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Improvement in Battery Guns.

The accompanying engraving represents an improved ten barreled gun, recently manufactured at Colt's Armory, Hartford, Conn., under the supervision of R. J. Gatling, the inventor.

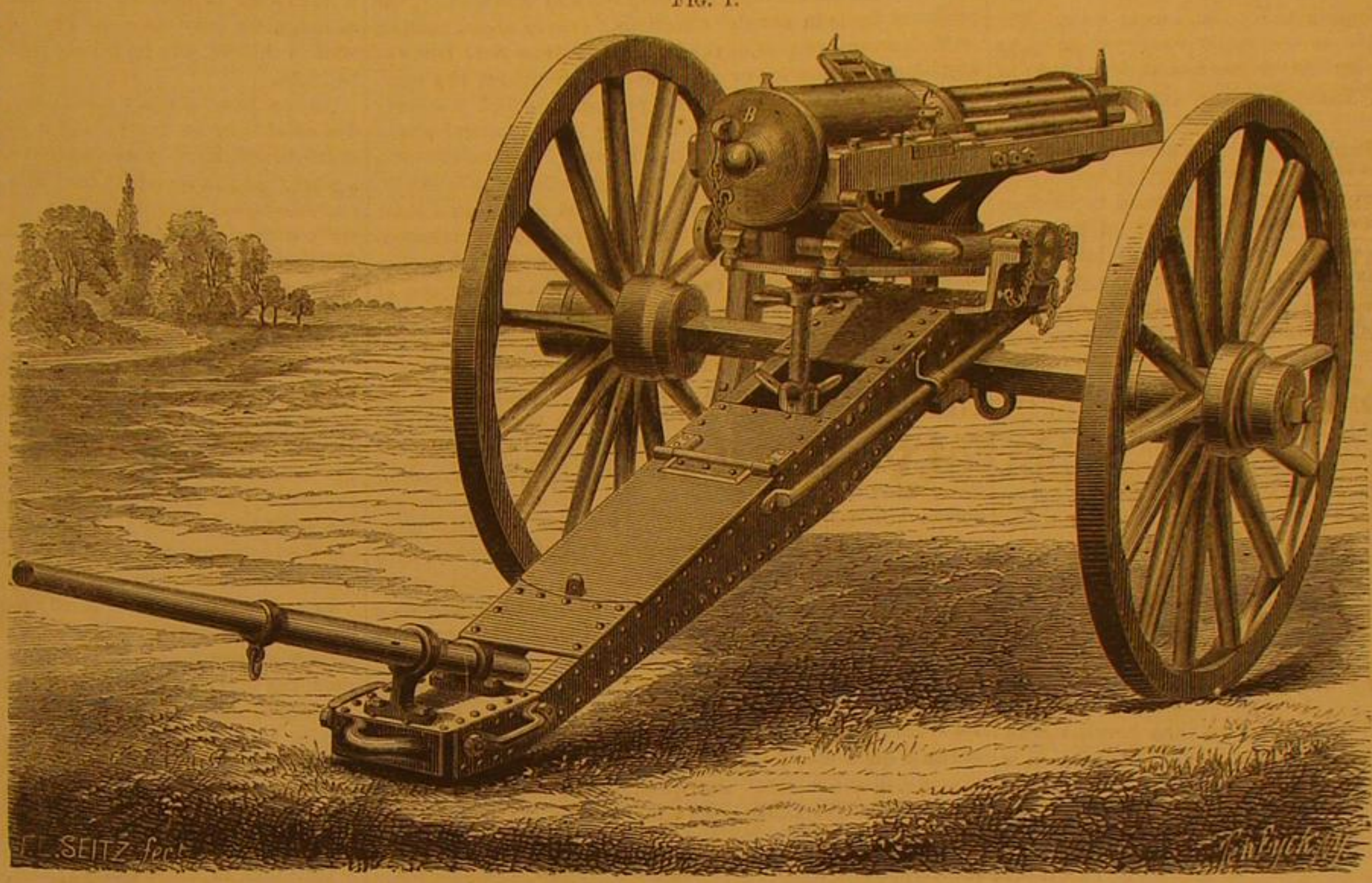
In this new gun there are many improvements upon the one published on page 17, Vol. XVI., of this journal.

First. The lock mechanism has been greatly strengthened and improved, and an adjustable plug, as shown at B, provides a means for taking out and putting in the locks, without taking the gun apart. By this arrangement, an old lock can be taken out and a new one, if desired, inserted in a few seconds.

Second. The gun has also a new cocking device, operated by a knob, shown at C, by the simple turning of which the gun is kept from being snapped when it is revolved while not in service; but in an instant, when desired, the gun can be made to snap or fire by simply reversing the position of the knob which operates the cocking device.

Third. The mode of feeding the cartridges to the gun has also been greatly improved by the use of automatic feed cases from which cartridges are fed to the gun through the hopper shown at A. These improvements enable the most inexperienced soldiers to work the gun without the least difficulty.

Fig. 1.



GATLING'S IMPROVED BATTERY GUN.

The cartridge for the use of this gun, a section of which is shown in Fig. 2, has been greatly improved. The cartridge shells, or cases, are now manufactured out of much stouter material than they were formerly, and are made with solid heads. They will now withstand the heaviest charges without the possibility of bursting, and the shells can be fired and then re-loaded, over and over again, for fifty or more times. The cases, or shells, being thus utilized, the cost of the ammunition will be but little more than that of the lead and powder used in reloading. The heads of the cartridges in front have square shoulders, which enable the shells to be easily extracted from the chambers of the barrels after they have been fired. The carriage upon which the gun is mounted has also been much improved. It has an adjustment which enables one man to give to the gun, when it is firing, a lateral train motion, so as to sweep the sector of a circle of more than twelve degrees without moving the wheels or trail of the carriage. In this way the gun can be played like a hose pipe, and made to cover five hundred yards, or more, of the enemy's front, and that too without interrupting its continuous fire. The gun fires with great rapidity, but always one shot at a time in rapid succession, so that the tendency of recoil is only that produced by a single shot, and this is entirely overcome by the weight of the gun and the carriage, and by a simple device attached to the trail of the carriage. The true elevation having therefore been once obtained, any desired number of shots may be rapidly fired with accuracy without resighting or any further adjustment of the gun. These are advantages not possessed by any other arm.

Fig. 2

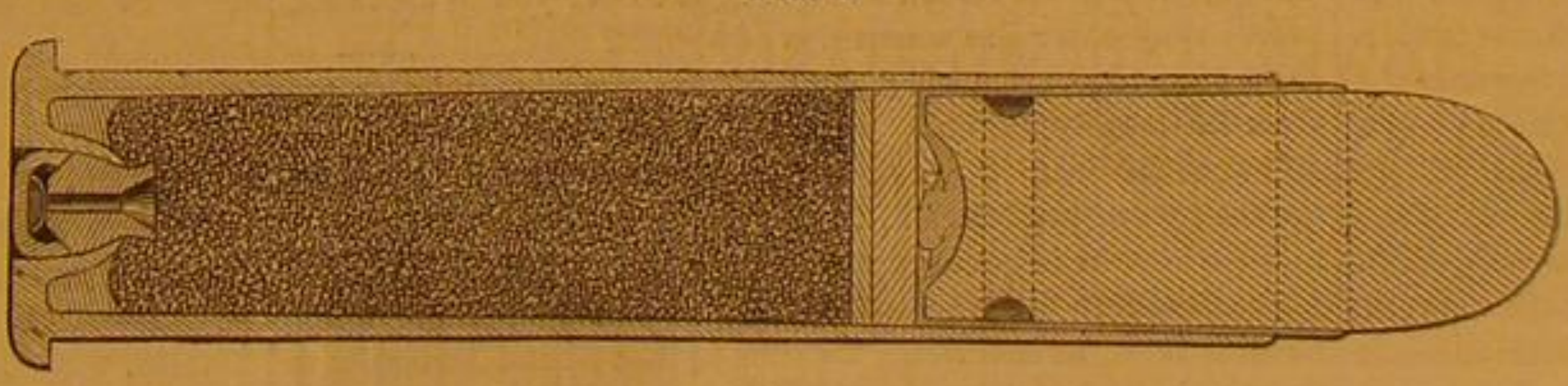


Fig. 3

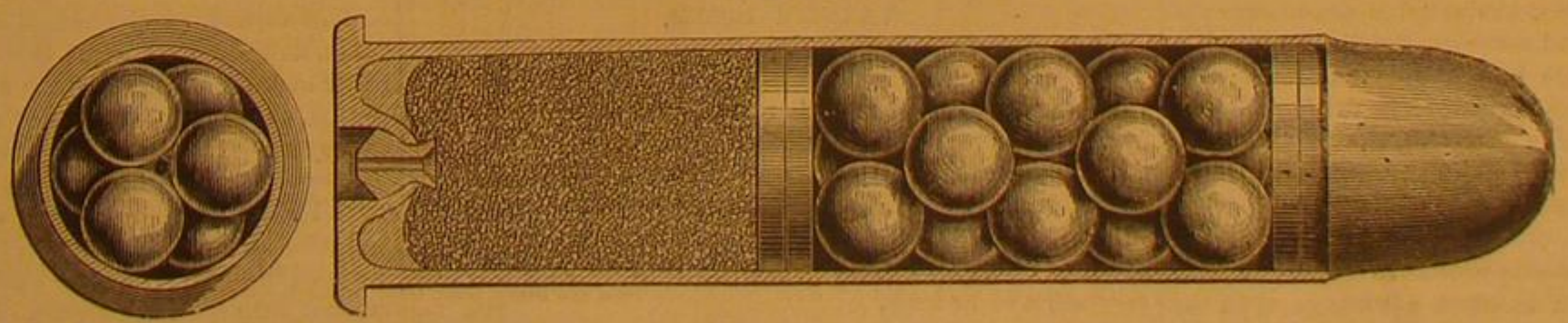
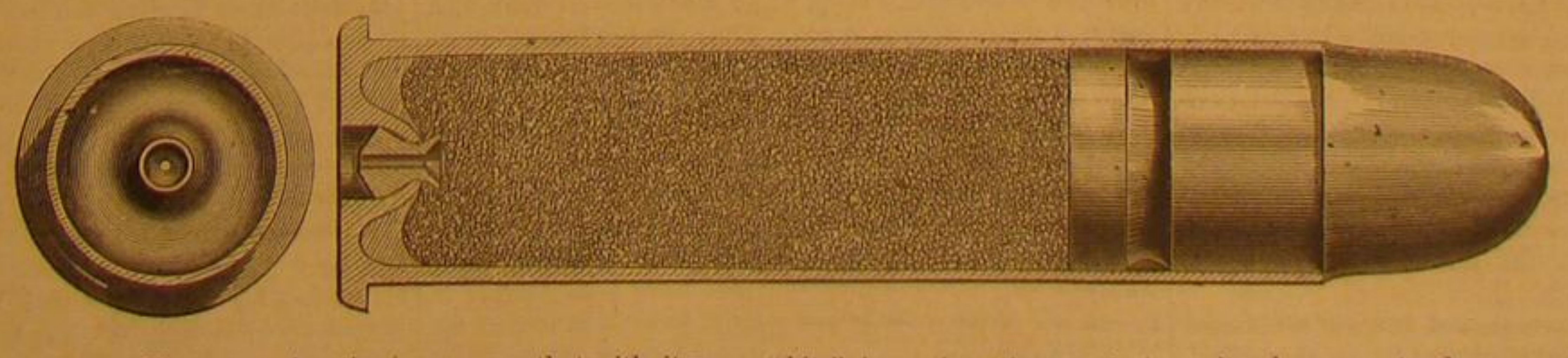


Fig. 4.



This peculiarity of *no recoil* is of special value in the defense of bridges, fords, mountain passes, etc., for the reason that such points are usually attempted to be passed during darkness, fog, or storm, when the movements of the enemy cannot be clearly observed. The gun, having once been properly located and accurately aimed to cover the threatened point, is ready at any time to pour its rapid and deadly fire with certainty of effect, while other guns placed under similar circumstances, after having delivered the first fire, must of necessity be readjusted and fired at random, and therefore with little effect.

The effective range of the gun is over two thousand yards, being greater than that of any other rapid firing arm; its accuracy is also very remarkable, and is claimed to be quite equal, if not superior, to the best rifled cannon. The inventor assures us that with it more "hits" in a given time can be made on a target placed at a distance, say of 1,500 or 2,000 yards, than with any other arm.

Such rapidity and continuity of fire must give the performance of this gun the greatest moral effect. Few troops can be found so brave as to contend against such a death-dealing engine of warfare. The use of such an arm must undoubtedly have a tendency to shorten wars and to lessen the number of troops required in service as well as to deter nations from going to war.

The Gatling system is equally well adapted to large or small caliber, which is not the case with other kinds of repeating arms. The projectiles of the largest caliber Gatling gun, like those of field artillery, may be solid shot, shell, or canister. A canister cartridge is shown in Fig. 3, and a solid shot in Fig. 4.

Four sizes of these arms are now being manufactured by Colt's Patent Fire Arms Company, at Hartford, Ct.

The gun is simple in its construction, strong, and durable, and in all respects stands first among the numerous ingenious fire-arms which have been brought into use during the past ten years.

Any further information may be had by addressing "Gatling Gun Co.," at Indianapolis, Ind., or "Colt's Patent Fire Arms Co.," Hartford, Conn.

Blasting on the Pacific Railroad.

In several places, where one side of the road-bed was at grade, the other slope would be in seventy-feet cutting. Royal have been the salutes fired from this escarpment; immense the peaceful execution done. What enjoyment to have been here two months before, in the heat of the battle between intelligent force and mountain cohesion! The powder bill alone for the month of July was $54,000! From five thousand to ten thousand men were employed all the season. The times of firing along the whole cliff were limited to three a day. At those times, an immense broadside cleaved a little of the shell from the grand mountain side, transforming a goat's path to a way for the iron steed. Let me relate one instance of skillful execution. With one drilled hole, eight feet in depth, 1,440 yards of granite were thrown clear from the road-bed. The eight-foot hole was drilled near a fine seam, lightly loaded, and fired. This enlarged the seam, which was lightly loaded, and exploded. This operation was performed carefully, several times, until the seam was widened to a considerable fissure, when an immense load was put in, the fire communicated, and three thousand tuns of granite were torn from their long resting place, making sad havoc with the sturdy pines beneath. I observed one rock, measuring seventy tuns, a third of a mile away from its accustomed place; while another, weighing 240 lbs., was thrown over the hotel at Donner Lake—a distance, certainly, of two thirds of a mile. In fact, the whole valley is covered with drops from these granite showers. As the season here is short, much of the work has been carried on night and day. Here we saw a retaining wall seventy feet in hight; there a tunnel of granite.—*Overland Monthly*.

THERE are no less than 3,642 spoken languages.

WIRE AND TUBE DRAWING.

[By John C. Anderson, C.E., in the Cantor Series of Lectures before the Society of Arts.]

Wire has been used in Europe for more than 400 years. At first it was made by drawing down, in blacksmith fashion, with the hammer upon the anvil. The draw-plate was invented in Germany about 300 years ago, but it was comparatively little used until recent times. Now, the rolling-mill and the draw-bench are combined into one system of manufacture, by means of which the rate and diminished cost of production have developed the trade so enormously as to have led to the use of iron and steel wire for ropes, bridges, fencing, telegraph, and so many other new purposes, that it has at length become a great branch of industry.

Hollow tubes are now manufactured of all sizes, and out of all the ductile metals. This apparently difficult process is accomplished in several ways. With one system it is done by first forming a hole through a short, dumpy piece of metal, either by casting or drilling; into this hole a mandril is inserted, and then the dumpy mass, by means of the drawing process or by rolls, is passed through a succession of holes until it covers the mandril from end to end. This mandril may be a fine wire, or large enough to form the tubes for a steam boiler. A similar process, but substituting rolls for the draw-plate, is mostly employed for the larger sizes. The same or similar principle is frequently employed to make tubes, close at one end, these tubes being of various sizes; in such case the holes are not passed entirely through the mass; the mandril is inserted and is then pushed through the successive holes in the draw-plate, until the metal is extended over the mandril. Sometimes the piece is formed from a disk into a thimble-form, and then put on a mandril to be elongated. There is also an extensive manufacture of iron wire and of iron tubes, both being covered with a thin brass tube, by which means not only beauty but greater strength is obtained at a reduced rate; and for such purposes as these articles are used, viz., picture-rods, hand-rails, shop windows, carpet rods, and such like, the arrangement fulfills the object equal to an entire brass structure. The iron wire or tube is made as before described; the outer brass tube is made in a similar manner, but sufficiently large to admit of its being slipped over the iron. The iron may now be considered as a mandril, and the two are drawn through the draw-plate together, thus fixing the thin brass tube upon the iron, while the whole surface exposed is brass.

