending one of the screws that serve as pivots for the bearing through a swivel holder, and through a slot in the hanger, so that it constitutes an additional means of safety for the parts supported by the hanger, and also limits the horizontal vibration of the swivel holder, the slot being of such diameter and form as to allow of the necessary vibratory movement of the screw therein.

WIND WHEEL.—Henry J. Campbell, of Virginia, Ill.—This invention furnishes an improved wind wheel which is designed especially for operating a pump. The arms which carry the wings are attached to a hollow shaft, and the wings are pivoted to them so that they may be turned with their edges more or less to the wind. Their forward ends are connected by ropes to insure their all moving together, and two of them are connected by rods and other appliances with a rod which passes back through the hollow shaft. By means of this rod the wings are adjusted as may be required; and a bucket, which receives the overflow from the pump tank, is so arranged in connection therewith as to stop the wheel by its weight when the tank is full. Other appliances of value are attached to the apparatus.

SIDEWALK.—John Monet, of New York city.—This invention consists in providing the surfaces of sidewalks, pavements, or stair plates, whether of metal, wood, or stone, with projecting blocks or pads of soft vulcanized rubber, which are fitted in to sockets or holes formed in the material. These are so disposed as to receive the pressure of the feet when walking and prevent slipping.

SAW FILING MACHINE.—Thomas M. Chapman, of Oldtown, Maine.—This invention consists in an arrangement of driving mechanism for imparting reciprocating motion to the rod or frame by which the file is actuated, which is calculated to simplify and cheapen the construction, improve the action, and economize space. It is a further improvement in the saw filing machine illustrated on page 182 of our volume XXVI, and consists more particularly in constructing the connecting bar so that it has considerable elasticity in the direction of its vibration, which direction is the same as that of the movement of the file holding frame. In this view, it is made of two bars of tough, straight grained wood, or metal which possesses some degree of spring, and the bars are connected together by bolts, and maintained, by blocks or long washers placed between them, at a distance apart suitable for forming connections with the wrist pin of the crank shaft and the connecting pin of the file frame. Other advantages incident to the present construction were pointed out in the article referred to.

CAR BRAKE.—Stephen E. Harrison, of New Haven, Conn.—This invention relates to a new mechanism for applying the brakes to the wheels of steam or horse cars, and consists principally in connecting the brake beams by a toggle lever, to the middle joint of which are attached chains which extend to the ends of the car, respectively, where they are fastened to shafts. Pinions on the shafts mesh into sliding racks that can be forced down by the driver or attendant so as to turn the shafts and wind the chains upon them. A spring serves to keep the toggle levers distended, and thereby holds the brake shoes away from the wheels. Whenever one of the chains is wound around its shaft by the depression of one of the racks, the toggle joint is raised and the toggle levers somewhat contracted, so as to draw the brake beams toward each other and thereby apply the brakes to the wheels. By this arrangement a very slight motion of the rack suffices to apply the brakes with great power. Immediately on the rack being released, the spring again distends the toggle levers, carries the brakes off the wheels, and unwinds the chain from the shaft.

SUCKER ROD JOINT.—Addison Crosby, of Westfield, N. Y.—This invention relates to a new means of fastening the ends of wooden rods in the metallic sockets by which the same are connected for use on pumps and other machinery; and consists principally in the employment of wooden wedges fitted through the sockets and rods, the apertures in the sockets being made larger than the wedges to permit the requisite spreading of the wood of the latter.

BEE HIVE.—Samuel D. McLean of Sunny Slope, Tenn.—This invention furnishes an improved bee hive which is very simple in construction. It is strong and durable and enables the hive keeper to inspect and control the bees readily. A prominent feature is a piece hinged to the front of a sliding bottom board, which is so arranged as to form, when open, an alighting place for the bees, and, when shut, to fit flush with the side of the hive and close the entrance.

BUTTER WORKER.—George Ruston of Freeport, Ill.—This invention furnishes an improved machine for working butter, which is simple in construction, convenient in use, and effective in operation, working the butter in about the same manner as when worked by hand. It consists in the combination of a round roller and a fluted one, geared together, between which the butter is worked, and a scraper by which the butter is kept from sticking to the fluted roller.

SCROLL SAWING MACHINE.—Samuel Ide, of Medina, N. Y.—This invention relates to a new coupling for the pitman and lower cross head of a reciprocating saw, and to a novel connection of the saw and cross head, which facilitate the attachment and removal of the saw blade, and insure a reliable joint for the upper end of the pitman where it is fastened to the cross head. It consists, first, in a peculiar arrangement of the upper part of the cross head for the reception of the saw; and secondly, in the use of a thimble and conical screw connection for the pitman.

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How Can I Obtain a Patent?

is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

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Toy gun, G. Stackhouse 128,078
Toys, mechanical, E. E. Newell 128,164
Toy steam locomotive, F. W. Clark 128,018
Trap, waste pipe, T. Smith 128,077
Valve, slide, H. H. Meyer 128,161
Valve, slide, J. M. Coale 128,117
Valve, stop, R. Beaumont 127,951
Vehicles, axle for, R. Daniels 128,127
Vehicles, traction engines, etc., mode of propelling, H. Sells 127,178
Vise, J. L. Isbell 128,045
Vise, G. M. Evans 127,969
Wagons, reach coupling for, W. P. Ripley 128,068
Washing machine, Smith and Camp 128,076
Washing machine, O. and A. Snell 128,187
Washing machine, E. McCoy 128,053
Washing machine, Lavine and Oclair 128,154
Water elevator, N. Adams 128,091
Whip socket, H. W. Comstock 128,019
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Wrench bar heads, machine for forming, A. G. Coes 128,118
Wringer, clothes, L. M. Cole 128,119

DESIGNS PATENTED.

5,937.—BADGE.—G. F. Crook, Cambridge, Mass.
5,938.—SHUTTER BAR.—W. Gorman, New Britain, Conn.
5,939.—BELL CRANK AND ROSE.—W. Gorman, New Britain, Conn.
5,940.—RECLINING SETTEE.—M. D. Jones, Boston, Mass.
5,941.—PICTURE.—E. Metcalf, Norristown, Pa.
5,942.—CIGAR BOX.—G. Moebs, J. B. Thiesen, Detroit, Mich.
5,943.—SKATING MUFF.—R. M. Seldis, New York city.

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861.—CEMENT.—Black Diamond Cement Company, Louisville, Ky.
862.—CEMENT.—Falls City Cement Company, Louisville, Ky.
863.—VARNISH.—C. F. Hollwede, New York city.
864.—GLOVES.—Kutter Luckemeyer & Company, New York city.
865.—CLEANSING POWDER.—M. H. M. Magan, Plainfield, N. J.
866.—FERTILIZER.—Southern Fertilizing Company, Richmond, Va.
867.—TIN LINED LEAD PIPE.—Colwells, Shaw & Willard Manufacturing Company, New York city.
868.—SCHOOL BOOKS, ETC.—University Publishing Company, New York city.

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APPLICATION FOR EXTENSION.

Applications have been duly filed, and are now pending, for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

21,102.—SEED PLANTER.—J. D. Willoughby. July 17, 1872.

EXTENSIONS GRANTED.

20,441.—MACHINE FOR MAKING HORSESHOES.—C. H. Perkins.
20,519.—TAILOR'S PRESSING MACHINE.—L. B. Storrs.
20,527.—PLANING MACHINE.—J. A. Woodbury.
21,538.—HOUSE BELL.—J. Barton.
8,778.—MACHINE FOR PRINTING FLOOR CLOTH.—S. Savage.

EXTENSIONS REFUSED.

20,539.—CUTTING GLAZIERS' PINS.—J. G. Baker.
20,566.—HANGERS FOR SHAFTING.—W. Johnson.
20,571.—DOOR LOCK.—J. R. Marston.

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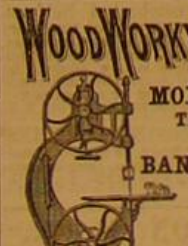

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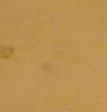

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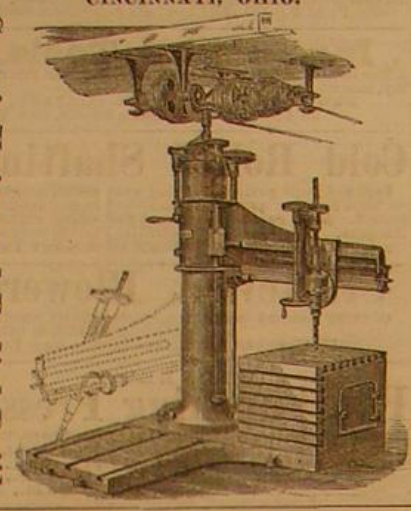

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Vol. XXVII.—No. 3. [NEW SERIES.] NEW YORK, JULY 20, 1872. $3 per Annum. [IN ADVANCE.]

MACHINE FOR BUNCHING, WIRING, AND INSERTING BRISTLES IN BRUSH BACKS.

We take pleasure in presenting to our readers engravings and a description of a machine which is so compounded of ingenious devices that it deserves to rank with such *chefs d'œuvres* of inventive skill as the machine for inserting teeth in cloth carding, the Jacquard loom, Blanchard's lathe, etc. To accomplish all that this machine does automatically, most inventors would have used more than one machine. The fertility of mechanical resources brought to bear upon its construction is a remarkable example of the power of combination, characteristic of the highest order of inventive genius.

While we shall endeavor to give the reader a good general idea of the peculiar succession of operations culminating in the final and firm insertion of the bristles in the wood, leather, hard rubber, bone, or ivory backs, we shall be entirely unable to show, in our prescribed limits, the exact means by which each step in order is accomplished. To do this would require a multiplication of diagrams, for which we have not space. Our description will not, therefore, do justice to the mechanical beauty of the machine, which must be seen in operation to be fully appreciated. In witnessing its working, the appreciative mechanic will be ready to share in the enthusiasm which compelled a bystander to ejaculate in our hearing "that machine has a brain!"

Fig. 1 is a perspective view of the machine with all the parts in adjustment for work, the brush block being in position, and two of the holes having had bristles inserted in them.

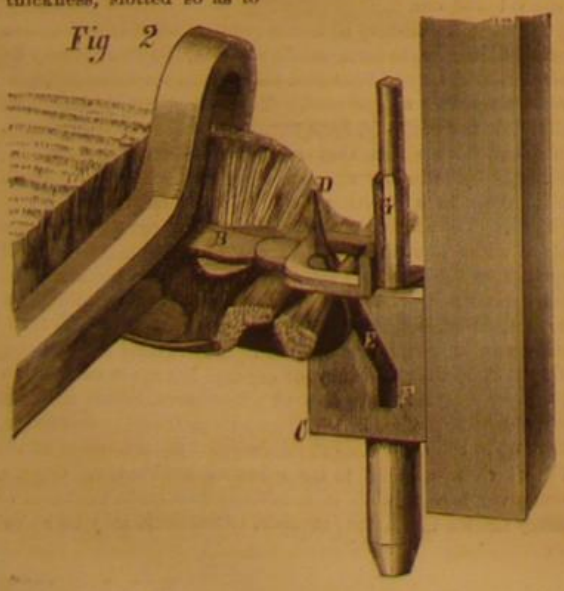
The other figures are detailed representations of important parts of the machine, which will be referred to below.

The first operation is the filling of the comb, A, with bristles. This comb is a plate of metal of uniform thickness, slotted so as to leave teeth of equal length and of uniform width throughout their length. The back of the comb being clamped in a suitable vise or holding apparatus, the bristles are drawn in between the teeth of the comb, the pressure of the teeth holding the bristles from dropping out. The bristles are so placed that the teeth hold them as near the middle as the eye can

Fig 1

WOODBURY'S MACHINE FOR INSERTING BRISTLES IN BRUSH BACKS.

Fig 2



arrange them, so that when the comb is placed in the machine, one half of the length of the bristles appears above the comb, as shown, the other half extending downward.

The comb is inserted in guideways, and is actuated by an intermittent traverse motion which, whenever the bristles are all removed from one of the spaces, moves the comb along the distance of one tooth and space to bring another filled space into position. Whenever one comb is emptied, another is made to follow it in the same guideways, the empty one being taken out at the opposite end of the guideways from that in which it was inserted. The operation is then precisely like what would be the case with an endless comb, the teeth of which should be filled in one part of the circuit before reaching the point of discharge.

As the comb is actuated in the manner described, each space is brought successively to correspond with and form a part of a twisted way or channel, B, Fig. 2. An ingenious combination of devices then forces the bristles, as they are wanted, down through this twisted channel, holding them all the time at the middle and bringing them at last into a horizontal position, as shown in Fig. 2.

At the end of the channel, the plate which forms the upper wall is bifurcated, the ends of the bifurcations being turned up as shown. Between these bifurcations, reciprocates vertically a device consisting of a body, C, which tapers off in front to a point, D, and is slotted obliquely and vertically, the oblique portion of the slot being suspended at E, and the vertical portion at F. The lower portion of this piece is a hollow cylinder, the end of which, descending, comes just flush but does not enter the hole in the brush block when the bunch of bristles is to be inserted; one bunch being put in at every descent of this part of the machine; which, from its resemblance to a hook, we shall call by that name as we proceed.

As the hook rises, it forces its point between the proper quantity of bristles for a bunch, and as the bristles cannot ascend they are obliged to move along the inclined portion, E, of the slot in the hook, and so arrive at the bottom of the vertical portion, F. Here they are acted upon by the plunger, G, Figs. 2, 3, and 4. The form of this plunger is shown in Fig. 3. Its end has two slots, crossing each other at right angles when viewed endwise. One of these slots receives the bunch of bristles, as shown in Fig. 3. The other slot (H, Fig. 3) is only of a width to allow the passage of a wire which is destined to bind the bunch together and secure it in the block. The plunger is carried by ingenious mechanism to descend till it doubles the bristles into a loop at the middle. Other mechanism then unwinds the binding wire, I, Fig. 4, from a reel or spool, straightens the wire, passes a proper length through the slightly enlarged upper portion of the slot, H, Fig 3, and cuts off the length of wire required. The plunger then descends further, now receiving as it descends a rotary motion, on its vertical axis, which winds the wire spirally by forcing it into the thread of a nut contained in the lower end of the hollow cylinder, fastening it around the doubled end of the bunch of bristles. This spirally wound wire is destined to be a screw thread for the bunch of bristles as the latter is screwed into the hole in the block, J, Fig. 4. The lower end of the wire acts as a tap, cutting a female screw in the hole of the block, which the spiral of the wire exactly fits. The upper cut end of the wire thread expands and engages with the material of the block, and acting as a pawl, prevents the unscrewing of the bunch, which is thus held with unequaled firmness and strength, so much so that to remove it from

Fig 4

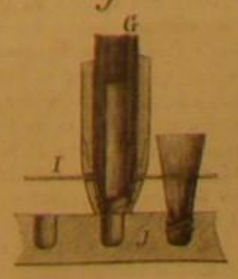


Fig 3

very resisting material will require the block to be split. These operations proceed at the rate of from seventy to eighty bunches per minute.

In order to bring the hole in the block exactly under the cone pointed hollow cylinder extending from the bottom of the hook, a guide, K, is employed which descends upon the block while the bristles are entering one of the holes. A slight movement of the guide by the operator causes the point of the guide to engage the next hole in the series. As soon as the plunger rises, the guide automatically draws the hole it engages to the exact position required to receive the next bunch.

We think the reader will agree with us that a machine, that performs so many distinct movements harmoniously and, at the same time, has nothing flimsy or weak in its construction, is a masterpiece of invention, and one which is doubtless destined to effect a complete revolution in the important industry of brush making. By its use, the difficulty of making the bunches of uniform size and fastening them thoroughly in the block, as well as all other difficulties unsurmounted in other machines hitherto designed to accomplish the same purpose, are entirely overcome. The machine, although including so many movements, is extremely simple and compact, the space being most ingeniously economized. The power required is very small. The table, S, Fig. 1, upon which the block is held, may be inclined at any angle and held by the notched arc, M, so that bristles may be inserted in blocks of any contour or pattern. Patented April 26, 1870, and Dec. 27, 1870. For further information, address Woodbury Brush Machine Co., 30 Cortland street, New York. Concerning European rights, address H. C. Covert, proprietor of the foreign patents, 643 Broadway, New York, or care of H. E. Towle & Co., 20 Budge Row, London.

SMELL.

The *Moniteur Scientifique* contains a paper by M. Papillon on this subject, having reference to recent discoveries in chemistry and physiology. We extract from it the following:

The seat of the sense of smell is, as we know, in the lining membrane of the nostrils. This membrane has a mucous and irregular surface, over which spread a number of nerves with delicate terminations. It secretes a lubricating liquid. By means of muscles, the apparatus of smell is dilated or contracted, like that of sight.

The mechanics of smell are, simply, the contact of odorous particles and the olfactory nerve. These particles are carried by the air into the nostrils. If, on the one hand, the nerve is injured, or even compressed: if, on the other, the air is prevented from passing into the nostrils, there is an absence of smell. The upper part of the nostrils is the most sensitive as regards odor. The sense of smell varies much in different people. Some are entirely without it. Others are quite insensible to certain odors, a case similar to that of Daltonism, in which some eyes fail to perceive certain colors. It is recorded of a certain priest that he perceived no odors but those of smoke and decayed cabbage, and to another person vanilla seemed quite inodorous. Blumenbach speaks of an Englishman who could not perceive the fragrance of mignonette.

Smell is sometimes voluntary, sometimes involuntary. In the former case, to obtain a lively sensation, we close the mouth, and make a long inspiration, or a series of short and jerking ones. The muscles contract the orifices of the nostrils, and thus increase the intensity of the current of air. On the other hand, when we wish not to smell, we exspire through the nose, so as to drive away the odorous air, and inspire by the opened mouth.

Smell and odors are closely connected with the phenomena of taste or gustation. Most savors perceived by us arise from a combination of sensations of smell with those of taste. There are, indeed, only four primitive and radical kinds of taste—acid, sweet, salt, and bitter. This may be shown by experiment. If we close our nostrils on tasting any sapid substance, the perceived taste will come under one or other of these four heads. Thus, when the olfactory membrane is diseased, the savor of food is altered.

How do odorous substances act with reference to the matter which separates them from the organ of smell? Prevost, in 1799, showed that if an odorous body were put in a saucer full of water, the emanations from it agitated the molecules of the water visibly. These motions, of which camphor gives a very good example, have been recently studied by M. Liégeois.

He found that some substances caused movements of gyration and translation over the water surface, similar to those of camphor. Of this class are benzoic acid, succinic acid, and orange bark. In the case of others, this motion ceases very soon, as they become encased in an oily layer over their surface.

He thinks these motions are due, not to a disengagement of gas, causing something like recoil, but to the separation and rapid diffusion of the odorous particles in the water. The fluid shows affinity for these. Similarly, a drop of oil falling on water sends out an infinite number of very small globules, which spread through the liquid, while the volume of the drop is not sensibly diminished. So with aromatic essences. Though insoluble in water, the small odorous particles tend to disperse themselves in it. A small quantity of odorous powder will thus impart perfume to a large body of water.

It is these same odorous molecules which are carried to our nostrils. And the action of water is thought by M. Liégeois to assist in the formation of them. In the morning, when the ground is moist, and the flowers are covered with dew drops, there is a large exhalation of perfume, and similarly after a shower of rain. In gustation, we have something analogous; the saliva is fitted to diffuse the odorant principle; by the motion of the tongue in the cavity of the mouth, this diffusion is promoted, for the surface of evaporation is enlarged. Now, in the same way as the small particles diffuse themselves in water do they diffuse themselves in air, which then becomes the vehicle carrying them to our nostrils.

Some odorous substances have a very great diffusibility. Ambergris, newly cast on the shore, is smelt a long way off. Bertholin states that the odor of rosemary off the Spanish coast is perceptible long before the land comes in sight. The degree of division of the particles is in some cases marvelous. A grain of musk will perfume an apartment for a whole year without sensibly losing weight. Haller mentions having kept for forty years some pieces of paper perfumed with a grain of ambergris, and at the end of that time they still retained their odor.

It is to be noted that the odorous particles are sent out, and the body emitting them does not act as a center of agitation giving rise to vibrations. It is thus a different case from those of light and heat. The odor is the odorous molecule itself; whereas light, as perceived, is not the luminous body.

We cannot tell whether oxygen has some chemical influence on the particles, nor what kind of action takes place on contact of the particle with the nerve, whether a mechanical agitation or a chemical decomposition. But the distinction of the senses into physical (sight, touch, and hearing) and chemical (taste and smell) is a just one. In the latter, contact is always implied.

An able writer has recently tried to prove a kind of music in odors. That is, different odors, according to him, affect the olfactory nerve in various degrees, corresponding to those in which sound affects the auditory nerve. Thus we may have octaves of odors. He enumerates various substances that produce the same impression, but in different degrees; for instance, these four, almond, heliotrope, vanilla, and clematis. By combination he obtains semi odors, corresponding to semitones: for instance, a rose with a geranium. He points out principles of harmony in perfumes corresponding to those in colors, and thinks it possible to produce a desired perfume from a mixture of others.

The theory is ingenious and worthy of attention, but it is open to grave objections. For the harmony in colors and sounds depends on exact numerical relations, which may be accurately determined; whereas, in the case of smell, the criterion is capricious and uncertain, and it is not possible to reduce to formula what our sense reveals.

There are many cases of hallucination as regards smell, united, generally, with insanity on other points. Lunatics have been met with who constantly complained of a fetid odor; others rejoiced in the most delicious, though imaginary, perfumes. M. Lelut tells of a patient, in the Salpêtrière, who was continually troubled with the smell of dead bodies, which she thought to have been buried in the establishment.

Capellini mentions the case of a lady who could not bear the smell of a rose, and fainted one day when a friend came in with one in her hand. Many other instances could be given. It seems to be well authenticated that in lunatic asylums these delusions as to smell are very frequent.

The intensity and delicacy of the sense of smell vary in different individuals and races. In some it is wonderfully sensitive. Woodwart tells of a woman who predicted storms, several hours in advance, from the sulphurous odor (due to ozone probably) which she perceived in the air. A young American, who was deaf, dumb, and blind, became a good botanist simply by the sense of smell. It is, however, in some of the lower animals that we find the sense most highly developed, ruminants, pachydermous animals, and above all, carnivorous mammifers. Smell is, with some of them, like an eye, which sees objects, not only where they are but where they have been. The keen scent of the dog is well known.

Humboldt mentions that when, in his travels in South America, it was desired to attract condors, all they had to do was to slaughter an ox or a horse, and in a short time the odor attracted a number of these birds, though none were visible previously. Of birds, waders have the largest olfactory nerves, and their sense of smell is most highly developed.

The olfactory organ in reptiles is large. Fishes also have an olfactory membrane, and fishermen have observed that they are driven away when certain odorous substances are thrown into the water. Sharks and other voracious fishes often gather from great distances when a carcass is thrown into the sea. Crustaceans are not insensible to emanations which come in contact with their olfactory fibers.

Entomologists say that the sense of smell in insects is very subtle, but it is difficult to determine the seat of it. When meat is exposed in the air, flies soon appear in great numbers, though none were seen before. The carcases of animals left on the ground attract hosts of insects, which find nourishment in them, and deposit their eggs. This will often happen when the object is concealed, so that their search cannot be guided by sight.

The flower of the cuckoo fruit gives forth a fetid odor, and a number of flies and other insects are often seen moving about on the corolla, in search, it is said, of decayed matter, from which, they imagine, the odor proceeds.

How Long should a Man Stick to his Engine?

A correspondent of the *Locomotive Engineers' Journal*, writing from Rutland, Vt., speaking of the duty and extent of the responsibility of an engine man in case of accident, says:

"Where an accident takes place, such as going down the dump or colliding with another train—a bridge may be gone, a culvert washed away—he may see the fatal leap; I ask you, thinking your experience is worth as much as mine, would there be anything heroic for me to stand on the foot board and plunge with my engine into certain and dreadful death? Is there anything brave about it? Have you no responsibilities here on earth, no matter if you have ten cars loaded with passengers that must follow the engine as the case may be? Now I consider an engineer's responsibility ceases, in such cases, when he has sounded his whistle properly and reversed his engine, opened his throttle, pulled open his sand box. He has done his whole duty to God and man as far as he can to stop the train, and if he has time and opportunity, if he is true to himself, he will try to get off and not go down to the bottom calling for brakes. Many engineers go down and collide and are killed, for the reason they do not have time after doing their duty. I never should feel as if a man was fit to run an engine if he had not courage to do his whole duty. But after he has stood to his post and done all that has been put into his hands to do, then I say he is a man that will try and save his own life."

Two Miles of Track Laid in One Night.

The new Baltimore and Potomac Railway, which Colonel Thomas Scott and the Pennsylvania Central are now building as a rival to the Baltimore and Ohio, a through line between the East and Washington, was completed through to Baltimore last week in a novel and characteristic manner. The opponents of the road, having failed in all other expedients, had determined to get out an injunction to prevent its passage through Baltimore. Their project becoming known to the officers of the company, all hands—some 300—were massed from all along the line, and, as soon as the court adjourned on Monday, work was begun in earnest in constructing the road and laying the track through the city. Night setting in, they were retarded a little; but the moon soon came out, and they went on the same as ever. At twelve o'clock, nearly half the track was completed, and the men, tired and hungry from their excessive labor, pitched into four wagon loads of provisions, that had been brought along, with a fine relish. Work was renewed with vigor, and before nine o'clock in the morning—the time when it was supposed the injunction was to have been made—the last spike had been driven. The distance of the track laid was about two miles, and crossed three streets, Calverton Road, Franklin and Townsend. At the two latter, double tracks were laid. The hands belonging on the lower section of the road embarked on the train for their quarters, and they moved off amid a chorus of yells and screaming of engine whistles.

Improvement in Street Watering.

An official trial lately took place at Hyde Park Corner, Knightsbridge, Eng., of the system for watering streets, public parks, and market gardens, patented by Messrs. Isaac Brown & Co., Edinburgh. The patented apparatus was shown upon the drive at the east end of Rotten Row, Hyde Park, and upon one of the large enclosed flower plots, which has been fitted with it by order of Mr. Ayrton, her Majesty's First Commissioner of Works. In one of the illustrations of the new mode of road watering, one and one half inch lead pipes are laid along close to each kerb stone, these subordinate pipes being supplied from the mains. At intervals of about two feet apart, the pipes are drilled with small holes of from a sixteenth to a thirty second of an inch, in groups of three, each of which is pierced at a different angle. These apertures from the pipes command the complete road, which at the place where they are exhibited is about nineteen yards wide. The water is, of course, supplied under pressure, with a head of about 100 feet, and a shower of a quarter of a mile in length can be commanded with a one and one half inch pipe. The other experiment for road watering was by a central pipe in the middle of the road, which throws its jets towards the kerb stones. The pipes are protected by shields, and provision is made for the surface water being sent past the sides of the pipe to the bottom, where it finds a passage. The central pipe is of course upon the crown of the road, and is protected by an asphalt covering. An apparent objection may be that the small apertures may get choked up by the *débris* of the roads. In practice, however, this is found not to be the case, as the pressure of the water, when it is put on, keeps the drilled holes open. In winter, when there is the danger of freezing, the watering pipes are kept empty, which is not found to be a matter of much practical difficulty.

The Origin of Metalliferous Deposits.

Great deposits of iron ore, says Professor T. Sterry Hunt, generally occur in the shape of beds, although waters holding the compounds of iron in solution have, in some cases, deposited them in fissures or openings in the rocks, forming true veins of ore.

The chemical history of iron is peculiar, since iron requires reducing matters to bring it into solution, and since it may be precipitated alike by oxidation and by farther reduction, provided sulphates are present. The metals copper, lead, and silver, on the contrary, form compounds more or less soluble in water, from which they are not precipitated by oxygen, but only by reducing agents, which may separate them in some cases in a metallic state, but more frequently as sulphides. The solubility of the salts and oxides of these metals in water is such that they are found in many mineral springs, in the waters that flow from certain mines, and in the ocean itself, waters of which have been found to contain copper, silver, and lead. Why then do not these metals accumulate in the sea, as the salts of soda have done during long ages? The direct agency of organic life again comes into play, precisely as in the case of phosphorus, iodine, and potash. Marine plants, which absorb these from the sea water, take up at the same time the metals just named, traces of all of which are found in the ashes of sea weeds. Copper, moreover, is met with in notable quantities in the blood of many marine molluscous animals, to which it may be as ne-

cessary as iron is to our own bodies. Indeed, the blood of man and of the higher animals appears never to be without traces of copper as well as iron.

Water, as we have seen, is a universal solvent, and the matters which it may bring and deposit in the fissures of the earth are very curious. There is scarcely a spar or an ore to be met with in the stratified rocks that is not also found in some of these veinstones, which are often very heterogeneous in composition. In some veins we find the elements of limestone or of granite, and these often include the gems, such as amethyst, topaz, garnet, hyacinth, emerald, and sapphire; while others abound in native metals, or in metallic oxides or sulphides. The nature of the materials thus deposited depends very much on conditions of temperature and of pressure, which affect the solvent power of the liquid, and still more upon the nature of the adjacent rocks and of the waters permeating them.

We are apt in explaining the appearances of the earth's crust to refer the formation of ore beds and veins to some distant and remote period when conditions very unlike the present prevailed, when great convulsions took place and mysterious forces were at work. Yet the same chemical and physical laws are now, as then, at work; in one part dissolving the iron from the sediments and forming ore beds, in another separating the rarer metals from the ocean's waters, while in still other regions the consolidated and formed sediments are permeated by heated waters, to which they give up their metallic matters, to be subsequently deposited in veins. These forces are always in operation, re-arranging the chaotic admixture of elements which results from the constant change and decay around us. The laws which the First Great Cause imposed upon this material universe on the first day are still irresistibly at work fashioning its present order. One great design and purpose is seen to bind in necessary harmony the operations of the mineral with those of the vegetable and animal worlds, and to make all of these contribute to that terrestrial circulation which maintains the life of our mother earth.

PHENOMENA ASSOCIATED WITH A HYDROGEN FLAME.

Phenomena of much interest, and possibly of future usefulness, are associated with the combustion of ordinary hydrogen.

1. To study these phenomena free from disturbing causes, three things should be attended to, although the effects to be described can be obtained without any special precaution. (1) The gas must be stored and purified in the ordinary way namely, by passing into a glass holder through a solution of potash, and then through a solution of perchloride of mercury or nitrate of silver. (2) From the holder, the gas must be led through red or black india rubber tubing to a platinum or, better, a steatite jet. (3) And then the gas should be burnt in a perfectly dark room, and amid calm and dustless air.

2. In this way, the flame gives a faint reddish brown color, invisible in bright daylight. Issuing from a narrow jet in a dark room, a stream of luminosity, more than six times the length of the flame, is seen to stretch upwards from the burning hydrogen. This weird appearance is probably caused by the swifter flow of the particles of gas in the center of the tube. The central particles as they shoot upward are protected awhile by their neighbors; metaphorically they are hindered from entering the fiery ordeal which dooms them finally to a watery grave. Dr. Tyndall has shown that the radiation from burning hydrogen is hugely ultra-red, and moreover, that it has not the quality of the radiation from an elementary body like hydrogen, but practically is found to be the radiation from molecules of incandescent steam. So that, except at its base a hydrogen flame is a hollow stream of glowing water raised to a prodigious heat.

3. Bringing the flame into contact with solid bodies, in many cases phosphorescent effects are produced. Thus, allowing the flame to play for a moment on sand paper and then promptly extinguishing the gas, a vivid green phosphorescence remains for some seconds. The appearance is a beautiful one, as a luminous and perfect section of the hollow flame is depicted. Similar phosphorescence is produced by the flame on white writing paper, or on marble, or chalk, or granite, or gypsum, etc. But no such effect is produced by coal gas, or olefiant or marsh gas. It is evidently a question of temperature, as oxygen driven through coal gas shows the phosphorescence well.

Far exceeding in generality the effect just noticed is a really magnificent blue image of the flame that starts up on almost every substance with which the flame is brought into contact. I have already drawn attention to this effect in the *Philosophical Magazine* for November, 1865, and the same effect has more recently formed the subject of a memoir, presented to M. Wurtz, of the Paris Academy of Sciences, the author of that paper evidently being unaware that the subject had already been investigated by myself.

The appearance is as follows: When the hydrogen flame is brought either vertically or sideways, say upon a white plate or a block of marble, there instantly appears a deep blue and glowing impression of the exact size and shape of the hollow flame. The moment the gas is extinguished, or the flame removed to the slightest distance from the solid, the effect as instantly ceases. If the flame be brought successively to the same spot on the solid, the effect grows fainter and finally vanishes, but instantly reappears upon an adjoining portion.

Other combustible gases, such as carbonic oxide, or marsh gas, or olefiant, or coal gas, do not yield this effect, nor does any lamp flame, luminous or otherwise; nor is it obtained in the oxidizing flame of an ordinary blowpipe; but it is imperfectly produced in the reducing flame when coal gas is used; it is not seen when oxygen is driven through coal gas, unless the latter be in excess; and it is poorer and vanishes more quickly with the oxyhydrogen flame than with hydrogen alone. This blue luminosity is therefore, not a question of heat, but some property depending either on (*a*) the chemical nature of hydrogen, or on (*b*) the physical effect of its radiation. At first I thought it was the latter, and that it was a new form of fluorescence, so closely did it resemble those phenomena. But after a weeks' incessant experimenting, the true cause was hunted down and found to be dependent on the former effect (*a*), and in every case ultimately due to the presence of sulphur. A chemically clean body, or a freshly broken surface, did not show the blue coloration; but after exposure for a short time to the air of London, the substance invariably yielded the blueness; this, however, was not the case when the clean surface was covered by a shade, or exposed to the air of the open country. The combustion of coal gas and coal fires yields sulphate of ammonia, a body often deposited in acicular crystals in the glass tube in a laboratory. Sulphate of ammonia is decomposed by a hydrogen flame, and when that salt is brought into contact with burning hydrogen, it permanently yields the blue colorescence. Hence this body is the main source of the blueness seen whenever a hydrogen flame comes into contact with glass tubes or a dirty surface. The effect must repeatedly have been seen by every one who has experimented on singing flames.

When the blueness, as is so often the case, is seen tinging the flame itself, without contact with any body, the sulphur is derived either from the vulcanized tubing, the dust of which is taken up by the passing gas, or, if the hydrogen be burnt from the bottle generating it, the blueness is due to the decomposition of the sulphuric acid spray, as will be shown further on.

As achemical re-agent for detecting sulphur, the delicacy of a hydrogen flame is extraordinary. This fact was estimated as follows: Pure precipitated silica yields no blueness with the flame; 500 grains of silica were intimately mingled with one grain of milk of sulphur. Less than one hundredth of a grain of this mixture was thrown on the surface of pure water or placed upon chemically clean platinum foil. The water is best, but in either case the blue color (absent before) now shot forth on bringing the hydrogen flame down. Tried again and again with fresh portions, the effect was very evident, but quickly vanished. The sulphur in a similar portion of the mixture could not be detected chemically by nitro prusside of sodium. The wonderful sensitiveness of the flame may be still better seen in another way. Immediately after washing, the fingers show no color when brought for a moment into the flame, but if a white india rubber tube be touched ever so lightly, the fingers not only show a vivid blueness, but for some time any clean object touched by them, such as platinum foil, shows traces of sulphur by the appearance of the blue coloration with the flame. A block of melting ice continually weeps itself free from dust, and thus presents an excellent surface upon which to try the foregoing experiment. Or a plate of platinum, after heating to redness, may be written over with a stick of sulphur. If kept covered, the invisible letters may long after be traced out by sweeping the hydrogen flame over the surface of the platinum.

Examined through a prism, the blueness derived from any source shows blue and green bands, similar to the spectrum of sulphur, but I have noticed also a red band. This mode of obtaining a sulphur spectrum suggests further inquiry White marble smeared over with a bit of sulphur, or with vulcanized rubber tubing, is a convenient source for obtaining the effect at pleasure.

Some sulphates and sulphides show the blueness with the flame, and are evidently composed by the hydrogen. Thus sulphate of soda gives no blue appearance, while sulphate of ammonia, or alum, does.

Various liquids were tried in contact with the flame. Sulphuric acid was very notable. Here a magnificent blue effect was observed. For persistence and brilliancy of the of the color, this experiment leaves nothing to be desired; the spectrum is very fine. If the liquid is in a glass dish when the flame is brought vertically down, the blueness lights up the glass in a lovely manner.

6. But the presence of sulphur is by no means the only body that a hydrogen flame reveals. The least trace of phosphorus is detected by the production of a vivid green light. It is striking to notice the wonderful sub division of matter in these experiments, and how an immeasurable trace of an element can evoke pronounced and disproportionate effects.

Might not this ready detection of minute quantities of sulphur and phosphorus be of use in the manufacture of iron? And might not hydrogen introduced into the molten metal be employed for the removal of these great enemies of the iron worker? I speak ignorantly.

7. Among the range of substances I have tried, tin was was found to yield the most conspicuous effect, after the bodies named. A fine scarlet color is almost instantly produced when the hydrogen flame is brought into contact with tin or any alloy of tin. Tin is somewhat volatile, and its spectrum is rich in red rays. The tin must be clean; or the sulphur blue, which is much brighter, will mask the effect. A charming experiment may be made by partially scraping a soiled surface of tin; the blue and the scarlet colors mingle and a lovely purple is the result. When a trace of phosphorus is present, there may be obtained a green belt encircling a rich blue, then a purple zone, and finally a glowing scarlet at the root of the flame. These colors, it must be remembered, are not imparted to the flame, but reside on the surface of the body which the flame touches. And where the combustion of the hydrogen is complete, as in the upper part of the flame, or in the luminous stream referred to (2), these effects are not produced: they are best developed at the root of the flame.

8. Passing from liquids and solids, I next tried gases in contact with the flame of hydrogen Many gases imparted a color to the flame, but here the effect was different to that previously noticed. The whole flame was tinged with the color imparted to it. A mere trace of hydrochloric acid gas imparts a reddish brown to the flame; ammonia gas gives a yellow, and burns freely. It is striking to note the combustion of ammonia gas rising from an unstopped bottle that contains the usual solution and which is placed below the flame.

But carbonic acid gas yields the most striking result in contact with the flame. A pale lilac tinge is instantly produced by a stream of this gas. This, I imagine, is due to the decomposition of the carbonic acid by the hydrogen, and the production and combustion of carbonic oxide. For it is at the lower part of the flame that the effect is most marked. One per cent of pure carbonic acid, admitted to a jar of air, can be detected on holding the jar over the flame. The breath, of course, shows the effect most strikingly.

9. Here then is an eminently practical method of noting the presence of vitiated air in rooms or public buildings. A continuous hydrogen apparatus might be employed with a wash bulb attached. The flame might be burnt from a brass burner or lava jet, placed within a blackened tin cylinder. Opposite the flame a hole might be pierced in the cylinder and closed by a lens for better viewing the flame within. As soon as the atmosphere in a room becomes unpleasantly vitiated, the flame would indicate the fact by its changed color. A similar apparatus might likewise be employed by miners, in metal mines as a warning against impure air, and in coal mines as a detector of fire damp. In this latter case the ends of the cylinder could be covered with wire gauze.

Irrigation Canal of the Rhone.

The proper irrigation of the four departments of France, the Drôme, Garde, Hérault, and Vaucluse, has been for many years under consideration, and at last the Minister of Public Works has granted a credit of small amount for the necessary preliminary steps to be taken to carry out the plans of M. Aris ide Dumont, Engineer in Chief of *Ponts et Chaussées*, who proposes to cut a canal for irrigation from the Rhone, at Condrieu, to Mornas.

The length of the canal from its source to Mornas will be about one hundred and twelve miles; all the towns by which it passes can be supplied with water, and it is anticipated that many new factories will spring up in consequence. From a reservoir at Mornas, the canal passes to the right bank of the Rhone by means of a siphon aqueduct. After passing Uyés through a tunnel more than three miles long, it reaches Montpellier at the hight of 180 feet above the level of the sea, irrigating the whole of the environs of this town by means of numerous channels which will distribute the water over the vast plains, which suffer terribly and frequently from drought, that lie between Montpellier and the sea.

The amount of water to be taken from the Rhone at its lowest level is set down at 33 tuns per second, but during about half the year the volume will be increased to 40 or 45 tuns.

The distribution is calculated in the following proportions: 20 tuns for agricultural irrigation, 10 for irrigation in the vicinity of towns, and 3 tuns for evaporation and loss.

The great importance of this canal consists in the fact that, while in the summer all the other rivers in the South of France are nearly dry, the Rhone, being fed by the snow and glaciers of the Alps, pours a grand stream into the sea, which would make the fortune of agriculture. At extreme low water, this noble river passes Lyons at the rate of 235 tuns per second, Tournon at the rate of 310 tuns, Valence at 410, Avignon at 450, and Beaucuire at the rate of 530 tuns per second. At average states of the river, the flow at the spot where the canal is to commence is equal to more than 600 tuns per second; there is little fear then of exhausting such a supply as this, and it is asserted that the abstraction of the volume of water above named will have no effect, even upon the shallowest parts.

The estimated cost of this important work is equal to ten millions of dollars for the formation of the canal and its distributing conduits, and the time required for its execution is three years.

The great hight of the source of this proposed canal will allow the irrigation to be carried to poor dry lands on the slopes of the hills, and thus greatly increase their value and the author of the plan sets down the increased value of such lands at about sixty dollars.

Grand as this scheme is, there is nothing extraordinary or even novel in it; the canal of the Muzza takes 77 tuns of water per second from the Adda, and the grand canal of the Techino, 48 tuns per second from that river.

The great quantity of water proposed to be taken from the Rhone will require the canal to be very little larger than an ordinary one for navigation.