The so-called copper wire which is now extensively used by upholsterers for the spring cushions of sofas, beds, and similar purposes, is merely iron wire, which is made in the ordinary manner until just before the last process, when it is immersed in a solution of sulphate of copper for a short time, sufficient to allow a thin film of copper to be deposited on the surface of the iron wire. The iron wire thus covered with copper is now drawn through a draw-plate, by which it is rendered hard and elastic and suitable for a spring, at the same time the dull surface of the deposited copper is made as bright as a new farthing, and serves to protect the wire from oxidation.

There is yet another application of the natural law, which a few years ago would have been reckoned an impossibility—it is the process for drawing conical tubes. Nothing yet said will explain how this can be done. A taper mandril will suggest itself, which, so far, is simple. But the die of varying diameter, how is that to be obtained? For a long time rolls for rolling taper gun-barrels have been in use, in which a succession of tapering grooves are formed, while, by dexterous management, the roller contrives to insert the thick end of the gun barrel at the precise point in the revolving rolls, and thus the gun-barrel is elongated towards the muzzle by means of the narrowing groove in the rolls; bayonet blades are likewise drawn out in the same manner. In the process to which I now refer, for the drawing out of the long tapering brass tubes, an expanding die is used for a draw-plate. This die consists of a ring of block-tin containing a small percentage of copper, to give it a little greater rigidity; this ring is applied at the smaller end of the mandril, and the brass is drawn through the die. By this means two effects are produced, first, the metal is drawn over the mandril to a small extent, and secondly, the die is destroyed, from the extension to which it has been subjected; it is therefore thrown into the melting-pot, to be cast into a new die, and thus by a succession of new dies, the metal is gradually drawn over the steel taper mandril, until it is covered with brass from end to end, when the steel mandril is withdrawn.

There is yet another remarkable process in connection with this natural property, which is taken advantage of in the formation of ornamental twisted tubes of various patterns, such as we see in the gas fittings of churches and other places. To produce such tubes, the brass is first drawn into a plain tube upon a mandril, in the way described; this plain tube is then passed through a succession of revolving blunt screw-tools, having the required form upon their interior surface. In form the tool is arranged as a screw-nut, but not being adapted to cut the metal, and the plain tube being without a mandril, its surface is slightly depressed by the screw pressure, and by a succession of such screw-tools, or nuts, it is finally depressed to the finished ornamental pattern as required.

We sometimes see these ornamental tubes of a diamond screw pattern, where the spiral is crossed by another spiral, uniformly along the entire surface. This is done by means of two sets of screw tools, one set turns to the right hand, the other set to the left hand, and between the two the pattern is formed. This pattern may be of any section, plain, square, octagonal, ribbed, rounded, or otherwise, all depending on two principles; first, the flowing properties of the atoms of the metal, and secondly, the copying arrangement, by which the required pattern is transferred to the tube under operation, thus shifting the relative position of the molecules, yet without cutting the metal.

Referring again to the wire-drawing process, such is the effect produced by the operation that, contrary to what might have been expected, the strength of the wire or steel is greatly increased. In the case of iron of an ultimate strength of 25 tuns per inch, it is increased in strength fully 10 tuns, and some of the best iron, with a strength of 28 tuns, is raised to 40 tuns. The most remarkable change in this respect is in the case of steel music-wire. The mild steel out of which this is made has a strength, when in the natural state, of from 30 to 40 tuns, according to its steeliness, but when tempered mildly, by being made red-hot and then cooled in oil, and elongated into wire, its strength is increased fully three-fold. At the same time, if such steel or even iron wire is made red-hot, so as to allow the natural law to assert itself, all these high conditions vanish, with only one redeeming quality, that the wire then becomes more pliable, and similar in strength to the iron or steel out of which it was made.

The knowledge that this treatment of steel has the effect of increasing its strength and toughness so enormously, has produced fruits in several directions. One of these, bearing on the present subject, is the attempt to draw steel tubes of any length, or section or substance. Throughout the engineering world there are many purposes (indeed wherever motion is involved) for which a strong light material would be extensively applied, provided it could be obtained at a moderate cost. To accomplish this operation, a hole or slit, according to the section required, is first formed in a short thick mass of steel; two dies are employed, the one internally (which remains in use throughout the operation), the other externally (which has to be exchanged for a smaller one at every passage). Then enormous hydraulic pressure is brought to bear in pulling it through the vacant space between the internal and the external dies, thus leaving a portion of the steel behind, which forms a reservoir of steel for the increased length, by future elongating with that which could not pass through at the rate of motion of the apparatus, but to follow suit as it has opportunity, and then, by annealing the mass of steel, and using smaller and smaller external dies in succession, the thick lump becomes gradually elongated into any length of any section, and, if necessary, with the high qualities of the music wire.

With the object of carrying out such a manufacture, a company was recently formed in London, to produce steel tubular forms of any size or section. A variety of remarkable specimens was produced by them which made every engineer's mouth water, and although commercially it has not succeeded (simply because the arrangements of the world were not quite ripe for it), still that, judging by all past experience, does not affect the question any more than the receding wave affects the rising tide. The grand fact remains that it is a possibility, by sufficient pressure and patience, to cause solid steel to flow into any hollow form of section without breaking its continuity; it is a wonderful triumph of mind over matter which cannot be ignored, and which has yet to accomplish most important results in the future history the mechanism of the working world of applied mechanics, and the advantages are so apparent and so numerous that its ultimate success is only a question of time.

My chief object in making the foregoing remarks, is chiefly to show that the natural laws which govern materials and things, are a great lesson to be taught to our young students, before they enter the workships of applied mechanics, and to show that the varied operations of the practical worker are thus intimately blended with the profoundest philosophy, and that the fashioning of matter into the various forms required by our civilization, is not the drudgery to a thinking mind which it is generally considered to be, but that we are fellow-workers in carrying out and taking advantage of the natural laws, as laid down for men by the Grand Designer of the Universe.

VARNISH ROOMS.

From the Hub.

There are few good varnish rooms in this country—very few. Consequently, there are plenty of poor ones, and, for the sake of example, which may illustrate those features of a varnish room which are objectionable and should be avoided, we shall describe a certain poor one which we have in mind, and which we assure our readers is by no means the very worst of its class.

This shop is situated in the outskirts of a city. The varnish room is a small one, in the second story, and directly over the blacksmith's shop, while above it is an unfinished garret in which stock is stored. The room has two windows, which open only at the bottom. One window is shaded by a large elm tree, which is considered very attractive, but as the room is dark and this tree shuts out half the light which would otherwise enter, its shade is very objectionable. The light from the other window is partly obstructed by a series of shelves, upon which are arranged a variety of varnish and japan cans. The ceiling and walls are of rough boards black with age, and here and there pictures have been hung. In the middle of the ceiling newspapers have been tacked up, in order to prevent the passage of dust which rattles down from the cracks between the boards every time any one enters the third story.

It is not difficult to perceive that in such a shop the varnisher must be obliged to labor under many serious disadvantages. In the first place, his room is dark, whereas he needs the best light possible. Not only are the windows too few in number, and partly obstructed, but the walls and ceiling, being dark, cannot reflect and make the most of what light there is. Again, he has no proper ventilation, and this he must have in order to guarantee good work. The windows cannot be opened, for if this were done, an inward draft would be created and dust might be brought in. Even the cracks in the ceiling are rendered useless as ventilators, being covered with piles of lumber. Consequently, if you visit this shop on a warm summer day, you will find this room as hot as an oven, and the air so drenched with the moisture which comes from the rapid evaporation of the water upon the floor that it is difficult to see across the room. Every painter knows the effect produced upon varnish by a moist, muggy day; then who can expect that varnish will do its best in such an atmosphere as we have described. In the third place, the work in this shop is never safe from dust, for the walls and the ceiling being rough, they will hold a great amount of dust suspended, and this is liable to sprinkle down upon the fresh varnish whenever any jarring is caused by the workmen below, or by heavy teams, or even by the movement of the door, when the varnisher leaves the room at night. His work is therefore in constant danger of being spoiled in this way. If, under all these disadvantages, a varnisher is able to turn out perfect jobs even occasionally, he may be considered as eminently fortunate as well as skillful, and he cannot justly be blamed for frequent bad jobs.

As we have already mentioned, the shop which we have described is by no means the worst of its class, but is one that is looked upon by its owner as a "very comfortable sort of a place," and as we once heard him remark—"Anybody who can't dew good worruk in that 'ere shop, better jest go and try it with my gran'ther, who allus did all his varnishing in the back yard. That 'ere shop is where I done all my varnishing when I was a young 'un, and if there's anybody can do betterer varnishing than me in 1840, I'd just like to look at him."

In past times it seems to have been the policy to set apart, for varnishing, the odd room which couldn't be used for anything else; whereas, the varnisher ought to have first choice, and should have the best situated and the best fitted room in the building. The varnish room should be the "parlor" of the factory, for it is there that the most delicate part of the operation is performed. In some new shops we are glad to say that some improvement may be noticed in this respect, but still there are very few that approach perfection.

In conclusion, we shall briefly mention the several requirements of what we consider a model varnish room. These requirements refer to the railroad shop as well as the carriage shop, but more particularly to the latter, because the class of work is nicer, and also for the reason that in the carriage factory we find the faults are generally more serious. The paint room in a car shop must of necessity be roomy, and this will help ventilation, and the light is generally good.

1st. Every varnish room should have the best degree of light that is possible. A corner room with plenty of windows, is therefore to be preferred; and, if situated in the upper story, skylights will aid very considerably. The ceiling and walls should be white and smooth, as they will then reflect the rays and greatly increase the degree of light. Rays of sunlight must not be allowed to fall directly upon work, and each window should therefore be provided with a white curtain, which can be drawn when necessary.

2d. The varnish room should have a perfectly arranged system of ventilation. The windows should all be made to open at the top, and one or more of them ought constantly to be opened for an inch or two. If the room is in the upper story, as is usually the best situation for the varnish room, skylights will be found to give the best ventilation.

3d. Every precaution should be used to prevent the presence of dust. In the first place, the walls and ceiling should be finished smooth, so that dust cannot find place to lodge. Plaster, with hard finish, gives the smoothest surface, and we would advise its use in all new shops. When finished with wood, the boards should be planed and matched, and a coat of varnish or permanent wood filling added. In old shops, finished roughly, it is well to tack sheets of brown paper over the ceiling. In the second place, no shelves, cans, clothes, or pictures, should be allowed in the varnish room, as they are all liable to hold dust. The varnish room should be a perfect void—bounded by six blank smooth surfaces Then let the room be carefully dusted, swept, and sprinkled, and two or three hours afterwards the carriage may be wheeled in lightly, and the work of varnishing can be commenced with some confidence. Some varnishers have a silk suit to slip on before entering the varnishing room. This is a good plan, as they thus avoid carrying in much dust which would be likely to cling to their ordinary clothes. Thirdly, no one except the varnisher should be allowed to enter the varnish room. It should be the "*sanctum sanctorum*" of the factory.

4th. An even degree of temperature should be maintained. For this reason, it will be seen that the best situation for the varnish room is in the northern end of the building or in the northeast corner, for there the sun will not lie in during the day and raise the temperature. Steam is the best method of heating the varnish room. When this cannot be employed, care should be taken to select a good stove, that does not require constant attention, and this should be placed near an aperture in the wall, in such manner that it may be fired from the adjoining room, and furthermore, it should be inclosed in a tin or sheet-iron casing, made conical at the top, and this will prevent any dust from arising when the fire is replenished, or the ashes shaken down. The degrees of heat

which are best adapted for varnishing range from sixty degrees Fahrenheit to about seventy-five degrees, and are about the same that make the room seem comfortable to the varnisher. A good thermometer should be hung up, and great care should be taken that an even temperature is maintained during working hours, and until the varnish "s ts." If possible, the heat should be preserved throughout the night.

THE BERLIN HEATING GASWORKS.

From Engineering.

During the past five years gas heated furnaces of various kinds have come into extensive use in a large number of important works both in this country and abroad, and everywhere the great cleanliness and convenience attendant upon the employment of gaseous fuel have won for it a good name even under circumstances where its economy alone would not have been sufficient to do so. Gas heated furnaces, in fact, bear much the same relative position to ordinary furnaces using solid fuel that a gas light does to a lamp or candles; and it is probable that ultimately the gaseous will supplant the solid fuel as universally for heating as it now does for lighting purposes. Under present circumstances, however, there are certain practical difficulties in the way of of applying gaseous fuel universally to heating purposes. Ordinary coal gas, as supplied from the gas works, is too dear to be extensively used as fuel, while gas producers, such as are used by Mr. Siemens in connexion with his well known regenerative furnaces, do not work well on a small scale, and, in fact, do not give the best results unless they are worked in groups of, say, four or more; and it thus follows that where merely a small supply of heating gas is required they could not be satisfactorily adopted.

This being the state of affairs, it appears to us that what is wanted is a supply of cheap gas specially intended for heating purposes; and we are glad to see that the subject has attracted attention on the Continent, and that plans have been already brought forward for furnishing such a supply to the city of Berlin. The "Berlin Heating Gasworks" Company as it is named, proposes to establish works at Fuerstenwalde, a town distant about thirty miles from Berlin, where there are extensive mines of lignite, this latter being the material from which it is intended to manufacture the gas. At Fuerstenwalde it is proposed to erect twelve retort houses, each 165 ft. long by 62 ft. wide, these houses containing seventy retort furnaces with ten retorts in each. The retort furnaces are to be heated on Mr. Siemens' regenerative system, three gas producers being provided for each furnace; and the arrangements are to be such that the lignite may be tipped direct into the retorts from the wagons in which it comes from the mines. From the retorts the gas is to be conducted to the condensers, where any unconverted tar, water, or other condensable matters will be separated, and it is then to pass to the blowing engines by which it will be forced through a 4 ft. main to Berlin.

The blowing engines are to be four in number, and each is to have a 5 ft. 9 in. steam cylinder, and 7 ft. 7½ in. blowing cylinder, the stroke in each case being 6 ft. These engines are rated at 360-horse power each, but they are to be capable of being worked up to 500-horse power each in case the extension of the works should render it requisite. The blowing engines are to force the gas into the main under a pressure equal to 16 ft. head of water, or about 7 lb. per square inch, it being considered that this comparatively high pressure will by enabling a smaller main to be used, in the long run give more advantageous results than larger pipes and less powerful engines.

The main leading to Berlin is, as we have stated, to be 4 ft. in diameter, and it is to be constructed of ½ in. wrought-iron plates, and is to be carried above ground, being supported on piers of masonry placed at convenient intervals. This arrangement will give perfect facilities for examination and repair, and it is considered that, under the circumstances, it will be found preferable to burying the main below ground. Provision will, of course be made for the expansion and contraction due to changes of temperature. It is calculated that this 4 ft. main will, under a pressure equal to 16 ft. of water, pass 407 cubic feet of gas per second; while, if the pressure is increased to one atmosphere, the conveying power of the tube will be increased to 584 cubic feet per second, the actual weight of gas passed through per second under these latter circumstances being, of course, nearly three times as great as that flowing through in the former instance. At Berlin the gas is to be received in twelve gas-holders, each 154 ft. in diameter, 40 ft. high, and having a capacity of about 720,000 cubic feet each; and from these holders it is to be distributed by pipes to the various parts of the city in the same manner as gas for lighting purposes.

From experiments which have been made at the laboratory of Dr. O. Ziurek, the consulting chemist to the Berlin Board of Health, it is stated that it has been determined that there can be produced from lignite, by a simple process, a gas mixture well suited for heating purposes. The specific gravity of this gas mixture is 0·5451 (that of air being taken as the unit), and its chemical composition is given as follows:

Hydrogen	42·36
Carbonic oxide,	40·00
Marsh gas	11·37
Nitrogen	3·17
Carbonic acid	2·01
Condensable hydrocarbons	1·09
	100·00

The proportions of carbonic acid and nitrogen are, it will be seen, extremely small, and if this chemical composition can be maintained in regular practice, the gas mixture will certainly possess very high heating power, although for lighting purposes it would possess but very little value. Experiments have, in fact, shown that 3,000 cubic feet of this gas mixture are equal in heating power to one Prussian tonne (2 200 lbs.) of lignite, or one-third of a tonne of pit coal. It is proposed to supply the gas at Berlin at the price of 6d. per 1000 cubic feet, and supposing the results of the above-mentioned experiments to be practically correct, the heating power of a tonne of pit-coal will thus be supplied for 4s. 6d., a cost which is certainly low.

With the arrangements for consuming the gas, the Berlin Gas Heating Works Company propose to have nothing whatever to do, it being their intention to merely supply the gas by meter at the price we have named, leaving the purchasers to do what they like with it. The annual supply which the works are laid out for manufacturing, in the first instance, is about 9,500,000,000 cubic feet, or about 2,627,000 per day, and it is estimated that this quantity would provide sufficient fuel for domestic purposes for about half Berlin, or about 8,000 houses.

Whether or not the Berlin Heating Gasworks will prove a commercial success—and we really see no reason why they should not—they will certainly be regarded with great interest as the first really practical attempt to make gaseous fuel available for domestic purposes. That gaseous fuel will, when once its proper management is understood, be as generally appreciated as coal gas for lighting purposes now is, we have little doubt; and although at first there will be many prejudices to overcome, yet we fully expect that one of these days we shall regard cheap gas for heating purposes as a domestic necessity.

The British Ironclad, "Glatton."

The London *Artizan* says: "This turret ship which is in course of construction at Chatham Dockyard will be the most powerful ship, for offensive and defensive purposes yet built. The *Glatton* is being constructed from the designs of Mr. E. J. Reed, C. B., and the utmost exertions are being used to have her completed as early as possible in the ensuing year. From the circumstance of the *Glatton* being the first vessel built by the Admiralty on the pure turret principle, with an exceedingly low freeboard, more than the usual amount of interest is taken in her construction. She will be constructed with a single turret, in which will be placed a couple of 25-tun guns. The thickness of the armor plating on her sides will be no less than 12 inches above the water line, and the remainder 10 inches in thickness, worked to a teak backing of 20 inches. The inner skin plating to which the timber backing is attached consists of two thicknesses, each one inch thick, laid on the usual iron frames 10 inches deep, placed two feet apart. The total thickness of the iron and teak of the *Glatton's* sides will thus be 3 feet 8 inches. The armor plates on the turret will be 14 inches in thickness in the most exposed parts, and 12 inches thick in the remainder, worked on a backing of teak of 15 inches, with two thicknesses of skin ¾ inch each. The entire base of the turret is inclosed by a breastwork carried to a hight of 6 feet 6 inches above the deck, the whole being covered with armor-plating 12 inches in thickness, laid on a backing of teak 18 inches thick. The turret guns will fire over the breastwork, the *Glatton* when in action having a freeboard of only two feet, measured to the deck, the turret guns being exactly 11 feet 6 inches above the water line. This arrangement of breastwork possesses the advantages of raising the turret to a convenient hight, whilst at the same time it affords great protection to the lower part of the funnel, hatchways, and other necessary openings from the deck. The arrangement for the turret are such that the 600-pounder guns will command a fire round the bows, to within about twenty degrees of the fore and aft line on each side; while a single gun can be trained and fired from this line round to a right aft fire on each side. On the top of the breastwork the plating is 1½ inch thick, and on the deck outside the breastwork 3 inches thick. When not in action her mean draft of water, forward and aft, will be 19 feet, but she can be submerged to any depth by means of water ballast, pumped into tanks specially fitted for this purpose. At her 19 feet draft her deck will be only 3 feet above the water, her armor extending 4 feet below and 2 feet 6 inches above the water, a 6-inch oak deck covering the upper edge of armor. Above the breastwork will be fitted a flying bridge, from which on all ordinary occasions the ship will be conned; in action, however, an armor-plated conning tower, specially fitted for this purpose, will be used. Stowage accommodation is provided for 250 tuns of coal in her ordinary bunkers, but this quantity can be increased to between 500 and 600 tuns by using the water ballast tanks for stowing the coals. She is to be fitted with engines of 500-horse power nominal, capable of working up to 3,000-horse power actual, and her estimated speed will be from 9½ knots to 10 knots per hour."

French Forgeries.

When photography became established as a practical art, it was found that bank notes printed with black ink lent themselves too readily to the machinations of the forger. Thereupon, the Bank of France determined to employ blue ink, which baffles the photographic imitator, and to have some engraved device or other on both surfaces. This plan has been completely successful. In regard to other modes of falsification, an experienced chemist is constantly employed in studying all new discoveries that may perchance be brought into requisition, in order to devise means of averting roguery. Forgery of the notes is now extremely rare. On one occasion, three persons attached to a deposed royal prince were found to have been concerned in a deep-laid scheme of note forgery; a packet containing twelve false notes of one thousand francs each was presented to be cashed, but the fraud was detected in time to avert loss. About 1853, a more determined attempt upon the bank was made. False one hundred franc notes came to the bank with great rapidity and regularity. They were so admirably executed that no banker, money-changer, or trader, could detect the fraud, and therefore no reason presented itself for refusing to take them in the ordinary way of trade. The experts at the bank alone detected them by means of a tiny black spot near the figure of Mercury. For eight years continuously did these notes make their appearance, defying all endeavors on the part of the authorities to discover the malefactors. The bank did not like to make the fraud known, lest it should shake the confidence of the public in the one hundred franc notes generally. At last the clever scoundrel was discovered; he was an engraver, and it was found that he had successfully put into circulation false notes to the value of nearly two hundred thousand francs. His end was strange and horrible. Transported to Cayenne in 1862, he tried to escape into the Dutch settlements; faint and exhausted, he became fast embedded in the thick slimy mud of a river, and was there *eaten alive by crabs!*

Interesting Discoveries in Canada.

During the summer just closed good work appears to have been done by the Geological Survey in the Lake Superior region. Professor Bell's party have all returned to their winter quarters, after having experienced many of the hardships and privations incident to the life of the first explorers in the distant wilderness. We understand that the results of the expedition include a complete topographical and geological survey of Lake Nipigon, and an exploration of much of the surrounding country. This lake, it appears, will rank, in point of size, with the other great lakes of the St. Lawrence, forming the sixth and last in the chain. Professor Bell has not yet been able to map the whole of his extensive survey, but thinks the area of Lake Nipigon will be found to exceed that of Lake Ontario, or even Lake Erie—some 500 miles or more of coast line having been traversed. This great lake is drained by the Nipigon river, or upward continuation of the St. Lawrence, beyond Lake Superior, which is described as a very large clear-water stream, about thirty miles in length. Upward of a dozen rivers, of considerable size, are reported to empty into Lake Nipigon from all sides. We understand that one of the most singular features in the geography of this beautiful lake, is the immense quantity of islands which are scattered throughout its whole extent, and presenting a great variety in size, form, and elevation. It appears that geological discoveries of a highly interesting and important nature have been made, and that, contrary to common belief, a large extent of level land, with deep and fertile soil, exists in the Nipigon country. Professor Bell had received instructions, in addition to his geological explorations, to obtain as much information as possible in regard to a route to our great Western territory, and his discoveries in this direction, are, perhaps, not the least important of the results of the expedition. If we are not mistaken, he has found that this country, so far from being a difficult one, offers great facilities for railway construction. Further, he has, we believe, ascertained that the elevation of Lake Nipigon above Lake Superior is very moderate, and, consequently, this lake may be found useful for the purpose of navigation in the desired direction. —*Toronto Globe.*

Hager's Rules on Treatment of Platinum Vessels.

Every beginner in chemical analysis, must learn that, though little effected by acids and other powerful agents, except its solvents, platinum may be injured or destroyed by many other articles which hardly ever effect glass or porcelain. Platinum vessels, such as crucibles, dishes, wire, and rods, are at no time to be brought into contact with, or used for fusing either of the following:

I. Alkaline or alkaline earth sulphides, or their sulphates when liable to be reduced to sulphides.

II. Nitro-muriatic acid, or anything which might evolve free chlorine, iodine, bromine, sulphur, selenium.

III. Those processes in which silica is separated at a high temperature.

IV. Fusion, and heating of the caustic alkalies and alkaline earths, as well as their nitrates, and all the salts of lithia.

V. Fusion, or reduction from their oxides, of the fusible metals, like lead, bismuth, cadmium, tin, as also of the oxides of nickel, copper, etc., which give off oxygen at high temperatures.

VI. Heating or fusion of phosphoric acid and acid phosphates with carbonaceous matter or other deoxidizers.

VII. Evaporation or calcination of readily decomposable chlorides, *e. g.*, sesquichloride of iron, etc.

VIII. Fusion of iodides and bromides.—*Chemist and Druggist.*

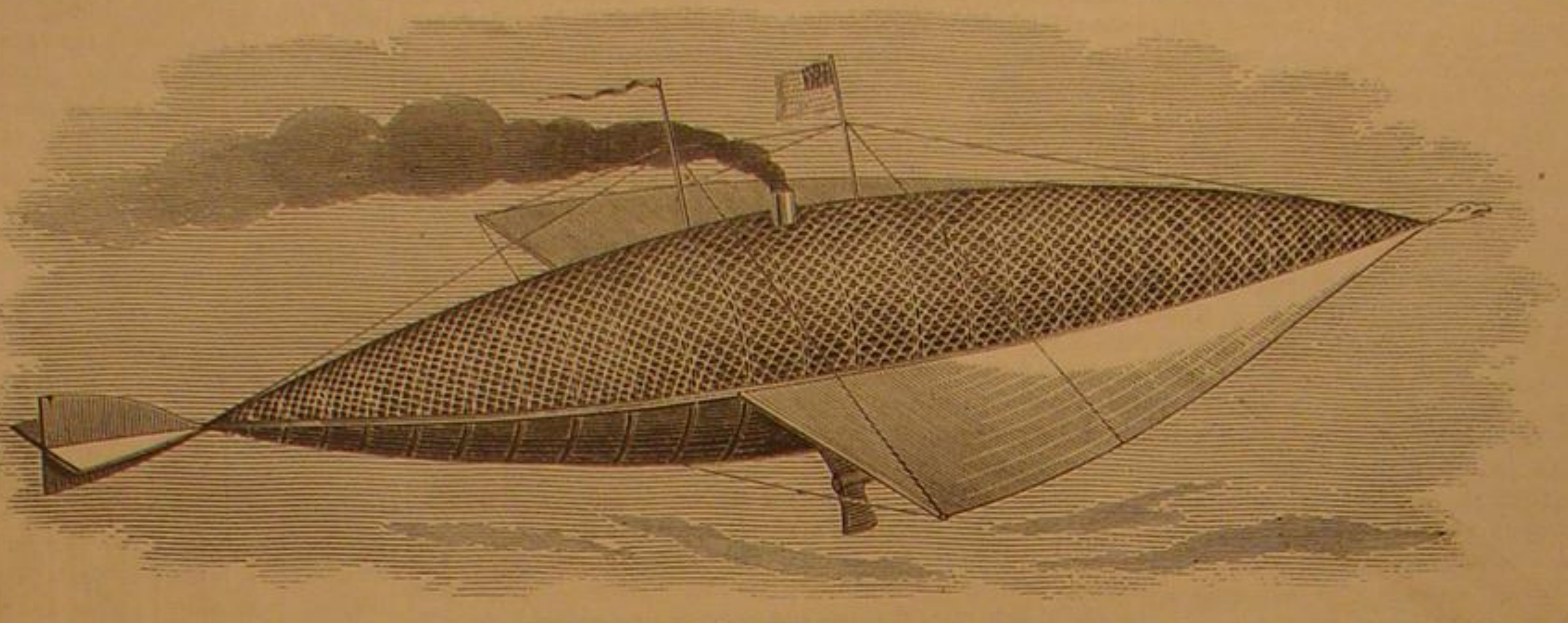
ONE of the most extraordinary passages ever undertaken and performed has recently been accomplished by the steamer Helen Brooks. On the 5th day of August, 1869, the steamer Helen Brooks left Baltimore, Md., for Bayou Teche, La. She left Baltimore by way of the Chesapeake Bay, and passed through the State of Delaware by canal; up Delaware river to Trenton, N. J.; through the State of New Jersey by canal; down Raritan river to New York city; up Hudson river to Troy; through the State of New York by the Erie canal to Buffalo; thence by way of Lake Erie to Chicago; down through the Illinois canal to the Illinois river, and thence down the Mississippi river, arriving at Napoleon, Ark., on Thursday morning, October 14, after a circuitous journey of over 3,000 miles.

AERIAL NAVIGATION.

NUMBER FOUR.

Subsequent to the experiments of Mr. Porter, Dr. S. P. Andrews, of Perth Amboy, N. J., a gentleman well known in scientific associations, and of high reputation as a successful inventor, devoted much time and money to the subject of aerial navigation, and with partial success.

Having been early acquainted with scientific principles, and had extensive experience in mechanics, his projected enterprise gained much confidence with many intelligent men, who supposed him to be more competent to accomplish this long desired scientific improvement than any other man; and this confidence in his ultimate success yet remains, in the minds of many, unimpaired. But to give our readers a chance to judge for themselves, we shall give a general description of his ingenious arrangement. The float or buoyant supporter consists of three cylindroids——cylindrical three fourths of their lengths, but tapering to points at the end. These are placed side by side, horizontally, and connected to each other three fourths of their length, which is 100 feet, and the diameter of each cylindroid is 20 feet. The contents of the united three, when inflated, is 80,070 cubic feet, and their buoyant power 5,720 lbs. This combination float is furnished with an efficient rudder for steering. About thirty feet below this combined float, an open basket saloon, sixteen feet long, is suspended by a large number of wires or cords; and within the saloon is a longitudinal rail track, upon which is a car freighted with ballast, and so connected to a crank windlass, and a pulley at each end of the saloon, that the car may be readily moved from one end to the other, though its natural position is on the center, which is a little lower than the ends of the track. When the car is brought to the rear end of the saloon, the float is thereby made to incline from ten to twenty degrees; so that when a small quantity of the ballast is discharged, the float will rise; and its upper surface, presenting about 6,000 square feet to the air above, it will naturally shoot forward, on the principle of the sails of a ship, with a side breeze. And when it has attained a sufficient altitude, the car is moved forward, which has the effect to reverse the inclination of the triple float; and by letting off a portion of the gas, the float will immediately commence descending, and, by its reversed inclination, will continue its forward motion. The ballast may be replenished as often as the saloon descends to the earth; and a supply of densely compressed hydrogen gas may be carried, whereby the float may also be replenished. Dr. Andrews has probably other improvements and facilities projected, which will be developed in the future. This machine made one ascent, some time ago, but, for reasons best known to the inventor, it did not travel far; and whether he intends to give it another trial, we are not informed. Such experiments are expensive, and the enterprising projectors are entitled to the respectful consideration of the public.



MARIOTT'S "AVITOR" AIR SHIP.

On the second of July last an exhibition of a flying machine, named by its inventor, Mr. Frederick Mariott, "The Avitor," took place in a large room of the Avitor Works, at Shell Mound Lake, Cal. We give herewith an illustration of this machine. The hopes which were first raised by the success of the experiment as performed under cover, have been since dashed by unsuccessful attempts to navigate the machine against currents of wind.

This was only a trial machine, the balloon being cigar-shaped, thirty-seven feet in length, and eleven feet from bottom to top, measured at the middle of the apparatus. Lengthwise around this balloon or float was a light frame-work made of wire, wood, and cane, and on both sides of this frame were attached wings, as shown in the engraving. A complete description of this machine was published on page 75, current volume of the Scientific American. The machine, as we have stated, operated quite well when shielded from the influence of winds.

But it is not enough that a machine should fly in a closed room or in still air. It must be equal to stemming very strong currents, and until this is accomplished air navigation can never be a practical success.

Manufacture of Optical Glass.

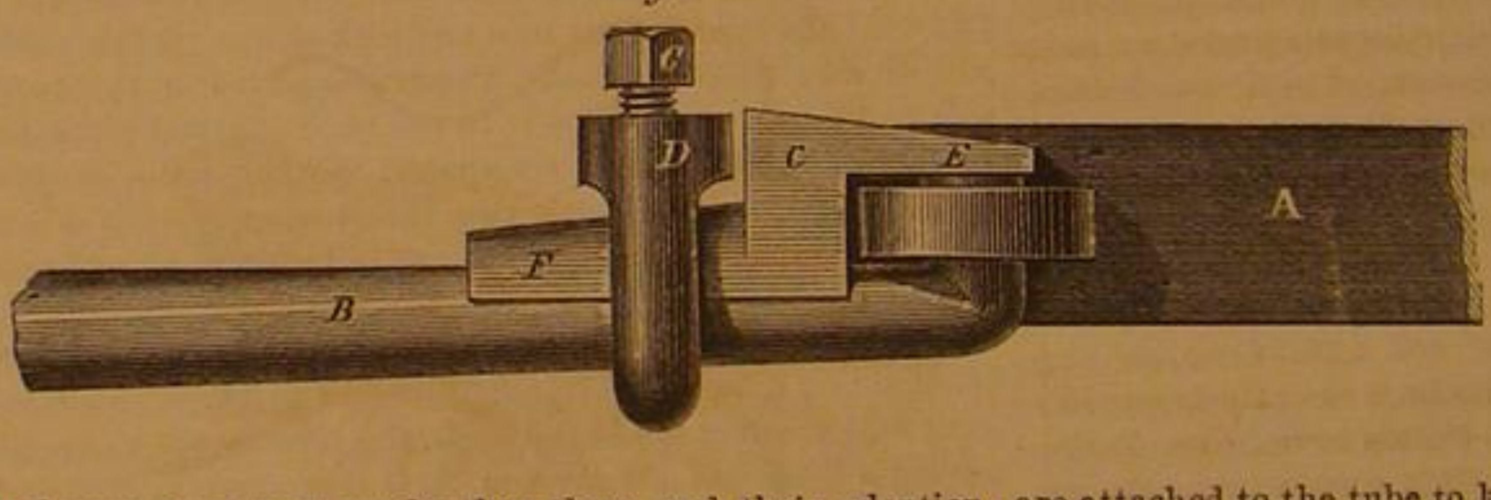
The materials are fused in the furnace; and when nearly ready for working are stirred about with cold iron rods to break the cords and lessen the cloudiness. Sometimes the metal is ladled all from the cruibles, and thrown into cold water. This stirring and ladling has the effect of breaking the strica. It is then closed up in the crucible again until it is perfectly fused in the ordinary manner, but is not worked out—as is the case at Whitefriars Glass Works—for working either with the glass-maker's rods or the iron ladle renders it worse. When a large crucible is declared to be perfectly ready, it is allowed to cool until the whole mass is one solid piece of ordinary glass, weighing about twelve or sixteen hundredweight. This mass is sure to crack up into large boulders, and from these pieces are selected those which are to be made into lenses; they are placed in large clay molds made of the best fine clay. When a piece has been selected of sufficient hight and size, it is put into a mold of the required dimensions, and then gradually re-heated until the glass has melted exactly the shape of the mold. Then, when it is sufficiently annealed, it is polished by the glass cutter in the regular manner.