RESTORING WASTE RUBBER.—Among the recent patent extensions is that of Baschnagel's patent of 1858, for restoring waste vulcanized rubber. The invention consists in subjecting the old rubber to a heat of from 150° to 600° F, either with or without immersion in water or other cooling liquid. This process so restores the qualities of the gum that it can be used again in the manufacture of rubber goods.

THE density of the four satellites of Jupiter has been ascertained to be nearly fifty per cent greater than that of the planet itself.

CINCINNATI.

In the city of Cincinnati we are afforded an excellent example of the rapid rise and growth of our Western towns. In the year 1800, four hundred people were settled there, in a small straggling, unpromising village, and surrounded by an uncultivated wilderness.

Great natural advantages attach to the site, which is peculiarly favorable to commerce and health. Lying on a natural plateau nearly twelve miles in circumference, which is surrounded by hills three hundred feet high and through which the Ohio river flows, it affords a large variety of position and scenery, while the situation of the city enables it to collect within itself the raw material of mines and forests, and other productions of a large extent of surrounding country, and to redistribute them after they have undergone the process of manufacture or been otherwise prepared for market.

It was estimated, in 1859, that the river imports and exports must have reached nearly $100,000,000, and the present increased prosperity of the city is perhaps best evidenced in the number of its public schools, libraries, etc., and the development of a taste for improved architecture, all of which have been much aided by the great liberality of its own private citizens. Among the benefactors are numbered Messrs. Davidson & Probasco, the well known merchants. That they have assisted the advancement of their city with no stinted hands, is proved by the present they have lately made of the magnificent fountain shown in our illustration.

FOUNTAIN PRESENTED TO THE CITY OF CINCINNATI.

Wooden Railways

The substitution of timber for iron permanent way, which constitutes the great feature of the Canadian wooden railways, is due to Mr. J. B. Hulbert, an American engineer. After a short line, 6 miles in length, had been built and worked for a considerable time, another was commenced 47½ miles long, between Carthage (New York) and Harrisville, and was opened for traffic in 1868.

In addition to this, a third line was laid down in Canada, in the province of Quebec, and known as the Quebec and Gosford wooden railway. This line is 26 miles long, but next next year its extension for 100 miles is intended. Another, the Sorrel, Drummond, and Arthabasca Counties railway, 60 miles long is finished, and several short branches are about to be made next spring, whilst the Levis and Kennebec wooden railway, in the province of Quebec, is in progress. This line will also be 60 miles in length, with 40 miles of extension to be made at a future time.

The traffic upon all of these lines is of course very light, and would not have warranted the construction of the cheapest possible form of railway in which iron permanent way was employed; nevertheless three through trains a day are, on an average, run over the railways already opened, and carry passengers and freight at least equal to what is conveyed over many lines upon which a large construction capital has been expended. Moreover, a fair speed, varying from 18 to 20 miles an hour for passenger trains, and from 12 to 16 miles for freight trains, can always be secured, and the amount of adhesion with the 30 tun engines now running, is sufficient to take any required load up the gradients which are severe. Thus on one of the lines, where 20 tun engines are employed, from 60 to 80 tuns can be taken up gradients of 1 in 60, whilst there is no difficulty, on far steeper inclines of 1 in 21, in taking up 20 tun trains with engines weighing 14 tuns. Experience has also shown that the wooden rails remain in at least as good a condition in winter as iron ones; and with the use of the snow plough, there need be no check to the traffic, even when the snow lies on the ground to a depth of 3 or 4 feet.

Screw Propeller.

An improvement in the design and construction of the blades of screw propellers, for steam vessels, has lately been patented by Hermann Hirsch, London.

This is intended to remedy the great vibration, produced by ordinary screw propellers, by obtaining the best effect in converting the force given out in rotation into a pressure directed in the line of the axis, so as to produce a maximum amount of longitudinal pressure as useful effect for propulsion. To obtain such maximum of useful effect, the improved screw propeller, or each blade of the same, is so curved that the direction in which the water yields will be a direction converging from the periphery of the blade towards the axial line of the propeller; and consequently opposed to the centrifugal action which the rotary motion of the blades tends to impart to the water. Thus this curvature of the blade counteracts the centrifugal action, and so utilizes for propulsion the power that would otherwise be wasted.

The effect will be to drive the water in a cylindrical column aft in an axial direction relative to the screw, thereby producing the most direct and economical application of the power applied to the propeller, and at the same time avoiding vibration and increasing the efficiency of the rudder by surrounding it with a column of unbroken water, thrown directly against it with considerable velocity.

The Sewing Machine and its Attachments.

We have just inspected an advance copy of a book entitled "Sewing Machine Attachments," published by G. W. Gregory, Esq. Examiner of Sewing Machines and Textile Manufactures, United States Patent Office, Washington, D. C. Mr. Gregory has collected in his work the claims of all the patents for sewing machine attachments to January 1, 1872, (nearly 400), has given a description of each, with the claims in force, with a photo-lithographic drawing, and has also added rejected cases open to public inspection January 1, 1872, and English patents on like subjects. This compilation, the first of its kind, has been prepared with much care, and will prove a most valuable work for persons in any way connected with sewing machines, either as attorneys, manufacturers, inventors, or dealers. Price $25.

The Prospective Supply of Pig Iron.

While there is, naturally, some diversity of opinion with regard to the probable course of the iron market within the next twelve months, we think it safe to conclude, from all indications, that both production and consumption will show a marked increase before the end of another year. Owing to the present scarcity of iron in the market, and the high price demanded and obtained by the furnaces, there is, just now, a temporary falling off in the consumptive demand this is particularly noticeable in the case of rails, the high price of iron having forced many of the rail mills to suspend operations, because rails cannot now be marketed at remunerative prices, since, as compared with pig iron, they are relatively cheap. There has also been a noticeable curtailment of consumption in other ways, but this cannot be other than temporary. Iron is an article in which there can be no economy of consumption. Just so much is needed, and if it is not supplied this year, it must be next year. If we build a less mileage this year because rails are high, we shall make the more rapid progress when rails become cheaper.

Thus, while the consumption may fluctuate from year to year, the percentage of increase must be and will be maintained. It need not be inferred, therefore, that because there is just now a curtailment of consumption, there is less encouragement to increase the supply than when the inquiry was more active, the consumption greater, and the supply more abundant. On the contrary, the fact that consumers are now compelled to limit their purchases, to the supplying of their immediate and imperative requirements, gives assurance of a greater and more pressing demand in the immediate future; and no better opportunity was ever offered for starting new furnaces, wherever coal and iron can be had, than that which now presents itself. Great as it was last year, the consumption of iron in the United States is capable of indefinite expansion.—*Iron Age.*

A NEW LIGHT.—At a recent meeting of the Inventors Institute, Mr. M. M. Harris, member of the council, in the chair, Mr. Carl Molchin, a native of Hamburg, exhibited lamps burning a new compound oil to be used for lighting purposes, which was found to afford a steady, even light, very closely approximating in power, clearness, brilliancy, and intensity to the electric light, at a cost somewhat less than that of colza oil. It resulted from experiments made with this oil, burnt in a moderator lamp, that a light of 17½ spermaceti candles was obtained. This light is considered as very valuable for light houses, railway signals, railway carriages, and other purposes, and received the hearty approval of those present at the meeting, opinions being expressed that its use would mark a new era in artificial light.

CARRIAGE WHEEL.

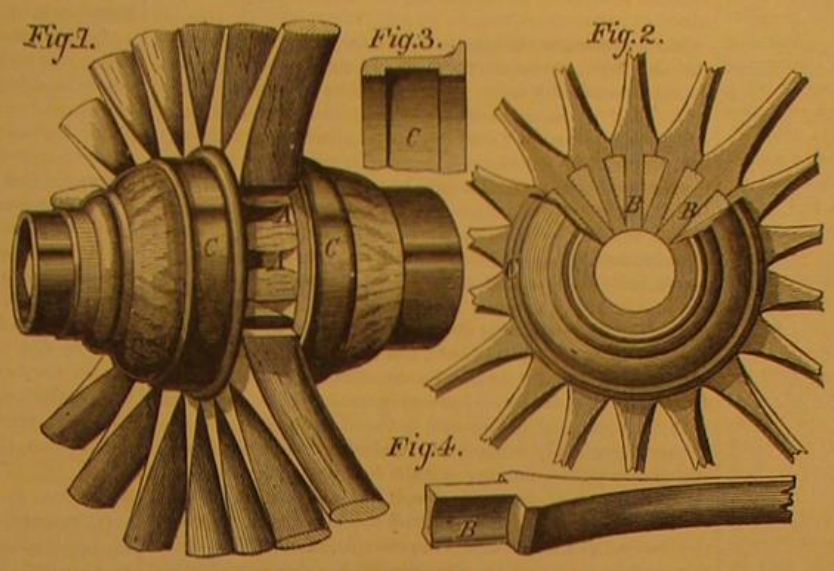
The great difficulty in effecting real improvements on the ordinary carriage wheel has lain in the seeming impossibility of retaining the elasticity which is so great a point of excellence in the common wheel. Mr. James O'Connor, of Jackson, Mo., has invented and lately patented an improved wheel which appears to overcome this difficulty. Our engraving illustrates the invention.

The first object the inventor had in view was to prevent the spokes working loose when subjected to lateral strain, which sometimes gives rise to serious accidents. This is accomplished by working the mortises in the hub of a double dovetail form, as shown at A. Fig. 1, and by shaping the tenons on the spokes to correspond, as shown at B, Fig. 4. The tenons are made slightly larger than the mortises, so as to fit tightly. In the common form of joint, the whole force of any lateral strain is exerted on the end walls of the mortises, and if the tenon is shrunk in the least, it easily works loose. In the form shown, the sides of the dovetails are made to bear a great part of the lateral strain as well as the end walls, which of course renders the hold on the spoke much more stable. The shoulders of the spokes rest on the hub on the divisions between the mortises, and may be slightly beveled so that they may fit close to and support each other, as shown in Fig. 2. The strength of this joint in resisting lateral strain has been experimentally compared with that of the old, and found to be as seven to one.

The second part of the invention consists in forming the hub band with a shallow groove in its inner face, as shown in the sectional view of the same, at C, Fig. 3, and in putting the bands on to the hubs after the metal of which they are composed has been heated. As the metal shrinks in cooling, it becomes imbedded in the wood on each side of the groove, and thereby forms a rib on the hub which fits into the groove. The bands are thus very securely fixed on the hub and remain so under all ordinary circumstances.

It is claimed that the elasticity of the common wheel is attained in this improvement, together with an increase of strength and durability, and a beauty of form, which gives it great superiority over the former. The mode of construction will apply admirably in heavy work, as the larger the surface of the tenon is, the greater will be the strength gained.

For information regarding rights to manufacture, Messrs. O'Connor & Davis, of Jackson, Cape Girardeau Co., Mo., may be addressed.



O'CONNOR'S CARRIAGE WHEEL.

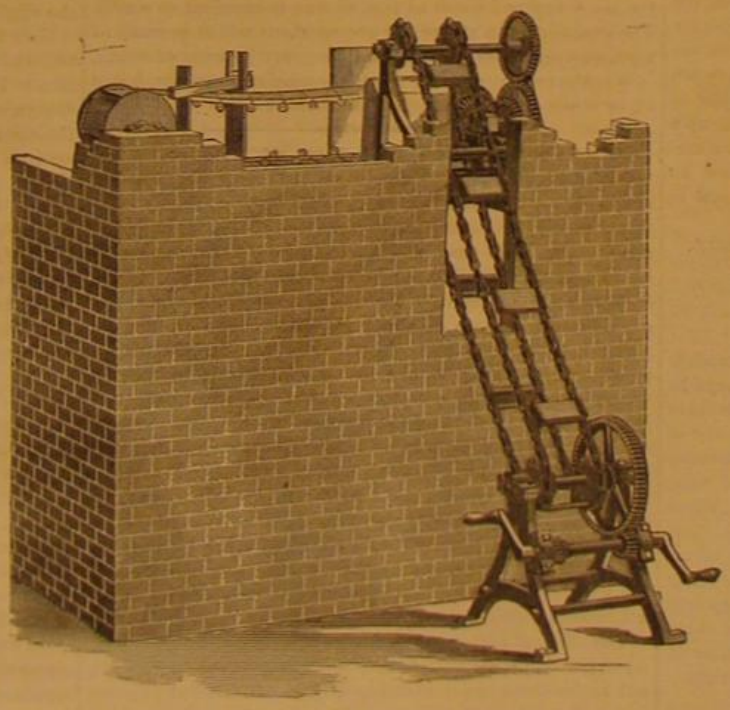
BRICK AND MORTAR ELEVATOR AND DISTRIBUTOR.

Our engraving represents a machine of considerable value for building purposes, which is designed more especially to supersede the labor of hod carrying. By its means the bricks and mortar are raised to the required elevation and then distributed among the laborers for use.

The plan, construction, and operation of the machine will readily be understood from an examination of the engraving. A frame, containing the driving drum, etc., is secured in position on the ground, and a second frame, which carries a shaft and pulleys corresponding with the drum, is secured on the scaffold or platform to which it is intended to have the bricks and mortar elevated. The drum below and pulleys above are connected by endless chains, the links of which fit between and engage with lugs which project from the faces of the drum and pulleys, in such a manner that no slip can take place. To these endless chains are attached buckets which carry up the bricks and mortar. The upper pulley shaft is geared in an appropriate manner to a drum which drives the distributing apparatus. This latter consists of the drum mentioned and another, which are placed at any required distance apart, and upon which is run an endless band by which the bricks and mortar are carried along. The band is composed of boards placed side by side and hinged together.

The operation of the machine is as follows: Upon the driving drum being operated by the winch, the buckets of the elevator, which are filled by the attendant laborers, are carried up. At the same time the rotation of the upper pulley shaft sets the drum of the distributing apparatus in motion, and the endless belt is kept moving from one side of the building to the other. When the full buckets arrive at the top, they are necessarily turned over by the action of the machinery, and deposit their contents on the moving belt beneath. A wide board is placed behind the belt at this point, which prevents either bricks or mortar falling over, and in front the descending buckets are made to pass so close to a kind of scraper set there as to insure their contents being lodged on the belt. The bricks and mortar are carried by the belt across the building, and are thus distributed among the workmen. A barrier is placed across the belt, as shown, to arrest the progress of the load and prevent any part of it being carried over the end drum.

The machine is also particularly useful in taking the material out of cellars while they are being dug, in which case it may be made to dump it directly into a cart. There is no doubt that wherever its services can be employed it will prove itself a great labor saver.



SHANKS' ELEVATOR AND DISTRIBUTOR.

The inventor and patentee, Mr. Thomas Shanks, is willing to dispose of the whole or part of his rights, and further information on the subject may be obtained by addressing him, corner Lombard and Sharp streets, Baltimore, Md.

Tunnelling by Diamond Boring Machine.

The diamond boring machine, of the company of which Captain Beaumont, R. E., M. P., is chairman, has been achieving great triumphs in the Cleveland district, in Lancashire, Cumberland, and other northern counties where it has been employed in "prospecting" for coal and ironstone. At Stanghow, in Cleveland, the borer recently reached a depth of 689ft. in two months; that could not have been got at in less than two years by hand labor. The borer is now employed at the Clifton tunnel on the Bristol Port and Channel Dock Railway. The tunnel, which is under Durdham Downs, is more than a mile long, and through hard mountain limestone. The heading is 10ft. by 8ft., into which the machine drills six holes of about 4ft. deep at a time. A core of about an inch diameter is brought out of each boring, showing exactly the material gone through. The drills made from 180 to 200 revolutions per minute, and advance about 2 inches in that time. The outside diameter of the boring is about 2 inches. Hand labor was employed at first in drilling the heading. It has been ascertained that the machine advances at about five times the speed that could be attained by as many men as could find room to work. The drill holes are in perpendicular rows, and the first blast is a wedged shaped piece taken out of the middle of the section. Dynamite is employed for blasting, and is found to answer the purpose admirably. The machine is so constructed that the drills command every part of the face of the heading, and the holes can be bored at any angle. Jets of water, under about 30 lb. pressure, are forced into each boring, and wash out the *débris*. The feed motion, which may be made absolute, is regulated by sensitive friction gear that indicates extra resistance. Compressed air is employed as a motor, but not, of course, for percussive action, as in the Mont Cenis Tunnel. The air engine has a 24 inch steam and 18 inch air cylinder, and a 4ft. stroke. The engine in the tunnel, upon which the air acts, and that, in its turn, gives motion to the drills, has a 13 inch cylinder and 12 inch stroke. The engine is worked by the compressed air, and is similar in construction and action to an ordinary steam engine. We believe that the diamond drill machine is to be employed experimentally upon the St. Gothard Alpine tunnel, and will be entrusted with the entire work should the experiment prove satisfactory, which there is little or no reason to doubt it will.—*Engineer.*

Paper Shields.

The possibility of employing paper as a material for the armor plating of vessels occupied the attention of many more or less ingenious inventors when the revolution in the construction of heavy artillery brought with it the necessity for a total change in the science of naval defence; but, in this country at least, no successful results have been attained, and the advocates of these schemes have allowed them to drop, in common with many others who, even more imaginative and less practical, have from time to time proposed to protect the sides of ships with all kinds of foreign bodies, varying from cotton bales to sugar canes, and more recently, as we have lately seen, with cork.

On the Continent, however, and especially in Italy, the idea that properly prepared fabrics may be employed successfully as armor plating material has never been abandoned, and so early as 1860, Signor Muratori, a colonel in the Italian army, commenced investigations and experiments upon the subject, which he has prosecuted ever since. In 1862, the attention of Victor Emmanuel was drawn to the results he had achieved, and which had obtained the approval of a body of officers in the Italian army. About the same time General Griffini published a pamphlet, in which he expressed his favorable opinion of Colonel Muratori's invention, and recorded all the results of the trials which had been officially conducted, and which satisfactorily proved the great power of resistance which the material offered.

In 1868 the matter was submitted to the notice of the Emperor Napoleon, who caused experiments to be conducted at Chalons, the results of which confirmed the earlier official trials made in Italy. The French report, indeed, speaks in very sanguine terms of the invention, and indicates the manner in which it could be utilized for the protection of vessels. After some delay, further trials were commenced, but before any action was taken, war with Germany was declared, and this matter, in common with a thousand others, was swept aside to make way for the pressing requirements of the time.

Colonel Muratori, who is now in England, is, we believe, making arrangements for an exhaustive trial of the armor, which has been approved of by several naval officers who have seen it, and who express an opinion that most valuable service may be rendered by it. One successful application certainly has already been made by the inventor, namely, in the construction of cuirasses, which, weighing the same as the ordinary service cuirass and costing less than one fifth as much, has nevertheless a far greater power of resistance. We have seen it turn a regulation pistol bullet fired from a distance of three feet, and it is equally capable of resisting a bayonent thrust.

By a modification of the process, fabrics suitable for military gaiters are endued with a singular power of resistance, and are thus invaluable in action, by protecting the wearers from spent balls or sword cuts.

While we refrain from advancing any opinion upon the more extended application of this process for defence against heavy guns, we speak with confidence as to its efficiency for the military purposes we have alluded to, although the Italian experiments, and later, those at Chalons, seem to point to a wider and more important use. And it appears to us as possible that this armor plating of cemented fabric may be found of service in protecting the bottoms of vessels from the explosion of torpedoes, combining, as it does, great lightness and power of resistance.—*Engineering,*

Shade Trees.

No native tree we have is better adapted to the purposes of shade and ornament than the sugar maple. Its foliage is full and dense, and its form is that of a rounded cone of beautiful proportions. It is also clean and free from insect enemies. It would be well if, in planting shade trees on our streets, there could be a suitable alternation of different kinds, some of rapid growth for temporary use, and others for permanence. Some attention should also be paid to variety. Probably the very best trees for general street planting are the different varieties of the maple. Next in value we would place the elms. For intermediate and temporary planting, the box elder and the ash may be mentioned. Here and there should be the bass wood, or linn, the tulip tree, the horse chestnut, and the buckeye.

Mechanical Table Waiters.

The dining tables of the Oneida community, Oneida, N. Y., are made double, and the central part revolves. All articles of regular use, such as bread, butter, salt, water pitcher, goblets, spoons, milk, sugar, etc., are placed on this central portion, and persons seated at the table wait on themselves, by turning the center until the thing they want swings around in front of them. These mechanical table waiters are found to be very convenient.

A friend of ours once had in regular use a little railway car on his breakfast table, which carried the sirup for the buckwheat cakes, and was propelled by strings back and forth across the table in front of all the plates. The children always derived the sweetest satisfaction from the movements of this convenient little machine.

Correspondence.

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

Crystallization of Antimony.

To the Editor of the Scientific American:

In your issue of June 22d, 1872, the interesting article on "Metallic Crystals" induces a small contribution on the part of one who, though not a deep or scientific student, has seen much to admire and venerate in the wonderful effects of laws originated and maintained, constant in power and truthfulness, by the Ruler of the Universe.

On one occasion, I was exhibiting to a friend the peculiar and wonderful action of antimony in a state of fusion cast on a plane surface; this is well known as an interesting chemical experiment, but it is not generally known that, just before fusion, the fragment of antimony is in a condition to deposit crystals of exquisite beauty and variety; some little skill in manipulation is requisite, but I have found results invariable under the following conditions: Take a small bit of the metal (in condition usually obtained from any extensive dealer in metals), weighing about two or three scruples, place it on a bit of charcoal with the broadest surface away from the flame of the blowpipe; heat it by commencing at the side nearest the lamp, and gradually working over to the broad side, getting the whole into a state of red heat; do not allow fusion. After it has been maintained at a red heat for two or three seconds, a dense, yellowish smoke will be observed to emanate from the broad side of the fragment; keep the metal hot for about one or two seconds after this smoke has made its appearance; then discontinue the heat and allow the fragment to thoroughly cool, when the broad surface will be found covered with a coating of the most delicate crystallization, which, examined under moderate microscopic power (75 to 100), will show an array of beauty and variety seldom equalled. The formation of the crystals may be clearly seen by the naked eye while the metal is cooling, but only as a dense forest of brilliant, diamond like points; under the microscope, they are seen to be transparent and somewhat polariscopic, having the shape of crosses, spears, peculiar shaped flowers, fans, etc. What the substance is that forms the crystals I cannot say, but a chemical friend suggests that it may be antimonious acid.

Another beautiful object for the polariscope is saturated aqueous solution of chloride of mercury (corrosive sublimate). About one dram may be put into a small vial (those used by homœopathists are best, say a two dram vial) and fill with water (distilled water is best). It is immaterial whether the water takes up all the chemical or not; indeed the shortest way to obtain a saturated solution is to have more of the chemical than the water will dissolve. Put a drop of this solution on a glass slide, and pass it a few times through the flame of a spirit lamp to facilitate evaporation, and the crystals resulting will be found, under the polariscope, gorgeous in color and beautiful in shape. Too much heat will result in disappointment.

I would add, in reference to the antimonious crystals, that they may be produced by making a small cavity in the charcoal and laying a flat piece of the metal over it, directing the flame from the blowpipe down on to it, as nearly perpendicular as possible; this gives a copious deposit both in the cavity and on the under surface of the metal; but I have not found them so interesting nor quite so pure in color as those produced in the mode first described. In breaking up a lump of the metal some of the pieces will assume a somewhat triangular form; these are the best to use without an an excavation in the charcoal. Do not allow the metal to fuse, and watch carefully for the peculiar smoke.

J. DE WALDEN CHURCHILL.

Buffalo, N. Y.

Sea Sickness in Railroad Cars.

To the Editor of the Scientific American:

In your paper of June 15th, there is an article on sea sickness from riding in railroad cars, in which the writer says he cannot tell why he with others "was made sick, when there was no pitching or rolling motion to the car." My theory of sea sickness is, not that we are made sick from the pitching and rolling motion alone, but from a combination of both, together with the sudden stopping of either motion. When we rise on to the crest of a wave, we take an upward motion, and when we sink into the trough of the wave, we take a downward motion, and there is a moment in each case when there is a sudden stop or almost a dead point (as in the case of the engine), reversing the mechanical action of the stomach and other viscera, causing a whirl of the brain, thus affecting the whole system. C. LEAVITT.

Windsorville, Conn.

An Invention Wanted.

To the Editor of the Scientific American:

It must be admitted by all persons who have given the matter serious thought that a great desideratum of the age is a clean and durable material for covering floors of dwellings. Carpets are certainly far from meeting the want, as they collect dust and impurities which are exceedingly injurious to the lungs of those sweeping them.

Some material susceptible of being manufactured in pleasing designs, which will be agreeable to the tread, durable, and not too expensive, would meetwith very extended sale.

San Francisco, Cal. GEORGE TASHEIRA.

RED ANTS, if made angry, discharge a very pungent acid substance, called formic acid, "formica" being the word for ant. If these ants are distilled, a substance is produced so burning that, if it is dropped on the skin, it eats into it like fire. It is also derived from the stinging nettle.

[For the Scientific American].

THE GATLING GUN. DOES HISTORY REPEAT ITSELF?

A writer, over the signature "S." under the head of "Notes and Queries," in the SCIENTIFIC AMERICAN of June the 18th, says: "In Littell's Diary, under date of January, 1690, mention is made of an expedition being fitted out against Ireland, and amongst the munitions taken are four of the new invented wheel engines which discharge 150 musket balls at once, and, turning the wheel, as many more; they are very serviceable to guard a passe." And the writer asks the question; "Does history repeat itself in this instance, and is this the forerunner of the Gatling and mitrailleur guns of all kinds?"

Many persons write upon subjects they do not understand. But this does not account for the habit some writers get into of depreciating the value of the labors of modern inventors by hunting up some ancient and obscure allusion to something that the writer (with the modern invention before his eyes to give him the idea) supposes may have been like what that he now sees. As to the case in point, it may be truly said the Gatling gun is not a "wheel engine," nor does it discharge 150, nor even 10, balls "at once." If it did, it would already have become a gun of the past, like your correspondent's antiquity, instead of promising to be the weapon of the future, as it now does.

The Gatling gun was designed expressly to secure continuity of fire. It loads itself, and fires one shot at a time, but it delivers its fire in rapid succession, at the rate of over 400 shots in a minute. Persons who are well acquainted with the history of firearms do not need to be informed that in past ages many engines of warfare have been invented which discharged a number of balls in a volley, or "at once."

Connoisseurs of the subject well know that none of these crude old ideas developed any of the essential features of the Gatling gun, which differs in principle, in method of operation, and in construction, from anything which has preceded it.

The Gatling gun is a repeating firearm, consisting of a cluster of barrels, or rather of breech loading guns, grouped about a central shaft to which they are attached and together with which they all revolve; each barrel is furnished with its own appropriate lock which revolves with the inner breech and barrels; moreover, each lock not only revolves, but moves forward and back at each and every revolution of the gun. A single stationary cam provided with inclined planes, contained within the casing of the gun, operates the breech mechanism of all the barrels, opening and closing their breeches as they successively come within its range so as to allow the cartridges to drop one at a time into line with the barrels and then be forced into their rear open ends. A single stationary cocking device effects the firing of each barrel in turn. In fact, the main characteristic of the Gatling gun is that it consists of sets of three parts, namely: locks, inner breech and barrels, all revolving at the same time; and a remarkable feature of the arm is that it cannot be loaded or fired when either of these three parts is at rest. The gun is supplied with metallic cartridges, which are of modern origin, from "feed cases" or "feed drums" through a kind of hopper in the same way and about as fast as corn is supplied to a mill. The gun also has a traversing arrangement which permits of a wide sweep of its shots during the very process of firing.

What person, previously to this invention, ever saw, heard of, or wrote about, a firearm of this kind? *

Laboring Men and Men of Leisure.

One of the prominent speakers, at the meeting of employers in this city the other day, stated very distinctly that there were in the late strikes some very marked traces of communism, and that the question had been frequently heard among the strikers "Why should we, too, not live in brown stone houses?" Twenty years ago, the sole object of a strike was to obtain a slight increase in wages; today most of the leaders, at least, look on themselves as doing something to has en a social reorganization, in which there shall be no class exempt from manual labor. Professional men, clerks, and all others whose work is mainly of the mental kind, or is at all events clean work which may be done without disfigurement of any kind, have become in their eyes nearly as obnoxious as the regular loungers. In short, the ideal society of the labor reformers, everywhere, though more vaguely held in some places than others, is one in which all shall be in a greater or less degree manual laborers, so that the social distinction now created by a man's not laboring with his hands shall disappear.

The effect of such a revolution as this on civilization—that is, of the disappearance from society of everybody who did not settle down every morning to some distasteful physical task and work at it as long as his nervous energy enabled him, and of everybody who owed anything in the way of greater social freedom, or the greater freedom in the choice of pursuits which wealth gives, to his father's accumulations or his own rapid success—would form a curious subject of speculation. It is well to remember, when we talk about "civilization" and glory in the difference it has made between us and our skinclad forefathers, that ninety-nine hundredths of it are the result of the work of what we may call the "leisured class," that is, the class whom our social arrangements permit to live in what to the manual laborer seems idleness. In fact, the first step in civilization is not made until some portion of the community is released from the necessity of toiling with its hands and allowed to occupy itself with thinking, speculating, or in other words, following the train of abstract reasoning and playing with the imagination; and the rapidity of the rise of every people into civilization has been in the ratio of the number of those whom it was able to release in this way from the common drudgery of life. A great majority of these have always, will always, to all outward appearance, think and imagine in vain, as if it were an essential feature in the moral order of the universe that there should be this seeming waste of effort in every department of human activity. But the number of those who have tried to make such contributions without succeeding, and the number of those who have made trifling contributions not great enough to rescue their names from oblivion but good enough to help the others, the Keplers, Newtons, Davys, and Harveys, to their discoveries, has doubtless been almost beyond count. But they could not have shown themselves at all, in a society of manual laborers such as some working men dream of.

God has somehow not organized society according to our notions of justice. He has made some men strong and healthy, others weak and sickly; some men wise and able, other men foolish and stupid; some women handsome, other women plain; He has imposed on one half of the human species the pains of reproduction, to the other half He has given only its pleasures, and on this inequality, human society is organized. Every man has his post, but there is an enormous difference in the comfort and dignity of the different posts.

The safety and progress of humanity, as a whole, depends on each man's serving faithfully and without murmuring. The rude fishermen of the Northern sea, as a great English writer has finely said, collects the oil which fills the scholar's lamp in the luxurious capital three thousand miles away. Should the day ever come when the fisherman will insist on the scholar's collecting his own oil, the day when there will be neither scholars, fishermen nor oil will not be far distant. —*Christian Union.*

Replanting Teeth.

[Dental Cosmos.]

On the 24th of April, 1868, a young, man C. W., called at my office to consult me in relation to three of his incisors. In a scuffle, the night before, he had these teeth knocked out by a blow,—the two central and left lateral incisors. He had replaced them as well as he was able at the time of the injury, but from the breaking of the alveolar border, the teeth did not stay in their places,—protruding about two lines. The gums were considerably lacerated and much inflamed. I administered the nitrous oxide, and with the aid of a pair of forceps, replaced the teeth. I then softened some gutta percha and molded the same over the loosened teeth, including two of the firm teeth upon either side of the loose ones, thus forming a dental splint which kept the teeth in their places until they became firm. I applied tincture of aconite and camphorated chloroform to the injured parts. At the expiration of five days, the gums were badly inflamed and the teeth sore. I continued the use of dilute aconite for one week longer, when the inflammation had subsided, and I removed the splint. At the expiration of four weeks, the teeth were sound and firm in their sockets; but from the effusion of lymph, the teeth protruded slightly from their sockets, and to avoid irritation I removed the cutting edges with a file.

Four years have intervened since the accident occurred, and the teeth remain perfectly firm, and have never given him the slightest trouble, nor have they changed their color.

Case 2.—In August, 1871, a young man, about seventeen years of age, came to me with alveolar abscess. I persuaded him to have the tooth extracted and replanted. He finally consented. I extracted the tooth, bringing away the sac at the apex of the root, containing pus. I cut three eighths of an inch from the end of the root, cleansed the socket by syringing it out by dilute carbolic acid, immersed the tooth in aconite and camphorated chloroform, and replanted it. In four days the tooth was a trifle sore, but he expressed himself as perfectly satisfied. About one month afterward I filled the tooth, which remains perfectly sound and firm until the present time.

I have replanted four others with like treatment, and with good results.

A Poor Boy's Victory.

An appointment to the United States Naval Academy having been placed within the gift of Colonel Wm. R. Roberts, member of Congress from New York city, he determined to award it to the applicant who should, in a competitive examination, prove himself to be best qualified therefor. This examination, recently took place in the hall of the Board of Education in this city. Twenty six boys were present, thirteen from the public and thirteen from the private schools of the Fifth Congressional district. Sixteen of the number were rejected by Dr. Skiff, the medical examiner. The examination was conducted by Superintendent Kiddle and his assistant, Mr. Harrison. Master John O'Keefe, aged fifteen years, of 107 Washington street, stood first in the order of merit and is to be the nominee. His parents are in very humble circumstances, his father, Timothy O'Keefe, being an ordinary dock laborer. The announcement of the decision of the committee was received with applause, as the appearance of the lad denoted his condition in life. He was heartily congratulated by all present, but by none with so much pride and emotion as his principal teacher, Mr. Duffy. Master O'Keefe, it was remarked by all present, bore a striking resemblance to ex-President Lincoln. A subscription is to be immediately started in the First Ward for the purpose of securing his necessary outfit.

IT is alleged that colored persons are never sunburned because the dark color of their skins absorbs the heat and conveys it into the system, so that it is converted into sensible heat, producing perspiration. But the white skin does not absorb the heat; the sun's rays therefore rest upon and burn it.

PRESSURE ON FOUNDATIONS.

We make the following extracts from an admirable article on this important subject lately published in the *Builder*, in which the principles governing the attainment of safety in building are laid down and classified.

The nature of the soil to be built upon is evidently the first object for consideration; and it is scarcely necessary to say that soils vary in their strength or bearing power as much as in their geological formation. They range from a soft or semi-fluid condition—such as that of marsh, mud or silt,—through all intermediate stages to the condition of the hardest rock. The inherent strength of the soil itself, therefore, and the load to be sustained upon a given unit of its surface (which is usually taken in practice as a square foot) are first to be inquired into.

Where the soil is incapable of sustaining the incumbent load of the structure to be placed upon it, it becomes the duty of the constructor either to increase its bearing power by artificial means, or else, by widening the area of the foundations, to extend and enlarge the bearing surface until it contains within it the resisting power necessary to the requirements of the case. The means by which these results are arrived at will form the second branch of the inquiry.

The materials commonly used for these purposes and the amount of bearing power obtained from them will also be considered.

Every soil is capable of sustaining a certain weight upon each unit of its surface, which varies according to the solidity of the soil. The bearing power of a soil approaching in fluidity to water itself may be assumed at zero, or the lowest point in a scale, and the bearing power of hard rocks may be assumed as the highest; and if these bearing powers be taken at from 0 to 30 tuns per square foot, it will be sufficiently accurate for practical purposes. Between these extremes lie all the intermediate soils of weak rocks, shale, gravel, sand, clay, loam, silt, etc. Supposing the soil to be capable of bearing a pressure of three tuns per square foot, it follows, of course, that either one square foot of foundation must be provided for each three tuns weight in the entire structure, or that the bearing power of the soil must be increased by some means to the required standard.

The weight of the intended structure should first be calculated, and should include all extraneous loading which may be incidental to it. Care must, of course, be taken to ascertain the proportion of weight carried on each part of the foundation, and the area of the part must be proportioned accordingly. The allowance for extraneous loading will vary according to the use of the structure.

Thus in a railway bridge, it is usual to calculate the weight of the trains at from 1 to 1½ tuns per foot run, for each single line. On a road bridge, the usual load assumed is from one half to one cwt. per superficial foot, the load of a crowd of persons standing close together having been ascertained to be a little more than three quarters of a hundred weight per square foot. In ordinary floors, the load may be assumed as similar to that of the road bridge. In a warehouse, the load must be ascertained.

It is then necessary to determine the number of tuns pressure per square foot which the constructor will put on the soil on which the building is to be erected. In this respect, great variety exists in the practice of the most eminent engineers, and pressures varying from 1 to 8 tuns have been allowed on foundations on the London clay. About 4 tuns is recommended in practice as a safe pressure on stiff clay. Loam, indurated clay or shale, as well as soils of similar strength, such as chalk, etc., vary in bearing power in degrees impossible here to indicate. The practical judgment of the constructor must determine in each case. Beds of solid gravel form, when of sufficient thickness and uniformity, one of the most unyielding of the ordinary soils, and they may be safely loaded with double the pressure which can be put on London clay.

The soils of sand vary from a compact close sand, with a clayey bind perfectly impervious to water, through all conceivable varieties of coarseness, looseness and porosity. Porous sand soils are easily removed by running waters, and they require the constructor's extreme care where this is likely to occur. The only course is to lay the foundations so deep that the current shall not lay them bare. Perhaps the most difficult of all engineering work is the foundation of bridge piers in a deep soil of this nature. The usual means employed in these cases up to a comparatively recent date have been the erection of coffer dams round the space to be occupied by the foundation of the pier, the piles forming the dam being driven till they reached solid soil. When a solid bottom could not be attained, long piles were driven all over the foundation surface and the concrete or masonry foundations were laid upon them. In the first case, the natural sustaining power of the lowest soil reached must be the measure of the pressure to be allowed; in the second, this is increased by the friction on the sides of the piles as well as the resistance of their lower ends to sinking. Of late years, these plans have been superseded by sinking, into the bed of the river, upright cylinders. (The construction and mode of operation of such cylinders are already familiar to the readers of the SCIENTIFIC AMERICAN, and need not be dwelt upon here.)

It is generally found that ordinary soils will bear more weight at great depths than nearer to the surface; which is owing to their condensation by the superincumbent pressure, and, also, to the increased difficulty of laterally displacing the soil. This may be understood by considering the action of a pointed pile, which, as it is driven, displaces the original material and renders the soil in its immediate vicinity more condensed.

When sand of good quality is protected from the influence of running water or rains, it forms an excellent foundation, and, when in thick beds, may be loaded with from 6 to 8 tuns per square foot with perfect safety.

There are, however, some practical considerations which modify the question of what constitutes a safe pressure. uppose, for instance, a solid block of masonry, 20 ft. square and 20 ft. high, and a thin wall of the same material, also 20 ft. high, were placed on the same soil. On this supposition, the conditions of both soil and pressure for each square foot of the foundations would be alike in each case; and yet the thin wall, as regards the stability of its foundation, would be far less advantageously situated than the square block. It is customary, therefore, in practice to extend the foundation courses of a wall or column to a considerable width beyond the face of the superstructure.

Rocky soils, which vary from the hardness of granite to that of soft crumbling stone easily worn by exposure to the weather or to running water, may be considered in the same category of bearing power as masonry itself.

The weight of the structure having been calculated, the pressure per square foot on the soil determined, and the area of the foundations deduced therefrom, as above described, the base of the structure must be extended, either by footings, concrete, or otherwise, so as to cover that area and transmit the pressure equally and uniformly over it.

It now remains to consider the pressures which may safely be adopted on the materials themselves which are used in foundations.

Good, ordinary brickwork will crush with a load of about thirty tons, and may be loaded safely up to ten tuns per foot. Brickwork of the best description, set in Portland cement, can be loaded with double this weight; though this should be considered extreme.

The load which can be put upon stonework depends upon the workmanship as well as upon the hardness of the stone itself. Thus, rubble walls with thick and irregular joints of mortar are weaker even than inferior brickwork, while well bedded ashlar masonry will bear loading to an immense extent. In general, from eight to thirty tuns per square foot may be taken as the practical limit.

Concrete will bear from six to twenty tuns per square foot, accordingly to the goodness and proportions of its materials.

The bearing power of timber piles is an important feature in foundations, and varies according to the nature of the soil and the size and length of the pile driven. Where long piles of whole timber are driven through a loose stratum to a firm one underlying it, to the usual extent (a tun hammer with a 15 ft. fall not driving the pile more than a quarter of an inch), they may be trusted with a load of from ten to fifteen tuns. Where their bearing power depends on the friction or adhesion of the soil on their surfaces, it may be easily ascertained by pulling up one of the driven piles by a lever. The measure of the weight required to raise it will be, of course, the friction of the ground on the surface of the pile. When the soil throughout is of a weak and fluid character, it should not be loaded with more than one sixth of the weight which will draw it.

These remarks are, of course, subject to modification in the endless variety of circumstances met with by the practical architect and engineer.

Instruments for Observing Earthquake Shocks.

Owing to the great importance of being able to foresee the eruptions of Vesuvius, the late Government of Naples was led to put up an observatory to watch its signs. The house, built in 1844 on Mount Vesuvius, stands near the hermitage, 2,080 feet above the sea, being placed on a ridge of the mountain, which has turned aside many lava currents without being itself submerged. It is founded on vaulted arches, above which is a large hall for specimens of lava and volcanic minerals. Steps lead up from this hall to the observatory proper. The whole is in charge of Professor Palmieri, of the Royal University of Naples, who, by his ingenuity and zeal, has brought the instruments to a state of great perfection.*

The most important sections of the apparatus are the seismographic or shock recording instruments, which are in a separate room, and are worked by electricity. There are also instruments for observing the electricity of the air, and the pressure of the wind and amount of rainfall, as well as the diurnal variations of the magnetic needle.

All former attempts at measuring and recording earthquakes depended directly on the shocks making their own marks; slight ones thus escaped notice, but by the use of electricity the certainty of record is invariable. The instruments are made to record the horizontal and vertical oscillations, the time of their occurrence, and their duration and direction.

Mercurial columns of ingenious forms are employed in the instruments. The agitation of the mercury, or its change of level, by any shaking of the earth, sets the delicate electrical recording apparatus at work, which instantly shows what has happened.