Other kinds of glass are made for optical purposes by being blown with the iron tube of the glass maker, as other things are blown, such, for instance, as glass for magnifying purposes. The glass is ladled from the crucible, then taken from the ladle on the end of the iron tube, and blown of an uniform thickness, exactly the shape of a lady's muff. When annealed it is cut up one side with a diamond, and then exposed to considerable heat. When the heat causes the glass to open where the diamond cut it, as it gradually opens it is laid on a flat surface, and spread out into a large square of thick optical glass. It is again annealed, and polished to the required magnifying power. It will be easily seen from all these processes that fine optical glass must necessarily be very expensive.—*English Mechanic.*

WOOD'S HARVESTER PITMAN CONNECTION.

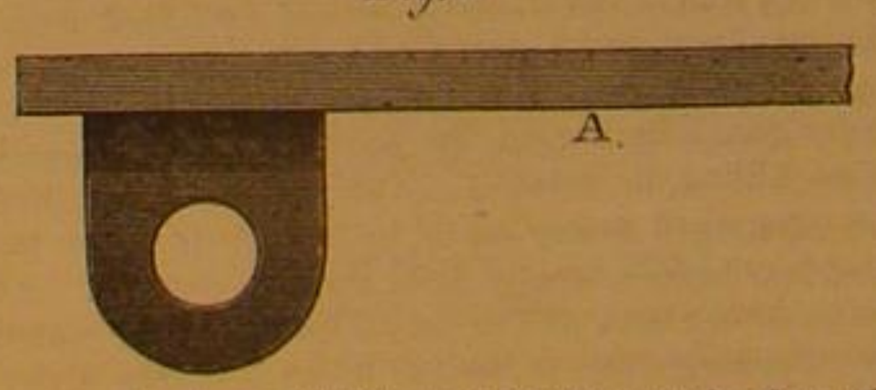
Our readers need not be told that any real improvement upon mowing or harvesting machines is important and valuable. No class of machines ever invented has perhaps produced more important results than these, and their adoption has become so universal, that it is almost as difficult to find a large farm unsupplied with one of them, as it would be to find one without a plow or a harrow.

Fig. 1



Much attention has therefore been latterly turned to the perfecting of details, which shall add to their durability, convenience, and utility.

Fig. 2



The invention herewith illustrated is the result of an effort of this kind.

It is obvious that any play on the pin which connects the pitman of a harvester to the sickle-bar must produce a blow at each reverse motion of the bar, the force of which will be in proportion to the amount of play permitted. This blow commonly called "end-shake," is productive of a disagreeable noise, and adds to the wear upon the working parts, not only of the pitman and sickle bar, but of the gearing which drives them. It is the object of this invention to obviate these evils by a simple and easily applied device, which may be employed in any of the machines now in use, and the expense of which is a mere trifle in comparison to its usefulness.

Fig. 3

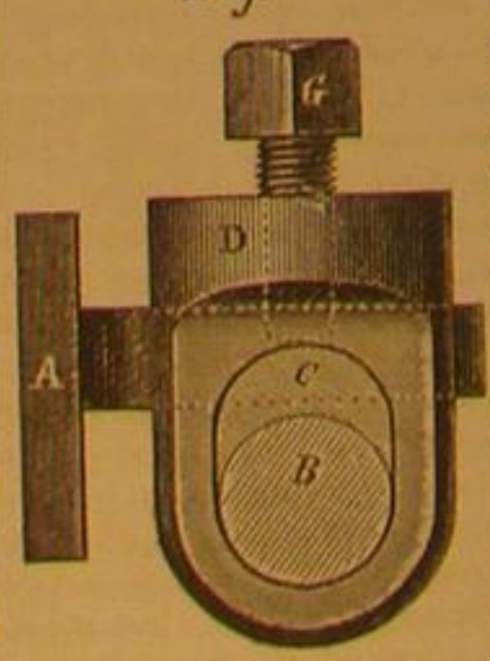


Fig. 1 shows a portion of a pitman and sickle bar connected together, and having this improvement attached. Fig. 2 is a sectional elevation of the same, and Fig. 3 an elevation of the eye and a portion of the sickle-bar. A, in each of the engravings, is the sickle-bar, and B, Figs 1 and 3, is the pitman, both of which are constructed in the usual manner. C and D, Figs. 1 and 3, are the parts of this improvement. C, Fig. 1, has two arms, E and F, placed longitudinally to the sickle-bar and pitman. F is concave on the inner side to fit the pitman, and its outer surface is convex to fit the collar, G, Fig. 3. E has its inner surface flat to fit against the connecting pin.

The collar, D, Figs. 1 and 3, is placed over the pitman, B, and held firmly by the set-screw G. The flat face of the body of the piece C, may, by this means be brought up flush to the eye of the sickle-bar, and the wear of both pin and eye, be taken up as often as needful. The body of the piece, C, also receives a portion of the wear, and thus relieves the pin and adds to its durability.

The attachment and adjustment of this improvement can be made with the utmost facility, and by the use of the wrench only.

Patented through the Scientific American Patent Agency, October 5,1869, by Rufus C. Wood, of Le Roy, Kansas, who may be addressed for rights or other information.

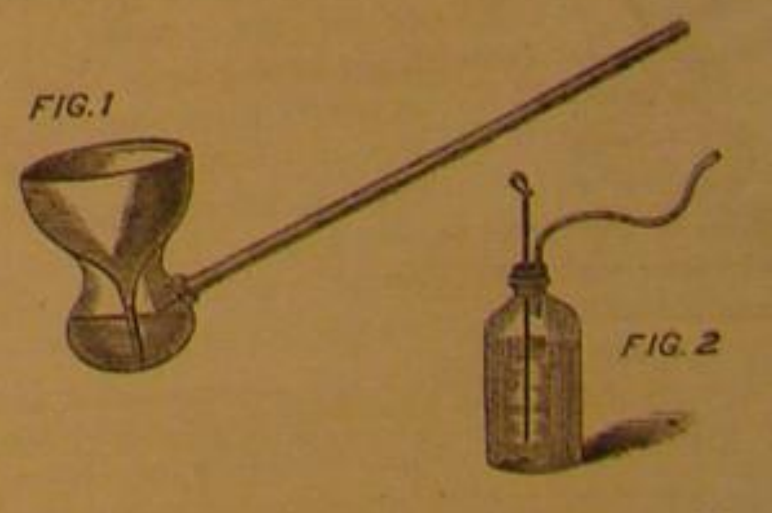
Pneumatic Tubes.

The pneumatic tube which has been erected by the Union Telegraph Co., connecting the offices of that company with the Chamber of Commerce in this city, is found to be extremely useful. The following is a brief description of it: The tube extends from the Merchants' Insurance Company's building diagonally across La Salle and Washington streets, to the Board of Trade hall, sufficient apertures having been cut through the thick stone walls of both buildings to admit the pipe or tube. This is of heavy brass, three inches in diameter inside, and one hundred and thirty-five feet in length. It is in sections which are fastened together at the joints and padded with rubber so as to render the tube air-tight. The process of transmitting the messages is simple. They are placed in a leather cup, of the shape of a dice-box, and made to fit the tube. By means of an ordinary bellows placed in the operating room, the cup can be forced over into the Board of Trade hall with great rapidity by the pressure of air. The suction of the bellows brings the cup back. The tube is supported by a tightly stretched cable of galvanized wire which extends between the roofs of the two buildings, and from which iron guys are attached to the tube to keep it in its place.

The construction and placing of the tube was a difficult matter. A small inclosure is constructed in the Board of Trade hall, where messages are sent, received, recorded, and dispatched across to the telegraph office for transmission, and where also messages for members are received almost instantaneously from the office. Messengers are on 'Change to deliver dispatches to members. The cost of the enterprise is between $3,500 and $4,000.—*Chicago Journal of Commerce.*

THE TURKISH HOOKAH.

This luxurious pipe of the Orientals is simple in construction, though often made of the most expensive materials. It is, however, generally composed of a red-clay bowl and a cherry stick stem. It washes the smoke precisely as gases are washed in the chemical laboratory, by passing them through water. It not only washes but condenses a great portion of the essential oil which would otherwise pass into the mouth



with the smoke. This oil contains nicotine, a deadly poison, and the active principle of tobacco; therefore the use of pipes of this kind is not so injurious as that of ordinary pipes. Its operation is as follows: The upper part of the bowl contains the tobacco, and a tube runs from it into the lower part, which is half filled with water. When the air is exhausted by "drawing" through the pipe, the smoke rushes down the tube and escapes through the water.

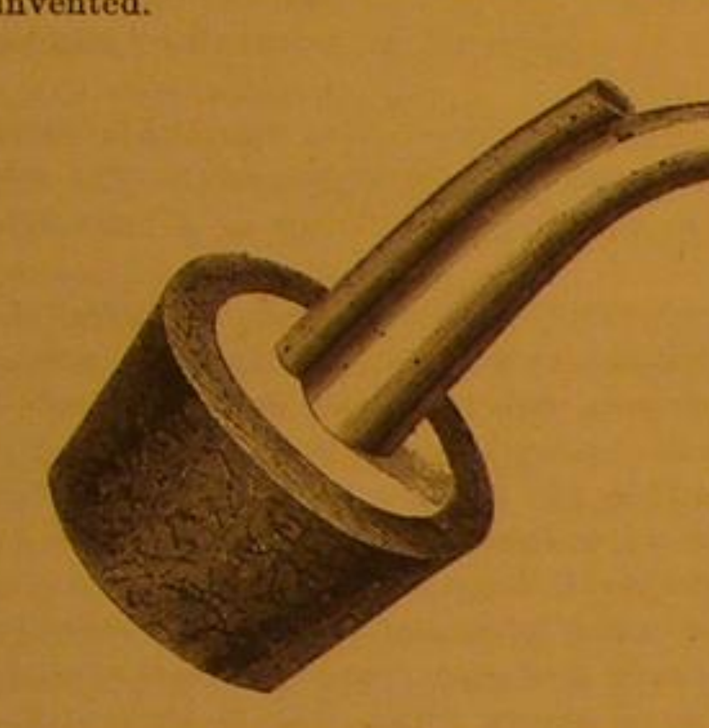
The velocity of light is so enormous, about 185,000 miles per second, that it can readily be imagined that any motion which we can experimentally produce in a source of light is at rest in comparison.

PRATT'S PATENT VENT STOPPER.

Within the past six or eight years, the great improvements made in the use of tin plate in the manufacture of cans, and every variety of articles for domestic use, have excited the wonder of all who have not made themselves familiar with this subject. The enormous consumption of cans for different purposes, has led to many patented improvements tending to reduce their cost, or to add to their utility and convenience.

The constantly increasing price of oak timber for staves, and the difficulty of obtaining such as are suitable for the secure transportation of oils and other penetrating fluids, render the substitution of cans almost a necessity. Nature has given us an unfailing supply of iron, the basis of tin plate, and the cost of the latter, notwithstanding the large duty upon it, has become so low, that with the advantages of improved machinery, and the economy of a well organized business, packages for the transportation of oils, can be furnished at almost the same price in proportion to capacity as well-seasoned barrels. For these reasons, together with freedom from leakage, and the avoidance of danger and loss by spilling, or changing of goods from barrels or casks by the dealer or retailer, it has now become a universally acknowledged fact that it is cheaper to buy oil, spirits of turpentine, etc., in such cans, than in barrels.

Among the many candidates for public favor in this line, "Pratt's Guaranty Patent Can," of which we give herewith an engraving, has gained an enviable reputation, and is probably as perfect a device for the purpose designed as has ever been invented.

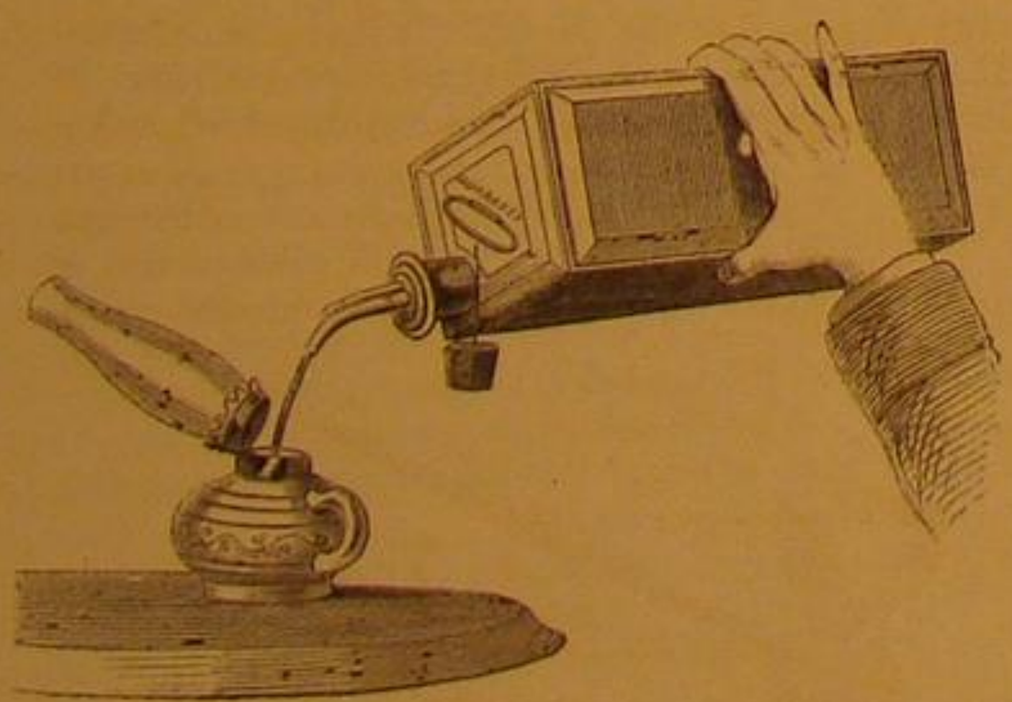


From the extended use of these cans a necessity has arisen for some simple and cheap means for overcoming the difficulty, which has been experienced in emptying cans and small vessels without spilling some of the contents, resulting principally from the fact that there was no vent or conduit for admission of the air to the can, while the liquid was being poured out. To remedy this difficulty, vent-nozzles or other like devices have hitherto been used with cans or vessels; but such appliances have always been costly, and their use has been attended with inconvenience, while they require cans of special construction, and indeed, are permanently united with and form parts of the cans.

A device of this kind, however, has been recently invented and patented by Charles Pratt, 108 Fulton street, New York city, which is worthy of attention. It is simple in construction, can be easily and cheaply made, may be readily removed from or applied to the can, and used with any can of ordinary or suitable construction, and may be manufactured and sold as a distinct article, not necessarily accompanying the can.

The invention consists of a stopper, also shown in the engravings, for oil cans, or other liquid-holding vessels (for whatever use), provided with an opening or spout for the outflow of the liquid, in combination with a vent for the ingress of the air.

The manner in which this device can be constructed and used will be readily understood by reference to the drawings.



The body of the stopper, which is here represented as composed of cork (but which may be made of any other suitable material), carries a tube or spout for the outflow of the liquid, and another and smaller tube to act as a vent. The two tubes pass down through the body of the stopper and open into the interior of the vessel, the smaller, or vent-tube, being arranged upon one side of, and so as to follow the curve of the larger tube, so that when the vessel is tipped to pour the liquid, the larger tube will be beneath, by which arrangement the oil or fluid will flow only through its proper channel, the larger tube, or spout, leaving the smaller tube or vent free for the passage of the air.

The tubes are fastened to the cork by means of metal disks, which are soldered to the tubes at such a distance apart as to compress the body of the cork between them, the turned-up edges of the disks entering the cork and holding it tight. As already stated the device may be formed of cork or of any other suitable material capable of closing the orifice in the can, it may also be of metal and can be screwed into or upon the neck of the can.

In any event, however, a detachable stopper will be obtained, in which the spout or opening for outflow is combined with a vent; and this device can be applied to any can, vessel, or receptacle for liquids, whatever its shape or size, provided that such receptacle be provided with a neck or mouth, into which the stopper can be fitted.

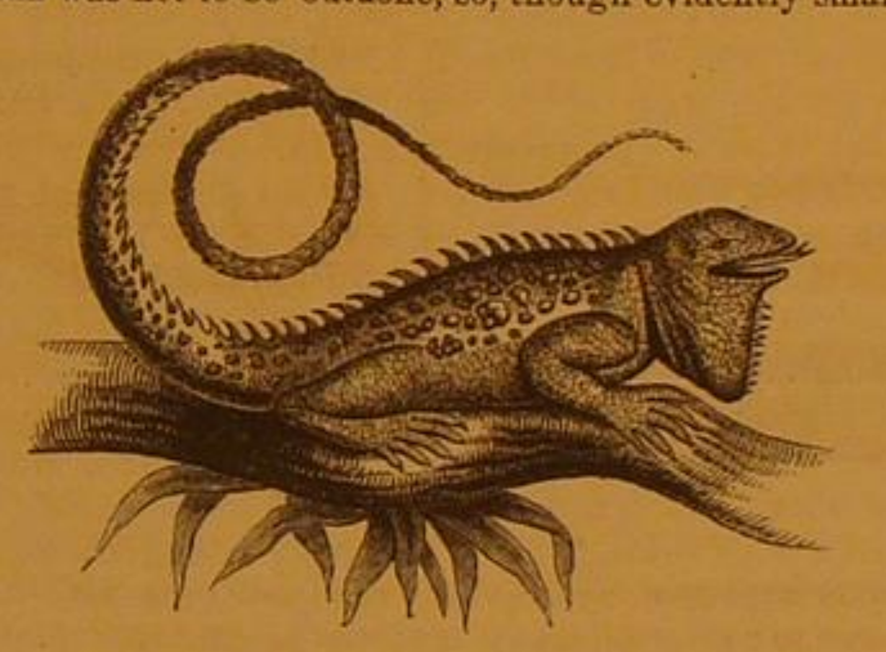
For the Scientific American.

IGUANAS.

Iguanas, or guanas, are a genus of lizards, one species of which is known to zoologists as the *Iguana tuberculata*. They are of a bright, green color when young, that hue changing to a dusky brown as the reptile advances in age. According to Webster, the term, Iguana, is derived from the Spanish name given to the animal by the natives of Haiti, in which island the iguana abounds. They are found also in the other West India islands and in some parts of South America. The size of these creatures varies from that of the common lizard, or nuto, to over four feet in length from the nose to the end of the tail. The head is similar in shape to that of an ordinary lizard, and is covered with a scaly armor of a pink color, tinged occasionally with blue and brown. The eyes resemble those of a fowl, and though small are very bright. The back is provided with a serrated comb, which extends from the nape of the neck to within a few inches of the end of the tail. The animal can elevate this or depress it at will, and with its tail can deal a lusty whack, inflicting sometimes a severe gash with this saw-like comb, some anecdotes of which peculiarity will be given further on. In old age, the skin assumes the appearance of old leather, being wrinkled in many parts, and it is so tough that with difficulty can it be penetrated by a shot.

Iguanas inhabit, generally, thickly wooded spots, where they perch on high trees, and, as they are of a green color, they can easily conceal themselves among the branches and leaves while they await their prey. Unlike chameleons, they are very lively in their movements, and will even pounce from a tree to the ground in order to seize what they want.

The food of guanas consists of herbage, insects, and poultry and their eggs, the latter of which they devour with great avidity and are very cunning in perceiving them. I once saw one of these reptiles attack a hen with her brood of chickens. Darting from a tree, it made a rush at the chickens, on which the mother flew at it and pecked it; but Mr. Guana was not to be outdone, so, though evidently smarting



with pain, it turned round and dealt the hen a lusty blow with its tail, thereby stunning her, and seizing its desired food it made for its haunt there to devour the poor chicken at ease. When it had finished this, it returned with full intent to pursue the same course, to which, however, I put a stop by discharging one barrel of my fowling piece at the rapacious monster. As soon as the smoke caused by the discharge had cleared away, I was much surprised to see the guana spring into a neighboring tree. But I was not thus to be foiled; so raising my gun, I discharged the second barrel at it, which took effect killing it instantly. The spot from which the guana sprung when ascending the tree was marked with blood, therefore I felt assured that the first shot hit it, the more so as there were perforations in the skin of the reptile that had assumed a whitish tinge, which is the case after the charge has been in the body some time.

How true it is, I do not know, but it is asserted that the guana is provided with a pouch under its throat, in which it conceals eggs very often. It happened on one occasion that I was out hunting, accompanied by my dog; and, returning, I thought I would pass through my poultry-yard to ascertain if I could shoot any more of these destructive creatures. I had not long entered the gate when my attention was attracted by a cackling among the fowls, and soon found it to be occasioned by the presence of a huge guana, which was disputing the right of a hen to some eggs upon which she was sitting. Wishful of seeing the procedure of the reptile, I watched it narrowly; it deliberately raised its whip-like appendage and brought it down on the back of the poor fowl; of course, she could not stand that, so she dashed upon it with all her force; the guana taking advantage of the opportunity was going to seize an egg to make away with it when I started my dog at it. Ready for defense, the agile lizard raised its tail, and laid it two or three times over the dog, sending her away howling, while it made for the bush hard by.

Although applied with considerable force, the blow given by means of the tail of the guana cannot make an incision through the hair of an animal, or feathers of a bird; but it inflicts a most unsightly wound in the flesh of a man, if the guana be large and if it apply the serrated portion of the whip to the object of its rage.

The flesh of this disgusting creature is esteemed by some persons as a great delicacy, and it is said that it bears a resemblance to chicken when stewed. The eggs, I believe are eaten by some epicures, but I think the former has too strong a likeness to that of frog's flesh, and the latter to the eggs of serpents to be relished by persons not accustomed to such diet.

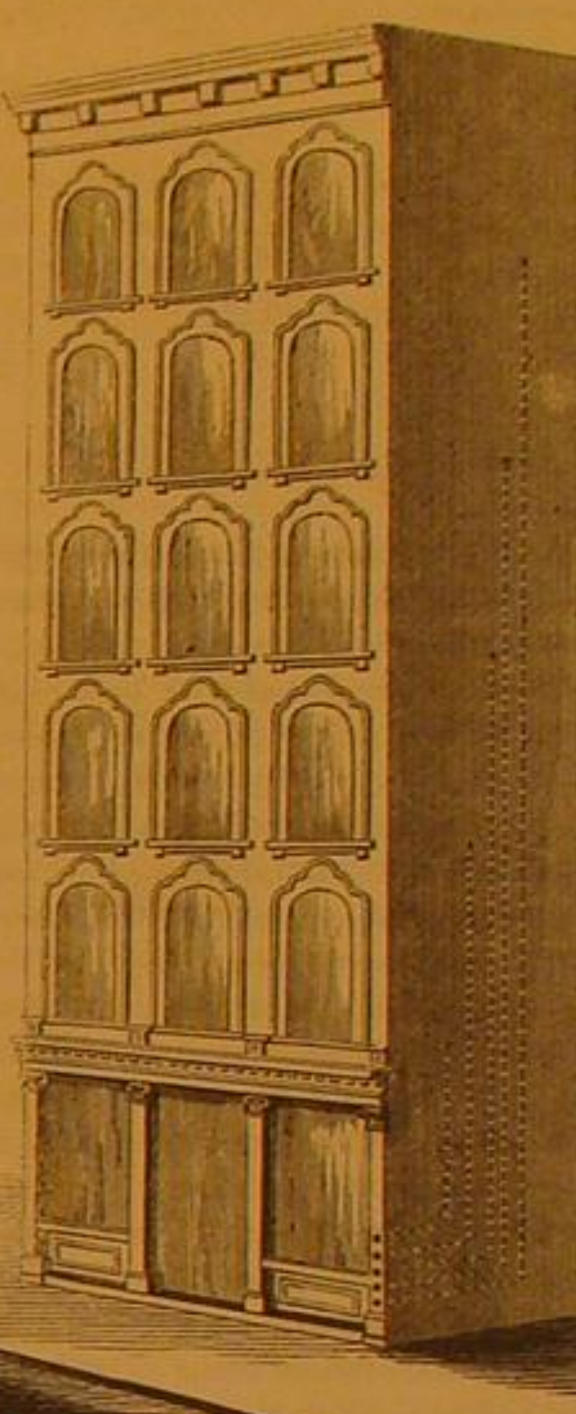
I have noticed several specimens of the guana exhibited in some of the druggists' windows in this country, some of which, I presume, have been brought from the island St. Thomas, D. W. I., to which place the foregoing narrative has reference. J. R. G.

Correspondence.

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

Extinguishing Fires in Buildings.

MESSRS. EDITORS:—I send you a plan of apparatus for extinguishing fires, which is original with me and may be new to others, and although not perfect in itself may lead to some thing better. It is this: In constructing the walls of a building, carry up within the wall, cast-iron or other metal pipes, one for each story, each pipe of the capacity of at least one steam fire engine; the lower ends opening near the ground to



which a hose can be attached, the upper ends opening in upon the several floors above. If there is no dead wall in the front or rear, the pipes can be constructed within the partition walls (see drawing), the dotted lines showing the position of pipes within the partition wall. The openings in the street need not be exposed, but may be placed in the sidewalk, inclosed, numbered, etc.

Now the successful application of this plan is upon the theory that if the floor of a building is flooded with water, its destruction (by fire alone) is prevented, and all above may be consumed whilst the submerged floor and all below are safe, and that all of the upper floors are made water-tight as near as possible, the openings, stairways, partitions, etc., constructed to insure the complete flooding of the floor—one or two inches is sufficient; and no matter if the floor is well stored with combustibles, water will find its way before fire. It has always been a mystery to me why more attention has not been paid to the construction of water-tight floors, when we so often witness the destruction of large and costly stocks of goods by water alone, when fire occurs in upper stories, which are often occupied for hazardous occupations. These fires always prove most destructive because inaccessible.

A building being constructed as before stated, on the breaking out of fire above, the fireman attaches his hose to the pipe leading to the floor on which it originates, and although it is not entirely extinguished, is greatly retarded when other ordinary means can be used.

This idea was suggested to me by the burning of the Lindell Hotel in this city nearly three years ago. In this case the fire commenced in the seventh story, and continued for nearly one hour before any serious apprehensions were felt for the safety of the building.

The following is an extract from the Chicago *Tribune*, in reference to a fire nearly two years ago, and I have noticed recent destructive fires in other cities in which this plan would have been applicable and saved a large amount of property:

"The great conflagration of Tuesday evening, which has shocked the entire community, and which will be remembered hereafter as an epoch in the city's history, will be worth all it has cost if it shall compel us to mend our system of constructing buildings. It is time that our penny-wise and pound-foolish economy in building was abolished, and that stores and warehouses were constructed under a system of public inspection, and with heavy penalties to insure them at least against external fires, and to keep the destruction within the walls where it begins. Burch's Block, though consisting of nine stores, four fronting on Wabash avenue and five on Lake street, burned as freely and scientifically as if the the entire building had consisted of one room. One reason

for this—and the same reason will apply to nearly all the commercial blocks of this city—is that the buildings are all too high, rendering it impossible to employ the fire apparatus effectively, or to raise the water to the required elevation. This was painfully evident at the fire on Lake street."

The plan I propose is practicable and cheap (the latter may be its most prominent feature); however, as before stated, it might be perfected, and I would suggest that although the floor is saved the walls may become so hot as to endanger the ends of the joists or timbers, metal baseboards perforated over each timber would retard its destruction by keeping the wood saturated with water. ARCHIBALD DOUGLASS.

St. Louis, Mo.

Thermometric Experiments.

MESSRS. EDITORS:—I would like an explanation of the results of some thermometric experiments, the object being to ascertain by Fahrenheit's thermometer the temperature of any liquid.

My apparatus is a glass jar and two thermometers, one of which is immersed, the other partially so (see annexed sketch). I fill the jar with a warm liquid, temperature 114° Fah., then I subject the apparatus to outdoor atmosphere, which indicates 34° Fah. at 7:30 o'clock A.M. Below please notice discrepancies.

	Thermometer immersed.	Partially immersed.	Temperature of atmosphere.
7:35 o'clock A.M.	112°	113°	34°
7:40 " "	108°	110°	34°
7:50 " "	105°	108°	34°
8:00 " "	98°	102°	34°
8:10 " "	92°	98°	34°
8:20 " "	89°	95°	34°
8:30 " "	86°	92°	35°

I now reverse operations somewhat by filling the jar with cold liquid—temperature 40°—and subject the same apparatus to indoor atmosphere, time 9:40 o'clock A. M.

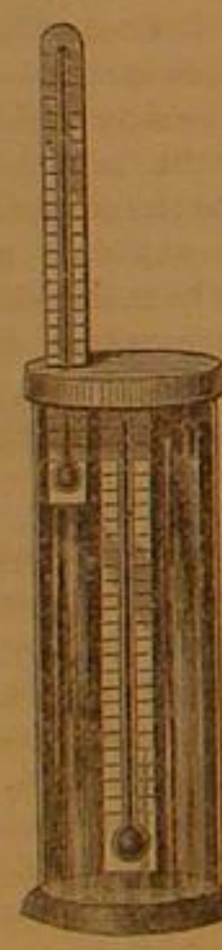
			Temperature of room.
9:55 o'clock A.M.	41°	51°	66°
10:00 " "	43°	55°	68°
10:15 " "	45°	58°	70°
10:30 " "	49°	61°	74°
10:40 " "	51°	68°	75°

QUESTIONS.—1st. Why is it that the thermometer partially immersed indicates in both instances a higher degree of heat than the one entirely immersed?

2d. In either case which thermometer is giving most accurately the temperature of liquid. P. MILLSPAUGH.

Glen's Falls, N. Y.

[Any fluid undergoing a change in temperature has its upper strata warmer than the bottom ones. The hotter particles rise and the colder ones fall. The expansion of mercury in the bulb of a thermometer is as much greater than that in the stem, as the bulk of mercury is greater. It follows that thermometric indications depend chiefly upon the expansion of the mercury in the bulb. One of the bulbs of our correspondent's thermometers is at the top in a warm stratum of fluid, the other is at the bottom in a colder stratum. Of course the upper one must give the highest indication, and neither would give the mean temperature, which can only be determined by calculation approximately. The varying discrepancies will depend partly on the form of the vessel. The deeper it is in proportion to its diameter, the greater will be these variations as the cooling progresses. We are not prepared to say that the figures given are correct in this experiment if the drawing is a correct representation of the apparatus used. We are somewhat inclined to doubt the accuracy of the thermometers, as the discrepancies seem almost too large for so small a vessel with the bulbs in the positions indicated.—EDS.



Cotton Picking by Machinery.

MESSRS. EDITORS:—Fearing that the communication of A. D. C., of New Madrid, Mo., may dampen the ardor of inventors now engaged upon the cotton-picker, I write with a view of keeping the ball in motion. When an individual says that such and such mechanical contrivances are beyond the scope of human ingenuity, he certainly takes a great liberty with the public, and must pardon some of us if we differ from him.

Many of us at the South have heard our fathers relate that it was the custom in their young days for each member of the family to pick the seed from his or her quart of cotton before retiring for the night. We now have saw gins for the same purpose, some of them capable of doing as much work as probably 500 men in the old way. The improvements in spinning and weaving have been even greater than in the gin over the fingers, and yet we are utterly devoid of a machine for taking the cotton through the first and simplest process. The reason is obvious: Heretofore, Southerners had a very effective though troublesome machine in the African, which under the *good old plantation* system, and occasionally greased with a little *hickory ile* did the work thoroughly; and it was then very uncommon to make more than could be gathered. On the other hand, the Northern man was interested in the spinning and weaving process, and gave his attention almost entirely to the improvement of machinery for this purpose. Now, North and South are equally interested in keeping up the waning supply of raw material. The African is no longer a machine, and his place must be supplied by a cotton picker, or cotton is not a living "king," but a dead dog. All other work in the production of the plant can be done by labor-saving machines now in existence; but it yet remains for some one to crown his brow and fill his pocket by the invention of this much needed machine.

Since the publication in the SCIENTIFIC AMERICAN, of my first letter on the subject, hundreds of letters have been written to me by inventors from Canada to Texas, some of them announcing the actual discovery of the machine—one claiming to pick as much per day, as can be done by one hundred hands; others more modest in their claims; and others yet, making inquiry in reference to the plant and process of gathering, etc., etc.