By means of this apparatus, the astronomical time of the first shock is recorded, as well as the interval between the shocks, and the duration of each; their nature, whether vertical or horizontal, is given, as also the maximum of intensity; and, in the case of horizontal shocks, their direction is indicated. Professor Palmieri has the instruments examined three times a day, and an assistant observer is always at hand, to hear the bell and put back the apparatus to its normal position for fresh observations. It appears that it records all the violent shocks that occur in the Mediterranean basin; thus, on the occasion of the late eruption in the Greek Archipelago, Professor Palmieri was able to announce to the Neapolitans that a great disturbance had taken place long before the news reached Italy. The shocks in connection with Mount Etna are readily observable.

It is recommended that where earthquakes are frequent the observatory should be founded on solid masonry, bedded in the earth, and should consist of a wooden house not liable to be overthrown.

The following signs of an approaching eruption are considered reliable: First, when the crater fills up and the vapor from it diminishes in quantity. Secondly, when the vapor from the crater gives much deposit of iron or sodium. Thirdly, when the water sinks in some of the springs of the neighborhood.

The phenomena more nearly preceding an eruption are the occurrence of earthquakes, increasing in intensity and frequency for some days beforehand, also the irregularity of the diurnal variations of the magnetic needle. One of the remarkable attendants of an eruption (which may be observed to a lesser degree whenever the mountain is steaming much) is the frequency of lightning flashes, attending on the condensation of the vapor of water from the crater; just as, in an ordinary thunderstorm, lightning occurs at the time the vapor is condensing, as is proved by the rain that follows.

In addition to these phenomena of Vesuvius, the volcanic activity of the district is shown by a gradual rising of part of the coast of the bay near Torre dell' Annunziata, where there is already an alteration of several feet; while on the other side of Naples, at Pozzuoli, the pavement at the edge of the harbor is sinking below the level of the water, and the pavement of the temple of Jupiter Serapis had, in the spring of 1869, sunk about 16 inches lower than in 1858.

*The late eruption, which was so extensive and so fatal, was foretold by him as about to take place, and with admirable courage he remained in the observatory at the most dangerous period, when the building ran great risk of being ruined, in order accurately to observe the records of his instruments; a service for which, it is understood, he is to be made a senator of the kingdom of Italy.

Hot July.

In New York, the heat of the first July week has not been paralleled within ten years. On Tuesday, the 2nd inst., the mercury at 3 P. M. stood at 100° in the shade. On the Sunday and Monday previous, it reached 98°, the three days averaging nearly ten degrees hotter than the corresponding days of 1871.

The suffering of both man and brute has been terrible. In the crowded business streets of down town, in the new buildings in process of erection, it was pitiable to see the laborers working unprotected by shade and sweltering in the fierce rays of the sun. Cases of sunstroke were frequent. On the 2nd inst. nearly one hundred and fifty persons were prostrated during the day. Owing to the admirable ambulance system now in working order throughout the city, the sufferers were promptly cared for, but about seventy of their number, it is stated, have died. The horses on the street cars and omnibuses seemed unable to draw their load, dozens succumbing to heat and exhaustion. Among the tenement houses and rookeries in the lower wards of the city, the misery has been appalling.

Railway in Egypt.

The staff of surveyors and assistants, nearly thirty in number, taken out by Mr. John Fowler, C. E., to make a survey for a railway in the valley of the Nile, have returned, after having successfully completed their work. The line surveyed is about 600 miles in length, and commences at Wady Kalfah, near the second cataract, and terminates at Khartum, where the Blue and the White Nile unite their waters, above the sixth cataract. For nearly three fourths of its length, the line will be on the edge of the valley of the Nile, about three fourths of a mile from the river, and constructed above the level of the periodical inundations. At the commencement of the great bend, between 18° and 16° north latitude, the railway will leave the valley, and proceed by a direct line across the desert of Bayuda to a point near the sixth cataract, whence it will follow the valley southwards to Khartum, the intended terminus for a time.

THE merchants in Birmingham, Eng., and the surrounding townships who do business on foreign account continue to receive valuable advices from nearly all the markets, as well in Southern as in Northern Europe, from the British antipodean colonies, and from British Canada and the United States. The reduced tariff which will come into operation in America on the 1st of August, by which all metals and their manufactures, except iron wire, watches, and jewelry, are to be admitted at a reduction of 10 per cent, and tin plates at a reduction of 15 per cent, is stimulating not only the demand for iron by American customers, but is also leading to an enlarged business in respect of nearly all the goods contemplated in the reduction. Valuable orders have already been sent across; and enterprising manufacturers and merchants are stimulated to greater energy with a view to the extending of their connection with the different United States markets.

THE velocity of electric waves through the Atlantic cables has been ascertained by Professor Gould to be from 7,000 to 8,000 miles per second. Telegraph wires upon poles in the air conduct the electric waves with a velocity more than double this. It is a curious fact that the rapidity of the transmission increases with the distance between the wire and the earth, or with the hight of the support. The *Journal des Telegraphes* says that wires, placed on poles slightly elevated, transmit signals with a velocity of 12,000 miles a second; and those at a considerable hight give a velocity of 16,000 or 20,000 miles.

RAILROAD CAR BRAKE.

The improved brake illustrated in our engravings is more especially adapted for use on four wheel coal cars, or such ore cars as are generally used about furnaces, though it admits of various modifications of its arrangement which would adapt it to other forms of car without altering the principle involved.

Fig. 1 represents a coal car with the brake applied to one pair of wheels. Only the upright shaft and hand wheel are shown in the engraving, the other portions of the brake being indicated by dotted lines. Fig. 2 shows the side frame of the car, in section, with the brake attached. At A are shown the brake blocks, which are made of wood or other suitable material. These are attached to a flexible iron strap, B, the ends of which are secured to the frame of the car by the nuts and screws shown at C. This strap is about three inches wide and a quarter of an inch thick. D is a vertical brake rod which is operated by the wheel seen in Fig. 1. On the lower part of the brake rod is a screw which works in the nut, E, attached to the frame of the car, and on its extreme end is the block, F, which has a groove lengthwise through which the strap passes. It is prevented falling out by a pin. The end of the brake rod works in a socket in the block in such a manner as to raise or depress the block without turning it. When it is desired to apply the brakes, the rod is screwed down by means of the wheel, and the strap is carried down with it. This brings the blocks, A, in contact with the wheels of the car and throws part of the weight of the car upon the brakes. The amount of weight sustained by the brake blocks is dependent upon the pitch of the screw on the rod, D, and upon the diameter of its wheel. When the brake is not in use, the rod, strap, and brake blocks are elevated sufficiently to relieve the wheels of all restraint. Should the strap stretch, it may be easily brought to the proper tension again by tightening the nuts at C.

It will be noticed that the brake blocks are applied directly on the top of the wheels, which prevents the strain coming upon the boxes as it does when they are placed in any other position. On gravity roads, this brake is said to work admirably. One in use on a road having a uniform grade of 200 feet per mile, did all the braking up of five cars for six months, and has been running, in all, two years in good order. It appears to be durable, and costs only an insignificant sum to keep in order. For further information, the inventor and patentee, Mr. Frederick A. Canfield, of Dover, N. J., should be addressed. Patented Jan. 9, 1872.

Fig. 1

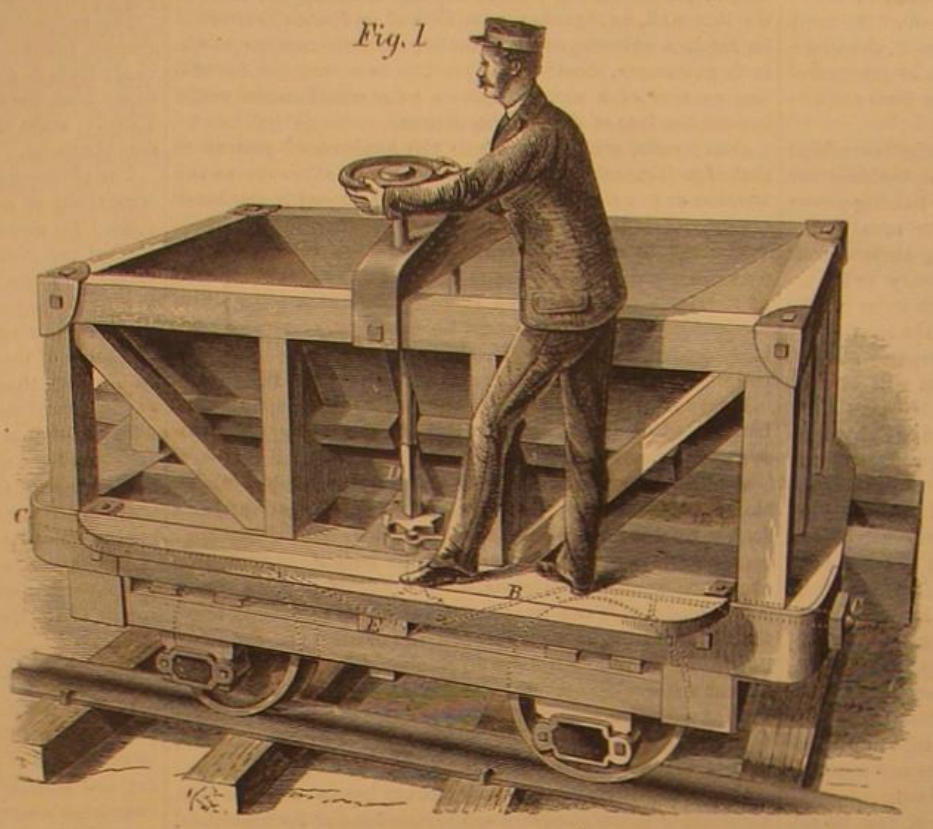
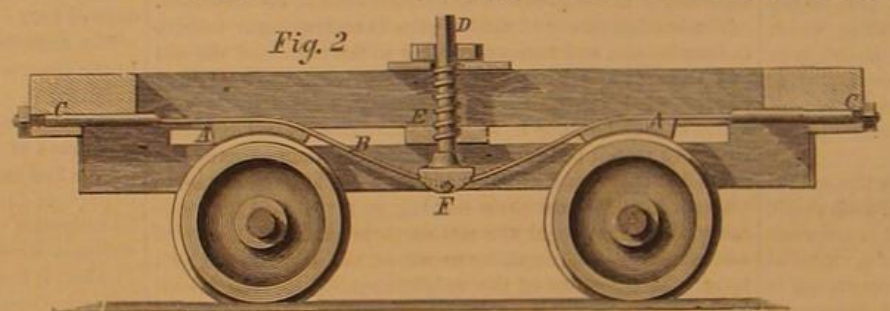


Fig. 2



CANFIELD'S RAILROAD CAR BRAKE.

RAILROAD RAIL.

The improvements in railroad rails, which we this week illustrate, are designed to give to the rail that degree of elasticity which will enable it to bear all the pressure and shocks to which it may be subjected with the least possible amount of wear and tear to itself and the rolling stock which passes over it. To effect this much to be desired object, the inventor relies on the merits of the form and construction of his rail, the material of which it is made, and his method of joining the ends of adjacent lengths. Several designs for the rail are shown in our engraving, where, generally, A is the rail and B the connecting piece, all of which are secured by letters patent.

The first patent granted to the inventor, Mr. Rufus S. Sanborn, of Rockford, Ill., dated August 8, 1871, was for the rail and joint shown in Figs. 1 and 2. It will be seen that the rail is tubular, the upper part being nearly cylindrical and the lower somewhat of a triangular figure. The material of which it is formed is steel. The rail used in practice would be four inches high and four inches wide at the base, which, it will be noticed, is slightly arched. The sides approach at the neck, C, to within about a quarter of an inch of each other. Now it will be readily seen that the effect of a weight applied on the top of this rail will be to bring the sides nearer together at C. A sufficiency of pressure would make them touch. There will, at the same time, exist a lateral thrust of the lower sides which will tend to flatten out the arched base, the yielding of which brings into play a reserve of elasticity that is available after the sides are closed at C. The closure of the neck effects a slight change in the form of the arch at the rail top, which enhances its strength without sensibly affecting its bearing surface. The joint, B, is, in effect, a hollow spring of about sixteen inches in length, which is compressed when inserted in the ends of the rails to be connected. It binds them securely and is capable of yielding with them to the influence of pressure or percussion. The joined rails are shown at Fig. 2.

Finding that there was a practical difficulty in manufacturing the exact form of rail just described, which arose from the weld required at the base, Mr. Sanborn devised the form shown in Fig. 3, which was patented December 12, 1871. Here a separate base is secured to the body of the rail by a lap joint as delineated, which very much simplifies the construction. The elliptic form of the top arch and the configuration of the connecting spring, B, shown at Fig. 4, forms the subject matter of a further patent dated March 26, 1872. In this form the sides are at once connected with the base without being doubled over, as in Fig. 3. The elliptic arch affords a wider tread for the wheels, and the connection is rendered more secure by the enlargement of the spring joint.

The three forms of rail described are similar in principle, so far as their elasticity is concerned, and in each case the limit to the yield or give of the rail is fixed by the space left between the sides at C, and by the arch in the base. The inventor claims that by this arrangement the tread is not affected by pressure sufficiently to produce an up grade for the wheels to run on. The tubular connecting joints make, virtually, a continuous rail. The junctures are made without bolts or other fastenings, and allow of expansion and contraction taking place freely while keeping the rails securely in position. In this way the violent hammering arising from the wheels striking the ends of the ordinary T rails is obviated, and consequent damage to the rails and rolling stock is prevented by the elasticity of the joint.

The rails made as in Figs. 1 and 2 have the advantage in strength and durability, and those constructed as in Figs. 3 and 4, with lap joints, possess that of cheapness. The elliptic top may go with either construction. The inventor states that all the forms presented can be readily manufactured. The first form he proposes to make by passing a round tube of proper size through rolls constructed to press it into the required shape. The other forms, and the connecting pieces for all, may be made of rolled metal plate of the requisite thickness. He claims that a length of rail of this kind, weighing forty pounds, has as much strength as a similar length of solid rail weighing sixty pounds, and that great economy of material will consequently arise from the use of the new rail.

Mr. Sanborn designs placing his invention under the control of a stock company, by whom it would be tested and its practical worth fully developed. He may be addressed, as previously stated, for further information on the subject.

Fig. 1

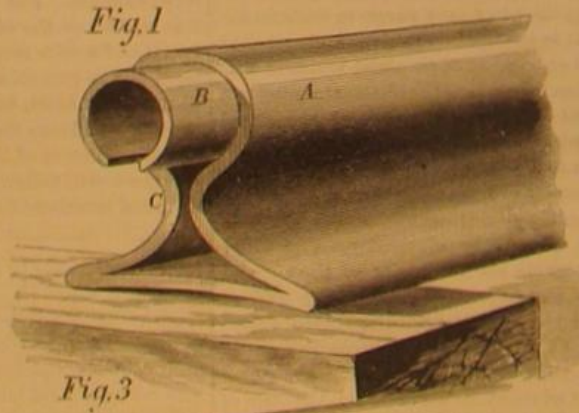


Fig. 2

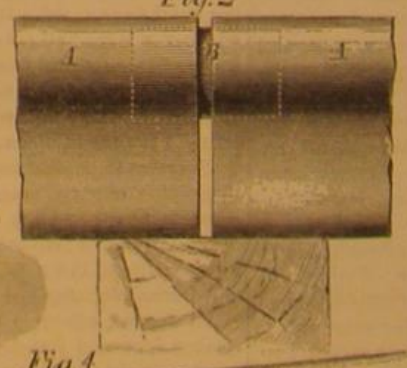


Fig. 3

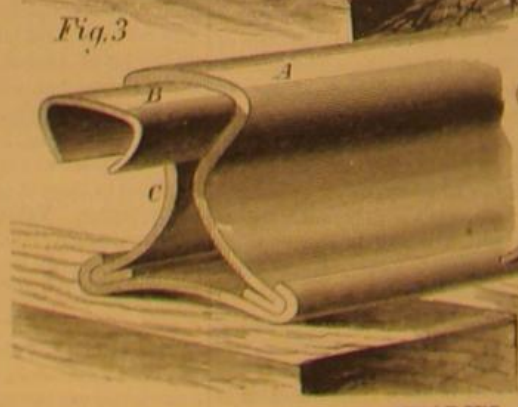
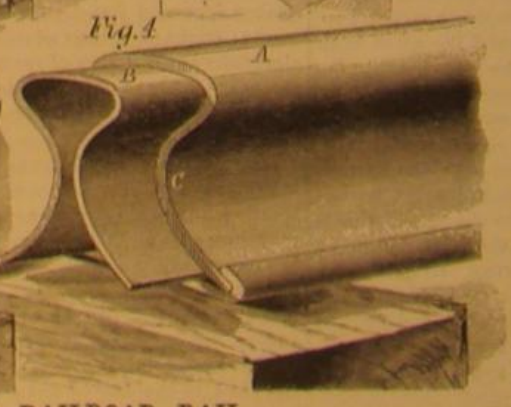


Fig. 4



SANBORN'S RAILROAD RAIL.

The Polariscope.

Most of our readers have seen an example of what is termed double refraction by looking at any object through Iceland spar, which is a crystallized carbonate of lime. When a piece of the spar is placed upon a sheet of printed paper or any other well marked object, two images of that object or print will be seen, each separated from the other by a small degree. If the rhomb of spar be turned slowly round with the same face resting on the paper, one of the images will be seen revolving round the other. By judiciously sawing the rhomb of spar in two and cementing the surfaces with Canadian balsam, one of these double images may be entirely got rid of; and a piece of Iceland spar thus treated, and which is now well known all over the world as a Nicol's prism, forms the means by which the great majority of the experiments with polarized light are at present made. This simple piece of apparatus is most extensively used wherever light and its various phenomena form the subject of research. No microscope of the better class is considered to be complete unless it has a polariscope attached to it.

The polarization of light may be employed as a means of chemical investigation. A few days ago, says the British *Journal of Photography*, a friend called upon us with two bottles of similar size and appearance, filled respectively with aqueous solutions of bromide of cadmium and bromide of ammonium, and labels on which he suspected had got "mixed up" just before being pasted on, leaving him in some doubt as to whether they were properly labelled. Instead of subjecting one of the solutions to an analytical chemical test, as had been suggested, we merely placed one drop from each of the bottles upon a small plate of glass, warmed it slightly to start the crystallization, and examined the two crystallizing solutions with the polariscope. In less than thirty seconds after placing the glass slide on the stage of the instrument, we indicated, in the most definite manner, which was the cadmium salt and which the ammonium. This is only one of many uses to which a polariscope may be put.

M. Blanquart-Evrard.

M. Blanquart-Evrard, recently deceased in France, aged 70, may justly be esteemed one of the early fathers of the photographic art, for he it was who first popularized its productions and proved that it could be applied successfully to the illustration of books. At the time when he first started his photographic printing establishment at Lille (1850), nothing was heard of in photography but daguerreotype portraits and prints from calotype negatives upon paper, in a rusty red, inartistic style. He began by entirely changing or reversing the process of Talbot in taking negatives, and established the principle which has since been observed in the common collodion process. He showed the importance of organic matter in the film as conducing to clearness and density. He discovered sulphur toning, as well as the gold toning of paper prints; and so modified the negative process of printing by development as to enable it to produce the most artistic photography upon paper yet seen. His latest discovery was a mode of intensifying a negative by exposing it with its back to the light for an hour two after it is developed but before it is fixed.

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THE DOMESTIC TELEGRAPH.

Not many evenings ago, an intelligent, gentlemanly looking individual presented himself at our door and asked "if we didn't want the district telegraph put into our house." At the same time he handed over for our examination a very pretty little instrument, composed of cog wheels and somewhat resembling a clock. "We attach the instrument to the wall," he said, "in some convenient position in your house, and to it we connect a wire leading to your roof, where it unites with another wire that extends to one of our district offices on Broadway." Pointing to a small knob, he continued: "If a fire breaks out in your house, you just push that lever, and in three minutes the firemen will be here. If thieves break in, you move that other lever, and in three minutes the policeman will make his appearance. If you want a special messenger to go upon any sort of business, night or day, you just turn this little button, and in three minutes the man will be at your door ready for service. The signals you thus make are all received and recorded at our Broadway office, where we keep a force of attendants, in readiness at all hours, to execute the requirements of our customers. Your wife or any other intelligent person can make the signals. We make no charge for putting the instrument into your house or for keeping it in order; but you pay us $2.50 per month for its use and fifteen cents an hour for the time occupied by our messenger in doing your business. When you go away to the country in summer, you can have an attachment put on, so fixed that, if burglars attempt to break in, an alarm will be sounded at our office, when our policemen will quickly surround the house, and catch the thief in the act."

We rather liked the idea of having such a telegraph in the house, gave the order, and it was promptly put in.

In the course of a week or so afterwards, thinks we to ourselves, that is our wife and we, "let's try our telegraph just for fun, and see whether the telegraph folks are as wide awake as they pretend, or whether they are napping." This was early in the morning, just between getting up time and breakfast—before business begins—the hour when night hands go home and day hands have not yet come—the time when the manager is probably not on hand. Now let's see what this new-fangled telegraph is good for. So we pressed the knob, and there followed a slight click and a buzz. We looked at our watch, went down stairs, took seats at the breakfast table, when we were startled by a ring at the door bell. "Messenger from the District Telegraph Office. Got your signal. Wants to know what is wanted," was the report that came to us. Looking at the watch we found that just two and a half minutes had elapsed since we gave the signal. We felt a little bit sheepish in being obliged to tell the messenger that we had sent for him "just for fun, to see if he was really awake," etc., and as we were entirely satisfied on that point, he retired, sorry that we had no real business for him to do.

After breakfast, we went to the company's office, where we found a Morse paper recording apparatus, with which the various dwelling houses in the district are connected. Whenever a signal is given from any of the houses in the circuit, a gong sounds in the office, which notifies the attendant, and at the same time the telegraph clock work is set in motion; the paper moves, and upon it a signal is stamped and restamped or repeated. Each house instrument gives a different signal, and the various signals, with the names of the occupants and numbers of the respective dwelling houses, are registered or tabulated on the wall, like a hotel indicator. By glancing at the register, the attendant sees at once from what house the signal has come, also its nature, whether a fire has occurred, a robbery going on, or a messenger needed. The office is in connection with the city fire telegraph and police offices, and instant signals are sent thither if required.

Taken altogether, this district or domestic telegraph is a most useful and valuable institution, promotive of comfort, convenience, and safety of families. That it will soon come into general use, cannot be doubted. The wires are so arranged that in case they are severed, either by design or accident, an alarm is instantly sounded at the district office and the repairs are quickly effected.

SUMMER HEATS IN VARIOUS COUNTRIES.

For the benefit of our readers who are suffering under the effects of the present heated term, we have collected, from various sources the following, relative to the extreme summer temperature of the different countries of the world.

Thibet, situated in Central Asia, between the thirtieth and thirty-eighth parallels of north latitude, is a decidedly hot country, so hot, indeed, that even the fiercest heat which the firemen in a sea-going steamer have to endure is comparatively insignificant besides its midsummer temperature. "Misery loves company," and as the reader sits slowly melting with thermometer at 98° Fah., he will probably gather consolation from the knowledge that the unfortunate inhabitants of the above mentioned country are worse off than himself. The intense heat, reaching 150°, doubtless prevents their remaining either in their houses or their garments during the day, but such is the inconstancy of the weather that if they venture to remain out doors or to continue in their primitive costume throughout the night, they may possibly be frozen to death before morning.

Senegal in Africa and the island of Guadeloupe in the West Indies are next to Thibet in summer heat; the weather is variable, but often reaches a temperature of 130°. Still more changeable is the climate of the Great Desert of Sahara, where the thermometer, after rising to 130° during the day, at nightfall descends to among the fifties. In Persia, fearful plagues and pestilences are bred by an atmosphere heated to 125°. At Calcutta and on the Delta of the Ganges, points from which the Asiatic cholera is said to begin its western march, the mercury rises to 120°, while in Central America the same limit is attained.

In the jungles of Affghanistan and in the deserts of Egypt, 110° is the maximum. Strange to say, the same high temperature is reached in some of the interior valleys of California, although the average of the surrounding country is much lower. At Cape Colony, the diamond diggings in Africa, and in some parts of Utah Territory, the midsummer heat is 105°. This is next greatest in Greece, reaching 104°; then comes Arabia, 103°, the arid deserts of that country being much less heated than the vast expanse of Sahara. Now follows a strange anomaly: it will hardly be credited that our blue nosed neighbors in Canada ever experience such a temperature, but it is nevertheless a fact that at Montreal the extreme summer heat is often as high as that of the deserts of Arabia, both being 103°.

Our own State—New York—is not far behind, its summer limit being 102°. Spain, Upper India, Canton, China, the island of Jamaica, and most of our Southern States average 100°. With the exception of New York, 98° is the highest range in the Northern States. The island of Mauritius is next on the list, having a summer temperature of 96°; then come Sierra Leone in Africa and Guiana in South America, both 94°; then Ceylon, 92°. Throughout France, in St. Petersburg (Russia), Denmark, Belgium, Burmah, Shanghai in China, Penang, the Sandwich Islands, Buenos Ayres, and the islands of Bourbon and Trinidad, the average is 90°. That of Nova Scotia and the majority of the Azores islands is 87°. England, Ireland, Sicily, Siam, and Peru in summer are of about the same temperature, not exceeding 85°. Pekin in China, Portugal, and Natal Colony in Africa all have mild summers, 80° being the extreme. In Siberia, 77° is the limit. In Western and Southern Australia and the eastern and western parts of Scotland, the temperature does not rise above 75°. In Italy, Venezuela, and Madeira, 73° is the maximum.

The thermometer in Prussia, Victoria Land, and New Zealand rarely rises above 70°; in New South Wales not above 68°, nor, in Switzerland and Hungary, above 66°. Colder still are the summers in Bavaria, Sweden, Northern Siberia, Tasmania, and Moscow, in Russia, where 65° is the extreme limit. Norway, Greenland, and Newfoundland have no weather warmer than 60°; 55° is the maximum for Central Scotland, the Orkney Isles, Patagonia, and, the Falkland Islands; and finally, amid the ice and snow of the arctic regions, the heat of midsummer is below 50°.

Iceland, however, is colder still. The northern portions of that country virtually have no summer; on its southern shores, which are swept by the Gulf Stream, the temperature sometimes rises to 45°. Last comes Nova Zembla, bleakest and most inhospitable of islands, lying frozen in the Arctic ocean, on the confines of Northern Asia. It can be truly said that in that country there is no summer; for even in these midsummer days, while we suffer under the intense heat, there the mercury fails to rise beyond 34°—two degrees above the freezing point—and this is the very extreme of temperature.

FUNCTION OF POTASSIUM IN SOILS.—According to Nobbé, the presence of potassium in soils is necessary in order to enable the chlorophyll grains of the leaves to form starch, sodium and lithium being unable to replace potassium in this function, the latter indeed being actually injurious. He has also ascertained that the different combinations of potassium vary very much in their value, the chloride being by far the most efficacious.

THE NEW PATENT LAW OF CANADA.

We are indebted to the editor of the New York *Daily Witness* for an official copy of the new patent law lately passed by the Dominion Parliament, and which goes into effect September 1, 1872.

As this new law provides for the grant of patents and caveats to American citizens, our readers will doubtless be interested to know its general features, and we therefore subjoin an abstract.

The Canadian law is somewhat peculiar. It appears to contain a mixture of the English, American, and Continental systems, together with a few original articles.

Under the English and American laws, the patentee may exercise his own discretion as to the date when he commences the manufacture of his improvements. In consideration of making known his invention, the exclusive right to it for the period of the patent is guaranteed to him, and he may do as he thinks best about introducing it. If he chooses not to work the patent until a late date, or even not at all, it is his own affair. The grant is his and holds good during its allotted term. But at the end of the term, the invention becomes public property, and all persons may then freely enjoy its benefits.

The Canadians have adopted the Continental plan by requiring that the invention shall be actually worked in Canada within two years from the date of the patent on pain of forfeiture of the grant. Provisions of this nature are generally discouraging and inconvenient to inventors. But the proximity of Canada to this country, and the fact that Americans may, during the first year of the patent, make their goods here and take them to Canada, still enjoying protection under the patent, will greatly assist them in establishing the manufacture there within the period required.

Any American invention, even if it has been already patented here, may also be patented in Canada, provided that the American patent is not more than one year old. But if the sale and manufacture of the article has been commenced in Canada before the grant of the Canadian patent, the parties so manufacturing may continue the manufacture after the issue of the patent, without accountability to the patentee. But all other persons will be required to obtain the consent of the patentee before they can sell or manufacture. Our citizens can readily avoid any difficulty on this score by applying for the Canadian patent before the American patent issues.

The Canadian law affords suitable facilities for the sale of part rights in patents and for the record of assignments. But these privileges appear to be somewhat nullified by another clause, of singular phraseology, which reads as though it was intended to empower the owner of a paltry town right to destroy the validity of the entire patent, should he choose to do so, thus sacrificing the interests of all other owners or workers under the patent, without their knowledge or consent. To effect this nullification of the patent, a part owner has only to import or cause to be imported into Canada a single example of the patented article. This section evidently needs modification.

Another incongruous section is that which punishes the patentee with fine and imprisonment if he fails to stamp the word "Patented" and the year of the patent upon every patented article. The law is specific upon this point; but compliance with it would in many cases be almost impossible. For example, upon needles, hooks and eyes, percussion caps, eyelets, etc., it would be difficult to place a legible stamp. In this country, the law directs that the stamp shall be placed upon the package when it cannot be conveniently affixed to the article.

The Canadian law is also faulty in making the omission of the stamp a penal offence. A patentee's own interests will always lead him to attach the stamp to his goods; and whether the stamp is affixed or not, the public is benefitted, not injured, by the issue of the improved goods. Surely a patentee ought not to be treated as a criminal for the omission of a trivial thing which only concerns himself.

In this country, if the patentee fails to stamp the date of the patent upon his goods, and if any persons not knowing that such goods are patented should imitate them, they cannot be held liable for infringement of the patent. This is a more just and equitable provision than that of Canada.

The Canadian method of deciding interferences is novel. If two persons apply for a patent for the same invention, they are each to choose an arbitrator, and the Commissioner of Patents is to appoint a third. The arbitrators have power to summon witnesses and take evidence, upon which they determine who is the prior inventor, and to him the patent is issued. We shall watch the workings of this peculiar mode of settlement with much interest.

ABSTRACT OF THE NEW CANADIAN PATENT LAW, TAKING EFFECT SEPTEMBER 1ST, 1872.

The Canadian Patent Office is attached to the Department of Agriculture, the Minister whereof and Deputy are, respectively, Commissioner and Deputy Commissioner of Patents. The Governor appoints clerks and assistants. No employee in the Patent Office shall hold an interest in any patent. The Commissioner shall publish an annual report, a list of patents granted, and may also print the specifications and drawings if he thinks best.

Any person having invented any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement on any art, machine, manufacture, or composition of matter, not known or used by others before his invention thereof, and not being in public use or on sale for more than one year previous to his application in Canada, with the consent or allowance of the inventor thereof, may, on a petition to that effect presented to the Commissioner, and in compliance with the other requirements of the

Act, obtain a patent granting to such person an exclusive property therein; but no patent shall issue for an invention having an illicit object in view, nor for any mere scientific principle or abstract theorem.

But an inventor shall not be entitled to a patent for his invention if a patent therefor in any other country shall have been in existence in such country more than twelve months prior to the application for such patent in Canada; and if, during such twelve months, any person shall have commenced to manufacture in Canada the article for which such patent is afterwards obtained, such person shall continue to have the right to manufacture and sell such article, notwithstanding such patent; and under any circumstances, where a foreign patent exists, the Canadian patent shall expire at the earliest date at which any foreign patent for the same invention expires.

The patent may be granted to any person to whom the inventor has assigned or bequeathed the right of obtaining the same, or in default of such assignment or bequest, to the executors or administrators or as signs of the deceased inventor.

The applicant for a patent must make oath (before any Judge in the country where he lives) that he is the inventor, must furnish a full specification of his invention, with drawings in duplicate, together with a neat working model, made on a convenient scale. If the invention is a composition, he must furnish specimens thereof and of the several ingredients.

DURATION AND EXTENSION OF CANADIAN PATENTS.

Patents shall be valid for a period of five, ten, or fifteen years, at the option of the applicant; but at or before the expiration of the said five or ten years, the holder thereof may obtain an extension of the patent for another period of five years, and after those second five years, may again obtain a further extension for another period of five years, not in any case to exceed a total period of fifteen years in all; defective patents may be corrected by reissue or the filing of disclaimers.

The Government of Canada may always use any patented invention, paying to the patentee such sum as the Commissioner may report to be a reasonable compensation for the use thereof.

Patents may be assigned in whole or in part; assignments shall be registered with the Commissioner; the assignment first registered shall be good as against any other assignment of the same patent or interest therein.

INFRINGEMENTS.

An action for the infringement of a patent may be brought before any Court of Record having jurisdiction to the amount of damages asked for, and having its sittings within the Province in which the infringement is said to have taken place, and being, at the same time, of the Courts of such jurisdiction within such Province, the one of which the place of holding is nearest to the place of residence or of business of the defendant; and such Court shall decide the case and determine as to costs. Any Judge thereof, in chambers if the Court be not sitting, may, on the application of the plaintiff or defendant respec ively, make such order for an injunction restraining the opposite party from further use, manufacture or sale of the subject matter of the patent, and for his punishment in the event of disobedience to such order, or for inspection or account, and respecting the same and the proceedngs in the action, as the Court or Judge may see fit.

MANUFACTURE AND IMPORTATION OF PATENTED IMPROVEMENTS IN CANADA.

Every patent shall be subject to the condition that such patent and all the rights and privileges thereby granted shall cease and determine, and the patent shall be null and void, at the end of two years from the date thereof, unless the patentee, or his assignee or assignees, shall, within that period have commenced, and shall after such commencement continuously carry on, in Canada, the construction or manufacture of the invention or discovery patented, in such manner that any person desiring to use it may obtain it, or cause it to be made for him at a reasonable price, at some manu factory or establishment for making or constructing it, in Canada, and that such patent shall be void if, after the expiration of twelve months from the granting thereof, the patentee or his assignee or assignees for the whole or a part of his interest in the patent, imports or causes to be imported into Canada the invention for which the patent is granted.

Whenever a patentee has been unable to carry on the construction or manufacture of his invention within the two years hereinbefore mentioned, the Commissioner may grant to the patentee a further delay on his adducing proof to the satisfaction of the Commissioner that he was for reasons beyond his control prevented from complying with the same.

CANADIAN PATENT FEES.

The following are the patent fees:

On petition for a patent of 5 years	$20 00
On petition for a patent for 10 years	40 00
On petition for a patent for 15 years	60 00
On petition for extension from 5 to 10 years	20 00
On petition for extension from 10 to 15 years	20 00
On petition for extension from 5 to 15 years	40 00
On lodging a caveat	5 00
On petition to reissue a patent	4 00

CAVEATS IN CANADA.

An intending applicant may file in the Patent Office a description of his invention so far, with or without plans, at his own will; and the Commissioner shall cause the said document to be preserved in secrecy, and such document shall be called a caveat. If application shall be made by any other person for a patent for any invention with which such caveat may in any respect interfere, it shall be the duty of the Commissioner forthwith to give notice by mail to the person who has filed such caveat, and such person shall within three months after the day of mailing the notice, if he would avail himself of the caveat, file his petition and take the other steps necessary on an application for patent.

REJECTIONS.

The Commissioner may object to grant a patent in the following cases:

When he is of opinion that the alleged invention is not patentable in law.

When it appears to him that the invention is already in the possession of the public with the consent or allowance of the inventor.

When it appears to him that there is no novelty in the invention.

When it appears that the invention has been described in a book or other printed publication before the date of the application, or is otherwise in the possession of the public.

When it appears that the invention has already been patented in Canada (or elsewhere, for more than one year), except, however, when the case is one in which the Commissioner has doubts as to whether the patentee or the applicant is the first inventor.

INTERFERENCES.—ARBITRATORS TO DECIDE.

In case of interfering applications for any patent, the same shall be submitted to the arbitration of three skilled persons, one of whom shall be chosen by each of the applicants, and the third person shall be chosen by the Commissioner or his deputy or the person appointed to perform the duty of that office. And the decision or award of such arbitrators, or any two of them, delivered to the Commissioner in writing, and subscribed by them or any two of them, shall be final as far as respects the granting of the patent.

The arbitrators, or any one of them, after having been so worn, s hall have the power of summoning before them any party or witness, and of requiring him to give evidence on oath, orally or in writing (or on solemn affirmation, if the person be entitled to affirm in civil matters), and to produce uch documents and things as such arbitrators deem requisite to the full investigation of the matters into which they are appointed to examine, and shall then have the same power to enforce the attendance of such witnesses, and to compel them to give evidence, as is vested in any court of law in civil cases.

The fees for the services of arbitrators shall be a matter of agreement between the arbitrators and the parties.

CANADIAN STAMP PENALTIES.

Every patentee under this act shall stamp or engrave on each patented article, sold or offered for sale by him, the year of the date of patent applying to such article, thus: "Patented 1872," or as the case may be; any such patentee selling or offering for sale any such patented article not so marked shall be liable to the punishment of a fine not to exceed one hundred dollars, and, in default of the payment of such fine, to imprisonment not to exceed two months. The penalty for using the stamp of patented upon an article that has not been patented is a fine not exceeding two hundred dollars and imprisonment not exceeding three months.

The above new Canadian patent law goes into effect Sept. 1st, 1872, when a large number of patents will be applied for by Americans. In fact many persons, desirous of avoiding delay, have already ordered Canadian patents, and their specifications, drawings and models, are now in preparation for deposit in the Government archives at Ottawa. Messrs. Munn & Co. have perfected their arrangements for securing Canadian patents in the most prompt manner, on very reasonable terms, and will be happy to furnish, without charge, further information upon the subject to all who apply. Enquiries may be addressed to them at the SCIENTIFIC AMERICAN Office, 37 Park Row, N. Y.

[Special Correspondence of the Scientific American.]

LETTER FROM PROFESSOR R. H. THURSTON.

PITTSBURGH, Pa., June 25th, 1872,

A visit to the works of Messrs. Sellers. The Giffard Injector. The Baldwin Locomotive Works. Mountain scenery. The Pneumatic Railway Brake. The Water Scoop.

Another of the most interesting among the great manufacturing establishments of Philadelphia is that of Messrs. Sellers & Co., the well known builders of machine tools.

Here about five hundred and fifty men are employed, and, with the ingenious machinery and the effective system adopted in doing work, they produce a larger amount per year than could two thousand men have done ten years ago in even these works, which were then, as now, remarkable as a leading establishment in the business.

The Messrs. Sellers were among the very earliest in the introduction of the system, now almost universal among the best builders, of making all their work precisely to gage, and thus securing the best of workmanship and interchangeable parts. As representing the effectiveness of this modern method of manufacturing, their shops form, as in many other respects, a model establishment. Their machines are as nearly perfect in material and workmanship as it is to-day possible to make them, and they were probably the first to prove by actual experience that such machinery can find a market in this country at remunerative prices. It must be confessed that there are, however, comparatively few builders who adhere, like this firm, to a determination to do none but the best possible work under all circumstances.

The planing machines and the steam hammers made here are, if a distinction can be made at all, particularly noticeable tools. The method of driving the table of the former, by a spiral pinion working into a rack, is found as effective as it is ingenious. The steam hammer has the weight of its drop in its piston rod, which is made very large, and the system adopted in guiding it and thus escaping the serious danger which arises in ordinary hammers from a glancing blow, is peculiarly excellent. The valve gear is at once the simplest and most effective that I have seen. Taken as a whole, it is a splendid tool.

THE GIFFARD INJECTOR.

The Giffard steam boiler injector—that wonderful substitute for the steam pump—is another of the most interest ng machines made here. I well remember the incredulity with which I first heard, a dozen years ago, of this apparatus in which steam left the boiler, picked up a quantity of water while passing through the instrument, and carried it into the boiler again without the loss of a drop of water or of a particle of steam. I remember that the story appeared still more absurd when it was added that the new pump needed neither valve, plunger, nor any other moving part. It required a visit to the works of the Messrs. Sellers shortly afterward to remove all doubt, and, as a matter of course, the wonder, once seen, became the simplest thing imaginable. The manufacturers have greatly improved the injector since that time, and now there are few railroads in this country on which it is not in regular use.

Every minute spent in this establishment afforded useful information, and I only regretted that I had not a week to spare, instead of but a few hours.

THE BAIRD LOCOMOTIVE WORKS.

An afternoon was spent very pleasantly, and most profitably, in the great Baldwin Locomotive Works of Messrs. Baird & Co. At this establishment, more than twenty-five hundred men are at work, turning out from seven to nine completed locomotive engines every week, and the orders still increase. The proprietors of the works were working men who have, by their industry, intelligence and good management, become the employers of this industrial army, and who have shown what may be done by labor in the acquisition of capital, teaching the same lesson that may be learned in nearly all of the most successful manufacturing estal lishments here and abroad. All work is here, also, made to gage, and the several parts are "assembled," to make the complete machine, without the expense attending the old process of "cutting and carving" in fitting up. Some of the engines in progress here are for Russian railroads. Like the majority of great industrial establishments, this immense manufactory has been many years in process of growth. It was established half a century ago, and its first locomotive was built in 1830. In 1831, an engine was built here for the Philadelphia and Germantown railroad, which is said to have run a mile in a minute.

Good material, good work, and a plain finish, seem to be the practice here.

There are many other large manufactories and interesting places that attract the attention and afford valuable information to the engineer, and a dozen of them would each afford material for a full column in the SCIENTIFIC AMERICAN; but my time was limited, and I was compelled reluctantly to leave the "City of Brotherly Love," and to pursue my journey westward over that most excellently managed road, the Pennsylvania Railroad.