This argues that there is an interest in the subject, and I am not willing that friend A. D. C. shall kill it; let it go on for a while, and if we do not have a picker soon, I will join him in his *horticultural problem*.

Allow me, in closing, to say that I cannot correspond with *every body* on the subject of the cotton plant and picker. I have already exhausted time and patience, and in future (without intending offense) must claim the privilege of answering only such letters as strike me.

Winnsboro, So. Ca. T. W. WOODWARD.

Care of Carpenters' Tools---Filing and Setting Saws.

MESSRS. EDITORS:—Your article on "How to File and Set a Saw" gave me much gratification. I have long wished that something upon this and cognate subjects might appear in your paper. Much has been said, from time to time, upon the use and care of machinists' tools, but the carpenter has not received so much attention. I will venture to say that the carpenters' trade contains more botches than any other in this country. Raw country boys are employed at a few dollars per month and their board, and, having worked one season perhaps building barns, come out in the fall finished carpenters and joiners in their own estimation.

But a prominent source of botches is want of knowledge how to properly sharpen and keep tools in order. This, coupled with carelessness and slovenliness, is a common fault. I find frequently the most common tools shamefully out of shape. This great evil might be, to a great extent, remedied by proper instructions in the columns of such papers as the SCIENTIFIC AMERICAN.

The article I have referred to is in the main correct as far as it goes, but a few words more about the saw may yet be of benefit.

I always file my rip saw from point to handle instead of from handle to point. I claim that in so doing the teeth can be kept at a more uniform length, which is all-important for a straight running saw. I file all from one side, and square across, or at right angles with the line of teeth, and I raise the handle of the file a trifle above the point, say at an angle of two degrees. I have found that if I hold the file horizontal I would get the edges of the teeth nearest to me a trifle lower than those on the opposite side, and the result would be that the saw would run crooked. Then I file the teeth for about six or eight inches at the point at a much less angle than I do the rest of the saw, and give them about the same pitch that I do a crosscut saw; the object in this is to facilitate sawing through knots, as a rip saw catches too much in knots. A great many are in the habit of changing saws when they come to a knot and saw through it with a crosscut; but if a rip saw is filed at the point, as I have stated, it will readily work through knots, by simply raising the hand and sawing with short strokes until the knot is cleared. All new saws (back saws excepted) will be found high in the middle and I keep mine in that shape, say one-fourth inch swell in a 26-inch saw. It is almost impossible for any one to maintain a parallel stroke forward and back; the hand will naturally fall a little in pushing a saw forward, and rise in drawing it back, so a saw that is full in the center will counter-balance that rocking motion of the hand, but that motion should be avoided as much as possible.

In filing crosscut saws too much pains cannot be taken to keep the teeth of a uniform length, and this can only be done by often jointing the saws. They do not necessarily need much jointing at a time, but little and often is my plan, and the same in filing. I would rather file twice or three times, and file but little at once, than file a good deal at one time. I have often heard mechanics complain that they would invariably get the teeth the shortest on the side they filed first, and this, in fact, used to be my fault; but I found the remedy is to not file the first side quite up to the points, then turn and file the other side, then turn back and finish the first side—if necessary, turn again and finish the second side. But if a saw is not very dull, three times filing across is sufficient; if it is very dull better go over it the fourth time. After a saw is filed, round off the last tooth at the point; this will prevent this tooth catching in the kerf as the hand is drawn clear back and at the instant of starting it forward, and lessen the danger of bending or breaking. Almost any one can saw (or rather tear) a board in two, but few can handle a saw nicely.

Much might be said upon this point, but I have already made this communication too long. I will only add that a saw should always be used with great care, and with even, steady strokes, not short and quick, and all jerking either up or down should be avoided. The full length of the saw should be used as much as possible, and the saw should not be crowded, but given a chance to clear itself of sawdust.

Whoever will follow out the above directions will have as nice, smooth, and straight running saws as he will wish for.

Cleveland, Ohio. A. A. FRADENBURG.

Preservation of Brown Stone Fronts.

MESSRS. EDITORS:—I read in your paper, No. 20, current volume, page 313, an article, entitled, "What is to Become of our Brown Stone Fronts?" I also find on page 307 of the same issue an article headed "Damp Walls." May not the latter paragraph be considered as an answer to the former? Is there any reason why the discovery of Mr. Frederick Ransome, therein described, cannot be used for this purpose? If so used, would the stone retain its natural appearance or be covered with a glossy, vitreous coating?

New York city. J. H. HAMERSLEY.

[There is hope that Mr. Ransome's process will answer for the purpose mentioned by our correspondent, but it must be borne in mind that the trial of any process designed to effect this object must extend through a considerable period, and it would not be safe to assume that Mr. Ransome's process has yet been sufficiently tried to test its efficacy as a protection to brown standstone in our climate.—EDS.

Friction or Percussion?

MESSRS. EDITORS:—Your correspondent, "C. C. H.," in your issue of November 13, page 310, failing to agree with me in the conclusions arrived at in my former article on this subject, published on 246, current volume, and evidently wishing some further explanations, with your consent I will say a few words in reply.

First, he says that while I consider the heating of a nail on a grindstone to arise from the percussion produced by its leaping from one granule of the stone to another, I "estimate, indirectly, that in the majority of cases heat claimed to arise from friction is the result of percussion instead."

If he will again refer to the article alluded to, he will see that I merely suggested that it is impossible to show at what point, in cases similar to the "nail and grindstone," percussion ceases and friction begins, intimating that friction and percussion may often be one and the same thing; not that the result should be considered as produced by percussion "instead" of friction.

Again, to quote—"Let 'Spectrum' take in his fingers a smooth brass button and rub it briskly up and down a planed pine board, and he will soon drop it," etc., "if he does not the theory."

"C. C. H." seems to think that in this case, under these conditions, nothing like percussion could possibly occur, and I grant that apparently such would be the result; however, let him examine his "smooth brass button" under a powerful microscope, and he will see that its apparent smoothness is a delusion. It is true that in this case there would be no perceptible percussion of bodies as in the grindstone experiment; still, if the button be applied with any degree of pressure, it would not only produce waves in the wood immediately in front of it, no matter which way it be moved, and against which the particles of the button would strike or impinge, but the microscopic roughness of the button—its grooves, indentations, and prominences—would produce a like result, for the elastic wood being forced into these grooves and depressed by the minute prominences, alternately, would acquire a very rapid undulatory motion, which, by contact, would be communicated to the button, rendering it unpleasantly warm to handle.

Now, to say that there would be in reality no percussion in such cases is to affirm that if a huge boulder be rapidly dragged over a rough, stony piece of land there would in the result be no percussion between it and any other against which it might be impelled—one is but an exaggerated illustration of the other. I hold that so long as we are unable to produce a body or mass of material which shall be of perfect hardness and smoothness, and totally inelastic, there will be in rapidly rubbing any two solid bodies together more or less percussion, whether perceptible or not to our imperfect senses.

Again, if, as he suggests, the superior heat-conducting power of the large hammer, owing to its being longer in contact with the metal hammered, prevents the iron from becoming as hot as with the small one, why, after it has become too hot to touch, will it not continue to grow still hotter—red hot?

Lastly, he says, "Will 'Spectrum' inform me why it is that while iron can once be heated by percussion [?], but if suffered to cool, the heat cannot be reproduced in the same manner until after the iron has been heated by the absorption of foreign caloric?"

Now, the words last quoted show that "C. C. H." evidently makes no distinction between the heat produced by percussion and that rendered sensible by compression. Iron, in its ordinary state, contains a certain amount of heat which is insensible both to the hand and to the thermometer, called its latent heat, and by changing the condition of the iron, by condensing it, more or less of this heat is expelled according to the degree of pressure sustained.

Iron in this condensed state cannot be made to assume its former bulk by any other known force then that internal antagonism of its particles caused by the intensely rapid molecular agitation known as heat, but if "C. C. H." should take the same piece of iron which, as he thinks, has "once been heated by percussion," though in reality it is scarcely more than condensed, and submit it to the action of a series of minute hammers, the blows of which succeed each other with great rapidity—for instance, let him apply it to the grindstone, and I think he will find that it can be heated without the aid of "foreign heat," and that, too, by means of true percussion.

I have been somewhat prolix, but the subject is an interesting one; and hoping that the "percussion" or "friction" of ideas may produce sufficient light for the discernment of truth, I again sign myself SPECTRUM.

Havana, N. Y.

Oscillation of Railway Carriages.

MESSRS. EDITORS:—On page 280, current volume, SCIENTIFIC AMERICAN, I notice a piece entitled "Why do Railway Carriages Oscillate?" I agree with the writer in some part of his heory, namely, effect of cone-shaped wheels upon

a straight track. There is no doubt but wheels of this form will caused a greater oscillation than cylinder-shaped ones. But in passing around curves, give me the cone shape.

To substantiate my theory, let me ask Mr. C. F., if his assertion is correct about the running of a car around a curve, why is it that the inner side of the shorter rail is always rusty and not worn off like the opposite one? What experience I have had with cars, is that it would be far more dangerous upon curves to use cylinder wheels, and I think that the friction and wear would be double what it now is. I make the assertion that the cone shape does lessen the danger upon curvès. The cone-shaped wheel is not altogether the cause of the oscillation on a straight line. I have measured one thousand new wheels with a metal tape-measure and hardly found any two of them the same size, although many of them were cast in the same chill. You will perhaps say, "Why is this difference?" I reply that the iron when it flows from the cupola into the different ladles, is rarely of the same quality in each, and when poured into the molds the temperatures vary widely. The hottest iron will shrink the most, and if the mold is not set to a dead level, the wheel will become oblong in cooling. I have frequently found them one eighth of an inch out of round. Furthermore, the men who have charge of pressing on these wheels, are usually common laborers, who make no pretensions to mechanical skill. They are supplied with an old, rusty, rickety pair of callipers (which a true mechanic would not use a moment), and with this tool they begin to operate, first applying one leg near the flange and passing the other down the opposite side. The rickety old machine will hit about the same anywhere from the tread next the flange out to the edge, and the conclusion is, "She is all right, lets shove her on." Now this I know to be the case in three prominent railroad shops, and at one of these same shops I measured two new wheels upon the same axle, and one was three eighths of an inch smaller in circumference than the other.

No wonder oscillations occur under such circumstances. If, as *The Times'* correspondent says, a cone shape does no good in passing around curves, why are street cars raised on to the flange to round corners? Cone-shaped wheels have been experimented with, and the proportion of one in twenty, I believe, has been taken as the standard. What is wanted is a remedy for the evils I have specified. If cylinder wheels are used, a train of cars will certainly haul harder around a curve because there will be more back slip to the inside train of wheels.

On March 28, 1865, through the unrivaled office of the SCIENTIFIC AMERICAN, I had a patent issued on a car axle which obviates all difficulties herein mentioned. Upon this plan, the old callipers may be thrown aside, the common laborers eye is good for determining the size of wheel. No matter what the size of wheels no oscillation can possibly occur. J. W. HARD.

Decorah, Iowa.

How to Remove the Sulphur Compounds of Petroleum.

MESSRS. EDITORS:—Having some two years ago discovered a process for removing the sulphur compounds of petroleums—such as are found in Canada, Kentucky, and Tennessee—and as my process has been disclosed to some of the refiners of oil in Canada, by a workman I then had employed, I desire through your columns to give it to all who choose to use it. I am aware that certain persons have discovered the use of plumbite of soda independent of me, but I believe none can claim priority, as my discovery was made as early as June, 1867; evidence of which fact I have on record. The details of my process are as follows:

The crude oil should be distilled in the usual manner, making the proper specific gravity for burning oil. The distillate should be allowed to remain in open tanks for one or two days, to allow the free sulphureted hydrogen to escape, and thereby saving chemicals in its removal. The oil should then be pumped into an agitator and the treatment begun, first, with a solution of plumbite of soda—made by saturating a boiling solution of caustic soda of 20° strength, with litharge. About one quart of this solution to the barrel is quite sufficient. The oil, in a few minutes after the solution is added, and brisk agitation made with air, becomes brown and then black. The agitation should be continued for about fifteen minutes, and the oil allowed to settle. The formation of a heavy brown deposit of sulphide of lead is the phenomenon to be then looked for. Sometimes it occurs by the time agitation is finished, at other times several hours afterward, and again not until a further treatment is given it. The oil is allowed to remain in the agitator 12 hours, in case the precipitate does not fall sooner, and at the expiration of that time; if no precipitate has formed and the oil becomes clear, then the following treatment:

A solution of penta-sulphide of soda is made by boiling 2 lbs. of sublimed sulphur in 10 galls. of a solution of caustic soda 20° strength, until it is all taken up, and the liquid becomes of a clear deep brown. About one quart of this solution to every bbl. of oil, is added to the oil in the agitator, after the settled plumbite of soda has been withdrawn, and agitation with air continued for half an hour. If the precipitate does not form in that time, the solution of soda is allowed to settle, drawn out, again boiled with half its original sulphur, returned to the agitator, and agitation made for half an hour. This seldom ever fails to cause the precipitate.

The oil is then carefully run off the precipitate, by tapping the side of the agitator, into the proper tankage, where it can be pumped back again. The agitator thoroughly cleaned by washing, the settled oil is returned to it for further treatment, as follows:

Sulphuric acid in the proportion of one lb. to the barrel of oil, is added, and agitation with air begun. The air before being introduced into the oil, should be passed over chloride of calcium to remove all moisture. Within an hour after air has begun to pass through it, sulphurous acid gas is given off in large quantities, and continues until every trace of sulphur is oxidized in the oil. After 18 hours' agitation the tar is allowed to settle for an hour, drawn off, and a fresh amount of acid added, and agitated again 18 hours. This treatment is continued until a sample of the oil will not be tinged, when shaken with a solution of plumbite of soda, and left to stand for six hours. Three or four treatments of this kind are generally sufficient, though it varies with the kind of oil under treatment. After the acid treatment, the usual amount of caustic soda is added, and the oil thoroughly washed. The chemical reactions which take place I have noticed very closely, and will at some other time give you my theory. H. T. YARYAN.

Supt. Tenn. Oil Works, Nashville, Tenn.

Naphthaline.—The Cause of Serious Accidents.

MESSRS. EDITORS:—When hearing of the first explosion that occurred last spring in Jersey City in saturating wood with carbolic acid oil for the purpose of making it fit for preservation, I was not in doubt for one moment as to the true cause of this accident. A second explosion followed soon after in San Francisco, where this process was being introduced, causing, as you state, the loss of seven lives and more than $50,000 worth of property; and now a third sad accident is reported, resulting in the death of the chemist and an operative employed in the wood preserving establishment.

I do not propose to enter into any of the many hypotheses forwarded in regard to the probable cause of these explosions, but shall simply relate some facts which I have observed in distilling the same kind of oil employed in the process referred to. This process consists, so far as I am informed, in the impregnation of timber by the hot vapors of "dead oil," which, in being the source of carbolic acid, is sometimes, but improperly, termed carbolic acid. This oil is produced as a by-product in the manufacture of gas from coal, and is composed of from five to fourteen per cent of carbolic acid, a large and varying quantity of neutral oils, and from twenty five to forty per cent of naphthaline. This latter is deposited by the oils distilled from the tar in granular crystalline masses, called "salts" by the workmen. It is then thrown away, or, at best, burned for lamp-black.

In subjecting dead oil to distillation, naphthaline comes over during the entire distillation, and, according to Bowditch (*vide* his "Analysis, Technical Valuation, Purification, and Use of Coal Gas"), hardly a sample of commercial benzole can be obtained which does not contain naphthaline, although the boiling point of the latter substance is 410° Fah., and of the former but 176° Fah.

This hydrocarbon (the naphthaline) has a very great tendency to stop up the coils of the stills, especially in cold weather, and, in accumulating there very rapidly, it is easy to comprehend that explosion must occur, when the tension of the vapor inside of the still becomes greater than the resisting power of the shell. I have had tuns of naphthalized oils distilled, but being acquainted with the facts by previous experiments, and fully aware of the danger attendant upon a neglect on my part, I never failed to keep the water of the condensation tank at a temperature of about 160° Fah. At this degree of heat there is never any danger of obstruction, the oils run off fluid, but, after having left the coil they will soon assume a buttery consistency. In order that I might at any time be able to liquefy the naphthaline, should emergencies require it, I had a steam pipe attached to the upper part of the coil. This proved to be a very efficient arrangement.

Naphthaline is a constituent part of our gas, and readily stops up the gas pipes in winter. Besides for lamp-black, it is now employed to a limited extent for the preparation of dye-stuffs as a carbureting material, and quite recently has been proposed by a chemist in this city as an ingredient of an explosive in combination with chlorate of potassa. As to its efficiency as a preservative, I still entertain some doubts. It is by no means an explosive material, as little as charcoal in gunpowder, since it may be thrown into a red-hot crucible, when it volatizes and decomposes, condensing in the air in snowy spangles.