THE PENNSYLVANIA RAILROAD AND ITS SCENERY.

The excellence of the road bed and the smoothness with which the train ran—sometimes over forty miles an hour—allowed the passengers to enjoy, without annoyance, the beautiful scenery of the Alleghanies. The atmosphere was slightly hazy, but not so much as to interfere seriously with the view of distant mountains and adjacent valleys. At this season, when every mountain side is clothed with the fresh verdure of early summer, and the atmosphere still gives that softness to the distance that is only seen when the heats of summer or the low temperature of winter has not deprived it of its moisture, the scenery is most lovely. This oldest of our mountain chains certainly presents studies for an artist which, if surpassed in grandeur by those of younger ranges, cannot be excelled in quiet beauty.

The run down the western slope of the mountains gave an excellent opportunity of watching the operation of the Westinghouse air brake, which has been many months in use on the Pennsylvania railroad and, we were told, giving perfect satisfaction. We were much pleased with what we saw of it. A continuous brake, not liable to break down just when most needed to "brake up," powerful but controllable in action, and directly under the hand of the engineer—all of which merits are claimed for this—is a much needed invention, and its successful introduction would undoubtedly save many lives, a large amount of property, and perhaps considerable of the expense of running fast trains making frequent stops; and, still further, it would save time to a very important degree. Something of this kind must, sooner or later, be adopted.

At Altoona, a station house roof truss attracted attention by its neatness and simplicity. We noticed also, at two points on the road, troughs of considerable length laid down between the rails and filled with water. The engine was supplied with water, without stopping, by letting down a curved pipe until its mouth entered the water; and, at the high speed at which it ran, it scooped up a quantity while running the length of the trough to replace that previously drawn from the tender. This device has been for some time in use abroad, but the Pennsylvania railroad is probably the first to introduce it in this country. It will probably be found a very valuable device on long lines of road running through express trains.

We finally arrived at Pittsburgh on time, after a quick and pleasant run, and are perfectly willing to agree with those who claim for the Pennsylvania Railroad the credit of having an excellent road bed, good rolling stock, and the best of management.

R. H. T.

Facts for the Ladies.—Mrs. H. F. Taylor, Brasher Falls, N. Y., has used a Wheeler & Wilson Lock-Stitch Machine since 1858 in dress-making and family sewing, without any repairs and has broken but 2 needles in 13 years. See the new Improvements and Woods' Lock-Stitch Ripper.

Barnett's Cocoaine gives new life to the hair.

To Lead all Competitors is the aim of the proprietors of the New Wilson Under-Feed Sewing Machine. It is founded on the very best principles known to the sewing machine science, and improvements, in advance of all other sewing machines, are being adopted constantly. The Wilson is rapidly gaining the preference of all parties that are acquainted with sewing machines, and it has already taken the front rank among the first-class machines of this country; and its price, owing to its being manufactured where labor and material are much cheaper than in eastern cities, is fifteen dollars less than all other first-class machines, which fact alone is sufficient to induce all to examine the New Wilson before buying any other. Salesroom, 707 Broadway, New York; also for sale in all other cities in the U. S.

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.

The best recipes on all subjects in the National Recipe Book. Post paid, $2.00. Michigan Publishing Company, Battle Creek, Mich.

The official report of the Master Mechanics' Association will be published in full in the RAILROAD GAZETTE, 72 Broadway, New York, beginning July 6. Send $1.00 for 3 months' subscription.

We will Remove and Prevent Scale in any Steam Boiler or make no Charge. Two Valuable Patents for Sale. Geo. W. Lord, Phila., Pa.

Wanted—To hear from parties who make a specialty of manufacturing small patent articles. Address H. D. Chance, Llewellyn, Pa.

Steam Boiler and Pipe Covering—Economy, Safety, and Durability. Saves from ten to twenty per cent. Chalmers Spence Company, foot East 9th Street, New York—1232 N. 2d Street, St. Louis.

"Anti Lamina" will clean and keep clean Steam Boilers. No injury to iron. Five years' use. J. J. Allen, Philadelphia, Pa.

For Sale—To R. R. Contractors: Two second hand direct-acting Locomotives, 12 tons and 20 tons weight—in good running order. Address Grice & Long Loco. Works, 1340 Beach St., Philadelphia, Pa.

For Hydraulic Jacks and Presses, New or Second Hand, send for circular to E. Lyon, 470 Grand Street, New York.

For Marble Floor Tile, address G. Barney, Swanton, Vt.

Wanted—A 2d Hand Boiler of about 3 horse power. Whitney Arms Company, New Haven, Conn.

Wanted—A situation under instructions in draughting room by a young man who is a machinist. Address J. S. C., care of B. F. C., Princeton, New Jersey.

For the simplest, cheapest, and best Rotary Pump in use for thick or thin liquids, send for circulars to Hersey Brothers, So. Boston, Mass.

Wanted—Iron Planer, of 5 to 6 ft. square by 12 to 16 ft. long, capacity. Must be new, or as good. Will exchange for some choice selected lands situated within 5 to 10 miles of Rail Roads in Northern Iowa. John Cooper & Co., Mount Vernon, Ohio.

The best Bolt Forging Machines are those that work vertical, and forge Bolts any length horizontally. For such, address John R. Abbe, 39 Charles Street, Providence, R. I.

To Capitalists—Two valuable Patent Rights for Sale or exchange for other property. For particulars, address John J. Baringer, Germantown, Columbia Co., N. Y.

Upright Drills—The best in the world. Built by Hawes Machine Co., Fall River, Mass. Send for Circular.

For the most beautiful Site, Building, and Water Power for manufacturing purposes, address Harris Brothers, Newport, N. Y.

Three fourths saving of fuel, by the Ellis Vapor Engine (Bisulphide of Carbon) is running the Haskins Machine Co's Works, Fitchburg, Mass. To whom apply.

Old Furniture Factory for Sale. A. B., care Jones Scale Works, Binghamton, N. Y.

Steel Castings to pattern, strong and tough. Can be forged and tempered. Address Collins & Co., 212 Water street, New York.

The Waters Perfect Steam Engine Governor is manufactured by the Haskins Machine Co., Fitchburgh, Mass.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss. 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N. Y.

Portable Baths. Address Portable Bath Co, Sag Harbor, N. Y.

Standard Twist Drills, every size, in lots from one drill to 10,000, at ¼ manufacturer's price. Sample and circular mailed for 25c. Hamilton E. Towle, 30 Cortlandt st., New York.

If you want to know all about the Baxter Engine, address Wm. D. Russell, office of the Baxter Steam Engine Co., 18 Park Place, N. Y.

If you want a perfect motor, buy the Baxter Steam Engine.

Manufacturer's and Mill Supplies of all kinds. Greene, Tweed & Co., 18 Park Place, New York.

Blake's Belt Studs. The best fastening for Leather or Rubber Belts. 40 000 manufacturers use them. Greene, Tweed & Co., 18 Park Place, New York.

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

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

For Tri-nitroglycerin, insulated wire, exploders, with pamphlet, as used in the Hoosac Tunnel, send to Geo. M. Mowbray, North Adams, Mass.

Machinery Paint, all shades. Will dry with a fine gloss as soon as put on. $1 to $1.50 per gal. New York City Oil Company, Sole Agents, 116 Maiden Lane.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

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Notes & 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.]

1.—COLORING LINSEED OIL.—How can I color linseed oil red or brown? Aniline in alcohol will not do.—J. P. W.

2.—TAXIDERMY.—How are birds and animals stuffed?—J. H. Y.

3.—CLEANING MARBLE.—What is the best way of cleaning polished marble slabs from grease, oil, or red wine stains?—C. R.

4.—POLISHING KNIVES.—Will some one inform an old subscriber how the English polish is put on knives, how the wheels are made and what kind of leather should be put on?—J. G.

5.—WALNUT STUMPS.—What is the value of walnut stumps and in what shape should they be sent to market? Are the white walnut, black walnut, or butternut the most valuable?—E. C.

6.—VINEGAR.—Will some practical man inform us of the best mode of making vinegar from the best materials, that the public may not continue to be poisoned by vitriolic and other mixtures?—G.

7.—SKIN DISEASES.—I notice in your paper of May 11th, 1872, a communication from a sufferer from skin disease, attributing the cause to the use of a certain kind of soap. I am one of many shop mates who have the same disease, and I think we contracted it from using sand paper, as it is altogether on the hands. I have had it two months, and have had two of our best doctors here at work on me, but without success. What they give me to use are washes for the hands, which apparently drives it away for a few days; but just as soon as I commence to work, out it comes again. I have been using carbolic acid and glycerin, bathing the hands in strong salt brine, nitrate of lead, and sulphuret of potassium; the latter apparently does the most good, but the cure is not permanent. We should be grateful to you if you could get, from some of your eminent physicians in New York, a radical cure. I think some medicine should be taken to purify the blood, but both the doctors I have seen do not give me any.—C. N.

Answers to Correspondents.

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. D., and others.—Multiply together the area of the piston in inches, the mean boiler pressure in pounds per square inch, the length of the stroke in feet, and the number of strokes per minute; divide by 33,000 and you have the horse power of your engine.

To R. P. P.—There are positive and negative poles to the induced currents of the electrical machines that you speak of. As to method of manufacture, consult books on electricity. It is not new to place a wheel at the bow of the canal boat, nor to have side pieces extended forward to prevent lateral movement of swell or waves. This plan was illustrated in last volume of SCIENTIFIC AMERICAN.

W. S. M.—The clearest and most dense ice will keep the longest and produce the most refrigeration. Placed in water, the temperature produced by two cubes of ice, one of porous or snow ice, the other of dense clear ice, will be the same. But the clear ice will refrigerate a larger quantity of water than the porous ice.

MILK SOURED BY A THUNDER STORM.—Milk, beer, and other fluids turn sour by oxygenation. After a thunder storm there is always in the air a considerable excess of ozone, which is oxygen in its most active condition, ready to attack any matter that can be affected by it.—D. B., of N. Y.

PROPORTIONS OF STEAM ENGINE.—D., query 5, page 26, is informed that James Watt determined that the condenser and air pump should each have one eighth the capacity of the cylinder. In more modern practice, however, the air pumps are made larger, especially in marine engines. Some engineers also make their condensers larger, but the practice is not justified by any economical result.—D. B., of N. Y.

DIMENSIONS OF BELT.—Query 7, page 416, Vol. XXVI.—W. J. S. can ascertain the width of belt required for his purpose by calculation from the speed of his driving pulley. A belt one foot wide running at the speed of seventy feet per minute will develop one horse power; a belt three inches wide, to develop the same power, must run of course at 280 feet per minute.—T. L., of Mass.

GILDING ON GLASS.—In answer to J. F., query 5, page 416, Vol. XXVI., I would say that gilding on glass is done by the use of what is termed a water size, made by the use of some mucilaginous substance, such as the white of egg reduced with water. I conclude that English gelatin is best, but great care is necessary not to make it too strong; and it should be perfectly clean, therefore straining it through thin muslin is a good precaution. The gilding is done upon the back side of the glass. First clean the glass perfectly with alcohol; then apply the sizing with a flat camel hair brush, and immediately lay the gold leaf. Stand the glass on edge and allow the surplus size to settle from under the gold. The gold will flatten and have a burnished appearance. When dry, lay out your designs on paper and transfer by the use of some sharp pointed instrument, pricking through the paper; then paint your design on top of the gold; asphaltum varnish is a good material for that purpose. When that is dry, wash off the surplus gold, and shade the letters or other design with paint of any color desired and let it dry. If you desire a colored ground, then paint the whole surface with the color desired. Experience is necessary for this class of work.—R. F., of Mass.

OCEAN CABLES.—H. F. H., query 1, page 416, Vol. XXVI.—The Atlantic cables mostly lie at the bottom of the ocean, but there are many stretches between the submarine mountain peaks. The specific gravity of the cable causes its sinking and remaining at the bottom of the sea.—E. H. H., of Mass.

CEMENT FOR LETTERS ON GLASS.—To J. F.—This is frequently made by diluting white of egg with water to a suitable degree of fluidity, and adding a little carbolic acid to prevent decomposition, and then filtering. Paint the glass by means of a badger hair brush, allow it to partially dry, and apply gold or silver leaf, and allow it to become thoroughly dry. Now put on the stencil plate, and with a needle point mark out, down to the glass, the letters or design. Then put the whole plate into a shallow dish of tepid water, and by means of a stick, finger, or finger nail, etc., rub off the extraneous metal, and you will have your perfect letters left, and if the cement has not been too thick, with a perfect brilliancy.—E. H. H., of Mass.

SLACK COAL AND SAWDUST.—To J. F. T.—Mix them together with enough gas tar to stick and make into bricks. A machine like the pug mill of a brick machine would do, or indeed a brick machine at once would probably answer, especially such a one as would press the mass into a mold, and not such as would drive out the stuff in a stream, then to be cut with wires. This last style of machine would inevitably make very poor work, but by the former you would get, I think, a splendid fuel, and only take a very small quantity of the cheap tar.—E. H. H. of Mass.

SLACK COAL AND SAW DUST.—J. F. T. can burn all his sawdust for fuel if he has proper grates and has a good draft to his fire box. I am sawing green hemlock with a five feet circular saw, and burn every bit of sawdust made. I use no coal or extra fuel.—N. J., of N. Y.

CUTTING STEEL AUGERS, ETC.—To A. V., query 10, page 354, Vol. XXVI.—I would say, first, that the diameter should vary with the diameter and pitch of thread, and should be about two inches for threads from 24 to 32, three inches from 16 to 24. The number of revolutions should be from 12,000 to 16,000 per minute, and a pulley 2 x 2 (on a steel arbor running in Babbitt boxes) will be large enough to run it. A. V. will find he will have to harden his cutters and temper to a straw color in order to have them stand.—C. M. P., of Mass.

TEST FOR ZINC.—To J. B.—The simplest method for an amateur to employ is probably to evaporate a gallon of water to dryness, put the residue on to a platinum wire, and moisten with a solution of protonitrate of cobalt. Apply the blowpipe flame, and the little mass will yield a green colored appearance if zinc be present. Other means of testing are adopted, but to any but a professional will be found complicated. The presence of five grains in a gallon would eventually prove injurious, but it would probably be only after a lengthened use of such water. The antidote for acute zinc poisoning is the exhibition of an emetic, and afterwards the drinking copiously of albuminous fluid and large doses of tannin or oak bark tea, etc.—E. H. H., of Mass.

UNITED STATES COINAGE.—To F. R. E., query 16, page 10.—Copper cents were issued first in the year 1793 and ceased in 1857. In 1815, there were none coined. The half cents made their first appearance in 1793, and were discontinued in 1857. In 1798, 1801, 1812 to 1824 inclusive, and 1852 there were none coined except a few pattern pieces in 1813, 1832, 1840, and the eight succeeding years, and 1852. The eagle head nickels were first issued in 1857, and in 1859 were supplanted by the Indian head.—E. T. P., of N. Y.

Recent American and Foreign Patents.

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

HORSE SHOE NAIL CLINCHER.—Wm. H. Lyman, Springfield, Mo.—Many efforts have hitherto been made to construct this tool so as to afford the greatest leverage to the hand of the smith, to avoid side strain upon the screws and pivots, and to prevent the liability of the jaws to slip from the nail. Some clinchers have one of these advantages and some another, but none have hitherto combined them all. This clincher has the following advantages: 1st: It is constructed so as to take off all side strain from the fastening screws or pivots and thus to allow none of the parts ever to lose their true relative position to the others. 2nd: It is provided with double leverage jaws, so that the grip of one hand will easily and accurately clinch the nail. 3rd: It has a peculiar shape of underjaw which prevents that jaw from slipping and causes it to rock on the nail head. The effect of these several advantages is to give the smith complete control of the horse's foot, while he is being shod to enable him always to turn off perfect work, and witha to furnish him with a most durable tool that is not liable to get out of order.

HARVESTER REEL.—George S. Grier, Milford, Del.—The invention consists in supporting an adjustable reel by means of a pivoted crank shaft, which passes through the hollow shaft of said reel and moves up or down with it.

FIRE KINDLER CASE.—David W. Thompson, St. Joseph, Mo.—The invention consists of a screw capped can for holding the oil and kindler, so that the former is prevented from spilling or waste in the event of the can being accidentally upset, and the latter is kept from rattling or moving about in the can while the can is being handled; at the same time the kindler is always saturated and ready for use.

ROSSING MACHINE.—Charles Gilpin and James T. Hill, Cumberland, Md.—The invention consists in causing the knife of a rossing machine to change its position automatically according to the thickness of bark passing between the rolls, and in the peculiar arrangement of devices by which this new idea is carried out.

PEANUT AND COFFEE POLISHER.—Benjamin F. Walters, Norfolk, Va.—The invention consists in combining a rotary and stationary brush with a feed hopper, so that coffee or peanuts may be readily, conveniently and effectually polished for market.

CIRCLE FOR CARRIAGE.—Edwin Wilson, Prattsburg, N. Y.—This invention relates to an improved method of connecting the reach, front axle, head block and circle of a carriage. The reach and head block are rigidly attached to a three armed plate or strap which rests upon the circle. The straight part of the circle is attached by clips and yokes to the axle. The ring bolt is attached to the upper side of this straight part, and passes through the strap and the head block. The whole is strengthened by braces.

COVERING TUBULAR FABRICS WITH RUBBER.—William H. Bates and Hugh Faulkner, of Leicester, England, assignors to Ezra Thomas Sawyer, of East Hampton, Mass.—This invention relates to a new machine for applying an outside coating of India rubber, gutta percha, or other analogous elastic gum to tubular fabrics that are to be made water tight. It is more particularly adapted to, and intended for, the manufacture of rubber hose, but may also be used for other tubular fabrics. The tube to be covered has a core placed within it and is joined at the ends. It is passed over two drums, and by their means carried repeatedly through the waterproofing solution, drying cylinders, and an annular scraper until the covering is thick enough.

WATER WHEEL.—James P. Lamoree, of Mexico, N. Y.—This invention relates to that class of water wheels in which the buckets are arranged in diametrical pairs, and are thrust in and out as they rotate. It consists in adjusting the throw of the buckets so that the maximum protrusion thereof takes place at different points, which is accomplished by means of a shaft, axle and axis which are arranged adjustably in a rectangular slot in the ymiddle part of each pair of buckets.

PROJECTILE.—John Rigney, of West Point, N. Y.—In this invention a composition or soft metal cap is applied to the rear end of the projectile in such a manner that its sides are forced over a conical part of the shot and expanded into the grooves of the gun when the same is fixed. The cap is connected to the shot by means of interior projecting studs which are passed into corresponding zigzag grooves formed on the end of the projectile. These grooves are so formed as to prevent the backward escape of the studs, but they admit their forward movement when the cap is driven forward by the explosion.

CULTIVATOR.—William C. Percy, of Bayou Sara, La.—This invention furnishes an improved plow for cultivating cotton and corn, especially of use when it is desired to simply loosen and pulverise the soil and destroy the weeds without turning a furrow. The plow, which is made pointed, is curved forward so as to form the arc of a circle ten inches in diameter. The middle part is cut away, forming a hole or opening of about the same shape as the body of the plow. The curvature and the opening cause the plow to pass easily through the ground and destroy the weeds, stir up and loosen the soil, and leave it loose and level.

WOOD FILLING.—Frank Seabury, of Yarmouth, Me., assignor to himself, John S. Seabury, Ammi D. Seabury, Adolphus Grant, and Nicholas Grant, of same place.—In varnishing or otherwise finishing wood the varnish sinks into the grain and it is impossible to make a level surface by using varnish alone. If the wood is oiled the grain is left open, and in use fills with dirt. To remedy this various fillings are used; but all have to be colored to imitate the wood, and thus all the finer shades of color are destroyed, as the same color of filling is used for the whole piece. To obviate these difficulties the inventor employs the substance known as *terra alba*. It is finely ground or powdered, mixed with oil, and applied in the ordinary manner. This filling is transparent, does not injure the color of the wood, allows all the shades of color and the grain of the wood to show, and, at the same time, is hard and perfect.

LAMP CHIMNEY CLEANER.—Adelbert Austin Ford, of North Abington, Mass.—This invention relates to an improved lamp chimney cleaner, and consists in constructing the same of a stem or handle of wood to which are attached a swab and wiper. The swab is made of manilla and fastened to one end of the handle; the other end is slit or quartered a portion of its length by a saw, and the wiper is simply a square piece of paper or cloth, so folded or crimped that it enters the slits, and is then folded down by turning the stem with one hand and holding the wiper loosely with the other. A thimble slides loosely on the stem, and is crowded up on to the wiper to hold it in place. The thimble is made slightly tapering so that it does not tear the paper while gathering and confining it tightly to the stem.

STOVE PIPE DAMPER.—Charles Reed, of Beaver Dam, Wis.—This invention supplies a self cleaning damper for stove pipes. It consists of a metal disk which is slotted across its face, and an upper grating the bars of which fit into the slots of the disk and nearly close them. These are mounted on the same axis, so that the bars may be turned down through the slots and the passage opened. The turning is effected by thumb screws, which are so arranged that the grate may be turned alone, or the grate and disk together.

NUT LOCK.—Rasselas G. Peterson and Jonathan Coulter, of Perryville, Ohio.—This invention relates to a new nut lock for use on railroad rails and for other purposes, and consists in the use of a hook in connection with a grooved nut and recessed fish plate by means of which the nut is locked. The nut on its inner face has a number of grooves. The plate is also grooved or recessed close to the aperture which admits the bolt, the recess being L-shaped. When the nut has been screwed on to the bolt as far as necessary, and until one of its grooves is in line with the longer part of the recess, the hook is inserted in the recess and pushed under the nut into the groove. The nut is then slightly unscrewed, carrying a projecting ear of the hook into the L-shaped recess. The hook in this position properly locks the nut, as during a jar or motion of any kind the tendency of the nut to become unscrewed will only the more firmly apply the hook to its place and insure the lock.

BRIDGE.—Reuben L. Partridge, of Marysville, Ohio.—This invention furnishes an improved bridge which is simple in construction, light, and strong and consists in the construction following: The upper and lower chords are made in two sections. The ends of the ties or posts are securely bolted to and between the sections of the chords, and stand at an angle of sixty degrees with the horizontal plane. The main braces are arranged in pairs, and stand at an angle of forty-five degrees with the horizontal plane. The two braces of each pair are parallel with each other, pass upon opposite sides of the ties or posts, and are bolted at their middle parts to the middle part of the said ties or posts. The ends of the braces rest against iron foot pieces which are interposed between the ends of the braces and the ties and chords. The sides of the foot pieces are flanged so that the ends of the braces rest squarely against them, and their rear sides are notched to fit up on the ties or posts.

WIND WHEEL.—James J. Hosey, of Cape Girardeau, Mo.—This invention relates to a new self regulating windmill, the motion of which does not vary with the strength of the wind, but is always steady. It consists in surrounding the fan, or wheel, with an upright stationary cylinder which is provided with about eight large openings through which the wind is admitted to the fan. Each opening is furnished with a gate which is pivoted vertically near the middle in such a manner that the wind when striking it has a tendency to close it. It is also furnished with a weighted lever which tends, on the other hand, to keep it open. In this way, aided by other attachments, the wind is admitted to the fan in quantity proportionate to the work to be done.

STREET CARS.—John Stevenson, of New York city.—This well known street car and omnibus builder, whose passenger vehicles may be seen in nearly every country on the globe, has recently received patents for various improvements in their construction which consist as follows: The first invention relates to securing the metallic connection between the running gear and the body of the car, which is accomplished by interposing rubber or other elastic material between the parts so as to reduce the discomfort experienced by passengers from the noise of the wheels, the clattering of the parts, and the jar occasioned by applying the brakes. The next improvement consists in making the axle journal without a shoulder and placing a spring check at its end, by which arrangement, as the car is forced from side to side through inequalities in the track, the concussions are relieved by means of the spring check. The third invention provides means for securely holding and fastening the caps of car axle journal boxes, and the fourth improves the construction of car brakes so as to simplify the same and facilitate repairs.

MOWING MACHINE.—Benjamin Attwood, of Stanstead, Canada.—This invention furnishes an improved reaper and mower which is simple in construction, light, strong, and durable, not liable to get out of order, and which readily adapts itself to inequalities of the surface of the ground, has a very light side draft, and consists in a peculiar arrangement of a lever, suspension bar, and brace bar, in combination with the driving pitman and frame, by means of which these objects are attained.

CAR COUPLING.—Samuel G. Northrop, of Wilmington, N. C.—This invention furnishes an improved car coupling which is simple in construction, and is adjusted to couple itself when the cars are run together. The cavities of the bumper heads of the car are divided into two compartments by horizontal partitions. The coupling pins pass down through the bumper heads and through the coupling link or bar which enters the lower compartments of the bumper heads. One end of this link or bar is made thick, so as to hold the link in a position to enter the bumper head of the adjacent car when the cars are run together. The thinner end of the link has a slot ormed through it to receive the coupling pin. In each partition, at the rear side of the hole through which the coupling pin passes, is formed a recess to receive the lower end of the pin so as to hold it suspended while the cars are being run together. The recesses support the pins with their lower ends below the upper surface of the partitions, so that they may be sure to drop into their holes when pushed out. Levers are pivoted to the sides of the bumper heads at the rearedge of the horizontal partitions. Their upper ends are bent forward, so as to nearly touch the coupling pins when in position to couple the cars. As the cars are run together the forward end of the coupling link strikes the lower end of the lever and pushes the coupling pin out of the recess and allows it to drop through the slot in the link.

APPARATUS FOR MOVING BUILDINGS.—William N. Hemenway, of Pecatonica, Ill.—This invention furnishes an improved truck for moving buildings, which is simple in construction and effective. Two short rollers are placed end to end upon a shaft which is attached to the centers of the lower sides of three longitudinal bars. The lower sides of the bars are beveled toward their ends, so as to prevent them catching upon the ground. They are connected at their ends and at their center by cross bars. The central cross bar is made thicker at its middle part, and to its center is attached a king bolt or pivot to receive a swinging bar or bolster upon which the building rests while being moved, and to which are attached two or more upwardly projecting spikes to prevent the bolster turning or getting out of place beneath the building. To the under side of the end parts of the bolster are pivoted the ends of bars or straps by which the bolster is rigidly connected to the framework of the truck when adjusted. This construction enables the truck to be adjusted with respect to the direction in which the building is to be moved, or to change it without disturbing the connection between the bolster and the building.

BUTTER TUB AND COOLER.—Arthur J. Connelley and Theodore Benjamin, of Philadelphia, Pa.—This invention furnishes an improved cooler for preserving and transporting butter, milk, lard, and other articles. It consists of an oval cooler which is strengthened by hoops. At the ends are ice chambers, and along the sides, which are made double, is packed some suitable non-conducting material. The cover, which is in two parts, hinged, is also made double, and the cooler has a false bottom, both of which are filled with similar material. The waste water is conducted so as to run off freely through a stop cock.

PURIFYING SACCHARINE JUICES.—Theodore E. O. Allaire, of Paris, France.—This invention consists in purifying sugar and all kinds of saccharine juices, and in extracting nearly all the crystallizable sugar therein contained, by means of the hydrofluosilicate of ammonia, or the double fluoride of silicium and ammonium, or other double fluoride containing silicium, whereby more or less insoluble precipitates are formed, whose presence in the saccharine juices would have prevented the crystallization of a certain quantity of sugar; and, also, in the after treatment of the precipitates.

SEWING MACHINE.—Theodore A. Weber, of New York city, assignor to Lebbeus W. Lathrop, of same place.—This invention consists of an improved arrangement of apparatus for working a spool carrier in a continuous rotary course; the combination, which includes several ingenious contrivances, and mode of operation would hardly be understandable from a verbal description.

WARDROBE BUREAU.—John H. F. Lehmann, of New York city.—This invention provides a useful and convenient piece of furniture which is so constructed as to serve a variety of purposes. It may be used as a bureau or expanded into a wardrobe, and admits of service as a writing desk also.

APPARATUS FOR DRAINING AND COOLING SUGAR.—Branch Tanner, of Cheneyville, Louisiana.—This invention consists of a simple apparatus by means of which sugar may be cooled and strained readily and inexpensively. An open case or cooler is mounted on trunnions so that it can be turned upside down, and in this the hot cooked sugar is placed and allowed to stand uncovered until it is cooled. Then perforated tubes with conical ends are forced through the sugar to the bottom of the case and equally distributed throughout; after which a straining cover is fastened on the top of the case, and the same turned over. The molasses is thus allowed to escape through the tubes and strainer and the sugar is retained.

STOP MOTION FOR KNITTING MACHINE.—Thomas F. Wynn, of Atlanta, Georgia.—This invention has for its object to provide an improved stop motion for looms and knitting machines of the class in which the motion of the machine is arrested, immediately on the breaking of a thread, by means of a drop weight or its equivalent, which operates by aid of suitable intermediate mechanism to disconnect the driving wheel or shaft. The invention consists in the arrangement of certain wires, rotary rings, and other connected parts, whereby a simple, inexpensive, but efficient piece of mechanism is produced.

MEDICAL COMPOUND AND DISINFECTANT.—Joseph Walton, of Newark, Ohio.—This invention furnishes an improved medical compound for driving away mosquitos, flies, etc. from the person or house. It is a disinfectant and preventive, especially in cases of cholera, small pox, etc., and is useful as a lotion and for other purposes. It is composed of camphor, one ounce; carbolic acid, twelve ounces; aqua ammonia, ten drams; and salt soft water, eight drams.

HORSE POWER.—William G. Halbert, of Columbus, Miss.—This invention is an improvement in horse powers. Some distance below the main wheel are fitted, through the shaft, two radial beams, each of which is somewhat longer than the diameter of the wheel and is slotted at both ends. The inner end of each draft beam is, by an inclined brace, connected with the under side of the wheel, while near its middle it is, by a pin or bolt, connected with the end of one of the radial beams. The pin plays in the slot of the radial beams. The four ends of the two beams may in this manner be connected with as many draft beams or levers. By this arrangement considerable leverage is obtained, the power increased and equalized, and the machine made more valuable.

MILL PICK.—Frank Kortick, of Mendota, Ill.—This invention relates to certain improvements in mill picks, which consist in holding the movable blade firmly in position between two jaws, one of which is rigid and the other a spring jaw, which latter is pivoted to the further end of the former so as to allow of its swinging laterally. The blade is firmly lodged against steps in the rigid jaw, from one to another of which it is shifted as it wears out. The handle is provided with pivoted clamps by which the set of the pick may be adjusted.

BROOM AND BRUSH HOLDER.—George B. Cunningham, of Northampton, Mass.—The object of this invention is to improve the machinery employed in the manufacture of brooms and brushes; it consists of a holder for the broom or brush handle which is used while putting on the corn and which does not injure the handle. It is constructed of a tube, from the interior circumference of which at one end project spring wires with jaws at their ends. A cap is screwed on to the end of the tube and compresses the jaws more and more as it is further screwed on. The broom or brush handle is inserted in the tube and held by the compressed jaws as described.

STEAM ENGINE.—John Donnelly, of Hudson, N. Y., assignor of one half his right to Horace R. Peck, of same place.—This invention relates to that class of steam engines in which rotary motion is established by the cross head or a projection thereon acting against spiral ribs on a cylinder; and it consists, first, of a jointed piece on each of the flanges or ribs, with a spring which rises and allows the cross head to pass from one rib to the other at each end of the stroke, the pieces being returned to their positions again by the spring. The invention also consists of a shifting idle wheel, two drums and gearing, for shifting the connection of the main shaft from one to the other of the cylinders to reverse the motion, the cylinders being arranged for driving in opposite directions. It also consists of a brake for arresting the motion, which is formed by a cam wheel on the driving shaft and a secondary steam piston arranged to be forced against the wheel, said secondary piston being in the end of the steam cylinder opposite to the main piston.

RAILWAY GATE.—George A. Kristie and Samuel Horn, Fort Seneca, Ohio.—This invention is an improvement in railroad gates which are designed to be operated automatically by means of a spirally grooved or flanged roller, arranged so as to be acted on by the wheels of the locomotive. The roller is placed outside the track, but is secured to the rail, and is connected to the pivoted gate by a link, or bar, which, when the gate is closed, assumed a vertical or inclined position over the roller. In this way great leverage is obtained on the gate, and it can be raised rapidly and without liability to injury.

ATMOSPHERIC WATER ELEVATOR.—Frederick Baldwin, Janesville, Wisconsin, assignor to Alexander Graham, of same place.—The object of this invention is to obtain a self acting water elevator or conveyer, which is operated entirely by air pressure derived from a reservoir of compressed air. The invention consists principally in a new combination of air and water chambers, floats, and automatic valves, all arranged to subserve the desired purpose, in the most economical and practical manner.

STONE TRUCK.—George A. Davidson, of Malden, assignor to himself and Horace T. Caswell, of Troy, N. Y.—This invention consists in detachably connecting the front end of the platform of the common two wheeled hand trucks used in stone yards to a front truck which is provided with gear for readily hitching thills to it and unhitching them, whereby all the advantages of a hand truck are combined with those of a horse truck, so that the loading of large flat stones, by tilting the rear end of the platform down to the foot of the stone, throwing the stone over on to it, and then tilting the stone and platform back on the wheels, may be performed in the same way with the horse truck that it is done by the hand machine, by simply detaching the platform from the front truck. After the stone is loaded, the front and rear trucks can be again connected.

WATER ELEVATOR.—Eli Deaver, of Rokeby, Ohio.—This invention relates to a novel arrangement of a sliding delivery trough with a well curb. With the exception of an opening through which the bucket passes into and out of the well, the curb is closed at the bottom. The sliding delivery trough is composed of a spout and an enlarged part which is designed to cover the opening. The spout is made of sufficient length to protrude through the side of the curb, and when the bucket is to be lowered it is drawn out so as to uncover the opening. So soon as the bucket is again elevated, the trough is pushed in and the bucket lowered to allow it to rest in the trough and occasion the delivery of its contents by means of a valve in its bottom. By this arrangement tilting or lateral movement of the bucket is obviated; the trough spout does not protrude when water is not being drawn, and no filth can get access to the well.

MOLD FOR CASTING AND CHILLING SLEIGH SHOES.—Volney A. Butman, Ironton, assignor to himself and V. L. Benjamin, Fond du Lac, Wis.—In this invention the improvement consists in forming the lower part or nowel of the flask with a cast iron bed mounted on wheels, whose surface is so shaped as to give the requisite curved form to the shoes cast upon it. The sides of the nowel are cast separate and firmly fastened to the bed by means of bolts. The ends are made detachable, being held by means of hooks to the projecting side pieces. This is for the purpose of preserving the flask, as, if the ends are made in one with the bed, they are very apt to crack off in casting. The patterns used have at their lower edges projecting dowel pins that fit into corresponding apertures in the bed. The dowels serve the double purpose of keeping the patterns in place and of core prints. In the process of casting, the metal is chilled as it comes in contact with the bed, and the shoes are thereby made ready for service.

STILL.—Allan M. Ring, St. John, N. B.—This invention provides a simple, cheap, and durable portable condenser for obtaining fresh water from salt water, to be used in connection with a galley for generating the steam. The worm tub is constructed of an inner and outer cylinder, and the condensing coil, which is of lead pipe, extends from the top of the inner one downward about two thirds of the way, where it discharges into a narrow space between two inclined plates which traverse the remaining portion of the cylinder. This affords a large area for condensation. A stand for the condenser is also provided, and is furnished with shelves underneath to support a boiler and lamp if required.

LINIMENT.—William H. Wagoner, of Hurd Post Office, Pa.—This invention provides a liniment which is compounded of equal parts, or thereabout, of alcohol, spirits of turpentine, rye whiskey and sweet oil.

APPARATUS FOR THE MANUFACTURE OF WARP AND PAPER PULP FABRICS.—Lindley M. Crane, Ballston Spa, N. Y.—This invention consists in combining with the ordinary machinery for paper making (where the pulp is taken from the vat and delivered to the apron continuously) a spool stand, from which the warp threads are arranged on one of the pulp rollers in such a manner as to be drawn in between the two layers of pulp as they are delivered to the endless apron, thus forming an improved fabric of paper and warp threads. Weft threads are also added by means of a shuttle and the employment of another pulp roller.

CULTIVATOR.—Abel Merrill, Ingersoll, Canada.—This invention furnishes an improved cultivator which is light and easily drawn and runs steadily and smoothly. The frame is in the shape of a right-angle triangle, the beam forming the hypothenuse of which carries the plows. The lower edge of each plow is bent outward so as to form a share, and the inner edge is bent upward and attached directly to the side of the beam. The forward edge of this part serves as a coulter, and is notched or slit so as to form a guard by means of which rubbish is turned aside and not allowed to obstruct the plow. The gang of plows is adjustable and can be set to work at any required depth, or entirely raised from the ground.

IRONING TABLE.—James T. Plowman, Sr., Baltimore, Md.—The object of this invention is to furnish a cheap, convenient, and durable table for ironing, which may be used for other purposes; and it consists in providing the ordinary framework of a table with a top which is in three pieces. The two side pieces are fastened down to the frame and the middle piece is arranged to be drawn out from between them so as to form an extension leaf to be used in ironing. To prevent weights placed on the leaf overbalancing the table, the opposite end is fastened to the floor with a hook.

SHUTTLE BINDER ACTUATING MECHANISM.—Henry H. Law, Gloucester, N. J.—This invention consists in an ingenious arrangement of mechanism by which an arm attached to one of the rods that connect the lathe of a loom with the crank shaft is made to operate the shuttle binding levers in such a manner as to retain the shuttle when driven into the box until the time for throwing it arrives.

BEDSTEAD FASTENING.—T. W. Moore, New York city.—In this invention which relates to a new and useful improvement in the mode of attaching the cast fastening plate to the rails of bedsteads, the fastening plate is let into the inside of the rail by cutting away the rail at the end, so that the joint end of the rail will be even with the post. A recess cut in the rail receives the hub or center, which serves to hold the plate securely in place. Orifices are made through the plate, which, in fastening the plate to the rail, receive glue or pins, and serve to hold the plate.

CARRIAGE RUNNING GEAR.—William Hemme, of Michigan Valley, Kansas.—In this invention the axles are pivoted in the center to plates which are attached to the under side of the wagon body. The hounds connected with the axles are joined at their extremities by means of a sliding swivel and pivot. This uncture forms a knuckle joint for the two axles, by which they are caused to move simultaneously when the wagon is turning a corner into such a position that the front and hind wheels run in the same tracks. An extension rod is connected with each axle, and adjusted so as to prevent too much play in them.

CARRIAGE CURTAIN FASTENER.—Timothy D. Marsh, of Jersey, O.—This invention furnishes an improved cam or lock button hole for carriage curtains and other similar uses. The locking button hole is composed of two metallic plates, one of which is attached to the curtain, and the other is so arranged as to admit of being turned round over the face of the first one to which it is connected by a ring. They are each pierced with a hole, a little on one side of the center, which is large enough to freely pass over the curtain knob. The fastening is made by turning the movable plate until the shank of the knob is clamped between that and the one attached to the curtain.

BRAKE MECHANISM FOR SEWING AND OTHER LIGHT MACHINERY.—John M. Cayce, Franklin, Tenn.—The invention consists in providing the needle cam of a sewing machine with an adjustable sleeve and spring brake whereby the needle can be made to pause within or without the fabric; and also, in providing a speed regulator which is very delicate, easily graduated, governs the period of retardation, and determines the stoppage of machine.

CIGAR MOLD.—Isaac Guthman, Morrison, Ill.—The invention is a cigar mold in three pieces, hinged together, and consisting of a semi-circularly, grooved bed plate and two quadrantally grooved covers.

PROCESS OF DESICCATING AND SEASONING LUMBER.—James F. Gyles, Chicago, Ill.—The invention consists in desiccating green lumber by applying pressure on a line at right angles to the grain thereof and gradually changing said transverse line of pressure by keeping the lumber in motion between two pressure surfaces.

MACHINERY FOR DESICCATING AND CUTTING LUMBER.—James F. Gyles Chicago, Ill.—The invention consists in a peculiar mode of constructing and combining tools and machinery for tonguing, desiccating, and cutting lumber into lengths, whereby green lumber may be sawed, dried, tongued, grooved, and applied to immediate use.

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5,949 to 5,954.—BEDSTEADS.—M. Fitzsimmons, Cincinnati, O.
5,955 and 5,956.—BUREAUS.—M. Fitzsimmons, Cincinnati, O.
5,957.—SIDEBOARD.—M. Fitzsimmons, Cincinnati, O.
5,958.—FLOOR CLOTH.—J. Meyer, Lansingburgh, N. Y.
5,959.—CARPET.—G. C. Wright, New York city.
5,960.—CARPET.—J. Dornan, Philadelphia, Pa.
5,961.—LETTER BOX PLATE.—W. Gorman, New Britain, Conn.
5,962.—TOY BANK.—D. A. Stiles, Middletown, Conn.
5,963 to 5,966.—GLASS HEAD FOR DOOR KNOBS.—A. E. Young, Boston, Mass

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869.—TREES, SHRUBS, ETC.—J. A. Bayles, Lee's Summit, Mo.
870.—CONFECTIONERY, ETC.—H. Maillard, New York city.
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DESIGNS PATENTED.

5,967.—MILITARY SHOULDER KNOT.—D. C. Hall, Boston, Mass.
5,968.—RAIL FOR HAT RACK.—D. Heald, Milford, N. H.
5,969.—TEA POT.—C. Hodgetts, Brooklyn, N. Y.
5,970.—FINGER OR OTHER RING.—F. W. Martin, Springfield, Mass.
5,971.—MONUMENT.—J. M. Martin, Cleveland, O.
5,972.—LEGAL BLANK.—J. B. Shaw, Brooklyn, N. Y.
5,973.—SCHOOL FURNITURE.—I. Wachob, Scranton, Pa.

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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending, for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

17,236.—COUPLING.—W. and C. Sellers. September 4, 1872.
21,554.—INKSTAND.—S. Darling. September 4, 1872.
21,566.—KNITTING MACHINE NEEDLE.—J. K. and E. E. Kilbourn. Sept. 4, 1872.
21,572.—CANAL BOAT.—J., S., and J. McCausland. Sept. 4, 1872.
21,587.—HARVESTER.—McC. Young, Jr. Sept. 4, 1772.
21,603.—TEMPERING STEEL.—R. G. Gardiner. Sept. 11, 1872.
21,659.—FOLDING GUIDE.—A. Douglas. Sept. 18, 1872.
21,745.—SEWING MACHINE.—C. O. Crosby. Sept. 25, 1872.
21,756.—CENTRIFUGAL PUMP.—W. C. Hibbard. Sept. 25, 1872.
21,712.—HAY RAKE.—G. Whitcomb. September 18, 1872.
21,856.—CUTTING STAVES.—W. Steele. October 2, 1872.
21,991.—SAFETY STEAM BOILER.—F. Stebbins. October 2, 1872.

EXTENSIONS GRANTED.

20,631.—EVAPORATING CANE JUICE.—D. M. Cook.
20,692.—GRINDING MILL.—B. A. Beardsley.
20,719.—HARVESTER.—W. F. Ketchum.
20,736.—FIRE AND BURGLAR PROOF SAFE.—T. Sharts.
20,775.—SEWING MACHINE.—L. R. Blake.
20,777.—RAILROAD CAR SEAT AND BERTH.—Z. Cobb.
20,815.—SAUSAGE FILLER.—J. G. Perry.
20,837.—PRESSING STRAW BONNETS, ETC.—H. E. West.

EXTENSIONS REFUSED.

20,728.—HAND DRILL.—H. H. Packer, Mass.

DISCLAIMER.

30,509.—BELL ATTACHMENT.—A. E. Taylor.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]
From June 14 to June 17, 1872, inclusive.,

CUT NAILS.—J. H. Garey, East Weymouth, Mass.
HARVESTING MACHINE.—S. Johnston, Brockport, N. Y. (Two Patents.)
IRON.—W. Sellers, Philadelphia, Pa.
IRON AND STEEL.—J. W. Middleton, Philadelphia, Pa.
IRON AND STEEL.—T. S. Blair, Pittsburgh, Pa.
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How Can I Obtain a Patent?

is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them; they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

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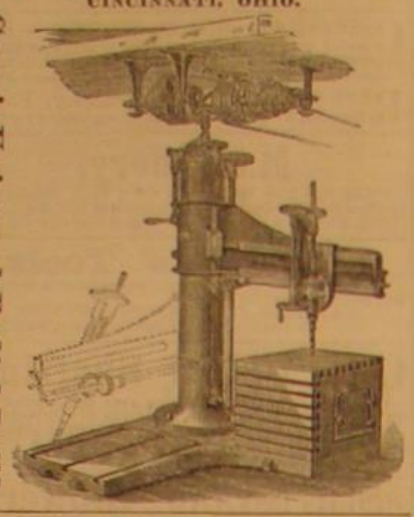

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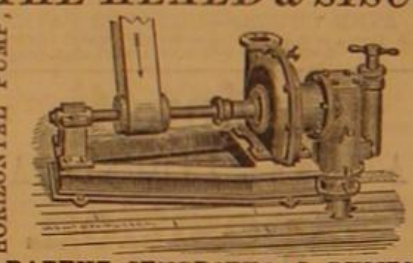

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We are also receiving, every week, the best scientific journals of Great Britain, France, and Germany; thus placing in our possession all that is transpiring in mechanical science and art in these old countries. We shall continue to transfer to our columns copious extracts, from these journals, of whatever we may deem of interest to our readers.

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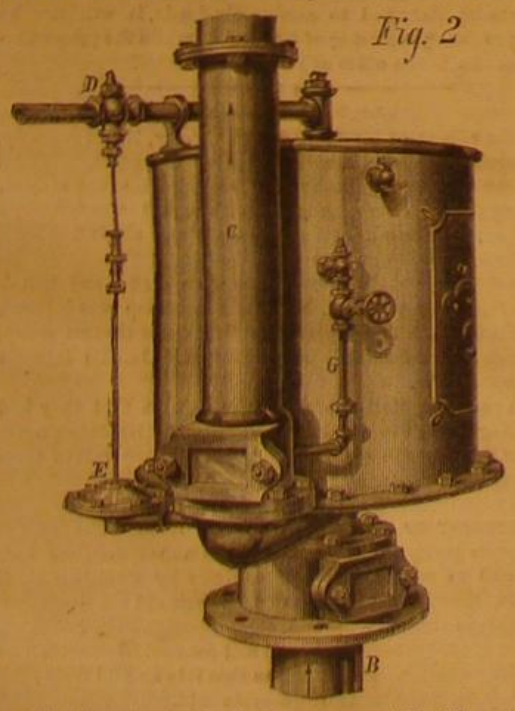
THE PRALL AUTOMATIC STEAM VACUUM PUMP.

We have pleasure in laying before our readers some account of the above pump, the performance of which we have lately witnessed. It is ingeniously and yet simply constructed, and appears to be very effective in operation. It admits of various forms of construction without essential alterations of principle, and can thus be rendered applicable to raising or forcing water, or both, under a variety of conditions. Its capabilities will best be understood from a description of its mode of action, which we will now give from the pump in its simplest form.

Figs. 2 and 3 give views of the single cylinder pump, the latter being a vertical section which shows all its working parts. A is the cylinder or body of the pump, which is made of cast iron and has its sides lined with wood. B is the section or supply pipe, and C is the discharge pipe. Each of these pipes is furnished with a check valve, as shown, to prevent the backward flow of the water. At the top of the pump is shown the steam pipe, which is connected with a suitable boiler. The passage of the steam is regulated by the valve, D, which is connected by a rod with a rubber diaphragm, shown at E. This diaphragm, upon the action of which the movements of the valve, D, depend, is placed between two disks which are slightly hollowed out on their inner sides so as to allow between them an upward or downward movement of the center of the diaphragm equal to the extent of the movement required in the valve. The space below the diaphragm is connected, by the pipe shown, with the water supply pipe, B, and to the upper side of the diaphragm air is freely admitted through the upper disk. In the operation of the pump thus constructed, when the cylinder is filled with water, the pressure on the under side of the diaphragm causes it to rise in the middle, and, by means of the connecting rod, to raise the valve, D. The effect of this is to admit steam, which, on entering the cylinder, is diffused

THE PRALL AUTOMATIC STEAM VACUUM PUMP.

Fig. 2



by coming in contact with the plate shown at F. The water contained in the cylinder is then driven out through the discharge pipe, C, with a force commensurate with the pressure of the steam. When the steam has descended low enough to come in contact with the cold iron bottom of the cylinder and to enter the mouths of the water pipe, a partial condensation ensues, which reduces the pressure sufficiently to cause the diaphragm to fall and thereby shut off the steam; at the same time, and by the same cause, the valve of the injection pipe, G, is raised, and sufficient water drawn from it into the cylinder to complete the condensation of the contained steam. The vacuum thus produced is immediately supplied by water entering through the supply pipe, B, and as soon as the cylinder is filled the diaphragm is again raised as before described, and the entire operation is repeated. This continues so long as steam is supplied from the boiler. A small pet cock, shown near the top of the cylinder in Fig. 2, admits sufficient air, while it is filling, to prevent the water rising above the plate, F; this allows of the diffusion of the steam over the water surface without agitation of the latter. The action of the check valves in the water pipes during the operation will readily be understood without explanation. It will be noticed that the chambers containing them are constructed with face plates which admit of easy removal, so that the valves may be inspected and repaired without difficulty. The action of the single cylinder pump is intermittent, but by using two cylinders, which force and condense alternately, the pump is made to throw a continuous stream. The double action pump is shown in operation in Fig. 1, together with a boiler of proportionate size for running it. In this form of the apparatus, the valve is made so as to admit steam to the cylinders alternately, and the sides of the diaphragm are connected, each with one of the cylinders, in such a way that it is moved upward by the pressure of water in one and downward by the pressure in the other. Thus a constant flow of water is kept up through the main discharge pipe.

The inventor claims that in this pump the steam is utilized to the fullest possible extent; it is made to perform a double duty—to expel the water by its pressure and to create a vacuum by its condensation. The absence of the working parts of ordinary pumps, such as pistons, levers, cams, cranks, etc., gives great advantages to this device, which he thus enumerates: 1st. Having no piston it is not affected by mud, sand, salt, or grit of any kind. 2d. Being frictionless, it requires no lubrication at any point. 3d. Having no moving parts but the valves, there is nothing (but them) to break down or require repair; the water flows easily and noiselessly in and out of the cylinder, and the pump may be run for years without special attention other than, perhaps, an occasional replacement of the check valves.

The single cylinder pump is adapted for service in filling railroad tanks, etc., where the water is to be lifted forty feet or more in large quantities. The double pump will perform the same duty, and is also adapted for use as a ship's pump, a fire engine, or for any purpose requiring water to be forced a long distance. The supply of water may be taken from a tank, river, well, or any other available reservoir by suitably connecting with it the supply pipe of the pump, and the inventor states that the vacuum formed is so perfect that the cylinder is filled when its top is placed twenty-five feet or more above the water level by the pressure of the atmosphere.

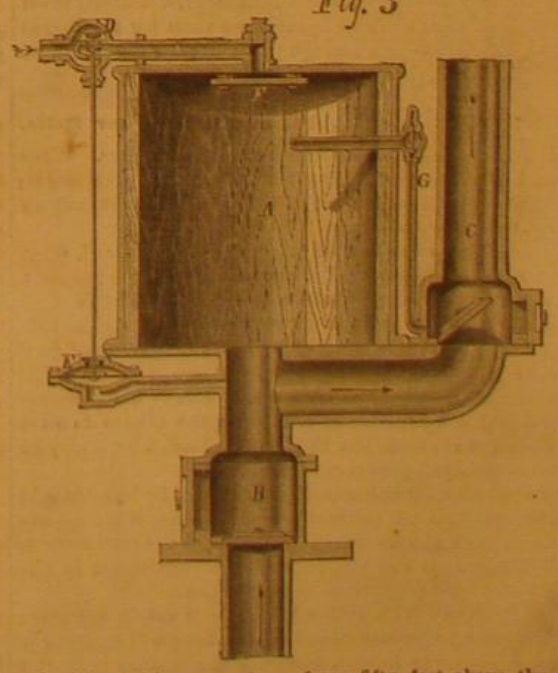
The pump may be operated by steam at a very low pressure where it is employed to raise water by atmospheric pressure alone. In this case the delivery pipe is placed below the cylinder, so that gravity may assist the discharge. Small pumps of this form are constructed specially for the use of farmers in raising water for their stock, and are also well adapted for purposes of irrigation.

The invention, which has been in practical use for the last ten months, was patented in this country July 4, 1871, and has been subsequently patented in Europe. Further information may be obtained by addressing the Prall Steam Pump Company, Indianapolis, Ind., where they are at present manufactured, or P. O. Box No. 3413 New York; or Messrs. Gray & Noyes, Washington, D. C., who manufacture for the Southern States.

A Great Flow of Gas.

A freak of an oil well near Titusville, Pa., is thus recorded in a recent number of the Titusville *Courier:* The well had been sunk for about twenty days, but continually poured forth such a volume of gas that it was found impossible to pump it, as the valves would not work. The tubing was pulled and the well was cased, in order to let the gas blow off, so that it might be pumped. After the casing was put in, the sand pump was lowered for the purpose of agitating the well, when the gas raised a column of water, throwing a solid stream into the air a hundred feet. The noise was terrific, and could be heard for a distance of more than two miles. The noise was something like the loud roar of thunder, and when the column burst at the top it threw the water each way for fifteen rods from the well. The water was exhausted in about twenty-five minutes, and then a column of gas followed, rising with tremendous force fifty feet above the derrick. The outpouring of the gas makes a roaring noise that can be distinctly heard for two miles from the well. No tools can be put into the well. As soon as the attempt is made, with such force does the gas come out that the tools are carried into the air. The stream of gas shows

Fig. 3



no sign of diminishing, and its loud and continuous roar can be heard for miles around.

Progress of the Great Tunnels under the East River at Hell Gate.

The work which is to culminate in the removal of the Hell Gate obstructions may now be considered as more than half accomplished. It is thought that about fifteen or eighteen months will yet be required to complete it, but this cannot be done unless Congress makes additional appropriations. The subject will be pressed at the opening of the next session, and it is not believed that a work of so much importance will be allowed to stop. The work is a wonderful piece of engineering.

Viewed from the head of the stairway, it reminds one of a railroad engine house, being semicircular in form, and having ten embrasures, with tracks leading back to the terminus of the tunnels. A turning table in the center of the shaft makes the simile all the more complete. Only ten tunnels are visible from the outside, but there are sixteen all told, six commencing in the interior of the work. Four galleries or intersecting tunnels are now completed, and the fifth has been commenced, thus leaving the rock above, which is about ten feet thick, resting on solid columns. Some of these columns have already been pierced for the reception of nitroglycerin. The main tunnels are numbered and named as follows: Farragut, Madison, Humphrey, Hoffman, Sherman, Jefferson, Grant, McClellan, Franklin and Jackson. As usual, General Grant is ahead, the tunnel bearing his name being 230 feet long. The aggregate length of these excavations exceeds 3,000 feet. The depth of the shaft is 34 feet.

Visitors to the works should by no means go in their best clothes. The leakage from above is so great that the pumps are kept constantly going, and even with the use of an umbrella the incautious investigator is likely to come out with his clothes considerably the worse for the journey. Supplied with a candle, the visitor gropes his way through the dark, sometimes descending at an angle of forty-five degrees until he reaches the dim light at the end of the tunnel. Here the workmen are found, some drilling and others shovelling up the loose stones. If he is fortunate enough to get into the gallery where the diamond drill is in operation, he will be well paid for his trouble, although it does deafen him with noise. There are two drills of this kind here, but one is now undergoing repair. The bore made by this machine is an inch and a half in diameter, and the cores, sometimes four feet in length, can be had of the miners. The drilling being over, the next thing in order is the blasting, which occurs three times a day, and is now done altogether with nitroglycerin. When powder is used, the stones are so large that the use of the hammer is necessary, whereas the glycerin breaks them into fine pieces.

When the charges are to be exploded, a gong is sounded, the workmen retreat to a place of safety previously indicated, and an electric battery does the work of explosion. The thundering, smothered sound of the successive charges forcibly reminds the visitor of a battery of forty pounders in full play. When the volumes of smoke have disappeared, the workmen return, and the operations of drilling and removing the *débris* are resumed. Specimens of stone can be procured from the miners, or from the piles of rock on the shore. Garnets, mica and quartz abound.

The apprehensions of danger when the general explosion takes place, are entirely groundless. So confident is Mr. Reitheimer, the general superintendent of the work, of this fact that he intends to remain in his office, about 300 feet from the shaft, when the final charge is exploded. On completion of the work of excavation, with the nitro glycerin ready, the coffer dam will be cut, and, as it is easier to raise a weight under water than above it, the shaft and mine will be flooded, and with the discharge of the electric spark the dangers of Hell Gate will no longer exist, But should the explosion by any accident not prove successful, or, indeed, if it should never take place, there will still be sufficient room for the largest ocean steamers to pass through the shaft after the coffer-dam shall have been cut.

Relative Merits of Rubber and Leather for Belts.

Rubber will not last one fourth as long as leather. When once it begins to give out, it is next to impossible to repair it; while wide bands cannot be used for or cut up into narrow ones, as leather ones can be.

Leather belts may be used over and over again, and, when of no further value for belts, can be sold for other purposes.

A rubber band, costing hundreds of dollars, may be spoiled in a few moments by the lacing giving out, and the band being run off into the gearing, or by being caught in any manner so as to damage the edge, or by stoppage of either the driving or driven pulley. A few moments of quick motion or friction will roll off the gum from the canvas in such quantities as to spoil the band, while leather belts may be torn or damaged, yet are easily repaired.

Should a rubber or gum belt begin to tear by being caught in the machinery, if the rent strikes the seam, it is most certain to follow it, even the entire length, if the machinery is not stopped. It would be impossible to tear leather in like manner.

Oil in contact with rubber belting will soften the gum; and rubber, gutta percha, and canvas belts will continue to stretch as long as in use, rendering it necessary to shorten them continually.

During freezing weather, if moisture or water finds its way into the seams, or between the different layers of canvas composing these bands, and becomes frozen, the layers are torn apart, and the band is spoiled; or if a pulley becomes frosty, the parts of bands in contact with it will be torn off from the canvas and left on the pulley. Also, gum belts will not answer for cross or half cross belts, for shifting belts, cone pulleys, or for any place where belts are liable to slip, as friction destroys them.

A well made leather band, if properly looked after—the width and pulley surface proportional to the amount of work to be done—will last twelve, fifteen, or twenty years, and yet be of value to work over into narrow belts.

THE HANDS OF THE NATION.

According to the returns of the census up to June 1st, 1870, the United States contain 12,505,923 working people. The number of inhabitants in the country is 38,558,371, so that the active workers constitute very nearly one third of the entire population, the ratio having considerably increased since the census of 1860, at which time it barely exceeded one quarter.

10,669,436 are males, and 1,836,487, females. Between the ages of ten and fifteen years, the males outnumber the females in a ratio of nearly three to one; between sixteen and fifty-nine years, the ratio increases to nearly six to one; while at ages above sixty years there are more than twelve times as many men at work as there are women. These figures apply to the men and women in actual outside employment. It will be noticed that as the women grow older, their numbers in proportion to the men decrease. This is accounted for by their marrying, abandoning their employments, and settling down to the drudgery of the household. Now, the population of the country may be estimated to be divided into 8,000,000 families, each of which has a woman for one of its heads. She is not considered as a worker in the foregoing calculations as given by the census, and here we consider a mistake has been made. The poor man's wife has far more labor to perform than her unmarried sister who works her ten hours a day. The cares of housekeeping and the rearing of children are the heaviest of burdens, and the woman that conscientiously fulfils her perpetual round of wifely duties ought surely to be classed first on the list of those who earn their bread by hard work. In at least seven million families, the lot of the wife and mother is no sinecure; so that in reality we find that the working women and the working men are not only nearly equal in point of numbers, but there is a balance on the side of the women in the shape of unending labor, the most monotonous and thankless in existence.

Out of the number of working people above mentioned, 9,802,038 were born in the United States; 949,164 in Ireland; 836,502 in Germany; 301,779 in England and Wales; 189,307 in British America; 109,681 in Sweden, Norway, and Denmark; 71,993 in Scotland; 58,197 in France, and 46,300 in China and Japan. There are therefore from three to four times more Americans engaged in useful labor than foreigners.

Regarding occupation, 5,992,471 are devoted to agriculture; 2,707,491 to manufactures, mining, and mechanical pursuits; 2,684,793 are rendering professional and personal services; and 119,238 are engaged in trade and transportation. Comparing the different callings of the inhabitants of foreign nativities, we find that of the Germans the largest numbers are engaged in manufactures and the least in domestic service. Of the Irish, the laborers and servants nearly equal numerically all the other occupations together. The English, Welsh, Scotch, and British Americans have a majority in manufacturing pursuits, and the least numbers in trade and transportation. Among the Swedes, Danes, and Norwegians, those devoted to agriculture constitute much the larger portion, while those following trades are considerably in the minority. The Japanese and Chinese are principally engaged in manufacture. Many of these nations enter domestic service, but a small portion devoting themselves to agriculture or trade.

The largest part of the population engaged in any single occupation are the planters and farmers, numbering 2,983,573. The farm laborers are nearly as numerous, reaching 2,880,045.

In manufacturing and mechanical occupations, the carpenters take the lead, numbering 344,596. Next in order come the boot and shoe makers, tailors, miners, and blacksmiths, ranging in numbers between 171,000 and 141,000. Then the milliners, brick and stone masons, and painters, each trade averaging between 92,000 and 85,000. Then follow the machinists, nearly 55,000, and next the saw mill hands, butchers, cabinet makers, carriage makers, coopers, and millers, each branch ranging in numbers between 50,000 and 40,000. The printers, harness makers, and tinners average between 40,000 and 30,000, and the tanners, cigar makers, bakers, fishmen, brick and tile makers, marble and stone cutters, plasterers, and wheelwrights between 30,000 and 20,000.

The number of manufacturers returned is 42,905. In the various factories throughout the country, there are 111,606 operatives in cotton mills, 81,000 in iron works, 58,836 in woolen mills, 41,619 in works not specified, 11,985 in tobacco factories, and 12,469 in paper mills. The aggregate number of clerks, salesmen, bookkeepers, and commercial travellers is 275,086, more than that of any trade except the carpenters. The railroads throughout the country furnish employment for 1,902 officials and 161,401 clerks and employees. The express companies require the services of 75 officials and 9,321 clerks and employees, and the various street car lines, 88 officials and 5,103 employees.

Of those gaining their living afloat there are 56,063 sailors, 7,338 canal men, and 7,975 steamboat employees. The hackmen, teamsters, and draymen number 120,975.

There are 62,383 physicians and surgeons or an average of one to look out for the health of every 618 people. The clergymen number 43,874, or one to take charge of the spiritual welfare of every 879 souls, and finally there are 40,736 lawyers, or one to adjust or foment quarrels among every 946 of the population. Education is instilled into the minds of youth by 136,570 teachers, and the washing of the entire nation is done by 60,906 launderers and laundresses. The laborers number 1,031,066, and the domestic servants 971,043. Our great hotels and restaurants furnish employment to 94,170 people, and the livery stables to 26,090 more. The office holders, national, state, and municipal, outnumber the members of any of the liberal professions, there being 67,912. It takes 23,935 barbers to shave the male portion of the population, and 15,667 nurses to attend the sick. 12,785 boarding-house keepers offer the "comforts of refined homes" to the unsuspecting public. 6,519 musicians make up the total of the various orchestras and bands. The journalists number but 5,286, although there are 6,432 periodicals published. This discrepancy can only be explained under the supposition that the census takers did not consider the individuals who, while engaged in other callings, edit country newspapers by means of scissors and paste, as belonging to the profession. Finally, the officers of the army and navy are numerically the least, there being but 2,286 in both arms of the service.

Another Boiler Explosion.

Another instance of a large loss of property and the severe injury of several persons through gross carelessness and incompetence took place recently at the Lafayette Iron Works in Titusville, Pa. A boiler exploded, overturning walls, tearing out floors and windows, and scalding and burning, though providentially not killing, six or seven men. The boiler was a "twelve horse power Washington," resting on a brick foundation, and supposed to be capable of withstanding a pressure of 150 pounds.

The cause of the disaster is abundantly explained by the testimony of the engineer. He says that he never tested his steam gage, and had no means of knowing whether it was correct or not; that he did not know what the safety valve stood at, and had never tried to find out. He did not know whether the boiler contained any scale or sediment or not. He knew there was a leak under the fire box, but was not aware whether it would discharge two cocks in twenty minutes or not. Believed that one of his gage cocks was in a damaged condition; was certain that he had thirty-five pounds of steam in the boiler a short time before the explosion, but had not noticed whether the steam had risen in the interval or not.

Any one who can run a boiler even for a week and not know at what pressure his safety valve blows off, or whether his steam gage is in working order, is certainly utterly incompetent to fulfil the duties of an engineer. Whether the explosion, in the present instance, took place from the water escaping from the leak before mentioned, or whether, as was most probably the case, the steam pressure was allowed to get too high, it is plain that there was the most deliberate ignorance and negligence, not only on the part of the engineer, but also on that of his employers, who, by retaining him in his important position, jeopardized the lives of the entire establishment.

The New Erie Railroad President.

Peter H. Watson, formerly an examiner in the Patent Office, subsequently a patent lawyer, and who, for two years during the war, served as assistant Secretary of War with extraordinary ability and success, has just been elected President of the Erie Railroad.

Mr. Watson is a gentleman of strict integrity and possesses great energy and talent. We congratulate the Erie Railway on its fortunate selection of so capable an officer, and Mr. Watson on his appointment to so important a trust. If the Erie stockholders fail to receive dividends, it will not be owing to the squandering of its receipts while the present incumbent holds the office of President.

Lightning Freaks.

At the village of Marlboro, Ulster County, N. Y., recently, two terrific thunderstorms went over the place. Three bolts from the consolidated storm descended into the village, striking three houses occupying, with regard to each other's situation, the three angles of a triangle and about five hundred feet apart.

The chimneys of the three houses were struck and demolished from roof to cellar, but only one person was injured. This man, James Terwilliger, was struck and thrown down, his boots torn off and his body scorched. But his injuries were not serious.

The people of Marlboro are of the opinion that they had lightning enough for one day, and that, if "lightning never strikes twice in the same place," it sometimes strikes three times in places quite close to each other.

CHEMISTRY OF THE COTTON PLANT ROOT.—The root of the cotton plant, which is employed as a medicine, has been subjected to careful chemical analysis by Professor E. S. Wayne. He obtained from the root a dark red resinous mass, insoluble in alcohol, ammonia, chloroform, and ether, but soluble in caustic solutions of soda and potassa. It contains no alkaloid principle. He concludes that it is an acid resin, and suggests for it the name of gossypic acid.

Two diamonds have lately been found near Placerville, Cal., one weighing almost three carats, the other nearly one carat. It is supposed that more of them will yet be discovered. Diamonds have been found in nearly all gold producing countries

LIGHTNING RODS.

"Lightning Rods and How to Construct them" is the title of a convenient little handbook by Professor John Phin, issued by the Handicraft Publication Company, 37 Park Row, N. Y. Price 25 cents. It contains much sound and useful information upon the subject, and ought to have a very wide circulation. The following selections will give some idea of the excellent character of the book:

Are Lightning Rods Really a Protection?—There are many instances on record where buildings protected by rods have been struck and injured. But this is not to be wondered at when we reflect that fully one half—nay, perhaps three fourths—of all the rods now actually erected violate the fundamental principles upon which their efficiency depends. Besides serious errors in regard to arrangement and continuity, it will in general be found that it is only by the merest accident that a good ground connection is ever secured. This point will be more fully discussed in a subsequent paragraph. Meanwhile, the following facts prove irrefragably the great value of well constructed rods. The Cathedral of St. Peter, in Geneva, although so elevated as to be above all other buildings in the neighborhood, has for three centuries enjoyed perfect immunity from damage by lightning; while the tower of St. Gervaise, although much lower, has been frequently struck. This doubtless arises from the fact that all the towers of St. Peter are accidentally furnished with perfect conductors. The great column of London known as the Monument, erected in 1677 in commemoration of the great fire, although over two hundred feet in hight, has never been struck; while much lower buildings in the vicinity have not escaped. The Monument, however, is protected by a most perfect conductor, the upper end terminating in a vase from which proceed numerous metal plates designed to imitate the appearance of tongues of flame. The vase communicates by means of stout bars of iron with the metal staircase, which descends through the middle of the column and terminates in the ground. A still more striking instance of the value of lightning rods is a church on the estate of Count Orsini, in Carinthia. This building was placed upon an eminence, and had been so often struck by lightning that it was deemed no longer safe to celebrate Divine service within its walls. In 1730, a single stroke of lightning destroyed the entire steeple; after it had been rebuilt, it was struck on an average four or five times a year, without counting extraordinary storms, during which it was struck from five to ten times in a single day. In 1778, the building was reconstructed and furnished with a conductor; and, according to Lichtenberg, up to 1783—that is to say, during the space of five years—the steeple had been struck only once, and this stroke had fallen upon the metallic point without producing any damage. For two or three years after its erection, the church of St. Michael in Charlestown had been frequently damaged by lightning; a conductor was attached to it, and during the following fourteen years it had not been injured. The steeple of St. Mark's, in Venice, has a hight of 340 feet, and was frequently struck by lightning until a proper lightning rod was applied to it, since which time it has not been injured. These facts leave no room for doubt in regard to the great value of lightning rods.

The Best Form for the Rod.—If we examine the rods ordinarily found in market, and puffed by those who have invented them, we shall find that, instead of being solid bars of a square, round, or merely flattened form, they are tubes, twisted ribbons, or bars whose cross section has the form of a star. And if we ask why these complicated and expensive forms have been adopted, we shall be told that it is for the purpose of obtaining the greatest amount of surface with the least amount of metal, and this is done because electricity always resides on the surface. Those who reason in this way, however, prove clearly that they have never studied the subject, else they would be aware of the fact that while static electricity, as it is called—that is, electricity at rest—always disposes itself on the surface of bodies charged with it, electricity in motion pervades the entire substance of the bar through which it passes, and consequently the power of such a bar to convey electricity is measured by the quantity of metal that it contains, and not by the extent of surface that it presents. Pouillet showed this in a very clear and decisive manner. He measured the conducting power of a fine wire of cylindrical form—the form that presents the least possible surface in proportion to its cubic contents—and then, having flattened and annealed it, he tested it again. Its surface was enormously increased, but its power to conduct electricity was lessened rather than otherwise; this diminution being probably due to the fact that the wire was increased in length, and, consequently, its cross section was somewhat diminished. An experiment, equally decisive and perhaps somewhat more easily performed, is at the command of every one who has access to a small electrical machine and a two quart Leyden jar. Take a fine gold wire, say one fiftieth of an inch in diameter. This wire will present nearly the same surface as a ribbon of metal 1-32 of an inch wide. The wire will carry off, without being injured, any charge that can be imparted to the jar. If, however, we pass the charge through a strip of gold leaf having several times the surface of the wire, it will be completely burned up and dissipated.

Arrangement of the Rod.—It is very obvious that the most perfect, though not the most economical, arrangement would be to cover the entire building with a sheet of metal. Then it would be impossible for the lightning to strike any point without falling upon a good conductor. But such an arrangement being obviously inadmissible, we must so arrange matters that the most exposed points shall be the conductor and its connections. The French Academy recommended the use of rods elevated nine to twelve feet above the building, and, after a good deal of experiment and observation, came to the conclusion that a rod was capable of protecting efficiently a space covered by a radius equal to twice the hight of the rod, above the most elevated part of the building. For ourselves, a very careful examination, of the conditions which arise during a thunderstorm, leads us to place no confidence whatever in elevated rods, and to depend wholly upon so arranging the conductor that every part of the building shall be protected.

It is obvious that the rod should be carried from the roof to the ground by the shortest possible way. Some have even recommended that it be carried down the chimney—a plan in which there is nothing objectionable, provided it happen to be the most convenient.

Attaching Lightning Rods to Buildings.—It is a very prevalent opinion that lightning rods should be carefully insulated from the buildings to which they are attached, and hence most rods are made to pass through glass tubes or insulators, the avowed object being to prevent the electricity from passing into the building. The extreme worthlessness of such arrangements ought to be obvious to any person who ever observed a flash of lightning. The discharge from a powerful Rhumkorff coil will pierce through five inches of solid glass, so that, if a lightning rod were entirely cased in a glass tube, an artificial flash of lightning can be produced which will pass through it as easily as a spark from one of the old machines would pierce a card! And if such a result can with safety be produced by artificial means, in a room filled with people, what would be the limit to the effects produced by natural means where thousands of acres of cloud surface are engaged? Insulators do very well to talk about, but as a security against Heaven's artillery they are powerless.

Lightning rods should be connected with all large masses of metal which may exist in or upon the house, such as metallic roofs, tin or iron gutters or pipes, iron railings, etc. In the second place, the rod should be attached to the house in the neatest and least obtrusive method possible. If the rod be flat, it may be pierced with small holes and tacked directly to the building; but a better way, both for round, square, and flat rods, is to employ properly shaped staples of stout wire. These staples may be driven into the studding of wooden houses or into the joints of brick walls, and, when properly painted, will not present an unsightly appearance.

Termination in the Ground.—Upon the perfection of the ground termination mainly depends the value of the lightning rod. If this be defective, no other good features can possibly make up for it. And yet, so little is it understood, that a careful examination of a very large number of rods leads us to believe that fully one half the lightning rods in existence are defective in this respect, and, consequently, furnish but an insufficient protection.

Iron conducts better than water, but water conducts better than dry earth. And just as we are able, by increasing its size, to make an iron rod conduct as freely as a copper one, so, by increasing the volume of water or soil employed to carry off the electricity, we can make it almost as efficient as the metallic conductor. These facts lead us to the following conclusions: 1. The end of the rod ought to be made to terminate in a layer of soil that is permanently wet; and 2. The end of the rod ought to expose to this soil as large a surface as possible.

Permanently moist earth is to be attained only at considerable depths—say at the level of the water in the wells in the vicinity. Unless we reach this point, we can never be sure that our rod does not terminate in dry or but slightly moist soil; consequently no effort should be spared in sinking the rod to a sufficient depth. This is most easily accomplished at the time when the foundations are laid; and we would advise all builders to sink the lightning rod termination when they sink the foundation. A short portion of the stem may be allowed to rise above the ground, and the conductor may be arranged and attached at a subsequent period.

It is a common practice among lightning rod men to form the earth termination by simply driving a crow bar into the earth, and inserting the end of the rod in the hole thus formed. No reliance can be placed on an earth connection made in this manner. The crow bar may have been driven into perfectly dry sand; and, in any event, the amount of surface exposed by the rod, and the consequent section of earth brought into action, is altogether too small.

How to Preserve to Prints the Beauty which they have in the Washing.

Every photographer must have observed how beautiful prints sometimes look in the washing water, and how much they lose of their vigor and beauty on drying. This is especially true of fully toned prints, which, although they show a warm tint of black in the water, dry sometimes of a cold inky tint, besides becoming mealy. It seems important, therefore, that prints which are intended to be framed for an exhibition, or which the artist desires to keep for himself as choice specimens and the best which the negatives will yield, should be so printed as to lose none of the beauty which they exhibit in the water—none of the rich warm tint, the transparency in the shadows, the clearness of the detail, the perfection of surface produced by the water acting as the varnish. But the only way to preserve all these excellencies is to substitute glass for water, and so to mount the print against the back of a glass plate as that when viewed through the glass it may appear exactly as it does under water, that is to say, exactly as it would if removed from the water and pressed while still wet against the glass plate. The problem, then, is to substitute for the water some kind of varnish which, when perfectly dry, will not produce any change in the appearance of the print. Imagine for an instant the problem solved and the thing done; what would be easier than to mount all such prints as we intended to be framed and glazed against the glass of the frame instead of upon a card board which is placed more or less loosely behind it? or to mount all such prints as an artist might desire to keep for his own use upon plate glasses, to be pressed in a plate box like negatives or glass transparencies?

The problem is a very old one, and it has been already solved by means of collodion and gelatin. M. Davanne has recently described the process at a meeting of the French Photographic Society. It is as follows:

Coat the glass plate to which the face of the print is to be applied with plain collodion, and immerse it immediately in a bath of cold water in order to wash out the ether and alcohol, as in the common wet process with the nitrate bath. Then pour over the film a solution of white gelatin, strength about eighty grains to the ounce of water. It must be sufficiently hot to flow freely, and care must be taken to avoid dust and air bubbles. Tilt the plate so as to let the excess of gelatin run off into another vessel, and then place it upon a horizontal support. The film of gelatin will thus be very thin. Before waiting until it is quite dry, lay the face of the print down upon it just as it comes wet from the washing water, and press it into close contact with the glass.

When viewed through the glass it will, of course, look just as it does in water, and this beautiful appearance it will not lose on becoming dry. With respect to the white background, or one of any other color, this may consist of a sheet of paper applied to the whole of the glass plate behind the print. Or if the negative be masked with black paper for a sufficient breadth round its edges, the print will have a white margin and need not then be trimmed. In subjects which are vignetted, this will, of course, be the plan to pursue.

As soon as the print has become dry against the glass, it may be put into a frame with a thin board behind it. Several prints may be mounted together upon the same glass. The only objection to the plan is that if the glass should be broken the print would be destroyed; but this objection is greatly outweighed by the increased beauty of the result. By using a rather thick plate of glass, the risk of breakage would become very small indeed. The perfect optical contact between the surface of a print and that of so splendid and smooth a varnish as a sheet of glass is an advantage not to be underrated or despised. There is no loss of detail, no change of color, none of the mealiness produced by drying, and none of the vulgarity of albumen. The result is not only technically but artistically finer than when any other method of enamelling and mounting is employed. If, when the print is dry, it be brushed over on the back with plain collodion, the pores of the paper would be so filled with air and waterproof material that greater permanency would, no doubt, be secured.

Pear Tree Blight.

Some interesting experiments are being prosecuted by Mr. William Saunders, superintendent of the Department of Agriculture grounds, at Washington, in relation to pear tree blight, particularly during the last two years. A pear tree which was badly blighted on its main trunk was made the subject of special experiment. Nearly all of the bark was blighted within three feet of the ground, only about an inch and a half in width being left to connect the upper part of the tree with the unblighted bark at the base. The affected part was removed and the sap wood left quite exposed to view; but to prevent injury from the air it was at once coated with a composition of carbolic acid, sulphur, and lime, largely diluted with water. After the lapse of two years, the tree has wholly recovered and the denuded part is again covered with new and healthy bark. The tree in all respects presents a healthy appearance. Many other trees much affected with blight were coated heavily with the sulphur compositions and have evinced marked signs of improvement. It is intended to continue these experiments on a larger scale, until sufficiently numerous and well established facts attest the best mode of treatment. The Department grounds consist of a heavy, compact, partially undrained soil, lying low; they are therefore unfavorable for the highest development of pear tree culture. It has been only by persistent effort that the fruit trees on the Department grounds have been brought to their present highly improved state.

Barry says that "blight has never been known to originate on the dry, sandy loam of Long Island, not even with heavy manuring, the drought of midsummer always ripening the shoots so completely that the leaves drop off long before frost commences." The true source of blight seems to have its origin principally in the action of frost on unripe wood, which may arise from a combination of causes.

Marvels of the Insect World.

The *Spectator*, in its notice of M. Touchet's work, "The Universe," says: "Man generally flatters himself that his anatomy is about the highest effort of Divine skill; yet that of the insect is far more complicated. No portion of our organism can compare with the proboscis of the common fly. Man can boast 270 muscles. Lyonet, who spent his whole life in watching a single species of caterpillar, discovered in it 4,000. The common fly has 8,000 eyes, and certain butterflies 25,000. M Touchet treats it as an established fact that so fine are the sensory organs of ants that they converse by means of their antennæ. Consequently the strength and activity of insects far surpass ours in proportion. In the whole field of natural science there is nothing more astounding than the number of times a fly can flap its wings in a second; it must in that point of time vibrate its wings five or six hundred times. But in rapid flight we are required to believe that 3,600 is a moderate estimate."

NEW STEAM DREDGING BOATS.

Our illustration shows a novel type of dredger, constructed by Messrs Simons & Co., of Scotland, for the Government of Canada. Our engraving is from the *Engineer*. The dredger combines in herself the properties of a powerful dredger, a hopper barge, and a screw steamer. She is intended to be employed at the mouths of harbors and rivers in Canada, to keep them clear of silting and other obstructions, at a cost below what would be practicable under the old system of a fleet, including dredgers, barges, and tug steamers—the work of all which is managed under the new system in "one bottom."

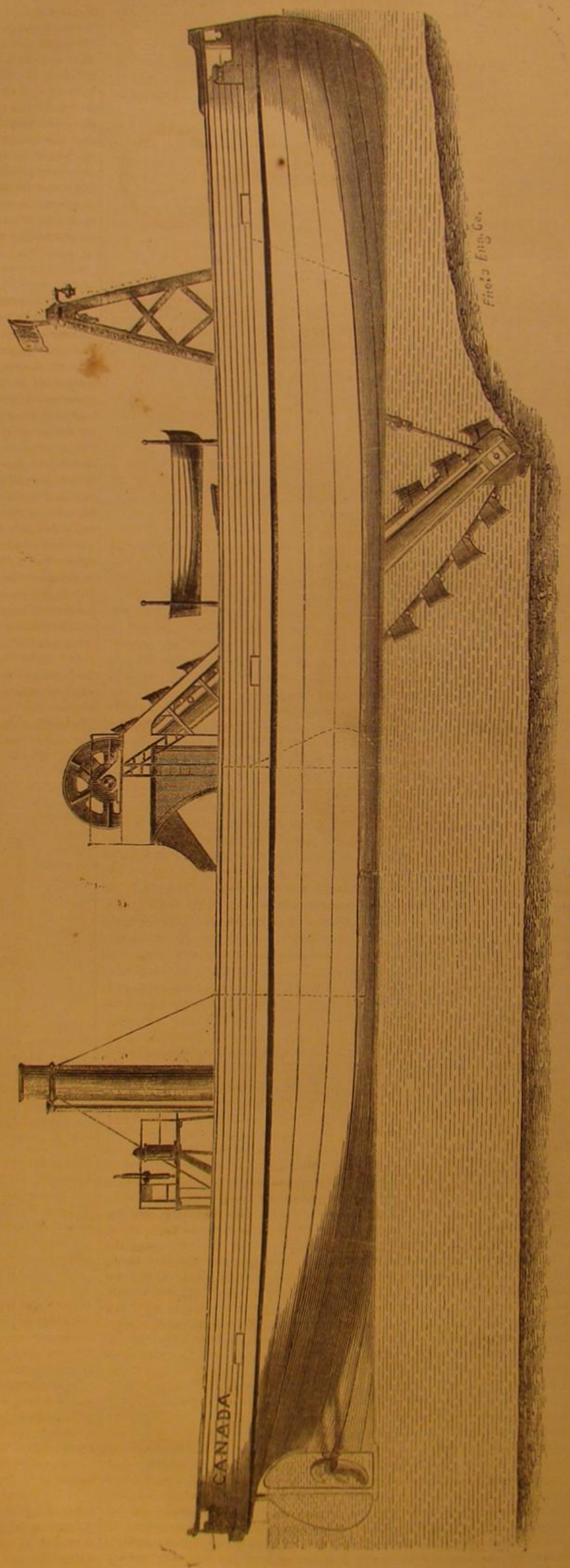
It will be seen that the novelty consists in the fact that barges are dispensed with, and we cannot better explain how than by stating what the dredger did a few weeks since on her first trial; the vessel was moored a little below Dalmuir, on the Clyde, at about 11 A. M., and the machinery started for operation in 18 feet water. In about two hours, the hopper cavity was filled with some 200 tuns of stuff—sand, gravel, mud, etc. dredged from the bottom of the channel. The dredging machinery was then disconnected, and the screw propeller put in motion; and the moorings having been loosened, the *Canada* proceeded down the river under easy steam, at the rate of about eight miles an hour, to the Kilcreggan shore, where the trapped bottom of her hopper cavity was opened, and the 200 tuns of dredged stuff above mentioned allowed to slide into the sea.