I append a table indicating the boiling points and specific weights of various constituents of the oils from coal tar:

	Boiling point.	Specific gravity.
Benzole	176° Fah.	·85
Toluole	230° "	·87
Cumole	284° "	·86
Amyle	311° "	·77
Cymole	338° "	·85
Caproyle	395° "	·75
Naphthaline	410° "	1·04

ADOLPH OTT.

New York city.

Has the Pacific Railroad Changed the Climate of the Plains?

MESSRS. EDITORS:—Without presuming to fully answer the interrogatory of Mr. Whitford, on page 214, current volume of SCIENTIFIC AMERICAN, I will offer an opinion, founded on years of observation, and I think corroborated by reasonable probability.

I have for the last four or five years advocated the idea that the extending of railroad tracks through the country, was changing the climate from the destructive droughts, we formerly experienced to the salubrious climate we have been enjoying for seven or eight years. The facts in the case are that here, in Central Ohio, the farmers have quit calculating on droughts and remember them as things that were; the complaints are that there is so much rain that they don't get an opportunity to cultivate crops; and all this is happening against counter-causes, such as artificial drainage and removing forests.

The cause of the change I have assigned as aforesaid; the reason is this: Railways, as now constructed, clamped together at the meeting of rails form complete and powerful conductors of electricity, and having contact with other railroads at crossings, etc., make a network of electrical conductors wherever they go, which, no doubt, has a tendency to promote electrical equilibrium. I believe it is now generally conceded that aerial disturbances and meteorological phenomena are dependent on electricity; and may not a more equable state of electricity in the air be productive of more equable and uniform falls of rain?

I have no doubt but the extending of the iron rails of the Pacific Railroad has produced the effect noticed by said observers. The turning up of soil and comparatively slight elevations and excavations in grading, could have no appreciable effect.

I have written the foregoing in hopes of eliciting the views of observing and practical meteorologists.

JOHN F. LUKENS.

West Mansfield, Ohio.

The Russian Fair Not a World's Fair.

CONSULATE-GENERAL OF RUSSIA TO THE U. S.,
New York, Nov. 18, 1869.

MESSRS. MUNN & CO., *Gentlemen*:—In reply to yours of yesterday, I beg leave to state that I have not received any official notification of the Fair in preparation in St. Petersburgh for 1870. But I read in Russian newspapers that it is not intended to be a *world's fair*, but merely an exhibition of *Russian* products. I am, very respectfully yours,

R. OSTEN SACKEN, Consul-General.

Editorial Summary.

WIENER KALK.—The *Horological Journal* states that the material generally used by watchmakers on the continent for polishing hard and soft steel, as well as brass, is a white substance called wiener kalk; it polishes much quicker than crocus, and with a beautiful black gloss. It is used in the following manner: The piece to be polished is first put on a piece of cork fastened in the vice and rubbed with a piece of plate glass, on which is put a little oil and oilstone dust, till it is perfectly flat and all the file marks have disappeared. It is then cleaned with a brush and soap and water, and dipped in spirits of wine, and, after being dried with a clean cloth, put on another clean piece of cork, in the same way as before, and rubbed briskly with a flat polisher, made either of bell metal or block tin, in which is put a little wiener kalk and fine oil, mixed to the consistency of a thick paste. It is necessary to prevent any dust getting in the polishing stuff or on the piece to be polished. Wiener kalk can be had at Mr. Ehnhuus' watchmakers' tools and materials warehouse, in Frith street, Soho square, London, where it is sold under the name of diamantine, and perhaps at some of the tool shops in Clerkenwell.

THE BAKER'S OVEN THERMOMETER.—This useful instrument for indicating the temperature of an oven, is the invention of Mr. J. Bailey, of Salford. Bakers have hitherto generally baked bread satisfactorily; nevertheless, housekeepers know that sometimes the bread is slack baked, while at others it is burnt; the fact being that the bakers judge the right heat of their ovens by the appearance only, and, as a consequence, they must sometimes be deceived; but by the use of a proper thermometer (heat measure) no error can well occur. This instrument is also useful to the japanner and others who use ovens and pottery furnaces.—*S. Piesse.*

WE learn from the London *Mining Journal* that England has sent more locomotives to Russia, Egypt, and Australia this year than heretofore, but in many other directions there has been a falling off. In August, steam engines were exported from the United Kingdom to the value of only £169,-495, as compared with £189,639 in August, 1868, and £187,781 in August, 1867. In the eight months ending August 31, this year, were exported, however, the aggregate value of £1,128,541, as compared with £1,075,635 in the corresponding period of 1868.

THERE is a *papier-maché* church, says the *Churchman*, actually existing near Bergen, Germany, which can contain nearly 1,000 persons. It is circular within, octagonal without. The relievos outside, and statues within; the roof, the ceiling, the corinthians capitals, are all *papier-maché*, rendered water-proof by a saturation in vitriol, lime-water, whey, or the whites of eggs.

As tallow-melters, oil-boilers, varnish-makers, and others, are very liable to accidents by fire, Dr. Piesse suggests to them the application of Sir Humphrey Davy's discovery of wire gauze, as in the miner's lamp, for the prevention of accidents, by covering the boilers and vats during operation with a drum-head or dome of wire gauze.

HEMMING SEAMLESS BAGS.—A correspondent complains that it is a common fault to hem seamless bags with a single-thread machine, and that the thread breaks, the hem speedily unravels, the bag cannot be securely tied, and its contents get wasted in handling, and asks why the lock-stich is not employed in the hemming of such bags. Will manufacturers answer why?

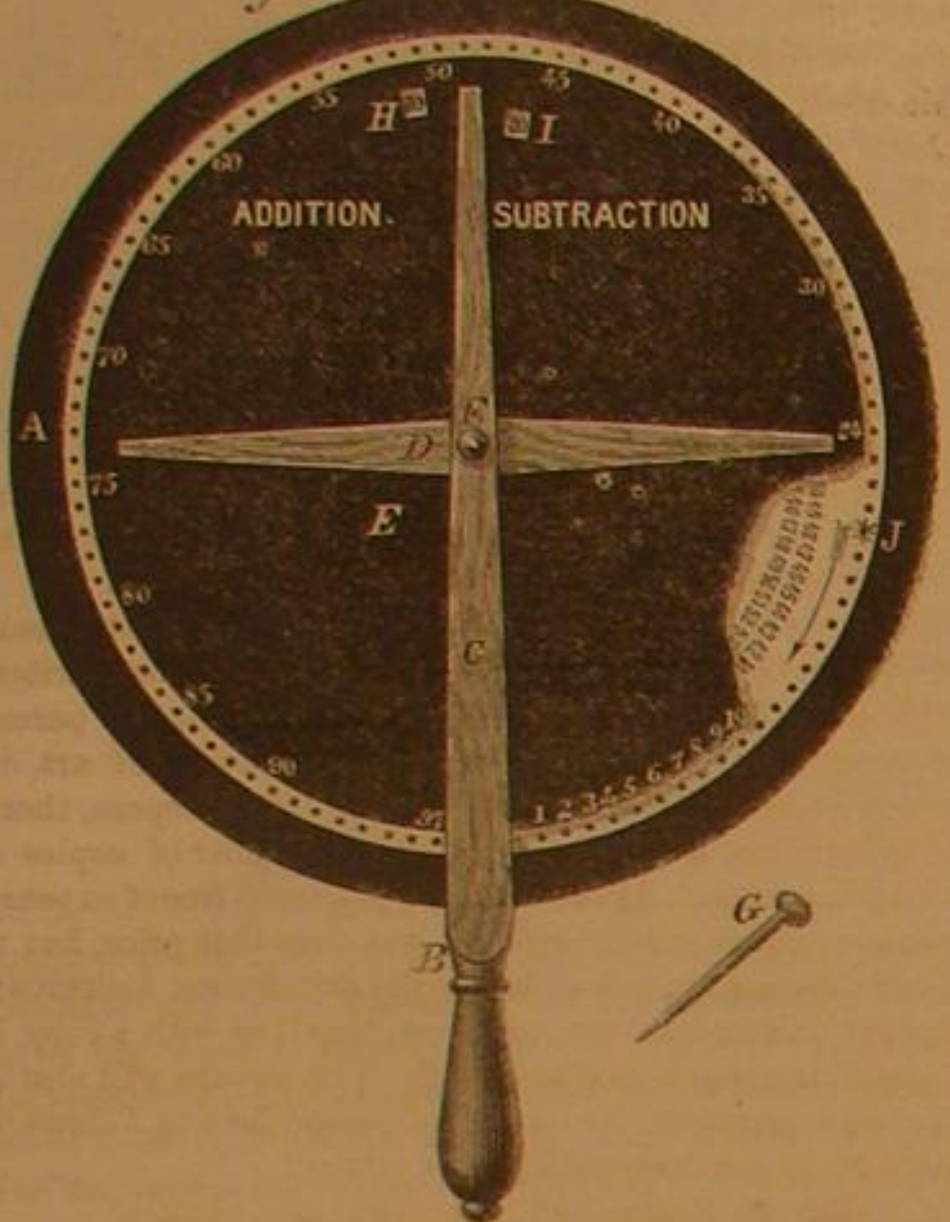
PETROLEUM oil, such as is used for lamps, is an effectual preventive against the destructive propensities of worms in timber. The timber is to be washed over with it.

REFFELT'S CALCULATING MACHINE.

Many attempts have been made to devise a simple and cheap calculating machine. For the most part these attempts have been confined, in the cheaper class of machines, to performing only the one operation of addition. The machine, engravings of which accompany this article, is capable of performing the four fundamental operations of arithmetic—addition, subtraction, multiplication, and division being executed with equal facility and accuracy.

The engravings give views of opposite sides of the machine, the converse operations of addition and subtraction being performed on the side shown in Fig. 1, and multiplication and division on the side shown in Fig. 2.

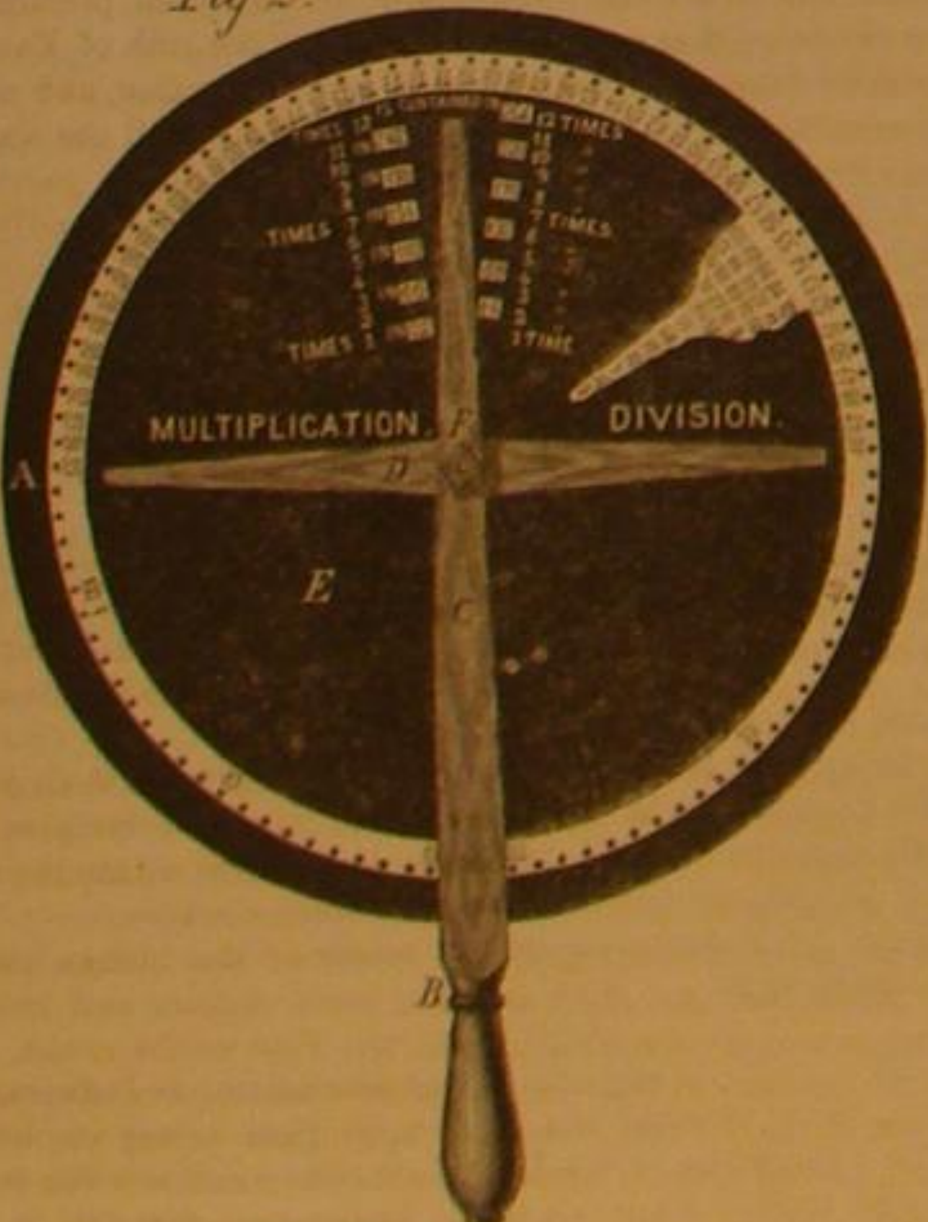
Fig. 1



An external rim or hoop, A, is fastened to a bifurcated handle at B, the bifurcations, C, extending up on each side of the frame, and forming, with the pieces, D, crosses, to which the stationary disks, E, are fixed. Beneath these stationary disks is a revolving disk which turns on a central pivot, F, when actuated by the style, G, Fig. 1, the latter being held in one hand of the operator, while the handle, B, is grasped in the other hand, and the style, G, being inserted in one or other of the small holes drilled in the outer edge of the revolving disk, as hereinafter explained.

The fixed disks, E, are smaller than the external hoop, A, or frame, and, also, smaller than the revolving disk, the edge of the latter fitting in a groove cut on the inside of the hoop, A. Thus, an annular space is left between the hoop and the disks, E, through which the outer part of the revolving disk is seen. On the outer part of the latter, next to the hoop, are shown the holes which receive the point of the style, G, when the machine is in use. There are one hundred of these holes.

Fig 2.



On the addition and subtraction side, the fixed disk, E, has marked on its outer edge numbers from 1 to 100 inclusive, placed at equal distances from each other, only the first ten of these being shown in our engraving, drawn in full, the rest being indicated in fives on account of limited space.

Upon this side of the revolving disk are two concentric rows of numbers, progressing in opposite directions from one to one hundred inclusive, portions of which are shown where a portion of E is broken away. As the revolving disk is turned by the style, the numbers in the outer row appear successively at the aperture, H, in the disk, E, and those in the inner row at the aperture, I.

Suppose, now, it is desired to add 6 to 7. One of the holes, J, to which the style is applied, is conspicuously marked. The style being placed in this hole, the revolving disk is turned in the direction of the arrow until the style is brought flush with C, when 0 appears at each of the apertures, H and I. The style being now placed in the hole at 6, the movable disk is rotated until the style stops at C, which brings the number, 6, to view at the aperture, H. The style is then withdrawn, and again inserted in the hole next to 7, and carried back to C, which brings 13, the sum of six and seven, to view at H. Two columns of figures can be operated upon at once, as it is just as easy, by this machine, to add 36 to 47, as to add 6 to 7, and by making a mark or tally every time a hundred is passed, the addition may be carried to any extent, thus: 70, 81, 96, 48, would be added in the following manner, J being first brought to C. Carry the style from C to 70, and bring that number to C; do the same with 81, and make a tally mark for the hundred passed; 51 now appears at H. Next carry 96 round to C, and tally for the second hundred passed; 47 now appears at H. Next carry 48 round to C; 95 now appears at H, which, with the two hundreds tallied, make the sum 295. A very little practice will enable the operator to carry the hundreds in the mind without recording them. In this way, two columns, of any length, may be added simultaneously. The sum of each successive two columns being set one place below the preceding sum, and two places to the left, and the several sums added, enable the machine to be applied to adding any number of columns.

Subtraction can be, of course, performed in a converse manner, but it is more convenient to reverse the order of succession in a second row of figures, hence such a row of figures is added, which successively appear at the aperture, H. Suppose it is required to subtract 29 from 36, the instrument being set to zero. The style is placed in the hole opposite 36 in the fixed disk, E, and brought back to C; this brings 36 to view at the aperture, I. Next the style is placed in the hole corresponding to 29, and again brought to C, when the required difference, 7, appears at the aperture, I.