Her dimensions are: Length 131 feet, breadth 21 feet, depth 10½ feet; the hopper compartment is 20 feet in length, 16 feet wide, and 12 feet deep, containing when filled about 200 tuns spoil; the hopper doors are formed of hinged iron plates lined with elm, having strong hinges fixed to center keelson, the door chains being carried over side pulleys to the hopper crabs. The vessel is propelled and the dredging gearing driven by a pair of inverted cylinder direct acting condensing engines of 35 nominal horse power, having starting gear on deck and also in the engine room. Disconnecting clutches and levers are placed at the fore and aft ends of the crank shaft, arranged so that the dredging gearing or the propeller can be worked independently or together, as required. The engines make eighty revolutions per minute when propelling the vessel about eight miles per hour, and sixty revolutions when discharging about twenty buckets per minute. The inclined shaft that drives the upper tumbler is fitted with a friction wheel to slip and prevent accidents when an undue strain comes on the gearing. The boiler is of the multitubular kind, with two furnaces, working steam pressure 25 lbs. per square inch. A hand lever is placed on deck for controlling the dredging ladder and securing that the buckets shall cut to the proper depth when dredging. There are twenty-four buckets on the chain, each containing, when full, nearly four cubic feet; the cutting lips, pins, and eyes of the buckets are of steel. Triple geared steam crabs are fitted at bow and stern, each having three independent barrels, arranged to work and control the head and stern or the side lines, as required, and to work together or separately. When the vessel has filled her own hopper, the bucket ladder is raised by steam, the propeller is then at once put in gear and connected, the mooring chains unshackled and dropped with a buoy and line attached; the vessel then proceeds to the required place of deposit, drops her cargo, and returns; the buoys and lines are picked up, and the chains hove in by the crabs to bring the vessel up to the cutting face of the soil.

UNITED STATES GOVERNMENT DREDGER.

It may be of interest to state, in this connection, that a novel dredging boat, working on a very different principle from the foregoing, has lately been built at New York, for the United States Government, intended for operation at the mouth of the Mississippi river, in open water.

The length of this vessel is 151 feet 8 inches, depth of hold 20 feet, and about 23 feet beam. She has a screw at both ends—at the after end one with three blades, 12 feet diameter, and 14 feet pitch, for propelling exclusively; the forward end is provided with a screw also, but something a little different in its aspect. It has six blades instead of three, and looks like a big whirligig. The screw, like the one at the other end, is made of brass; its diameter is the same, and it alone weighs 23,900 pounds. The blades are made separate and the boat carries extra blades, so that, in the event that any one should break, it can be taken out and a new one substituted. The forward screw performs two offices, namely, that of impelling the vessel through the water by a drawing on process, and digging in the mud and sand. It is worked by two oscillating engines, 40 inch bore by four feet stroke, and will perform 65 to 90 revolutions per minute with thirty pounds of steam.



STEAM DREDGE FOR THE CANADIAN GOVERNMENT.

The three bladed propeller is driven by a single oscillating engine, the same size and power with the others. Besides the six-bladed screw for digging, there is also a large scoop or drag, in the shape of a half cylinder, made of three eighths inch boiler iron, with heavy wrought iron rims and pinions. It is 12 feet deep, 20 feet concave linear measure, and will drag away fifteen tuns of mud or sand at a load. The scoop is suspended from two strong davits overhanging the digging end of the boat, and is managed by means of a pair of powerful hoisting engines forward. The boat is first driven, light, as far up on the bar or bank as possible. Then the scoop or drag, which hangs suspended from the davits, is let go on the run. Its great weight carries it far into the mud. Then the big six-bladed screw is set in motion, and at the same time the propeller at the other end commences whirling, to pull the boat off. The six-bladed propeller loosens up the mud, and adds greatly to the impelling power, which, when both are working, is tremendous, dragging the great scoop, with its freight of fifteen tuns of mud, out to sea. As the mud is worked away, the sinking tanks are gradually filled, the boat settles deeper in the water, and the digging apparatus works in deeper mud. The boat is built in the most stanch manner, and is perfectly seaworthy. She is brig-rigged. Her bottom is of solid oak, 18 inches thick, and will stand any strain to which it is liable to be subjected. When at sea she will work both propellers, one pulling and one pushing, and it is supposed that her speed will be 18 miles per hour.

Beet Sugar.

The problem of furnishing sugar to supply the large and constantly increasing demand for it throughout the civilized world is daily augmenting in importance. Sugar, in some of its forms, is widely distributed throughout the vegetable world, and though it is seldom found in chemical combination with other substances, yet it is generally so mixed with a number of other proximate principles that its separation in a crystallizable form is very difficult.

When it is ascertained that the juice of the sugar beet contains from 10 to 13 per cent of crystallizable sugar, and that the beet can be produced in unlimited quantities, most persons will suppose that the sugar problem is solved. But beet juice, in addition to sugar, holds in solution pectose, gum, albumen, asparagin, betain, oxalic acid, citric acid, phosphoric acid, sulphuric acid, chlorine, and silica. Besides these there are variable proportions of potassa, soda, lime, iron, magnesia, rubidium, and manganese, from all, or the greater portion of which, the sugar must be separated before it is fit for domestic purposes. Most of these substances, as compared with the sugar, are present in very minute proportions, yet these and their chemical derivations defeat all attempts to procure the sugar by evaporation merely. The efforts to manufacture sugar from beets or sorghum in this country have failed just at this point; and even in Europe, where the beet sugar enterprise has been most successful, this question of defecation is far from being satisfactorily settled.

In the most successful establishments in Europe, 75 per cent of the sugar actually contained in the beet is rarely obtained in a crystallizable form.

In the very interesting experiments of Professor Goessmann, of the Massachusetts Agricultural College, we have an attempt to obviate most of these difficulties on purely scientific principles; and, we are happy to say, with results which bid fair to lead to ultimate and complete success. Fifty pounds of the freshly expressed juice of the electoral

beet was brought rapidly up to a temperature near the boiling point (80° C.,) when the source of heat was withdrawn and one half of 1 per cent (4 ounces) of caustic lime, reduced to the condition of milk of lime, was stirred into the juice. The heat was then raised fully to the boiling point, when it was again removed, and after standing fifteen minutes, the clear juice was drawn off by means of a siphon. Several advantages are gained by heating the juice before adding the lime; the chief of which are the more perfect coagulation of the albumen and the consequent separation of the organic substances which it carries with it: the more perfect neutralization of the citric, oxalic, and phosphoric acids, and the precipitation of the insoluble salts thus formed. The asparagin present in the juice is rapidly converted, by the action of caustic lime, into asparaganic acid and ammonia. The acid combines with the lime and is thus disposed of, and the ammonia escapes in the gaseous form, being insoluble in hot water. These are important advantages gained by hot defecation.

After this the clear juice was concentrated by evaporation to 30° Brinx, and when cooled to 125° F. (50° C.) it was treated with carbonic acid, which had the effect to liberate the lime from its combination with sugar, and precipitate it as calcic carbonate. The clear juice, heated to near the boiling point, was passed through a filter of bone black, and by careful evaporation was crystallized. By the use of carbonic acid the greater portion of the sugar which has entered into combination with lime, potassa, and soda may be recovered.

By this process from 8 to 9·4 per cent of crystallized sugar was obtained from juice holding in solution not exceeding 13 per cent. These results are certainly very encouraging.

These successful experiments are the first fruits of our system of agricultural colleges, and indicate very clearly an important feature in their mission.

IMPROVED BUNG.

Our engraving illustrates an improved bung which is so constructed as to be easily extracted from the cask by the operation of the lever and key, represented in connection therewith in Fig. 1. In this figure, the bung is shown in section in its place in the cask, and in Fig. 2 a perspective view is given.

The essential parts of the invention are a bung proper, made of wood or other suitable fibrous material, shown at A, and a cast metal plate, B, which has a shank which passes through A, and through the washer, C, beneath which it is fastened with a pin. The shank of the plate, B, is hollow for some depth, and is provided with internally projecting shoulders, in such a manner that the key, D, may be inserted between them and made to engage with them on turning it a quarter round. This locking of the key with the shoulders

Fig. 1

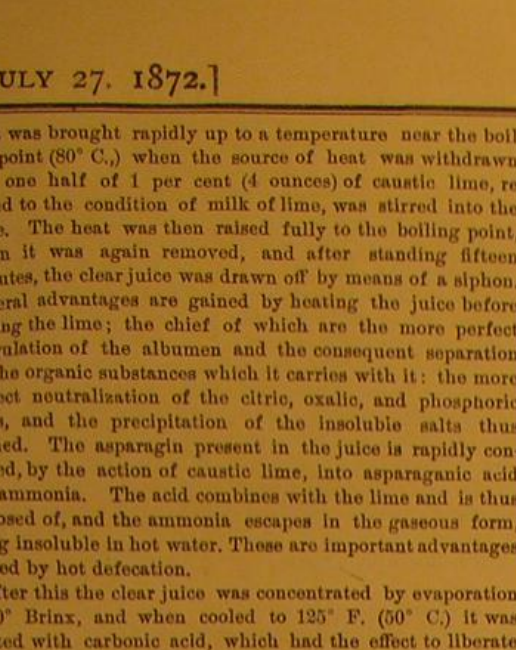


Fig. 2

of the plate, which will be readily understood from the cuts, enables a direct perpendicular pull to be made on the bung, by which it may be withdrawn from the cask. To facilitate the operation, the lever, E, is brought into play and hooked into the key, D, as shown. This lever is made of steel and is about 18 inches in length; the wheels, the axletree of which forms its fulcrum, are placed far enough apart to clear the bung while the fulcrum and key are brought very close together. Part of one wheel in the cut is broken away to show the bung. In this way, very powerful leverage is exerted and the bung easily extracted, without subjecting the cask to the liability of injury, which it always has to sustain when the bung is being hammered loose by the old method of extraction.

The invention, as described, was recently patented through the Scientific American Patent Agency, since which a further improvement has been made in the bung, which consists in the addition of a self acting valve which operates as a vent whenever liquid is drawn from the cask. The construction of this valve will be understood on reference to Fig. 1. A shallow groove is formed round the outside of the hollow shank, and a small hole is made connecting the interior with he groove. An india rubber ring is stretched round the groove and covers the hole air tight. Upon drawing off the liquid contents of the cask, the air raises, by its pressure, the rubber ring, and finds its way into the cask between the shank and the washer, which fit loosely.

Mr. Alfred Marsh, of 339 Fifth street, Detroit, Mich., is the inventor of the foregoing improvements, and further information can be obtained from him.

A BRIDLE BIT THAT IS SOMETHING MORE, AND AN IMPROVED STOCKING FOR HORSES.

Mr. Albert Van Auken, of Ludlowville, N. Y., has invented a bridle bit, which may be made the means of aiding in the cure of various diseases to which the throats and mouths of horses are liable.

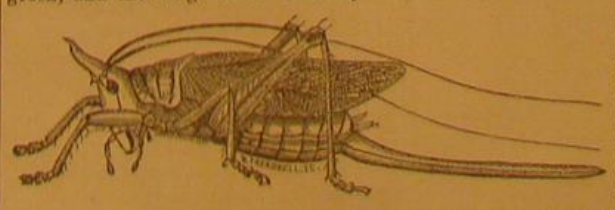
He makes the bit hollow, with minute perforations along the side. Into the hollow bit he pours, while melted, a medicament prepared with some bland substance, like lard, oil of theobroma, or other substance which melts at a low temperature, simply as a vehicle or which may be itself of service as an emollient. The warmth of the horse's mouth, when the bit is applied, melts the medicament, which then exudes and mingles with the saliva which flows to and over the diseased parts, which are thus reached for treatment, even when the animal is at work. How efficient this will prove in practice, we leave for veterinary surgeons to decide. In any event, the effort to ameliorate the condition of the horse is a humane and commendable one, and will receive the approval of the horse's friend *par excellence*, Mr. Bergh.

Mr. William Lewis, of Astoria, N. Y., has also been considering how he might contribute to the comfort, and, in one sense, to the support of horses, and to this end he has devised the improved stocking which figures in the accompanying engraving; it consists in a snug fitting elastic anklet of india rubber, molded to fit the horse's leg, and ribbed and reinforced to prevent sagging and slipping down at the top. It is also perforated to allow free exit for perspiration, and is laced in front as shown. The object of the invention is to provide a support, not always of the length shown, but longer or shorter as may be necessary for sustaining and protecting the tendons, ankles, knee joints, etc., of trotting and racing horses and horses in general, so as to prevent injuries from over bending or straining in stepping upon stones or rut holes, etc.

A New Grasshopper.

Mr. Townsend Glover, Entomologist of the Department of Agriculture at Washington, says that two full grown specimens, a male and a female, of a very singular and apparently new orthopterous insect, resembling *Conocephalus ensiger*, or conical sword bearer of Harris, were taken alive in the greenhouse of the Department of Agriculture, last season, by Mr. J. H. Brummel. A short time previous, two half grown larvæ were found, but died soon after being captured; and the remains of a fifth full grown imago were found, when cleaning out the flower pots in the winter.

These insects injured the leaves of the coffee plants, rose apples, and bananas, in the greenhouse, much in the same manner as is done by our native katydids, by eating holes in the leaves and gnawing away the edges. Their jaws were remarkably strong and sharp, and when the insects were incautiously handled they bit so severely as to draw blood. The male was about 1·75 inch in length, from the tip of the cone or horn on its forehead to the end of its wing covers when closed. The female measured 3·05 inches to the end of the ovipositor, which itself was at least 1·25 inch in length. The general color of both male and female was a light pea green, and the wings were delicately veined with distinct

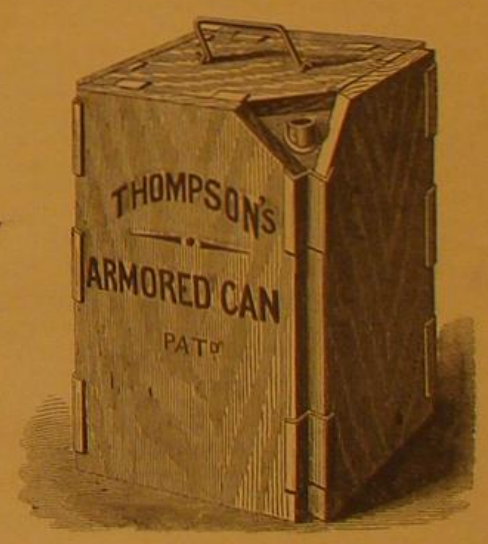


nerves, resembling the venation of leaves. A very marked feature in this insect, when alive, is that the labrum and clypeus are bright yellow, contrasting strongly with the jet black of the mandibles, which, together with the cone or horn on the top of its head, gives it a remarkable appearance. This cone or horn, which is placed obliquely upward on the top of the forehead, forming a line with the face, is yellow beneath, black at the tip, and ends in an acute point, which is somewhat bent downward at its summit. No insect resembling it having hitherto been found in this neighborhood, there is but little doubt but that it has lately been imported with or on some foreign plants sent from South America or the West Indies; and as many exotic plants have been received from Balize, British Honduras, it is probable that this grasshopper came in the egg state on some of the plants from that locality, and was hatched out last summer in the greenhouse. This fact alone admonishes us how careful we should be when importing new and valuable plants from abroad, for if a large insect, nearly two inches in length and fully the size of a katydid, can be so easily introduced, how much more readily the small and inconspicuous noxious insects hidden under the bark would be likely to escape notice until they had perpetuated their species, so as to become partially naturalized and injurious to our plants. There is no danger, however, that this grasshopper will spread, and, as it is apparently very tender and accustomed to a tropical climate, most probably it would not be able to withstand the rigors of our winters in the open air, and as all were killed or caught as soon as seen in the greenhouse, there is very little probability of any being left to perpetuate their race.

ARMORED CAN.

The sheet metal cans used to contain oils, varnishes and other liquids for transportation, have usually to be enclosed in a wooden box in order to afford them the requisite protection from accidental injury. It is the object of the invention we illustrate to economize in the cost of this wooden protection or armor, and at the same time to provide a covering of the needful strength. This is done by soldering small metal clamp plates to the angles of the metal can, and by fastening the armor, which consists of boards of the proper size, to the can by bending over it the projecting ends of the clamp plates. The entire arrangement will readily be understood from our cut, which represents the metal can enclosed in the improved armor. The boards for the top and bottom are first put on and clamped, and the four side boards are attached afterwards. In constructing the can, one top corner is sloped off and the nozzle inserted therein so that it does not rise above the top of the can, as shown in the cut. In this position, it is protected by the armoring of the top and adjacent sides and is conveniently placed for pouring out the liquid. It may be stopped in any manner required.

It is the design of the inventor to armor a five gallon can with wood of one fourth inch thickness at the sides, and one half inch at the top and bottom. The material, he says, can be furnished in shooks, cut to any size and ready for use, by eastern and western lumber merchants very cheaply. He claims that the expense of boxmaking is saved by this method and that less lumber is required, while the cost of the clamp plates is more than compensated by the saving in labor. The armor being lighter than the box affords greater



facility for handling the can, while its strength is amply sufficient for all practical purposes.

A patent was obtained for the inventor of the device, Mr. William F. Thompson, through the Scientific American Patent Agency, May 7, 1872.

Address for further information, Wm. F. Thompson or Edwin Jacoby, Toledo, O.

English Fast Train.

The Great Northern Railway Company is now running a fast train between London and Edinburgh, 395 miles, in 9¼ hours, which is at the rate of about 42 miles an hour. If we had good first class railways in this country, between our important cities, capable of the above speed, passengers might ride from New York to New Haven 74 miles, in 1¾ hours instead of three hours as at present required; to Boston 234 miles in 5¼ hours instead of 9 hours; to Washington 228 miles in 5½ hours instead of 9 hours; to Chicago 835 miles in 20 hours instead of 34 hours; to St. Louis 1000 miles in 24 hours, instead of 48 hours.

TEA GROWING IN INDIA.—The experiment of growing tea in India is proving quite successful. In 1862 the crop was estimated at 1,000,000 pounds; in 1871, at something over 20,000,000. It is claimed that India can now compete with China in producing teas of the best quality.

Correspondence.

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

Artists with Bad Eyes.

To the Editor of the Scientific American:

The article under the above caption, reprinted from the *Chemist and Druggist* on page 392, Volume XXVI. of the SCIENTIFIC AMERICAN, treating on the effect of faulty vision in painting, conveys the impression that the artist with astigmatized eyes attaches the stigma to his picture when painting from Nature. This impression, I think, is erroneous.

Turner and all who seek to faithfully copy Nature try to make their pictures produce upon their own eyes the effect of Nature, and since like effects proceed from like causes, the effect of Nature can only be produced by the reproduction on the canvas or picture of the forms, proportions, and qualities of Nature. And this is true whether the artist's eye be correct or incorrect, since the same eye observes both Nature and the copy; and differences can be detected and remedied as readily by the incorrect, as by the correct, eye, and neither eye can be satisfied until such differences are eliminated. I am, therefore, compelled to deny that "astigmatism" tends to error in copying directly from nature; or to vitiate the criticism which is based upon observation of Nature made at the time of such criticism.

The writer of the article under consideration says: "Turner painted from Nature exactly as Nature appeared to him, but not as it appeared to him when his sight was truthful."

It is readily seen, if the above reasoning be sound, that the last clause of this statement cannot be true; and the first clause can only be correct on the supposition that Turner's eye was truthful. For if we suppose his eye to have been incorrect, he would still produce the forms and proportions of Nature in order that his eye might be satisfied. Thus he would see wrongly, but draw correctly.

Similarly, I am compelled to dissent from the opinion, expressed or inferred in the same article, that yellowness in the lens of the eye of Mulready led to untruthfulness of color in his paintings made directly from Nature; because the color in his eye was spread over Nature and picture alike, as he observed them. And I believe that if he, with colored lens, truly sought to make his picture appear to himself like the Nature he painted (not as he saw, but correctly) the stigma was not painted, but was, to him apparently but not really, added to the work by his diseased or incorrect eye. But a source of error in a representation of Nature might be found in the case of an artist who has observed Nature with correct eyes, and afterwards has become astigmatized, and in the latter state has painted or sought to record on canvas the knowledge gained by his previous observations. In this case, the error in the picture will be the opposite of the stigmatization. This accords with the case of Mulready as stated in the article considered.

C. STEBBINS.

How to Destroy Mosquitoes.

To the Editor of the Scientific American:

The process for destroying mosquitoes may be condensed into a few words. The strongest crystallized carbolic acid should be placed in a bottle, and covered with the same quantity of strong red-codliver oil; shake the bottle thoroughly until a whitish colored foam appears; if such foam does not arise, however, a small quantity of powdered lime should be added, with a little water. Pour the mixture into a dish or other convenient article, and place directly under the open window, as it is from this quarter the mosquito enters.

In my humble opinion, the effect should be explained in this manner: The moment the mosquito enters, it loses the scent of blood; for, as the combined odor of the oil and acid is much more powerful than that of blood, it follows, as a consequence, that the mosquito becomes suddenly perplexed. The consequence is, that after scrambling and skirmishing about in the dark, the mosquito is led, as it were, instinctively into the mixture, where it is either drowned in the oil or burned to death by the acid.

Formerly I was accustomed to smear my face, arms, and breast with the strong oil alone, but I frequently arose in the morning smelling so terribly that, though it protected me from mosquito bites, I was happy to lay it aside. I have slaughtered more mosquitoes with the article explained above than ever I could have done with my fists or any other dangerous weapons. E. S. G.

Philadelphia, Pa.

A Machinist's Query.

To the Editor of the Scientific American:

On page 20 of your current volume, is an article from a young machinist which looks very young indeed. He says he has learned a trade; "jes' so." I'll guarantee he was one of those chaps who spend a good share of their time dogging horses, and if he is getting $3 50, per day it is only because he is in a new country where workmen are scarce.

If he is such an encyclopedia of knowledge, he had better try to fill some poor wretch's position, as good men are always in demand. He will probably find some thorns in that bed of roses.

It is not necessary for me to enter into all the comparisons between the two occupations: but I will state some of the qualifications necessary before becoming a member of the brotherhood of locomotive engineers. He must be sober, moral, truthful, and inclined to deal justly with all men, ever ready and reliable, of good judgment (one of the most necessary qualifications) as he will have from two to three hundred thousand dollars worth of property day after day, besides hundreds of precious lives, entrusted to his care. Does a machinist ever have one tenth the responsibility? Is he in danger of his life by land slides, rocks, trees in storms on tracks, or wrong switches? Not that I know of. The majority of engineers are men who commenced young and fired for from 2 to seven years, from 12 to 20 hours a day, sleeping on boxes, tops of cabs, wood piles, soft sides of hemlock planks, etc., generally too tired to wash up and go to bed to sleep only three or four hours; while a machinist generally gets plenty of sleep. I intend nothing derogatory to the profession. These are a few of the nice attractions incident to the route to the position of a locomotive engineer. Lastly, the young machinist ought to know that we are getting but $4.00 per day.

Hornellsville, N. Y. S. E. STURDEVANT, ENGINEER.

The Young Machinist Again.

To the Editor of the Scientific American:

I find, on page 20 of the present volume, "A Machinist's Query," wherein the young machinist says he is sorry he has learned a trade; that it is hard to know that, after serving four years apprenticeship, he only gets $3.50 per day for building and repairing an engine; whereas the engineer, who is entirely ignorant of the working of the engine, gets $4.50 per day for running it.

Now I am personally acquainted with machinists who are first class workmen and command the highest wages, and who build and repair engines, but are not capable of taking charge as engineer, because they do not understand the principles upon which the engine works, and they are theoretically as ignorant as they can be. A man may be a practical machinist, good at a lathe, planer, or vise; but if he does not acquire the theory as well as the practice, but goes by a better man's drawings, he is nothing but a first class laborer.

Practice without theory and theory without practice are dead.

So I say, give me an engineer who can make his own calculations, in regard to the engine and boiler and the use of steam, rather than a man who is a practical machinist, who has served four years at the laboring part of the business, and knows nothing of the first principles of what he makes or repairs. AN ENGINEER.

Philadelphia, Pa.

Laws of Electricity.

To the Editor of the Scientific American:

In your issue of June 22d last, a short article concerning electricity, its connection with the earth, and its probable obedience to the laws of gravitation, reminded me of some cogitations on the same subject which may, or may not, be sufficiently interesting to be worthy of notice. A year or two ago, your paper gave an interesting account of the generation of electricity by certain portions of swiftly revolving machinery in factories; it was an easy and natural transition of the mind to infer that the electricity with which the earth is charged is produced by virtue of its own swift revolutions; or, if not exactly produced, at least intensified. Each world, or star, would thus draw to itself its own share according to the speed of its revolution, from an unlimited ocean of attenuated electricity in which, they and we, all float. Electricity seems to be, humanly speaking, the source of vegetable and animal life, and indeed lies hid in all forms of organic or inorganic substances, only awaiting study to bring it to light.

Buffalo, N. Y. J. DEWALDEN CHURCHILL.

Extinguishing Fires.

To the Editor of the Scientific American:

Allow me to make a suggestion to parties who purpose building large warerooms or business blocks. In some part of the cellar, build a tank that will hold enough acid and marble dust to generate, when mixed, gas enough to fill the building. Let the stop-off arrangements extend to the outer part of the building; and when a fire occurs and gets beyond the control of the portable extinguisher, turn on the large one. In warerooms, the gas could ascend through hatchways; in other buildings, flues in the walls connecting with different floors would be necessary.

G. W. D.

Iron Shipbuilding in Pittsburgh.

To the Editor of the Scientific American:

In September, 1839, I was in Pittsburgh, and there saw the hull of the first iron steamer ever built, I believe, west of the Alleghanies. She was called the *Duquesne*, and was intended for a freight boat. The hull was on the ways and the mechanics at work on it. What became of her—whether successful or not—I do not know. I saw a notice in the Philadelphia papers of her departure from Pittsburgh on her first trip. As iron will probably replace wood on the Western rivers, I think this reminiscence might be interesting.

M.

Do Snakes Charm Birds?

To the Editor of the Scientific American:

H. L. Edis makes this enquiry in the June 22 issue of the SCIENTIFIC AMERICAN, and also relates a very interesting incident which he witnessed. Mr. Edis does not commit himself in any way to the belief that the snake has any power to charm, and the article would imply that he is not one of that superstitious class who believe that the serpent is more subtle than any beast of the field that the Lord God hath made. Many other beasts show far more cunning than the serpent; the fox, for example, the bear, or even the cat in her subtle manner of capturing her game, especially birds. Even the subtle spider, with her mechanical network trap for the capture of the fly, shows more subtlety than ever the serpent did. Some snakes are hostile enemies to birds when hatching or rearing their young. The hen, when sitting or rearing a brood of chickens, will fight an elephant or crocodile; so the small bird, with the same instinctive parental defensive nature, will fight anything so also the mother; possessed with the same rash parental instincts, will rush to the lion's jaws to save her infant child. I once heard a gentleman relate an experimental test he made in that direction.

The men in his field had killed a very large specimen of the black snake and dragged it to the house for exhibition. The gentleman had the curiosity to stretch it on the ground, with uplifted head and mouth wide open, directly under the eaves of his barn where the swallows are hatching and nestling their young; then he stood off and watched the result. Presently the monster was spied and the air filled with swallows, diving in the most frantic manner at the supposed enemy, until, in a few moments, as every plunge brought them nearer and nearer to the object of their fury, one struck the snake's head, knocked it over, and then, as he said, it would seem that every swallow would pour its fury upon the dead reptile, knocking it in every conceivable manner. Soon the excitement was over, the supposed adversary conquered, and one by one the swallows retired to their nests. No doubt the snake may make use of this means in order to capture the bird or other game. J. E. E.

The Right Kind of Windmill.

To the Editor of the Scientific American:

I notice the remarks of your correspondent C. B., of Memphis, on page 261, volume XXVI., headed "The Right Kind of Windmill." Many of his ideas are undoubtedly correct; indeed, such is the importance of this power that any suggestions calculated to throw light on the subject are welcome. The style he speaks of would certainly do a great deal of work while it lasts; but is it not a question whether so very cheap an arrangement as he speaks of is the cheapest after all? The writer has known several large mills burned down by the friction of violent running, and the noise attending a very rapid motion would sometimes be very objectionable.

For example: Upon the building in which I write is a self regulating windmill, used to elevate the Croton water to the four or five stories whither its own pressure is not sufficient to carry it. Its maximum velocity is some fifty or sixty revolutions per minute; but if it should be allowed to run 200 or even 150, the clatter (of the pump rod) would be intolerable, the pump valves would not have time to close properly, and the wear and tear upon the pump or other machinery would soon be destructive. (In this connection, see page 340, volume XXIV. of the SCIENTIFIC AMERICAN).

It would seem impossible almost for any windmill to accomplish what "Novice" there describes, and I dare say only the Continental or some of the high priced self regulating windmills would accomplish it. A windmill, to meet the wants of the times, must be strong and ornamental, well made and self regulating, so as to set and furl its own sails in all weathers.

If your correspondent "C. B." will send me his full address, I will forward him the fullest mathematical calculations.

61 Park Place, New York city. A. P. BROWN.

[For the Scientific American.]

SAVING OF TIME.--A SERIOUS CHARGE AGAINST THE SCIENTIFIC AMERICAN.

The life of a man is at the very best too short. When it is all utilized, the ten thousand daily duties and obligations consume so large a share of it as to leave very little time for its main purposes. I assume that they are these: Mental culture; the development of our powers; the advance of civilization; the increase of the sum of human happiness; the solution of Nature's mysteries; and the exalting the spirit for its new sphere of exercise in the other life.

Of the three score years, to which men of good health live, twenty years are consumed in reaching manhood and getting ready for duty. Of the forty years remaining, about thirteen years are spent in sleep, and this is a total loss, necessary for recuperating from our physical and mental exhaustion. To this we must add two years for the time consumed in taking our food, and twelve years in earning food and clothing, and three years in ill health and its exactions. Of all things mentionable, Time is the most precious!

The writer has himself reached almost to the three score, and is a very miser of time; and he would gladly rival that proverbial thief, Procrastination, in stealing it from every source. I have robbed sleep of two years, and I think used most of it well, thank God, who (be it reverently spoken) will not be hard on my class of thieves.

I have flanked and evaded disease, and saved nearly my whole three years by avoiding tobacco, liquor, and dissipation in all their forms; and I am grateful in saying that this has enabled me to exalt my moral nature by devoting at least one of those years to the relief of others less fortunate or less prudent than myself.

In many ways I cannot name (and would not if I could), I have economized, utilized, saved and stolen moments and minutes to the amount of four years more; and I shall, I think, count twenty years, instead of ten, spent in a rational manner. But they are gone into the past, and I have done so little and have so much to do, that I am not at all ready to leave my work on this side the river.

My mania for saving time is paramount, and this brings me to the main object of this communication.

You, Mr. SCIENTIFIC AMERICAN, have consumed and are still consuming a portion of my time, enough for a miser to notice; and your brethren, or class, are still consuming it in a wanton, utterly useless and inexcusable manner; and just

as remorselessly do you impoverish every one of your 50,000 subscribers.

It is not in spreading us an occasional article unworthy a perusal. This is not reckless, if at all chargeable; you do your best to send us the best and most instructive of reading matter, or I for one would not touch you. Life is too short. But *you do not cut your paper;* you compel us, the 50,000, each to cut his own! You have this day robbed me of five minutes precious time in cutting your paper, and the 50,000 each of five minutes! This would make about 520 days of the popular eight hour kind. Suppose it reached a year or half year of our most inestimable time; by machinery you could cut the whole edition for 25 dollars. Can you excuse yourself? Can all the slovenly publishers of books, periodicals, and newspapers furnish any sort of apology for this wasting of priceless time, amounting to some hundreds of times your own culpability? Why, *Harper's Monthly* has just cost me thirteen minutes, worth to me twice the price of the magazine!

What! 100 years or 500 years of human labor wasted weekly on cutting the leaves of your papers, when a few dollars worth of work by machinery would do it greatly better, and keep your papers and books neat, genteel, and durable! Shame on your whole fraternity!

* * * * * *

I am not done. If you will give me room, after such a scolding, I wish you to help me to show in much shorter articles, how we can easily save time enough to build and maintain all our asylums and schools, and a large share of our railroads and telegraphs. A MISER OF TIME.

New Orleans, La.

SCIENTIFIC AND PRACTICAL INFORMATION.

SULPHURETTED HYDROGEN IN BLOWPIPE ANALYSIS.

If a metallic oxide or salt be mixed with hyposulphite of soda ($Na_2 S_2 O_3$), and the mixture dissolved in a borax bead in the inner blowpipe flame, the hyposulphite is decomposed and the sulphur combines with the metals to form the well-known sulphides, most of which are distinguished by their characteristic colors. To prevent volatilization of arsenic and mercury, however, the precaution should be taken to heat the mixture of the substance and hyposulphite in a glass tube.

SAFETY FULMINATE.

A constant correspondent, Mr. E. H. Hoskin, Lowell, Mass., writes as follows:

"In the course of my investigations, I have formed a new fulminate for charging shells for exploding nitro-glycerin, dynamite, and dualin; this preparation is equally effective for the purpose as that now in use, and has this important advantage: The shells will not explode with ordinary friction, nor even if struck with a hammer or by means of a bar of iron of 10 pounds weight, allowed to fall and so thoroughly to flatten them out. This being so, they become quite safe for a careless man to handle, and quite safe to transport as freight; they are entirely free from danger to life and limb till they come in contact with fire, when they will explode with terrific force."

FRENCH PUTTY.

Ruban, of Paris, has invented a putty made by boiling 4 lbs. of brown umber for two hours in 7 lbs. linseed oil, stirring in 62 grammes of finely chopped wax. It is then removed from the fire and 5½ lbs. chalk paste and 11 lbs. white lead are incorporated in the mass.

CURCULIO.

A correspondent, Mr. J. H. Parsons, of Franklin, N. Y., denies the value of the method of preserving plum trees from the attacks of curculio, described on page 321 of our volume XXVI. He asserts that the bug will attack ripe fruit in preference to anything else; and that, as the curculio can fly, tarring the trunks of the trees is useless.

PARIS GREEN AND POTATO BUGS.

Mr. E. Wolff writes to point out that Paris green is a compound of two substances, arsenic and copper, both of which are poisonous in all their combinations. He disregards the often repeated argument that poisonous matter, strewn upon the plants or the soil, cannot enter into the roots or the fruit of the plant, and asserts that it is impossible to divest the potatoes from the substance which is spread over the whole soil. Mr. Wolff also states that repeated applications will render the soil so obnoxious that all vegetation will be injured. In commenting on this letter, we must say that it has not yet been observed, by any one of the thousands of farmers who have used Paris green as a bug destroyer, that any evil consequences to vegetation have followed the most liberal application of the mineral; and its poisonous effect on all the inhabitants of the soil is likely to be of the greatest service to the crops.

Mr. Wolff, however, sends us a suggestion which has the merit of novelty. He says: "Lay a piece of sheet iron, with the edges bent upwards, under the vines on each side of the row; and then, by beating the vines with a flat broom, shifting the iron pans along and emptying them occasionally into a pail of water, sufficient bugs and eggs may be destroyed." Mr. Wolff further asserts that the use of Paris green for painting purposes is to be deprecated. The color is inharmonious to the hue of foliage, the wood so painted will ultimately be burned, possibly in a baker's oven, and so the arsenical compound will get into the bread. We trust these warnings will be sufficient to deter our readers from the use of Paris green, for killing bugs or for painting, and that we may all be protected from eating bread baked in an oven heated with a fire lighted with a wood colored with a paint mixed with any arseniate of copper.

TO PRESERVE PENCIL AND INDIAN INK SKETCHES.

To a solution of collodion of the consistency used by photographers, add 2 per cent of stearin from a good stearin candle. The drawing to be protected is then spread on a board or plate of glass and the collodion poured over it as in photography. It dries in 10 to 20 minutes perfectly white, and so thoroughly protects the drawing that it may be washed without fear of injury.

HAIR DYES, HURTFUL AND HARMLESS.

Whatever we may think of the taste which leads people to desire their wrinkles and furrows to be surmounted by raven locks or auburn curls, the practice of using hair dyes seems steadily on the increase. Dr. Chandler's fearless exposure of the poisonous character of all the hair dyes in the market, and a knowledge that their long continued use will inevitably cause death, will not deter all the old fops and fools from using them. Perhaps we may rejoice it is so, for, like tight lacing, the use of poisons never removes from earth any sensible, well informed person whose life is really worth saving. Our duty seems to end when we have impressed upon their minds the dangers they incur, and we might leave them to choose for themselves between health and disease, between life and death. But we see too plainly every day that people are willing to take any risk for fashion's sake. We knew a lady recently who died from the effects of using Hall's *Vegetable* (?) Sicilian hair dye, and yet we have not known one of her friends to abandon the use of dyes equally dangerous. Since, then, people insist on obliterating the marks time bestows on their tresses, it is the best we can do to seek some substitute, less injurious than the salts of lead and silver now so generally used, in order that these people may choose the less of two evils. While we do not wish to assert that any dye is uninjurious, yet we should prefer a mild vegetable poison to an insidious, cumulative mineral like salt of lead. Among organic dyes which can be prepared by any one is that obtained from the green walnut burr, the epicarp of the fruit of the *juglans regia*. For this purpose the burrs are soaked in water and pressed. The liquid thus obtained is then evaporated and the dye precipitated as a black powder, which can be used in any convenient form of hair dressing. Dr. Kurtz says that large quantities are used in Greece, and are also exported thence for this purpose. The Greeks also make a dye by adding alum to the expressed juice, and use this to give a dark and marketable color to the cattle exported to Marseilles and other places where light colored stock is at a discount.

PRODUCTION OF GLYCERIN BY SYNTHESIS.

Another most interesting discovery in the compounding of organic matters has recently been made by Friedel and Silva. Propylen or tritylen is a gas eliminated from a compound of various gases evolved by decomposing the vapors of fusel oil in a red hot tube; and it can be more easily obtained by the action of biniodide of phosphorus (PI_2) upon glycerin. The new discovery is the production of glycerin from the chloride of propylen prepared by methods in which no glycerin is employed.

EMBALMING FLUID.

Busaline uses carbolic acid and camphor, dissolved in a sufficient quantity of petroleum, colored flesh color by vermilion.

PRESERVING MICROSCOPIC PREPARATIONS.

A nearly concentrated solution of acetate of potash is found to be the best means of preserving microscopic preparations.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections for the month of May, 1872:

During the month, 1,150 visits of inspection were made and 2,188 boilers examined—2,071 externally and 516 internally—while 216 were tested by hydraulic pressure. The defects in all discovered were 828, of which 201 were regarded as dangerous. The defects in detail are as follows:

Furnaces out of shape, 49—7 dangerous; fractures, 85—39 dangerous; burned plates, 37—16 dangerous; blistered plates, 109—11 dangerous; cases of sediment and deposit, 142—21 dangerous; cases of incrustation and scale, 142—17 dangerous; cases of external corrosion, 72—11 dangerous; internal corrosion, 27—7 dangerous; internal grooving, 21—4 dangerous; water gages defective, 48—6 dangerous; blow out defective, 31—10 dangerous; safety valves overloaded and out of order, 19—14 dangerous; pressure gages defective, 123—20 dangerous; boilers without gages, 149; cases of deficiency of water, 10—3 dangerous; cases of broken braces and stays, 24—10 dangerous; boilers condemned, 14.

When a safety valve spindle becomes oxidized and moves with difficulty through the guides, it should be scraped or rubbed clean, and all oxide removed. But to pour oil on to a safety valve for the purpose of lubricating the spindle, seat, or guides, is pernicious. The more volatile portions of the oil evaporate almost immediately, and that which remains is a thick, gummy mass, accumulating dust, and ultimately becoming little better than glue. Where parts of machinery are moving one on the other or in bearings, oil is essential as a lubricator; but, for safety valves, it is not the thing. We call attention to this, because we have recently seen instances where this practice had rendered the valve nearly inoperative, and was a source of danger.

THE nineteenth annual exhibition of the Iowa State Agricultural Society will take place at Cedar Rapids on September 9, 1872.

Deterioration of Cotton and Sugar Cane.

BY THE COMMISSIONER OF AGRICULTURE.

The conclusion is inevitable that both cotton and sugar have diminished in the quantity of production, but that neither has depreciated to any extent in quality, and the cause of failure is most unerringly traceable to the planter himself.

The seed is promiscuously taken from the gin, carelessly thrown upon a heap, where it remains until planting time, and, without regard to any selection of good or indifferent, is again committed to the earth to make its bad or indifferent product.

Indifferent seed produces an infirm and sickly plant, and a consequent dimunition of cotton. Practice sanctions the use of from two to eight bushels of seed to plant an acre of ground, and the planter consoles himself with the idea that it is not lost; but this is only partially true, for this wasteful mode of converting seed into manure is not justified by the benefits derived. It would be far more profitable to subject the seed, as it accumulates at the gin, to an application of plaster of Paris and muck from a swamp, or pine shucks or leaves and earth from the woods, and thus convert the refuse cotton seeds into a compost which will tell with ten fold the effect upon the crop of cotton to which it is applied. One bushel of well and carefully selected seed will be quite sufficient to plant an acre of ground in hills, twenty inches apart and in rows four feet apart. But, after all, the planter must be convinced that a rotation of crop is absolutely indispensable to any operation for a series of years. If the plantation contains 200 acres let 50 of them be in cotton, 50 in corn, 50 in peas or beans, and 50 in grass, and let the crops alternate; and it cannot be doubted that if this process be pursued for a series of years, the 50 acres will have grown more cotton than 100 under other circumstances. The use lime, if it can be procured at any reasonable expense, will always insure the growth of grass.

With respect to the cultivation of the sugar cane, the same principles which it has been endeavored to enforce with regard to cotton planting are equally applicable.

Effect of Rum on Chickens.

A French doctor has recently been making some curious experiments as to the effect of alcohol on fowls. The birds took to dram drinking with evident delight, and many an old cock consumed his bottle of wine a day, so that it became necessary to limit the allowance. They all lost flesh rapidly, more especially those which drank absinthe. Two months of absinthe drinking was found sufficient to kill the strongest cock or hen. The fowls which indulged in brandy alone lasted, however, four months and a half; while the wine bibbers survived for ten months. Their crests also swelled to four times the original size, and became unnaturally red. The *Pall Mall Gazette*, doubts whether man is justified in trying experiments with the dumb creation with the view of ascertaining how far he may himself venture to get drunk with impunity; but having proceeded thus far, he may as well go a step further, and by the introduction of the teapot into the hen house find out whether there is any ground for the suspicion entertained in some quarters as to the innocent properties of tea. A few experiments in late hours might be made with advantage at the same time. A party of carefully selected cocks and hens might be allowed to mingle in the festivities of the London season, returning to their roosts at the hour when they usually commence to cackle and crow. It would possibly be found that one week of political reunions, concerts, balls, and crushes would be as disastrous in its effects as two months of absinthe drinking.

Plaster as a Protection from Fire.

After the conflagration in Paris, it was generally found that, with good plaster work over them, beams and columns of wood were entirely protected from the fire. In cases where limestone walls had been utterly ruined on the outside by the flames passing through the window openings, the same walls, internally, escaped almost unscathed, owing to their being coated with plaster.

On many such plastered walls the distemper decorations were still to be made out. The iron roofs rendered good service, and the party walls of each house were carried up right through the roof—a most important precaution, for otherwise nothing could have prevented the disastrous conflagration from being more extensive than it was. It was also found that good woodwork in beams and posts, good wood floors, well pugged, and good wooden staircases, were safer and more to be depended upon than cast iron columns and stone staircases, landings, and floors. Stone staircases well protected by plaster were fireproof, although not so safe as wood in case of heavy *débris* falling upon them.

AN inclined railway is now in course of construction up the side of Mount Kohlenberg, near Vienna, Austria. It is to be completed by the time the Exposition opens next year. Mr. Francis Felbinger, late of the Pittsburgh, Fort Wayne, and Chicago Railroad, is the constructing engineer. The track is to be 6 feet wide. The cars are to carry 100 passengers each, and are to be drawn up by means of wire ropes, drums, and stationary engines, similar to the Pennsylvania coal railway inclines. Two engines each of 100 horse power will be employed.

MAGNETIC sand is found in immense quantities on the sides of the volcano of Mount Ætna. The specific gravity of this sand is 2·813. Acids have little effect upon it. Analysis gives silica 52·71, magnetic oxide of iron 19·44, alumina 19·09, lime 6·61, magnesia 1·85.

SEWING MACHINE.

In the invention which we here illustrate, a wide step appears to have been made towards perfecting the construction of the sewing machine. Mr. G. L. Du Laney, the inventor, has devoted the past fifteen years to the study of this branch of mechanics, and during that time has made many valuable improvements, the net results of which he has embodied in the present machine. Some of these results we will now proceed to lay before our readers, and a mention of one of the most prominent will at once take us into the heart of our subject.

In lieu of shuttle or bobbin, on which the lower thread is ordinarily wound, Mr. Du Laney takes the spool of thread, just as it comes from the manufacturer's hands, and incloses it in a case of hard rubber, through a hole in the upper side of which the end of the thread is drawn. The hard rubber case is partially of cylindrical form, and is somewhat pointed at its front end and rounded at its rear. It is confined, loosely, in the machine in a sort of holder which consists of side barriers, in such a manner that a loop formed by the upper thread may be easily drawn over its smooth exterior within the barriers. It is by the passage of such a loop over the spool case, and by afterwards drawing it up tight, that the upper thread is made to loop with the lower one and the stitch formed. The mechanism, employed to effect this, is shown in detail in Fig 2, which gives an enlarged view, while open, of the box seen closed in Fig. 1. The pointed end of the spool case is shown at A, and at B is one of the side barriers before alluded to, which form the holder for the same. C is a rotating hook of novel construction to which motion is imparted by the pin and revolving disk shown in the figure. The needle, with its operating mechanism, we shall speak of more particularly hereafter. The operation is as follows: The upper thread, the end of which is held by the operator, is carried down through the fabric by the needle, which on its return stroke causes the slack thread to form a loop. This loop is immediately caught up, pulled out, and carried along by the revolving hook (which has, at the same time, been moving upward and across from left to right) until it reaches the position shown in the figure. It is here opened out by the point of the spool case, and is afterwards, by the continued motion of the hook, made to glide along the smooth surface of the case until it has passed completely over it, when the hook releases the loop. It now lies loosely

Fig. 2

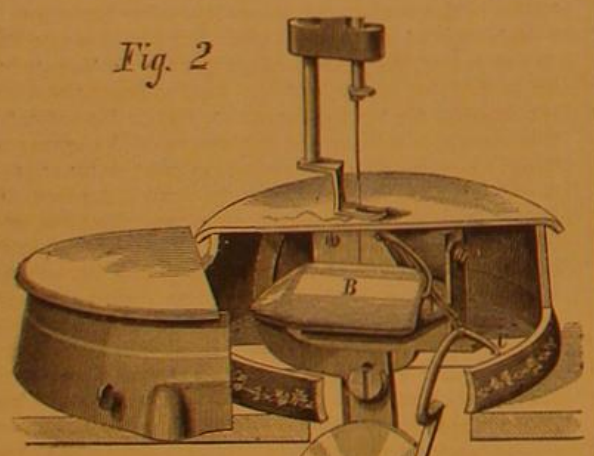


Fig. 3

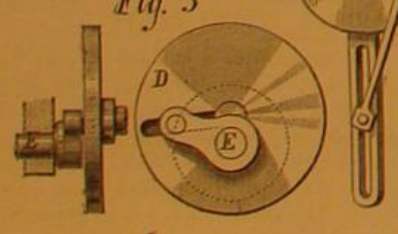
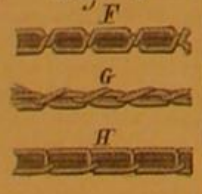


Fig. 4



on the top of the spool case and incloses within it the lower thread. The hook returns in time to catch up a second loop which has been formed by a second passage of the needle, and carries it along as it did the first. As the second loop is enlarged by the movement of the hook and by its passage over the spool case, the necessary additional length of thread is supplied by the slack of the first, and the whole of this slack is thus taken up. The effect of pulling the first loop tight is the formation of a double loop where it engages with the lower inclosed thread, and, also, the carrying up into the center of the fabric of this double loop. By these means the well known lock stitch is produced. The friction caused by its unwinding of the spool in its case is sufficient to produce the requisite tension in the lower thread. In its passage from left to right, the hook carries the loop as shown in the figure, but when passing under, from right to left, a barb, seen at the end of the hook, engages with the loop and holds it upward until its upward motion releases it.

The needle, which has the advantages of being straight and very short, is secured in its place by a small cam devised for the purpose, and its speed, during the upward and downward strokes, is regulated by a novel and very ingenious contrivance for producing variable motion, which is shown in Fig. 3. Here D represents a slotted disk which is attached to the driving shaft. E is a shaft through which motion is imparted to the needle, and which has its center placed lower than the center of the disk, D, it is connected with the disk by means of a crank and a crank pin, which engages with the slot. When the disk is rotated, the path described by the crank pin is as indicated by the dotted lines, and it is obvious, therefrom, that the nearer the crank pin approaches the periphery of the disk, D, the higher must be the speed

Fig. I

DU LANEY'S IMPROVED SEWING MACHINE.

of the shaft, E, which will decrease as the pin draws nearer the center. By the employment of two devices of this nature, the needle is withdrawn by an accelerated motion from the fabric before the loop is pulled tight, and the motion of the rotating hook is, at the same time, retarded so as to allow of the withdrawal of the needle before it catches up the loop. In this way the chafing of the thread against the needle, which would otherwise occur, is entirely prevented.

Another improvement in this machine consists in providing the pitman with ball and socket joints, by which means it and the treadle are rendered adjustable.

We have hitherto spoken of the lock stitch only, but two other stitches can be made by the machine. An ornamental cable stitch is made by removing a shield wire, which may be seen in Fig. 2; this allows of the loop being caught in a nick (instead of being passed directly over the spool case) and held while the needle passes through it. The result is the formation of a loop in the upper thread in addition to the locked loop; both loops are pulled tight at once by the hook. The ordinary chain stitch is produced by the action of the hook on the upper thread alone, after the lower thread has been cut off, or the spool and its case removed from the machine.

The three forms of stitches are shown in Fig. 4, where F is the lock stitch, G the cable, and H the chain stitch. A surface view of the cable stitch is given; the other two are shown in section.

The machine works easily and noiselessly, and the motion is rapid. The general neatness of the design can be seen from our engraving.

Patented July 3, 1866, and May 2, 1871. Further information may be obtained of Mr. G. L. Du Laney, 89 John street, Brooklyn (Blees' sewing machine factory).

The Cattle Business in Texas.

Among the noticeable changes made in the cattle business, since the close of the late civil war, is its concentration in fewer hands. The smaller owners found their stocks decreasing, and hence their profits did not meet their expenses. They have generally sold out, either to the larger proprietors or to the tallow and hide dealers. But few men now in the business have less than 1,000, branding about 250 calves. The herds range as high as 50,000, the numbers of calves branded being from 20 to 25 per cent of that number. On these larger ranches are maintained from 2,000 to 3,000 horses, in order to supply the army of *vaqueros* with remounts. Large numbers of the cattle are killed for their hides and tallow. Some of these dealers sell to purchasers on the spot, while others ship direct to New Orleans or drive to Kansas. Several leading stock raisers are mentioned as wintering from 2,000 to 3,000 each on the line of the Kansas Pacific Railroad.

The term stock cattle, in Texas, includes cows, calves, yearlings, and two year olds. A party selling 1,000 stock cattle would furnish 250 of each of the above classes, and charge a uniform price for the whole. The present price is $5 per head in specie. Three year old steers or four year olds generally bring from $10 to $12 per head. This class furnishes the staple of the Kansas trade. Four year olds, in good condition for shipment to New Orleans, bring $15 per head. The term beeves is applied only to animals four years old and upward. In good condition, they will net 500 pounds of beef per head.

HOSE COUPLING.

The improved coupling represented in our engraving is the invention of Mr. L. J. Roberts, of Meadville, Pa. It was designed by him with the view of securing quickness and ease in coupling or uncoupling hose pipes, and of protecting the screw threads of the couplings from injury; which objects he has attained in a simple and effective manner.

The coupling, which is shown in perspective in Fig. 1, and in section in Fig 2, consists essentially of three parts—the hose end, A, the nut, B, and the hose end, C. The nut, B, screws on the end of the hose end, A, and is kept in working position by a screw pin shown in the engraving. On each side of this nut is a projection and slot, shown at D, and on each side of the loose collar of the hose end, C, is a pin, shown at E. These pins and slots are made to engage by bringing the collar of the hose end, C, and the nut, B, together, face to face, and turning the collar round until the pins fall into the slots. The nut, B, is then screwed round until it brings the end of A, which is provided with a washer, tight up against the end of C. The button, F, is put on for the purpose of keeping the pins in the slots in case the nut should be jarred loose. It is provided with a rubber spring, which causes it to fall into a cleft in the nut, B, when the pins are made to engage with the slots. Attaching B and C in the manner described effects the coupling; the uncoupling is accomplished by unscrewing the nut, B, and pressing back the button, F, when a slight circular motion given to C causes the pins to fall out of the slots.

The hose end, A, is similar to that used with the old coupling, and the old hose end may, therefore, be used in conjunction with the parts, B and C, alone, to form a coupling on the improved principle.

On locomotive engines, also, the same two parts only are needed to make up a complete coupling.

The invention was patented through the Scientific American Patent Agency, Oct. 8, 1867.

Fig. 1

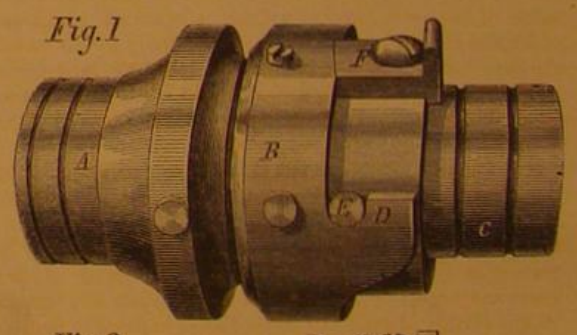
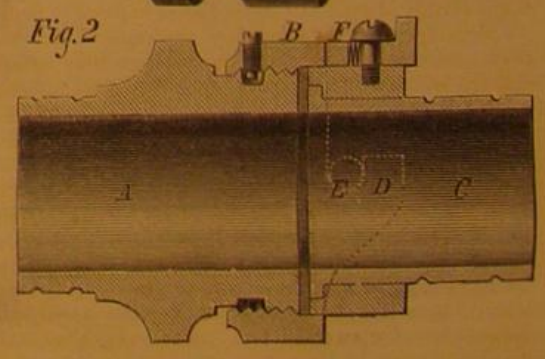


Fig. 2



Further information can be obtained of Mr. Roberts at the foregoing address.

NEW TESTS FOR SOME ORGANIC FLUIDS, by J. A. Wanklyn. The author has found that the differential action of potassic hydrate and potassium permanganate may serve as a method to distinguish between various animal fluids. When these are evaporated down with excess of potassa solution, and then maintained for some time at 150°, a certain fixed proportion of ammonia is evolved, and if the residue be now boiled with an alkaline solution of potassium permanganate, a further definite quantity of ammonia is given off; the relative amount of ammonia evolved by these two actions being constant for the same animal fluid. The author has examined by this method wine, milk, blood, white of eggs, and gelatin, the latter of which gives but a mere trace of ammonia by treatment with caustic potash, the quantitative results being given in a table. It would be possible by this process to distinguish between a spot of milk and one of white of egg on a cambric handkerchief.

Scientific American.

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THE TWO OCEANS.

Our solid earth's crust is surrounded by two oceans; one the fluid ocean, filling up the deepest hollows, and of which the surface is considered as giving the true measure of our earth's size; the other a gaseous ocean covering the former and those parts of the earth's crust not covered by the fluid ocean.

The first, or ocean properly so called, is usually considered to consist of water and common salt; the second ocean, commonly called the atmosphere, is considered to consist of fixed proportions of nitrogen, oxygen, and carbonic acid, with a variable quantity of watery vapors. Both these conceptions however, are very defective, and by no means the ones required for the true knowledge of the constituents of the sea and of the air.

The sea contains, besides common salt, the chlorides of magnesium, calcium and potassium, the sulphates of soda, magnesia and lime, the carbonates of alumina, lime, iron and manganese, phosphate of lime, bromide of magnesium, and iodide of magnesium and of sodium; also several compounds of fluorine and the salts of most of the ordinary metals, in minute quantities; even the presence of silver has been proved in such quantity that, when the amount in the whole ocean is computed, it exceeds in value a hundred thousand million dollars.

It is comparatively easy to analyze the constituents of the liquid ocean, but when we have to do with the gaseous ocean or atmosphere, we meet with the great difficulties inherent to the analysis of gases. It has been only during the last few years that we have been able to trace the presence of many gases and vapors in the atmosphere, and their condensation on the surface of solid and liquid bodies exposed to the same. We know now that the substances contained in our atmosphere, additional to those mentioned before, vary greatly in different localities; so in regions surrounding manufacturing towns, we find carbonic oxide, hydrocarbon vapors, and even often solid carbon, very finely divided, floating in the atmosphere. In the neighborhood of the ocean, common salt and hydrochloric acid are found, while Chatin found iodine in the air of France, Switzerland, Northern Italy, Germany, Holland, etc. After every thunderstorm, large quantities of ammonia compounds and nitrates are found in the air. They are formed by the electric discharges, causing the nitrogen to combine with the hydrogen and oxygen, respectively, of the watery vapors. These substances, with several others, are washed down by the rains during thunderstorms, and are then easily found in the rain water. So Barral found, besides nitric acid and ammonia (nitrate of ammonia), sulphate of lime, oxide of iron and common salt, and even organic nitrogenized compounds in rain water, while in almost the whole of England and all countries where large metallurgical operations are going on, free sulphuric acid is always present in the atmosphere and washed down with every rain. Sulphuretted and phosphoretted hydrogen are almost always found over swamps or places where matter is decaying, and even in and around the abodes of men. Who has not noticed the tarnishing of silver ware when exposed to the air in our houses? It is due to the formation of a coat of sulphide of silver, easily washed off by a solution of hyposulphite of soda, in preference to the customary polishing by friction, which removes also portions of the pure metallic silver, involving an unnecessary loss. These tests have last winter been brought to a degree of exquisite refinement by W. F. Barret in England. He made a flame of pure hydrogen gas, which is so faint that it is utterly invisible in even weak daylight. In order to prove that, when this flame becomes visible and colored, it is due to the minutest traces of foreign substances, he placed the 50,000th part of a grain of milk of sulphur on clean platinum foil; and a blue flame shot forth from it on his bringing the burning hydrogen jet into contact with the foil. If the reader asks the way to obtain the 50,000 part of a grain of any substance, we simply refer him to the homœopathic method of mixing ingredients with one another. In this case it was precipitated silica, which does not color the hydrogen flame, neither does pure platinum, nor pure water.

If, however, a platinum surface, porcelain plate, or block of marble has remained exposed to the ordinary atmosphere, and then a burning jet of hydrogen is directed against it, there instantly appears at the point of contact a deep blue and glowing image of the hollow flame; if the flame is kept for a long time at the same spot, the color and glow become fainter and will finally disappear. If, however, the flame is directed against an adjoining portion, the blue color will instantly reappear. If, in order to prove that this blue color is due to sulphur, collected by the platinum or porcelain during its long exposure to the air, the spectroscope be resorted to, the characteristic blue and green bands of sulphur are readily detected. When the jet was directed downward on the surface of water, this blue color showed itself when the merest trace of sulphur was present, while on the surface of sulphuric acid, the phenomenon was especially brilliant.

Barret finely applied this method of directing a pure jet of hydrogen against solid surfaces, to detect the slightest traces of different gases, vapors and dust, deposited on the same from the atmosphere. Even breathing against this flame produced a pale lilac tinge; the same was observed when the air contained one per cent of carbonic acid. It appears that the one fifteenth of one per cent of this substance, normally present in the air, is too small a quantity to affect the color of the hydrogen flame.

NARROW AND CHEAP RAILWAYS.

A convention was recently held in St. Louis, Mo., in the interest of narrow gage railways. About fifty gentlemen, including engineers, contractors, car and engine builders, and managers, all well known throughout the country in connection with railroading, attended and interchanged their different views relative to the comparative merits of the narrow gage or broad gage systems. After discussion, the conclusion, reached through the report of a committee, was that the narrow gage road is not only the most advantageous, both in construction and operation, but that it is by far the best means for a general and quick development of the national resources.

During the progress of the proceedings, information was given concerning the system in question by gentlemen connected with roads on which the same had been adopted. This, however, is somewhat meager and unsatisfactory. The lines referred to as now in operation have been but recently opened, and, besides, extend over but short distances, so that the experience gained by their practical working ought hardly to be considered as having so much weight, in the determination of the superiority of narrow gage, as is ascribed to it by the gentlemen advocating the adoption of the system.

The Denver and Rio Grande Railroad has 117 miles of road completed. Colonel W. H. Greenwood, its general manager, stated that as much business can be done thereon as on nineteen twentieths of the broad gage roads. As to speed, an average of twenty-five miles an hour has been made, although the usual rate of travel, including stoppages, is fifteen, which is considered sufficiently fast. The speaker preferred narrow gage passenger coaches to those of broad gage. The cost of the road could not be considered any criterion, as it was built over a very rough country at the foot of the Rocky Mountains. On the entire line, the saving effected by the use of the narrow gage is estimated at $199,500, or, with equal distances, its cost would amount to 64 per cent of that of the broad gage.

There is little question, in our minds, but that a narrow gage is the most suitable for a rough or mountainous country, where speed is necessarily subordinate to other requirements. There is no doubt but that the system is much less costly to construct in such localities, and is perhaps more generally advantageous than the broad gage; but in reference to the railroad above referred to, we can hardly coincide in the opinion that 15 miles per hour is a proper average rate of speed. Twelve miles per hour was the time made by the old fashioned English stage coach, to return to which would be much better economy rather than to lay railroads at an average cost of $10,000 a mile, to gain an advantage of but twenty-five per cent in increased rapidity of travel.

The preference for close and crowded narrow gage coaches is evidently not shared by the general public, as is amply proved by the long trains of spacious drawing room cars which daily leave our depots, and the willingness with which people pay increased fares in order to avail themselves of their accommodations.

Mr. Edmund Wragge, chief engineer of the Toronto, Grey, and Bruce Railroad in Canada, gave a sketch of the 3 ft. 6 in. system built under his supervision. He stated that 88 miles of the road were in operation, and that it required a 20 ton locomotive, heavier than those ordinarily used on narrow gage roads, to draw a train containing 600 passengers over a grade of 165 feet to the mile.

The remarks of Mr. Thomas M. Millington, chief engineer of the Memphis and Knoxville Railroad, also show the advantages of the narrow gage in rough or mountainous sections. On his road, a saving was effected by it of 41 per cent.

Another speaker dwelt upon the advantages of the system in developing the resources of the South, particularly in Georgia, in which State the people cannot afford the expense of a five feet road. Iron and coal abound, and can be readily produced and manufactured if narrow gage roads can be built in convenient localities.

The report of the special committee of eleven deals with the subject in considerable detail. It recommends that the 3 feet gage be adopted as the standard, and states that its cost of construction over mountainous districts would not be over one fifth of that of such roads as the Erie, Pennsylvania Central, and Baltimore and Ohio. In broken or rolling country, the saving will be about one half, and on plains, three fifths, of the present cost of the broad gage. Referring to the comparative expense of operating the two systems, a hypothetical case is taken of a narrow gage coach weighing 12,000 pounds, which is claimed to carry, when full, 36 passengers with a dead weight of 12,000: divided by 36—333 lbs. per passenger; while a broad gage coach, capacity 56 passengers, weighs on average 19 tuns, giving a dead weight of 38,000 divided by 56—678 lbs., or a difference of 345 lbs. per head in favor of a narrow gage. This argument, it strikes us, is somewhat lame—particularly in reference to the complement of passengers. An ordinary street car weighs a tun and a half, and is often packed with sixty passengers, the dead weight to each being reduced to a minimum, whereas the same sixty people, if wishing to travel comfortably, would fill three large and heavy drawing room cars.

Narrow gage locomotives, it is asserted, can be constructed of sufficient power and speed to answer all general requirements, in proof of which the Denver and Rio Grande Railroad is again appealed to for results. A 17 tun freight locomotive on that road has hauled a train of 24 cars with ease, up a grade seven miles long averaging 40 feet to the mile—four miles of the same having a grade of 75 feet to the mile. The total weight of cars, load, and locomotive was 157 tuns. A 12 tun locomotive has hauled cars and load amounting to 55 tuns up the same grades at schedule time, namely, 15 miles per hour. A remarkable performance was that of a passenger locomotive which ran 181 miles with only 2,340 pounds of coal, hauling the usual train of one baggage car and two coaches. Of this distance, 102 miles were run up an average grade of 40 feet per mile, and 8 miles at 75 feet per mile.

As regards cars, the report states that they furnish every requisite called for by a first class coach and that they will eventually become as popular with the public as the latter; a fact which, we must add, is merely an assertion and remains to be satisfactorily demonstrated by experience. In saving of dead weight, the narrow gage is claimed to have the advantage in all cases, and examples are cited in proof of the same. With reference to transportation, fares, etc., it is believed that they will be lowered in proportion to the cheapness of the first cost of the road, machinery, rolling stock, etc. For the transportation of cotton, it is stated that 10,000 miles of narrow gage road have been constructed by the East India planters, who control a labor market, the cheapest in the world. It is considered, in view of these facts, a serious question whether, with the dear labor and high rates of transportation in this country, we can maintain our supremacy in the production of cotton. The reports of the Festiniog line in Wales and of other short roads in Norway are also quoted in support of the theory that the narrow gage system has ample capacity for any business of any line on this continent.

The committee sum up the advantages of the system as follows: It costs only about one half as much as broad gage. It is within the reach of all sections to build and hence will enable them to avail themselves of railway facilities, with which they would otherwise be obliged to dispense. Its small cost, light expenses, etc., will make it a paying investment. It will supply cheap transportation and so develop dormant interests. Its general adoption through sections unprovided with railway facilities will enhance the value of property. Penetrating new sections, it will bring a large increase of business to the broad gage roads; and finally, a failure to adopt the narrow gage in the sections referred to will necessarily defer the construction of railways until the time when their means will admit of the more costly broad gage with its consequent high rates.

OXYHYDROGEN STREET LAMPS.

Within the past few weeks, the New York Oxygen Gas Company has extended pipes from their works in Eleventh avenue, corner of 41st street, to and through 23d street to the plaza formed by the intersection of Broadway, Fifth avenue, 23d and 24th streets, where they have erected large and beautiful chandeliers for the display of their new and splendid oxyhydrogen lights. The exhibition is a most gratifying success. The whole square is magnificently illuminated at night. The plaza is an excellent locality for showing the invention, as it is one of the most prominent places in the city, crowded at nearly all times with pedestrians and vehicles.

The light is presented in the form of intense white tufts of flame, which burn very steadily and yield most brilliant illumination, imparting a cheerful radiance to every object in the neighborhood, bringing out the natural colors almost like sun light. The company is now in readiness, we understand, to contract for the lighting of all the streets by this method. We need hardly say that its general introduction for this purpose would be a great public improvement. Our streets, thus lighted, would be rendered attractive and safe. Men who love darkness because their deeds are evil would have to emigrate to places where oxygen lights were unknown. A single jet of the new light is alleged to be equal in illuminating power to sixteen of the ordinary street gas jets. When the two lights are placed side by side, the common gas flame looks exceedingly poor and dingy.

The ordinary oxyhydrogen light is produced by directing a combined jet of oxygen and hydrogen against a block of lime, which latter is raised to a white heat. Each light requires constant special superintendence for the purpose of changing or turning the lime, as it crumbles away; it is therefore unsuitable for ordinary street uses.

The improved light is produced by the simple union in one burner of a jet of oxygen and a jet of common street gas, no lime or special attendance being required. The street gas supplies the hydrogen and carboniferous matter requisite for illumination.

The company make the oxygen gas by the manganese process, discovered by the distinguished French chemist Tessié du Môtay, consisting, substantially, in subjecting a quantity of manganese, placed in a retort, to a heat of 850° Fah., in combination with a steam jet, whereby the oxygen is liberated and carried into the gasometer for use. The manganates are regenerated, and are used over and over, without loss, by condensing the steam and directing upon them currents of atmospheric air. Oxygen is thus very rapidly and cheaply produced. This process will be found fully described in back volumes of the SCIENTIFIC AMERICAN, particularly in Volume XVIII.

One of the earliest exhibitions of the improved light in this city was at the premises of the Pneumatic Railway under Broadway, at Warren street, where the underground waiting room and also the pneumatic passenger car were for some time by it lighted. The oxygen was condensed in cylinders and carried upon the car.

In addition to the uses of oxygen gas for illuminating purposes, it is becoming extensively employed in this city as a medical agent. It is administered to patients suffering with asthma, pneumonia, croup, etc., either by charging the apartment with the gas, or by mouth piece and bag. The vivifying effects of oxygen upon the human system are well known.

END OF THE EIGHT HOUR STRIKE.

The great uprising which has been agitating the city of New York for the past ten weeks has at length reached its termination. Toward its close, it has been gradually but surely weakening. One by one the different trade organizations withdrew their support and returned to labor under the old system until, with the exception of the iron and metal workers, none of the great leagues, which in the beginning made such a show of strength and placed such confidence in their own powers, were left in existence. It was reserved for the above mentioned Society to give the finishing stroke to the movement, which it did by declaring by vote in solemn conclave that the strike was at an end. At the same time this colossal association which but lately threatened, through the aid of English gold and its emissaries sent throughout the country, to revolutionize the entire relations of capital and labor, decided to disband, leaving its members to follow their own inclinations in the matter of returning to work at old hours and former wages.

The men from Singer's sewing machine factory, numbering one thousand, followed the example set by the iron workers, and, dissolving their organizations, resumed their labor under the ten hour system, thus still further decimating the numbers of adherents to the movement. As we go to press, the marble workers, a few stone cutters, upholsterers, barbers and furriers, together with a small remnant of the once gigantic German League, are all that remain of the army of eighty thousand men which a few weeks since believed itself unconquerable.

The unfortunate results of the strike are too plainly before the public to require any special demonstration from us. The losses to the employers, from their works being left in idleness and their consequent inability to meet their contracts, have been enormous, and probably far in excess of any estimate yet published. It is only necessary to walk through the manufacturing portions of this city to prove the truth of this assertion. Factories have been closed by the score, buildings innumerable have remained unfinished, while the operatives leaving their labor have congregated in the halls and saloons where their meetings have been held. To the workmen, the effects of their ill advised action have been even more baneful. Apart from the pecuniary expense to which they have been put in order to maintain themselves for the past ten weeks, they have brought incalculable suffering upon their wives and children, and at the same time have opened a breach between themselves and their employers which will not readily be closed. During the heat of the controversy, little heed was given to what its after effects would be; failure was never thought of, and the fact of a few men having gained their point through taking advantage of their employers while the latter were hampered and powerless seemed to turn the heads of the entire working population of the city. Although the mechanics and laborers in the building trades at the time succeeded in obtaining a satisfactory compliance with their demand, it is now considered extremely doubtful whether the employers will stand by their concessions since the movement has turned out a general failure.

The past strike, like all similar uprisings heretofore, has tended but to prove that the workmen have yet to learn how to conduct such affairs with success. In the beginning the men used up all their available money, and then, being out of work and unable to earn anything, turned to outside unions for assistance. With the funds thus obtained, they were enabled to exist a little longer; but these exhausted, as a natural consequence the whole undertaking collapsed. The workmen will discover that they have gained nothing, earned nothing, and are indebted to other organizations for amounts loaned for the repayment of which their wages for some time to come will be taxed by the deduction of a large percentage.

If each trades' union had taken the money it has squandered on this unfortunate failure, and organized a business on the cooperative plan, it could have opposed not only a serious competition to the employers, but would have been able to obtain raw material for labor, to afford employment for a large portion of its members, and at the same time have sufficient funds remaining to constitute a fair working capital.

To the trades' union system, the strike has given a serious blow. Men are beginning to understand the hollowness and weakness, besides the arbitrary injustice, which has characterized the course of the majority of the societies. Large numbers of workmen who, having no sympathy with the cause, were forced to quit their labor by the intimidations of their associates, have changed from passive supporters of the system to its most bitter opponents, while the proceedings of such revolutionary bodies as the Internationals and kindred associations have been emphatically repudiated.

The time has yet to come in this country when the workmen will be able to coerce employers into concession to demands the sole results of which would be ruinous to both classes.

The lesson of the strike is fruitful both to employer and employed, although it is one which we trust may never be renewed. It teaches through numerous instances in our past experience, which now are corroborated by the successful adjustment of the late great English lock-out, that the true method of satisfactorily settling such extreme measures as strikes and lock outs is not by open warfare and bitter controversy; but by the meeting of both parties for the calm and temperate discussion of the questions involved.

PAPER HANGINGS AND THEIR MANUFACTURE.

Paper has been used as a wall covering by the Chinese from time immemorial. It was introduced in Europe, as a substitute for the ancient tapestry hangings, by the French, among whom its manufacture has always been a prominent industry. Paris contains numerous factories employing over 3,000 workmen, and several large establishments exist in the southern cities of France.

In New York city, three factories are in operation. Philadelphia has six, producing annually paper hangings to the value of $800,000.

Wall paper is prepared in several different ways. The cheap varieties are rapidly printed by ingenious machinery, but for the more elegant and elaborate patterns hand labor is almost invariably used. The paper is procured by the manufacturer in large endless rolls, weighing some eighty to eighty-five pounds each. In this condition, if of fine quality, it costs about seventeen cents per pound; if ordinary or cheap, the price fluctuates according to the market.

The designs to be printed are prepared as follows: Sketches of the different patterns are made in this country by artists employed for the purpose. These, on being approved, are forwarded to France, where elaborate drawings are made from them. Each color entering into the design must be printed separately, so that there must necessarily be as many blocks or types prepared to make the impressions as there are tints in the pattern. The blocks are constructed of two layers of wood, a thin piece of maple fastened to a thicker backing of pine board. Each block is about twenty inches wide, two feet long, and an inch and a half to two inches in thickness. On the maple, all of the design to be printed in a single color is drawn and afterwards cut out by engravers, or rather wood carvers, so that the lines are left in high relief. When the carving is completed, the work is brushed over with boiled oil and, when dry, sent to the printer for use.

The paint employed for coloring the paper is ground color mixed with warm size and passed through several sieves so that it is rendered perfectly smooth and free from lumps.

The design being decided upon, the block carved, and the paint mixed, the first process the paper has to undergo is its uniform covering with a ground tint. This is effected by passing the paper over an endless rubber belt working on rollers. A copper cylinder at one end of the machine used for the purpose rotates in a box of prepared color. From the cylinder, the paint is distributed to revolving brushes, by which it is applied to the paper passing over the belt. As the paper issues from the machine, it is drawn out along the loft and then hung up, in festoons over sticks resting on long frames, to dry. It is then wound on a large reel from which it is cut by boys into pieces of eight yards in length.

In case a pattern resembling oak wood is to be applied to the paper, another machine is employed. The paper is passed around a large cylinder, receiving an impression resembling the grain of oak from a smaller revolving wooden cylinder, which is suitably engraved and covered with the proper colored paint.

The rolls of paper, as they are wound by the boys from the large reel, are sent to a workshop below, where they are stamped with the patterns. This process is done by hand. The workman stands before a table over which passes the paper. Hanging above the table, supported by an india rubber cord, is the block on which the design is carved. The upper end of the rubber cord is attached to a small wheel traveling on an iron guide, so that the block may be swung from the table over to the place where it receives its covering of color.

The method of making the impression is very simple. The paint is obtained from what is termed the "slush box," which consists of a shallow box, the bottom of which is covered with painted ticking made watertight. This box floats on water contained in a larger box, so that its bottom is always perfectly level. Inside of the first mentioned box is placed a piece of woolen cloth on which the paint is uniformly distributed. The workman first places the paper across his table, then swings the block over to the slush box, and brings its carved side down on the paint. Next he carries the block back again, and places it on the paper, of course using great care in the registering so that the impression may fall exactly on the right place. A vertical movable arm attached to a frame above is now rested upon the back of the block, and forced down by means of a lever worked by the foot of the operator, thus completing the impression. This process is repeated until the whole piece is covered with the pattern, when it is hung up for from five to ten days until perfectly dry.

If the design is to be gilded, the parts which are to receive the gold leaf are printed in the same manner as above described, only glue size is used instead of paint in the impression. Gold leaf is afterwards applied by girls in the ordinary method.

Satin papers are sometimes prepared by mixing with the coloring matter sulphate of alumina and finishing off with a brush. Velvet or flock paper resembling velvet plush is made after printing the colors, by fixing to the surface some finely ground fibers of wool of the proper hue, by means of glue or white lead and oil.

Paper after being printed is also often embossed by being passed between steel rollers on which a design has been engraved.

The great care which is exerted in printing the many tints of the more elaborate decorations has rendered hand labor necessary in place of machine power; but the expense of producing the material has of course been proportionally increased. Large quantities of the finer qualities of hangings are imported hither from France, but it is a well known fact that much that is represented as of French manufacture is in reality made in just such establishments and by the same processes as above described.

Of late paper has been printed in patterns which have been suitable for theatrical scenery. At Booth's theatre, several of the handsomest scenes are thus made, while in Wallack's, the decoration of the entire auditorium is in paper.

In price, the fine grades of wall paper vary according to quality, but average from twenty-five cents to four dollars and a half per roll of eight yards.

SOLID EMERY GRINDER.

The value of solid emery wheels in various branches of manufacture and for various uses in the workshop is about being properly appreciated by metal workers and others. Wheels of good construction and properly mounted can be adapted by modifications of their shape, size and cut to numberless purposes, varying from the fine polishing of metallic surfaces to the gumming of a mill saw. Perhaps their economic value is nowhere better shown than in their employment as grinders, where they take the place of the file and render unnecessary the time and labor consumed in the use of that tool.

We may naturally conclude from the foregoing that a compact and efficient grinding machine that could readily be set up in any workshop requiring it would be an article in great demand.

Such a machine is produced by the Tanite Company of Stroudsburg, Pa., and called by them the "Table Emery Grinder." It is complete in itself, having its counter shaft and driving pulleys, fast and loose pulleys, and belt shifter all disposed commodiously at the lower part of the table. It carries two solid emery grinders, with many appurtenances, and can be run at varying speeds.

The Tanite Company have added a machine shop to their emery wheel factory, and have made a specialty of the manufacture of grinding machines of various characters, by which means they very much economize the production.

New Method for Indelible Writing and Printing upon Cloth and other Substances.

At a recent meeting of the French Photographic Society, in Paris, M. Dumas, made a very curious demonstration in the presence of his colleagues and a select audience of the public. The illustrious chemist, says the *Photographic News*, poured upon a piece of white stuff a few drops of a solution of nitrate of silver; he then pressed the fabric lightly in a pad of blotting paper to remove the superfluous liquid, and upon certain portions of the stuff was then pressed a metal seal, bearing a design in relief; immediately there appeared impressions in black of the design wherever the stamp had been applied to the fabric. This method of printing, at once so simple and rapid is the invention of a chemist in Paris, M. Em. Vial, who has already communicated to the Academy several engraving processes.

The particular method experimented with by M. Dumas is founded upon the circumstance that in the presence of zinc, lead, and copper a solution of nitrate of silver is immediately decomposed. Thus when a printing block engraved upon one of these metals is pressed upon a sheet of paper or any kind of fabric—cotton, linen, or silk—impregnated with nitrate of silver, this latter is decomposed as soon as contact takes place, and the silver is precipitated in the form of a black powder, faithfully reproducing in every detail the design traced in relief on the printing block. By a simple washing of the fabric afterwards in water, the remainder of the solution is removed from the stuff, and we obtain an indelible image, which adheres so tenaciously to the fabric that the design lasts as long as the linen or silk upon which it rests.

The color of the impressions may be varied at will from a very light gray to the most vivid black, according to the nature of the silver bath used for sensitizing the paper or

fabric, and according to the metal of which the printing block is composed. In general, the image is of a more intense black the more affinity the metal possesses for oxygen, and the further it is from the order in classification.

Cotton, linen, woolen, and silken stuffs, paper, and, indeed, any kind of material of this nature that can be impregnated with the solution, is capable of employment for this kind of printing. A slight dressing in the material favors the operation, and the finer and closer the fabric and stiffer without being dry, the better will be the results. Silk yields by far the finest impressions. In support of the communication, M. Vial submitted to the Academy a collection of proofs of different kinds, remarkable both for the fineness as for the sharpness of the designs.

THE NATURE OF COMETS.

Professor Zöllner, of Leipsic, in a lately published work on the nature of comets, makes it his purpose to explain the remarkable phenomena they present by an application of the established principles of physical science alone.

He starts from the fact that water, mercury, and many other substances, even solids, undergo evaporation to a certain extent; and he infers from the odors of the metals that they also, even at very low temperatures, are constantly giving off vapor, though in an inappreciably small amount; from which he concludes that a mass of matter in space will ultimately surround itself with its own exhalations, the tension of which will depend upon the gravitative energy of the mass and the existing temperature. If the attractive force of the body be insufficient to give the surrounding vapor its maximum tension for the temperature, the evolution of vapor will go on until the entire mass is converted into it. A further analytical inquiry leads to the result that a finite mass of gas in unlimited space is in a condition of unstable equilibrium, and must become dissipated by continual expansion and a consequent decrease of density; and a necessary consequence of this result is that the space contained in the stellar universe must be filled with matter in the form of gas.

By assuming, for the purposes of calculation, that stellar space is everywhere filled with atmospheric air, and taking the temperature as that of melting ice, he finds that gas in space, at its lower limit of density, is so attenuated tant a mass of air, which on the earth's surface would occupy a volume of one cubic decimeter, would, when reduced to this density, fill a sphere of inconceivable dimensions; a ray of light would not traverse its radius in a less number of years than is expressed by the numeral one followed by ninety-eight ciphers. Such a medium could have no appreciable effect either upon rays of light or the motion of bodies.

Solid bodies in space must, by virtue of their attractive force, condense the gas so as to form an atmosphere on their surfaces, and the density of the envelopes can be calculated when their size and mass are known. The value found for the moon is a vanishing quantity, and perfectly in accordance with the fact that no lunar atmosphere has ever been detected. For the larger planets, however, the value is very great, and the high density of their atmospheres must occasion perceptible effects upon the light reflected by them.

The temperature of a fluid mass, existing far from the sun or any body capable of radiating heat to it, would be that of the surrounding space, and if its attraction were not too great, slow evaporation would convert it into a sphere of vapor. Should it, on the contrary, approach the sun, the heat would cause the whole to be vaporized in much shorter time than in the former case, and the smaller the mass the shorter the time would be. The smaller comets, which often appear like spherical masses of vapor, are examples of bodies of such a nature.

The self-luminosity of comets he sets down to electrical excitement; and if it be granted that electricity may be developed by the action of solar heat, in the process of evaporation or the mechanical and molecular disturbances arising from it, we have a cause sufficient to account, not only for their self-luminosity, but also for the formation of their trains.

He then proceeds to discuss the quantitative difference in the effect of gravitative and electrical forces upon masses at a distance, and shows that, when a body is under both influences simultaneously, an increase of the mass results in a preponderance of gravitation, and a sufficient decrease of the same, in a preponderance of the electrical action. Hence the nuclei of comets, as masses, are subject to gravitation, while the vapors developed from them, which consist of very small particles, yield to the action of the free electricity of the sun. Careful investigation shows that, supposing the free electricity of the sun to be no greater than has been repeatedly observed on the Earth's surface, it would speedily communicate to a sphere, 11 millimeters in diameter and $\frac{1}{100}$ of a milligram in weight, a velocity of over 408 geographical miles per second, or such that it would pass over a space of over 70,000,000 miles in two days. The comet of 1680 developed in two days a train of 60,000,000 miles, which is a magnitude of the order calculated. It is therefore sufficient to attribute to the sun an electrical energy no greater than that supposed to account satisfactorily for the appearances presented by cometic trains; and it is quite unnecessary to assume the existence of some other repulsive force. When comets appear with trains directed towards the sun, instead of away from it, such direction is easily explained by the supposition of opposite, in place of like, electrical characters, resulting in attraction instead of repulsion.

Professor Zöllner and others think there is no improbability of the existence in space of fluid masses such as described, consisting of water or of liquid hydrocarbons, and the spectra of some of the nebulæ and smaller comets confirm the idea very strongly.

The Corn Cob Humbug.

Carbon, hydrogen, and oxygen, combined in certain proportions, make a good food for producing fat, but the fact that a substance contains either or all of those elements does not make it a valuable food. Add nitrogen to the above elements, and we have the constituents of the nutritious foods. It is not the fact, that an article contains these elements, which makes it a valuable food, but the proportions and their mode of combination. Common rosin, for instance, contains carbon, hydrogen and oxygen, yet but few farmers would care to adopt it as a diet for their cattle. Yet there are uses to which rosin is put for which wheat or corn would be of no value. Chemistry presents many curious contradictions; there are substances, which by analysis contain exactly the same elements in the same proportions, which are utterly dissimilar. Therefore, because a theoretical scientist finds that straw or corn cobs, or any other such stuff, contains a certain amount of carbon, nitrogen, and oxygen, he immediately publishes to the world that they are preferable, as food, to substances which good, old fashioned experience has proven of value. We knew a farmer once who acted upon just such nonsense, and it cost him about 10 cents a pound to fatten his pork on corn meal and corn cob meal mixed, while his neighbors fattened theirs on corn meal and potatoes at little over half the cost.

The next thing we shall hear is that corn cob meal is the best food for dyspeptics, and some vegetarian fool will be urging everybody to scratch their stomachs with it. We think it will do very well to go with the sawdust brandy, an article about which is going the rounds of the papers, and we venture the opinion that the man who eats the one and washes down the dry compound with the other will soon be in the undertaker's hands.

Much more sensible is the idea suggested by some one that the corn cobs be used for fuel and the ashes be utilized for making potash.—*New York World.*

Pneumatic Railway in Texas.

Colonel J. H Simpson, United States Engineers, describes the operation of the cars on the temporary railway now in operation at Matagorda, Texas. The road is used for conveying the materials for the new lighthouse now in process of erection at that place. He says:

"Transportation of material over the railroad at this work has been much facilitated by using a sail on the cars. A great speed as a mile in 2½ minutes was obtained by this means, and the heaviest loads the cars could take were moved along as well almost as if the cars were propelled by steam. It was found that the cars would sail almost as close to the wind as a boat."

ABSORPTION OF GASES BY CHARCOAL.—In the case of ammonia, it would seem that the amount of the gas absorbed by the charcoal continuously decreases as the temperature rises from 0 deg. to 55 deg., but at that point a sudden change occurs, and the amount of gas given off becomes considerably diminished. In the case of cyanogen, the absorption takes place very rapidly, being confined almost entirely to the first ten minutes, and the curve representing the absorption between 0 deg. and 80 deg. is continuous; the results obtained are given in tables, and also represented by absorption curves. Hydrogen and nitrogen are very slightly absorbed by the charcoal.

THE Central Park, New York, is 876 acres in area, and Phœnix Park, Dublin—one of the largest city parks in the world—is 1,752 acres.

Facts for the Ladies.—Mrs. S. W. Clark, Washington, D. C., with a Wheeler & Wilson Lock-Stitch Machine, used her first needle, No. 3, nearly 3 years, until it was worn out, doing all kinds of family and fancy sewing. See the new Improvements and Woods' Lock-Stitch Ripper.

The Times are Hard, is the complaint of many, and yet no family can afford to do without a sewing machine. There is one that has grown to a popularity equalled by few in market. It is the Wilson. Their immense manufactory is now turning out nearly fifteen hundred machines a week, and still they with difficulty meet the demand. The Wilson for family use has no equal, and is sold for fifteen dollars less than all other first-class machines. Salesroom, 707 Broadway, New York; also for sale in all other cities in the United States.

Business and Personal.

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To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies, see Manufacturing News of United States in Boston Commercial Bulletin. Terms $4.00 a year.

Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of easter or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—STRENGTH OF HORSES.—Will some one tell me at how many pounds pressure a horse of average strength can pull for one minute's time?—M. W. H.

2.—INK.—Can some one tell me how to make good ink that will not corrode steel pens?—M. W. H.

3.—IGNITION BY ELECTRICITY.—Can electricity be made to pass off a charged wire and ignite powder in the tube of a rifle, without the wire being connected to the rifle?—M. W. H.

4.—BREAKING WEIGHT.—If a beam, with ninety-nine hundredths of its breaking weight on it while at rest, should be moved at the rate of thirty miles or more a minute, on a level and without any jar, would the motion break the beam?—M. W. H.

5.—MAKING WINE.—Will some one give me a simple recipe for making wine from an abundant crop of grapes?—B. D.

6.—HARNESS BLACKING.—Will some practical tanner or leather finisher give me a recipe for a good, cheap blacking for harness and upper leather, one that will finish with a fine gloss?—A.

7.—DISSOLVING GUTTA PERCHA.—What is the best kind of spirit for dissolving gutta percha in, so as to retain all its sticking quality?—R. J.

8.—RAISING WATER.—What is the best method of raising water from a tank, in a place where the power is limited?—R. J.

9.—GILT DIP AND BLACK DIP.—Will some one inform me what are the right proportions of acids for making the gilt dip and the black dip for gas fixtures?—A. M.

10.—WATERPROOFING PAPER PULP.—Can any reader inform me of any substance, that can be mixed with paper pulp, to render it impervious to water?—W. R. H.

11.—MILL FOR CRUSHING CORN STALKS.—I wish to construct a mill to extract the juice of corn stalks. What size and length should I make the rollers? How many revolutions should they make per minute? I wish to have the mill adapted to run with two horse power.—H. A. S.

12.—POLISHING HORNS.—Will some one please inform me how to polish or clean elk horns so as to make them appear bright?—W. A.

13.—CLEANING IVORY.—How can I remove stains from ivory?—W. A.

14.—COMPARATIVE FRICTION OF VARIOUS GEARS.—Is there any table, showing the comparative waste of power when transmitted through different gearings, bevel gears, belts, quarter twist belts, friction wheels and bevel friction wheels? If so, where can it be found?—J. B. G.

14.—BURSTING OF SAWS.—Is it possible for a circular saw to be run at such speed that it will fly in pieces? Is there any instance known wherein a circular saw flew in pieces from too fast a motion?—G. A. H.

15.—CRYSTAL GLASS.—Would you please inform me what articles to melt together in a crucible to form the beautiful crystal glass? I mean the sort of glass of which the prisms that we see on glass chandeliers are made; they exhibit all the colors of the rainbow.—G. T. P.

16.—HARDENING OF RAIN WATER.—Will some one inform me why rain water becomes hard in my cistern, and how to remedy the evil? It is a common cement cistern, and is covered with planks and earth; it is situated for the most part under a laundry, and has been in use ten years. The roofs from which the water is collected were formerly covered with iron and overlaid with roofing cement, a mixture of coal tar and pulverized slate; but they have lately been covered with tin and painted, with no apparent change in the water.—B. D. A.

17.—MOUNTING CHROMOS.—How should chromos be prepared and mounted, so that they can be framed without glass, and be cleaned like oil paintings?—B. D. A.

18.—CLAY AND COAL OIL TORCHES.—In the bayous in Louisiana, we gig a great many small fish, especially trout, which come close to the bank on dark nights. The light used for this purpose should be quite intense, which the light of pitch pine torches is not; and they are, moreover, very uncertain and irregular. Could I prepare any light that is both cheap and light (in weight) and have the required intensity? Some time since I met a man who exhibited and offered for sale the recipe to make a torch composed of a piece of wire, from one and a half to two feet long, on one end of which was what seemed to be a lump of burnt porous clay; this he would plunge in coal oil until saturated, then light it, when it would burn for half or perhaps one hour, and when exhausted the torch could be re-saturated for an indefinite number of times. The article was not patented, and perhaps by making the lump large enough, or saturating it with some other fluid, it might give a very intense light. How may this contrivance be prepared?—B. J.

Answers to Correspondents.

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.

THE ATLANTIC CABLES.—J. H. P. is informed that the two cables between America and Great Britain were lifted and repaired in the fall of 1871.

HOT SPRINGS.—W. S. B. is informed that the heat of water, from a mineral spring or elsewhere, can never exceed 212° Fah., so long as it is exposed to the air. The only way in which water can ever rise to a higher temperature than this is by being heated in a confined vessel. Immediately after the water is allowed free contact with the atmosphere, the thermometer placed in it indicates 212° or even a lower figure.

C. W. L. asks: Is there any invention by which a watch can be kept in a waist pocket, dispensing with a chain? Answer: Yes; wear it without a chain, and put a button on inside the pocket.

E. A. W., asks: Can you or any of your readers tell me the probable dimensions of Noah's Ark? Answer: One of our Sunday School friends, whose relative sailed with Noah, says the dimensions of the ark were as follows: 512 feet long, 87 feet broad, 32 feet high.

UNITED STATES COINAGE.—Query 16, page 10, Vol. XXVII.—The large United States coppers were first issued in 1793, and were continued until June, 1857, with the exception of during 1815, in which year only bogus cents were made. The United States half cent was first coined in 1793, and was omitted in 1799, 1799, and 1831, and from 1812 to 1824, and in 1827, 1833, 1837, 1838, and 1839, and were discontinued after 1857. The small eagle cent was first issued in 1856, and in 1858 it was discontinued, after which the "Liberty" headed cent was substituted.—I. P. H., of N. Y.

BLASTING UNDER WATER.—In answer to A. A. P., query 12, page 10, current volume, I would say that the constructing engineer of the Potsdam water works used a tin tube (large enough to hold the charge and a little smaller than the drill), watertight, with a small tube from one end long enough to reach above water, for the fuse to reach the powder.—H. K. W., of N. Y.

CANARIES AND VERMIN.—Query 17, page 10.—D. F. W. should make some perches of elder or anything that he can get a hole through from end to end. Then cut small holes through the wood to the one in the center. It is said by those who have tried it that the vermin will go into the center of the perch in the night, so that they can be killed in the morning. I cannot vouch for this remedy.—H. K. W., of N. Y.

BLASTING UNDER WATER.—To A. A. P., query 12, page 10. Make cartridges, to fit the holes, of either tin plate or stout cardboard saturated with tallow and well secured, around the fuse or insulated wires where they enter the cartridge, with plenty of fat, or cement of rosin and tallow. Tin plate I recommend, as I have used such quite successfully.—E. H. H., of Mass.

MILK SOURED BY A THUNDERSTORM.—To H. C. R., query 1, page 10.—Under usual circumstances the nitrogenous elements of milk begin to putrefy and assume the properties of a ferment, inducing the sugar to absorb oxygen, and become converted into lactic acid. During a thunderstorm ozone is formed in the air, and this, I think, acts on the sugar, causing the formation of the same acid, without the decomposition of the nitrogenous matter. To illustrate this, make a solution of sugar of milk in water and submit it to the same conditions, and you will have a similar result.—E. H. H., of Mass.

STANDARD MEASURES.—To P. E. McD., query 5, page 10.—The standard is the length of a rod or pendulum beating seconds in vacuo at the level of the sea, in the latitude of 51° 29′ north, at a temperature of 62°. The length of this rod or pendulum is a certain quantity, and is divided into 39·1393 parts, whereof one part is called an inch, and 36 parts, one yard. The three barley corns, laid down in the old arithmetics, give only a rough and ready approximation.—E. H. H., of Mass.

F. H. Y. asks: Does an argand gas burner consume more gas than an ordinary one? Answer: It depends upon the sizes of the respective burners. If the ordinary burner is of such a size as to permit the flow of say eight cubic feet of gas per hour, while the argand burner only permits the flow of six feet per hour, it is almost unnecessary to inform you that the first burner will consume the most gas.

COOLING WATER.—To J. A. C., query 7, page 10.—Filter the water through a layer of charcoal, sand, and gravel to purify it. To cool it, fasten close, around a pitcher or other vessel, two or three layers of flannel. Keep these wet, and place in a draft of air. Cover the top in the same way. By the constant evaporation of the moisture from the flannel, the water will be kept quite cold.—E. H. H., of Mass.

STORING LARD.—W. H. C., query 2, June 22.—Lard is not injured by being stored in bright tin cans. I have seen it stored in a tin can several years past, and it remained perfectly good.—M. W. H., of Iowa.

DIMENSIONS OF BELTS.—W. G. S. (query 7, page 416, last volume) should remember that a belt of a given size and length will transmit a given amount of power at each revolution. A two ply rubber belt, running 1,500 feet per minute, will transmit one horse power for each two inches in width; but if the belt runs slower, it must be larger, to obtain the same result. If W. J. S. is constructing a horse power, he had better gear up with cogs until the rim of his speed wheel runs about 1,500 feet per minute.—H. A. S.

Recent American and Foreign Patents.

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

ROUND BELTING.—Albert Holbrook, Jr., assignor to A. and C. W. Holbrook, of Providence, R. I.—This invention consists in folding the margins of the strap over upon the inner portion before twisting it, and adjusting the parts folded so as not to extend quite to the center, by which means the belt is formed with rounded edges meeting together along the spiral line, which gives a much better and neater finish than the raw edges of the ordinary belt. The edges lapped over on the middle portion form the core, around which the said middle portion becomes twisted, and thus saves the sewing on of another strip for forming a core, as in the common way of making round belting.

SASH HOLDER.—Hazen O. Ball, of Sioux City, Iowa.—The object of this invention is to provide convenient and efficient means for supporting the sashes of windows in any desired position, and it consists in the following construction: A rubber roller is supported in a metallic frame let into the frame work of the window, and a rubber strip is applied to the side of the sash so that it bears against the roller. The journal of the roller is corrugated, and a spring, which is adjustable by means of a screw, bears against the corrugations. By adjusting the spring, sufficient friction is caused to hold the sash as required.

BLACKBOARD ERASER.—Frank G. Johnson, of Brooklyn, N. Y.—This invention relates to a new and useful eraser for use on blackboards, slates, and the like; and it consists in a holder of novel construction, which is adapted to hold a number of sheets of woven, felted, or other fibrous substances, so that they are sustained suitably for doing the rubbing by means of the ends of the threads or fibers exposed at the edges of the holder. In this way the rubbing substance is fully utilized.

DISTRESS RUDDER AND DRAG.—Heinrich Rabien, of New York city.—This invention relates to a new distress rudder which is intended to be kept on board of vessels for use in case of the loss of or injury to the regular rudder. It consists in the use of a weighted plank which is hinged to an upright post with projecting claws. Upon being thrown overboard, it floats on edge in the required position, and is adjusted by ropes so that the upright is held fast against the sternpost of the vessel. In this position it is worked by side ropes as an ordinary rudder; or it may be allowed to drag astern.

STRAW CUTTER.—Herman Baldwin, of New Haven, Conn.—This invention furnishes an improved fodder cutter, which is so constructed that the upper or movable feed roller may be made to move up and down squarely, whether the material to be cut be thicker under one end of the same or not, and which may also be readily adjusted to cut the feed longer or shorter, as may be desired.

GUN LOCK.—John H. Byers, of Delta, N. Y.—This invention relates to improvements in gun locks which prevent accidental explosion by contact with the hammer, and simplify the general arrangement of parts. It consists principally in setting the hammer in a recess of the gun stock, and back of a guard which is fastened to it, so that accidental contact with the hammer is thereby prevented. The invention also consists in a consequent change in the position and form of the nipple, which is L shaped; and also in a new manner of combining the trigger, hammer, and mainspring with

WATER HEATER AND STEAM GENERATOR.—George M. Woodward, of New York city.—This invention relates to an apparatus for heating buildings by water circulations or by steam, and for generating steam for all purposes; it consists in a chamber made with two compartments and a series of water tubes which are arranged in pairs, each pair being connected by a return chamber, and the whole arranged in a firenox or arch.

BEE HIVE.—William H. Roberts, of Campbell's Station, Tenn.—This invention relates to an improved moth-miller trap, and consists in the arrangement of passages in the front and base of the hive, and a peculiar disposition of illuminating holes by which the miller is entrapped into a box which can easily be removed from the hive.

THRASHING MACHINE.—John A. Lutz, of Bucyrus, Ohio.—This invention has for its object to adapt an ordinary grain thrasher for immediate use in cleaning timothy. At present thrashing machines, though provided with means for cleaning wheat, are not arranged to clean timothy; consequently, a second machine, a clover huller, is used subsequent to the process of thrashing. The improvement consists in providing an ordinary thrashing machine with an additional peculiar set of sieves secured in the shoe in place of the wheat riddles, by means of which the timothy is cleaned.

RAFTER HOOK.—Carl Gustav Buttkereit, of Toledo, Iowa.—This invention relates to a new hook to be used in connection with fire escapes, hay elevators, etc., with the object of furnishing a secure support, and at the same time permitting the instantaneous detachment of the same from the sill, rafter, or beam on which it hangs. It consists in providing the hook with a pivoted detaching lever and with a stop for the same, in such a manner that, upon pulling on the lever by means of a string attached thereto, it makes a fulcrum of the support on which the hook hangs and raises up the latter until it is clear of the support.

REFRIGERATOR.—Stephen A. Dunnington, of New York city.—This invention furnishes an improved refrigerator which is so constructed as to enable ice and salt to be applied to produce cold, and which keeps the articles placed in it perfectly dry. The inner box of the refrigerator is made of suitable sheet metal, and its top, which should be permanently attached, is recessed and made to incline toward the center, where is formed a channel inclined slightly toward one side, so that the melted ice and salt may flow off through a hole in the side of the box. The outer box is made larger than the inner, so as to leave a space between to receive the ice and salt. A doorway is formed through the sides of the boxes, and is encased so as to entirely separate it from the space between.

CANAL BOAT.—Peter Roberts, of New York city, assignor to himself and William A. Rees, of same place.—This invention relates to a new paddle wheel mechanism, which can be applied to canal boats and other vessels for the purpose of propelling and steering the same. It consists, first, in a peculiar construction of paddle wheel, which is formed with a double cone hub and two sets of paddles, which are arranged at an angle to one another and with a space between them and the hub; and, secondly, in a spring frame, which takes the shock of obstructions and protects the frame in which the wheel is journaled.

STOVE PIPE CONNECTION.—Charles R. Penfield, of Lockport, N. Y., assignor to himself and Charles Strawn, of same place.—This invention relates to an improved method of connecting stove pipes to the chimney or flue; and consists in a clamp collar which surrounds the pipe, and which is tightened thereon by means of a screw. This collar prevents the pipe being crowded into the flue, and by various attachments, such as a hook, a cam, or a screw and wedge, is the pipe held in position so that it cannot be drawn out.

PAPER CUTTING IMPLEMENT.—James Cook, of Grand Manan, Canada.—This invention furnishes an improved instrument for trimming photographs and doing similar work rapidly and without danger of tearing the paper; it consists in a circular cutter, which is attached to the end of a small cylinder in such a way that its edge overlaps the edge of the form or size plate which is laid upon the photograph to be trimmed. A short journal or shaft passes longitudinally through the cylinder and through the center of the cutter, and to its end, at the outer side of the cutter, is attached a handle.

REACH COUPLING FOR WAGONS.—William P. Ripley, of Friendship, Tenn.—This invention furnishes an improved coupling for connecting the reach to the rear hounds; it is simple in construction and effective in operation, and couples the reach to the hounds in such a way that, while making the connection firm and secure, the reach is at liberty to turn freely in the hounds, but cannot move longitudinally.

BUNG.—Thomas Burke, of New York city.—This invention relates to a new and useful improvement in the bungs of barrels, hogsheads, and all similar vessels, and consists in screwing into the bung hole of the barrel a tubular shell which is provided internally at its bottom with a valve seat. The valve, by which the barrel is closed or opened, is composed of wood, or of metal arranged with suitable packing, and is kept down on its seat by means of a crossbar, which is made to span the shell above it and to enter spiral grooves in the sides of the shell.

LAMP BASE.—Joseph Kintz, of Meriden, assignor to himself and F. J. Clark, of West Meriden, Conn.—This invention consists of a lamp base which is in two parts: the lower one is a hollow cup or approximately cup shaped plate, with four holes (more or less), through the bottom, and the upper one is a plate which covers the hollow one, and has four legs or pins corresponding to the holes through the lower piece, which pins are pressed down upon pieces of soft vulcanized rubber by the bolt which secures the lamp stand to the base, so as to press the pieces of rubber through the holes enough to support the base above the table, and thus prevent it from scratching or injuring it.

BOAT DETACHING APPARATUS.—David McFarland, of New York city, assignor to Adaline M. Ingersoll, of Brooklyn, N. Y.—In this invention the hinged arms, bow and stern, by which the tackles are held are kept in place by sockets which slide over them. These sockets are connected by rods, which are operated by a lever to release the hinged arms by withdrawing the sockets. The improvements consist also in providing plates which serve as guides for the sockets, and in arranging long rods, to which the keel of the boat is bolted, with suitable rings through which the sockets pass when sustaining the weight of the boat. In this way the weight is brought mainly on the keel and frame.

SHEET SEPARATOR AND DROPPER.—William Van Anden and Tristram Coffin, of Poughkeepsie, N. Y.—This invention consists of a holder for sheets of music, etc., and retaining, separating and actuating devices, arranged in such a manner that a pack of sheets suspended on the holder may, by the pulling of a cord or moving of a lever, be let fall one at a time upon a music rack or any other receptacle, in such a way as to be of great convenience to musicians and others by disposing of one sheet and bringing another into use quickly while performing, so that the musical or other performance is not interrupted.

VEGETABLE CUTTER.—Friederich A. Schaefer, of St. Louis, Mo.—This invention relates to an improved hand implement for cutting vegetables or fruits into slices, and consists in forming the cutter of a wire or wires stretched from side to side of a rectangular handled frame. It is cheaply made and easily repaired.

BEE HIVE.—Amos I. Root and Meron Andrews, of Medina, Ohio, assignors to A. I. Root and Company, of same place.—The object of this invention is to so construct the honey frames of bee hives that they may be readily taken from the hive or replaced without disturbing the bees. The ordinary hive frame is fastened at the corners with nails, and it is difficult to detach the frame from the hive or the honey from the frame without more or less injury to the frame and greatly disturbing the bees. The improvement consists in securing the frame and supporting it in the hive by means of metallic arms and corner pieces which are applied and cut so as to brace the frame in all directions. It can readily be detached, as the wax does not adhere to metal as it does to wood.

MACHINE FOR MAKING BLINDS.—James Milne, of Philadelphia, Pa.—This invention provides an improved machine for manufacturing window blinds and consists more particularly in the combination of two pairs of rotary cutters, arranged in movable bearings, and one pair arranged in stationary bearings, with a transversely movable bed upon which the stile or side piece of the blind is carried to have the te on cut; also, an arrangement of double chisels and boring bits for forming the mortise, in combination with a movable carriage, in such a manner that the boring and chiseling are done simultaneously.

WASHING MACHINE.—Ezra McCoy, of Pontiac, Mich.—This invention furnishes an improved washing machine which is simple, inexpensive, convenient, and effective; it consists in certain additions which are made to an ordinary washtub. At the bottom of the tub is placed a block from which radial arms extend to the sides. A framework, composed of slotted cross bars, is secured by one of them and wooden springs to the top of the tub, and through a hole in the center of the bars is passed a shaft which carries a pegged or knobbed rubber by which the clothes are washed against the lower block and arms. It is operated by a handle at the top of the shaft.

HARROW.—Greenbury Reed, Greencastle, Ind.—In this invention, the construction of harrows is improved so that the teeth can be readily cleared of rubbish. A light additional frame, through which the teeth pass, is arranged close under the ordinary frame and combined with levers and springs, in such a manner that the moving apart of the two frames effects the clearing of the teeth.

HARNESS SADDLE.—Elijah Dixon, Emporia, Kansas.—In this improvement the parts of the saddle above the back bone are all made flexible, with the exception of two curved plates by which they are connected. These plates overlap and slide over each other, so as to admit the adjustment of the saddle to different shaped backs, by means of screws which pass through slots in the plates.

DRAFT REGULATOR FOR HOT AIR FURNACES.—Stephen J. Gould, Cornwall Conn.—This invention relates to a new apparatus which can be applied to hot air furnaces for the purpose of reducing the draft if the heat produced should reach or exceed a certain degree. It consists principally in the use of a boiler which is placed within the hot air chamber that surrounds the furnace, and in the connection of the same by means of pipes, with a vessel containing a diaphragm or piston, in such a manner that, when, by an excess of heat, steam is created in the boiler, the diaphragm or piston is moved, and draws the doors of the furnace into the necessary position for reducing the draft.

TOBACCO KNIFE.—William A. Bernard, Danville, Va.—In this invention, the knife handle is made with a thumb rest on the back, and is so fitted by its shape to the hand of the operator as to enable him to make an upward cut. The blade, also, is of peculiar formation, and has a sharp point by which the stalk of the tobacco is readily slit before being cut off. The cut being made with an upward pressure, there is no danger of dulling the knife by contact with the ground.

BARBER'S CHAIR.—Johannes N. Ewald, Frankfort, Indiana.—This invention relates to a new barber's chair, which is made with a reversible seat with peculiar devices for locking it in a horizontal position, and with an index to show how often the seat has been turned. The object is to allow one side of the seat to cool while the other is occupied, and thereby avoid the spread of disease by contact with the warm seat. The invention consists in a peculiar support for the sides of the swivel seat, in a new mechanism for removing the same, and in the arrangement of the index in connection with the seat.

CHURN.—Thomas Stumm, Ada, Ohio.—This invention consists in forming apertures on each side of the body of a rotary churn, so that a circulation of pure air through the same may be established when desired. By means of slides, which have wire gauze openings to correspond with the apertures in the churn, the air may be admitted or excluded.

LOZENGE PACKAGE.—Henry W. Booth, Toronto, Canada.—This invention relates to a new method of putting up confectionery, and consists in a box package of lozenges, twenty-four or more in number and of two different colors or shapes, which can be used as men, and a checker or draught board of paper which is folded to the size of the box and added to the contents. Thus all that is necessary for playing a game of checkers is contained in the package.

WOOD STOVE.—Chauncey H. Castle, Quincy, Ill., assignor to Comstock, Castle & Co., of same place.—This invention relates to an improvement in the construction of the lining of tod-stoves—*i. e.*, elongated wood burning stoves. It consists in making the same flat at the bottom instead of arched, by which the strength and utility of the stove are very much increased and the facilities for cleaning improved.

WASTE PIPE TRAP.—Thomas Smith, New York city.—This invention is an improvement in the construction of waste pipe traps, and is designed to prevent the escape of noxious gases from sewers; it consists in the arrangement of a valve in connection with a removable cover for the trap box, and in the provision of flanges on the inner side of the box, for the purpose of keeping the valve in an inclined position.

BREAST COLLAR.—Ralph D. Kendall, Richville, N. Y.—This invention consists in forming a breast collar of a metal plate, shaped to the neck of a horse, covered with leather, and having metal loops for attachment of the shoulder strap, the same being secured by rivets. The loops also serve to prevent the leather from sliding or working on the plate, by reason of their projection through the leather.

ICE CREAM FREEZER.—John W. Condon, Logansport, Ind.—The invention consists in providing a cream vessel, that rotates within a freezer, with a dasher rod having plate arms bent so as to throw the cream upwards and thus to assist in creating a uniform frigidity; in providing the dasher rod with a loosely pivoted sweep that is forced by the current of cream to keep the side of the vessel from any adherence of particles; in a mode of adjusting the sweep to bear more certainly and positively against the side; and finally, in a frame which has clamps and a horizontal bar that may be detachably but rigidly fastened to the case, so as to receive the operating mechanism and fixedly hold the dasher shaft or rod.

HARVESTER.—George S. Grier, Milford, Del.—The invention consists in operating a rake, by means of an endless carrier, so that it will be transferred edgewise when traveling on the upper side of the belt, be turned at the end with the teeth across the front of the platform, be then drawn in that position to the rear, and, finally, be turned one quarter of a revolution as it ascends to the said upper side of the belt or chain.

SHIP'S PUMP.—Thomas Bell, of Bellport, N. Y.—The object of this invention is to improve the means used for discharging water from ships and for pumping water expeditiously in other situations; the pump is formed of a rectangular box which has the induction pipe at one end and the eduction pipe at the other; within the box are sliding boxes containing the valves, which are hinged. These valves and boxes are made to slide backward and forward by means of rods and eccentrics attached to a driving shaft which passes through the middle of the pump box. The valves are not moved in unison, but are arranged so as to cause a continuous flow of water through the pump.

THRASHING AND SEPARATING MACHINE.—William H. Bassett, of Burlington, Kan.—This invention relates to a new self feeding and band cutting attachment for thrashing machines, and to a new arrangement of discharge screw for the separator by which help is saved in operating the machine. A feed belt for conveying the sheaves of grain to the thrashing cylinder is applied to either side of the frame. A reciprocating knife is suspended above the feed belt from a crank shaft, and is made to move up and down during the motion of the belt. This knife serves to cut the bands of the sheaves of grain that are conveyed to the machine. The grain, after having passed the threshing machine and grain separator, is finally discharged into a transverse trough, in which there are two screws. When these screws are both turned in the same direction, they serve to discharge the grain at one end of the trough. But when the thrashing machine operates with great rapidity, so that one person cannot attend to all the grain that is discharged from it, the screws are revolved in opposite directions and separate the stream of grain so as to discharge it at both ends of the trough.

HEMP BRAKE.—Philonzo S. Fitch, of Hanly, Ky.—This invention furnishes an improved machine for dressing hemp and preparing it for baling, which consists in peculiar arrangements of stationary and moving knives and other machinery, by the operation of which the hemp is quickly and effectually broken and the shives beaten out.

GUN SIGHTS.—John T. La Rue, of Pleasant Post Office, Ind.—This invention consists in the construction of sights for rifles and other fire arms; and consists in a combination front sight and in a back sight which is adapted thereto. The front sight is composed of two hinged plates, which fold one under the other upon a bed plate, and are controlled by the action of a spring, so as to admit of being set for use either as a globe sight or a plain open sight. The rear sight is stationary, and is provided with openings adapted for use in conjunction with the front sight in either of its forms.

DEVICE FOR CUTTING SCREW THREADS.—Frederick G. Robinson, of Pittsfield, Mass.—This invention obviates the difficulty which attends the starting of a screw thread cutting die on the end of a rod or tube. A tubular holder is made to contain the die and is adjusted to screw into another tubular holder in which is inserted and fastened the end of the rod or tube. In this way the die is correctly guided and fed on to the rod.

ROTARY STEAM ENGINE.—Charles W. Patten, of Elk Point, Dakota Territory.—In this improved steam engine the cylinder is of the form of two cylinders, with about one quarter of each cut off longitudinally and joined together, thereby inclosing one space, which is divided in its longest diameter by a fixed partition, which has a space at the center, where the hubs of two axles are arranged side by side, and fit together steam tight; they also fit the partition steam tight, so that, by them and the partition, the cylinder is divided into two compartments. These hubs are placed in the axes of the two parts of the case, and they have each two wings applied at right angles to each other, one being in each compartment. The hubs, with the wings, oscillate a quarter of a revolution, or thereabout, the wings moving from the partitions to the central point between them, where they meet. The steam is applied between the two wings of one compartment, and between the partitions and the wings of the other compartment simultaneously, so that, practically, it is applied in three separate chambers, corresponding to ordinary cylinders, of which the whole or two, or only one, may be used at a time, which is desirable where the work varies considerably. This plan affords all the advantages of ordinary rotary engines without the objectionable sliding steam abutments or abutment valves; and it affords means for working the steam expansively much better than it can be done with ordinary rotary engines.

SHOE FITTING MACHINE.—William H. Praden and John P. Benjamin, of Williamsburg, N. Y.—This invention is an improvement in machines for fitting together the inner lining, gore and outer vamp of a shoe or gaiter, and consists in the employment of three hinged plates, one of which is made to slide, in combination with a suitable punch and an apertured table.

BOLT HEADING MACHINE.—Charles D. Wiley and Mason S. Norton, of Junction, Minn.—This invention furnishes an improved bolt heading machine, and consists more particularly in an arrangement for raising and dropping the hammer by means of a segmental gear wheel and rack bar; and also in apparatus for holding the hammer raised when the blank space of the gear is opposite the teeth of the rack bar.

BASKET.—James Graham, of Vassar, Michigan.—This invention furnishes an improved splint or stave basket, which is simple in construction and is strong and durable. The body of the basket is formed of two series or thicknesses of staves or splints, which overlap each other, and the ends of which, at the mouth of the basket, are secured to and between two hoops. The outer series of splints or staves extend entirely across the bottom, crossing each other at the center of the bottom. The other or inner series of staves or splints do not extend across the bottom, but terminate a little within the edge of the bottom board, so that their ends are confined beneath it. The bottom board, hoops and staves are secured in their places by means of clinched nails.

SHUTTLE FOR SEWING MACHINE.—Frederic A. Churchill, of Pittsfield, Mass.—The object of this invention is to provide efficient and convenient means for applying and varying the friction in sewing machine shuttles, so as to regulate the tension of the thread; and it consists in a bent lever which operates in connection with an adjustable spring spindle in such a manner as to increase or diminish the friction on the pivots of the spool.

KEY HOLE GUARD FOR LOCKS.—John B. Whitney, of New York city.—This invention relates to a lock, in which the outer key hole is closed by a sliding plate whenever the key is applied from the inside, and in which the bolt may be thrown back by applying the key from the inside when the same has been thrown out or locked by application of the key from the outside. It consists in such a combination, of the slide with the lock tumblers, that it is held by the tumblers and is drawn by a spring in front of the outer key hole as soon as the tumblers are raised by the key applied from within; a plate projects from the slide close to the key, when the same is applied from without, and prevents the slide from moving while the key is in the outer keyhole.

TOY STEAM LOCOMOTIVE.—Francis W. Clark, of New York city.—This invention furnishes an improved toy steam locomotive which runs for a considerable length of time, and has sufficient power to propel it upon carpets or other uneven or resisting surfaces; it is, at the same time, simple in construction and inexpensive in manufacture, and can be put into market at a comparatively low price.

COMBINED BUREAU AND CLOTHES DRYER.—William Hathaway, of Northbridge, assignor to himself and Chester Hastings, of Millbury, Mass.—In this improvement all the requirements for ironing, airing, and folding away clothes are combined in a bureau of ordinary size. It is made with drawers, a folding top, a recess above the drawers and an extension back to which airing frames are attached. When the apparatus is extended for ironing purposes, the recess holds the articles to be ironed; when ironed, they may be arranged on the frames for airing, after which they are folded and laid in the drawers.

MACHINE FOR DRYING PAPER.—Elihu C. Wilson, of Medway, Mass.—This invention consists of a long case, through which the web of bat, paper, or cloth to be dried is carried on an endless apron or belt. The case is arranged so as to cause the air which is forced through it for drying the bat to impinge upon its upper surface, and then escape around the edges and along the under side of the center, and thence through the bottom of the case into a chamber or draft box, from which it is exhausted by a fan blower or other suitable means. By this arrangement the bat is very quickly and effectually dried.

HAND CORN SHELLER.—Archibald McLean and James H. Ross, of Carondelet, Mo.—This invention furnishes an improved hand corn sheller which is convenient in use, and does its work quickly without scattering the kernels; it consists in the arrangement of a fixed and a movable jaw, which are provided on their interiors with flanges or threads by means of which the kernels of the corn placed between them are removed. Curved guards are attached to the sides of the jaws to prevent waste, and the operation is performed by moving forward a handle after the corn is placed in the jaws.

FEED WATER HEATER.—John Gates, of Portland, Oregon.—This invention relates to a new feed water heater and mud retainer for steam boilers, in which the heat of the exhaust steam is fully utilized and the sediment from the water collected before it is admitted to the boilers.

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THE MODEL POTATO: An Exposition of the Proper Cultivation of the Potato, the Causes of its Diseases or Rotting, and the Remedy; its Renewal, Preservation, Productiveness, and Cooking. By John McLaurin, M.D. 50 cents: S. R. Wells, Publisher, 389 Broadway, New York.

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is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

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DESIGNS PATENTED.

5,974.—BUTTON.—J. R. Farrell, Boston, Mass.
5,975.—CASE FOR RIBBONS, ETC.—J. Gross, N. Y., A. Ruth, Decatur, Ill.
5,976.—COOKING RANGE.—D. Hathaway, Green Island, N. Y.
5,977.—BEER MUG.—J. H. Hobbs, Wheeling, W. Va.
5,978.—ENDS OF BELTING.—B. A. Lewis, Plainville, Conn.
5,979.—STOVE.—G. G. Wolfe, S. S. Vedder, F. Ritchie, Troy, N. Y.

TRADE MARKS REGISTERED.

884.—ATTRITION FLOUR.—Chicago Attrition Pulverizing Co., Chicago, Ill.
885.—GUNPOWDER.—Laflin & Rand Powder Company, New York city.
886.—PRINTING MACHINERY, ETC.—V. E. Mauger, New York city.
887.—SOAPS, ETC.—Proctor & Gamble, Cincinnati, O.
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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending, for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

21,698.—HAY RAKE.—M. Raezer. September 18, 1872.
21,864.—SCREW CUTTING LATHE.—G. W. Daniels. October 2, 1872.
21,917.—HULL OF VESSEL.—R. and T. Winans. October 9, 1872.
22,157.—PIPE TONGS.—J. R. Brown. November 13, 1872.

EXTENSIONS GRANTED.

20,727.—CARTRIDGE.—G. W. Morse.
20,756.—ORE SEPARATOR.—H. Bradford.
20,824.—PLANING MOLDINGS.—H. B. Smith.
20,834.—EAR, CHEEK, AND CHIN MUFFS.—W. P. Ware.
20,841.—RAILWAY BRIDGE SIGNALIZER.—A. Burnham.
20,920.—SPINNING FRAME.—A. Houghton.
20,923.—MACHINE FOR CLEANING GRAIN.—W. H. Orr

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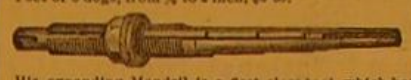

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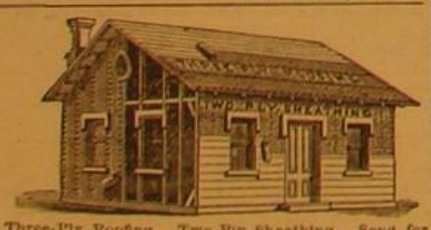

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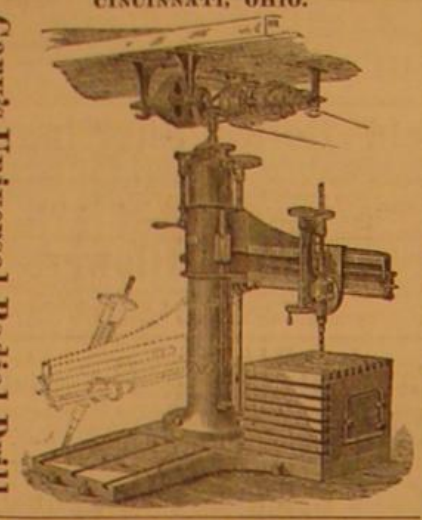

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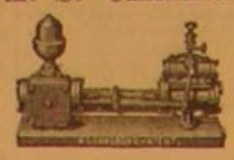

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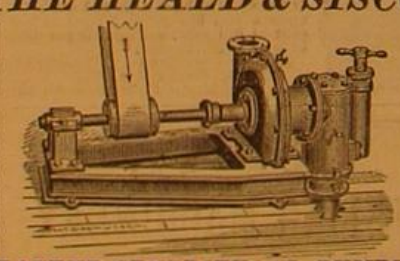

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