On the multiplication and division side, Fig. 2. The movable disk has upon it concentric rows of numbers, portions of which are shown by the breaking away of a part of the fixed disk, E. The inner row contains the numbers from 1 to 100; the next, the numbers from 2 to 200, which are divisible by 2; the next, those from 3 to 300, divisible by 3; and so on to the outer concentric row, which contains the numbers from 12 to 1,200, divisible by 12. As the revolving disk is rotated by the style in the same direction as in adding or subtracting, the numbers in these rows are successively brought under the apertures placed at the right and left of C, at the upper part of the fixed disk, E. The annular space between the hoop and the fixed disk, E, has upon it a row of figures from 1 to 100, inclusive, progressing in a contrary direction to the numbers on a clock dial. These numbers are so arranged, that when any one of them is brought by the rotation of the revolving disk flush with the bar, C, the products obtained by its multiplication into the odd numbers from 1 to 11, inclusive, appear at the left hand series of apertures, and the products obtained by its multiplication into the even numbers from 2 to 12, inclusive, appear at the right-hand series of apertures, the smallest product in each series being the inner one, and each series of products increasing regularly outward.

It is evident, therefore, that the multiplication of any number from 1 to 100, inclusive, by any number from 1 to 12, inclusive, is performed by bringing the multiplicand flush with C, by the use of the style, when the required product will appear in the aperture adjacent to the multiplier. Conversely, the quotient of any number from 1 to 1,200, inclusive, exactly divisible by any number from 1 to 12, inclusive, divided by any number from 1 to 12, inclusive, is found by bringing the divisor flush with C, when its quotient will appear opposite the dividend, which latter will show itself at one or the other of the apertures.

For the multiplication of the larger numbers, the amounts are divided. For example, suppose 123 to be multiplied by 5,689, the latter number is first multiplied by 12, and again by 3; and the latter product being set beneath the former, and one place to the right, the products are added, the sum being the true product.

Besides being adapted to business purposes, this machine is applicable to use in schools, for purposes of instruction. Further illustration of its operation is not needful, as the means of extending its use to many arithmetical operations will suggest themselves to arithmeticians.

Patented through the Scientific American Patent Agency, Sept. 14, 1869, by J. H. R. Reffelt.

For instruments, or rights to manufacture, address E. Steiger, publisher and dealer in German books, 22 and 24 Frankfort street, New York.

To Correspondents.

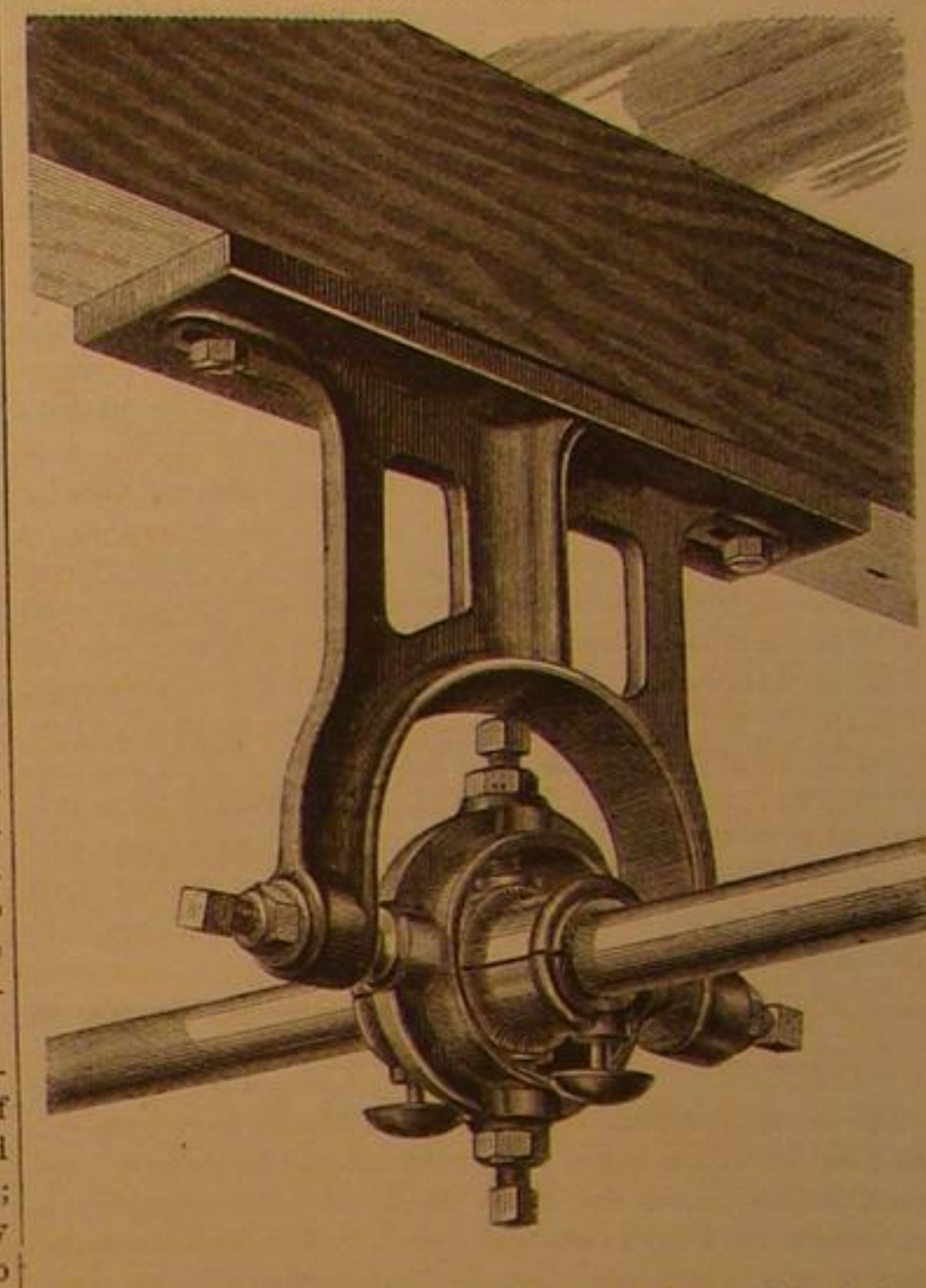
We have on hand a mass of interesting and valuable correspondence, and there must necessarily be some delay in its appearance; but it shall be attended to as fast as space will permit, and we shall be glad to get more of the same sort. If you have got anything practical you wish to bring forward send it along, and don't be too diffident about sending it in homely dress. We will take care that it does not put to blush the orthography and grammar of those unskillful in writing for publication.

We invite the attention of our readers to the announcement for the forthcoming Volume, 1870, on another page. It will be seen that premiums are to be given to all who send lists of subscribers of twenty names and upward.

IMPROVED UNIVERSAL HANGER FOR SHAFTING.

The form of hanger known as the universal hanger for shafting, from its utility in leveling and lining shafting, and the reduction of friction accomplished by its use, has grown into general favor. Our engraving illustrates still another improvement upon this form of hanger.

The engraving will show that the same general principles of construction as have hitherto been employed, are retained, viz., bearings having their axes placed at right angles; but the vertical screws engage with the upper and lower halves of the box, which is divided as shown.



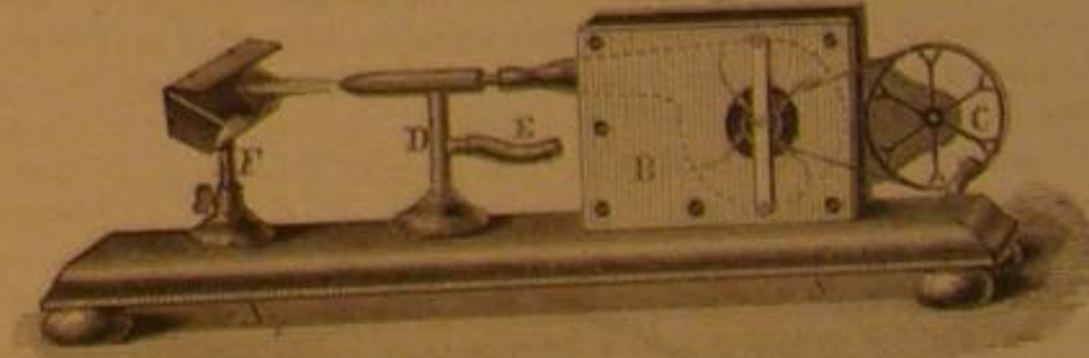
This arrangement enables the box to be made in halves and held together without the use of special bolts for this purpose, the upper and lower bolts in this hanger performing a double office.

The convenience of this arrangement is manifest, and besides the additional convenience, the fact that the wear of boxes may be taken up by the vertical screws, is another consideration in favor of this form of hanger.

An application for a patent on this improvement is now pending through the Scientific American Patent Agency, by J. Gallatin, Jr., of New York, and the hangers are manufactured by the Gallatin and Brevoort Machine Works, 223 Front street, New York.

USEFUL BLOWPIPE.

We give herewith engravings of two useful blowpipes, copied from the *English Mechanic*. The first illustration, Fig.



1, consists of a wood stand, A, a fan with sheet-iron frame and wood sides, B, a small driving wheel, C, and a blowpipe, D, with foot and blast tube running through its center connected by a flexible tube to the fan. E is the tube which conveys the gas to the flame, the gas escaping from an annular opening around the nozzle of the blast tube. F is a sheet-iron support for charcoal on which the article to be brazed is placed.

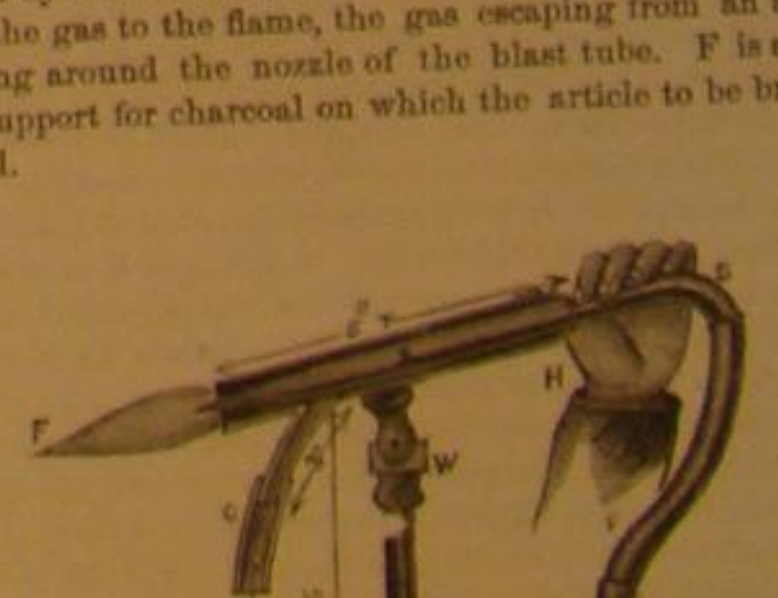


Fig. 2 is a blowpipe for light work which a contributor to the paper alluded to above, says he has used, satisfactorily, for six years. F is the flame, G is a gas tube, M the mouth piece, H the hand of the operator to draw the slide, S S, out a little for a large flame, and to compress it for a small one, T is the outside tube, into which tube, S S, slides; I is the iron wire stand; W is a gas swivel, and P the gas pipe to swivel on the stand adjustible on I.

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VOL. XXI., No. 23...[NEW SERIES.]...*Twenty-fourth Year.*

NEW YORK, SATURDAY, DECEMBER 4, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

OSCILLATIONS OF WATER IN STEAM BOILERS.

The peculiar oscillations of water in steam boilers, as indicated by the steam gage, have been a subject of common remark. The causes for these oscillations are imperfectly understood by many in charge of such boilers, and in conversations with engineers of justly high reputation, we have found that certain causes of this fluctuation in hight are unrecognized.

We may regard the following propositions as thoroughly established laws.

First, the pressure of a homogeneous liquid is as its depth. Second, a liquid subjected to pressure from a supernatant fluid, obeys the same laws of pressure as though it were free from the pressure of the over-lying fluid, and the degree of pressure thus sustained upon its surface does not modify or create exceptions to this rule. Third, if the supernatant fluid be a gas, and the liquid upon which it rests be water, a certain amount of the gas, increasing with the pressure, will be dissolved in the water. Fourth, in the absence of nuclei, which serve by their adhesion to assist the escape of a gas from a liquid supersaturated by that gas, the escape will be irregular, unequal, and will partake of the nature of an explosion. Fifth, in the absence of nuclei, the boiling points of liquids are higher than when such nuclei are present. Sixth, when a liquid is agitated so as to render it of unequal depths in different parts, the pressure upon the bottom of the containing vessel and upon the sides against which the liquid rests will be unequal.

A pressure gage, attached to any one point in the side of a vessel thus agitated, would show by its fluctuations the variations of pressure at that point, provided they did not succeed each other so rapidly as not to give time for this gage to act, in which case it would only show the mean pressure.

A water gage is only a form of pressure gage, communicating at the top with the supernatant steam, and at the bottom with the water upon which the steam rests. The pressure of the column in the gage back toward the interior of the boiler is equal to the weight of a column of water having for its base the section of the aperture which connects the boiler and gage at the bottom, and of a hight equal to the hight of the water in the gage above that aperture, added to the pressure of steam upon the upper end of the column. The pressure outward toward the gage is equal to the weight of a column of water having the same base as before, and of a hight equal to the depth of the water in the boiler above the aperture connecting the boiler and gage at the bottom, added to the pressure of the steam upon the top of the water column as before.

When both steam and water are at rest, the water, obeying the same laws of pressure as though there were no supernatant steam pressing upon its surface, seeks and finds a common level in both boiler and gage.

In a boiler supplying steam to an engine, or blowing off steam, the state of internal affairs is *never* one of rest. To suppose the contrary would be to suppose a uniform pressure maintained, a constantly uniform heat applied to all parts of its heating surface, and the escape of steam from the water unattended by ebullition.

That the pressure is never a constant quantity where steam is generated in a closed vessel, any one may see by watching a steam gage attached to such a vessel. The indication of fluctuations in pressure may also be detected in the variable sound of the steam when a boiler is blowing off. It is for this reason that in testing the evaporative power of boilers, it has been found necessary to eliminate the element of variable pressure, by allowing free escape to the steam, so that the pressure is constantly that of the atmosphere only.

We do not, however, regard the constant short bubbling of water in boiling as of much effect in producing the fluctuations of water indicated by the water gage. There are two causes, however, which are sufficient to account for such oscillations.

In the absence of nuclei the steam is generated under tension and escapes with a sort of explosive action; this occurring at one end of a boiler would raise a wave on the surface, which wave would travel along the surface of the water precisely as it would in an open vessel, and when this wave reaches the end of the boiler where the water gage is attached, the water would rise in the gage and recede with the recession of the wave.

Where a boiler is supplying steam to an engine performing variable work, the supply of steam will not be uniform, and the pressure in the boiler cannot be uniform. Whenever the pressure is diminished suddenly the steam escapes from the surcharged water like the gas from so-called soda water, and the volume of mingled steam and water expands; the water in the gage, obeying the same law as the water in the boiler, except in so far as its temperature may be less.

These causes would account for the oscillations of the water even admitting a uniform heat to be maintained in the furnace, a supposition which variations in draft, variable condition of the fire, and quality of the fuel, etc., forbid.

Where two or more boilers supply steam through a common supply pipe, connected to the boilers by branch pipes, the elements of variation in pressure must be still more multiplied, a point upon which it is unnecessary to dwell.

A consideration of the facts we have thus explained coupled with observation, will enable the intelligent reader to determine the causes of peculiar oscillations in individual boilers.

DIRTY SHOPS AND SLOVENLY WORKMEN.

Charles Reade has asserted that workmen are a dirty set and a reckless set. Is this true of American workmen? His observations have been confined to English workmen; would he have occasion to modify the general character of his statement were he to visit and inspect American shops?

Candidly we must say there would be too much in the general want of cleanliness and order in our workshops to justify the assertion. The shops in which cleanliness and order prevail are rather the exception than the rule; and the individual workman who, in the midst of all the carelessness which prevails in this regard, maintains a scrupulous care for personal cleanliness, order in the arrangement of tools, and method in the performance of his work, may be regarded as a rising man.

On our occasional journeys in those most disagreeable conveniences of the age, horse cars, at times when workmen are returning from their daily work, we frequently notice them with begrimed faces and smutty hands, on their way to homes perhaps no less attractive than their persons.

If this were compelled by circumstances, and the unavoidable conditions of their toil, it would be unkind indeed to find fault with it. We should indeed be the very last to look down upon the necessary accessories of honest toil, and, if any American workman is so situated that he *must* utterly disregard cleanliness, let it be distinctly understood we do not complain of him. But cases of this kind are rare, if they exist at all. What then is the reason for the inexcusable slovenliness of a large majority of workmen?

The first reason is that proprietors and overseers do little or nothing to encourage tidiness in their subordinates. They too often look upon a man who is making attempts to keep himself and his work-bench tidy, as a cat in gloves who will catch no mice, and speak contemptuously to him of being afraid to dirty his hands, although his hands may at the time bear the honorable evidence that his duty has been faithfully performed. But tell us pray, is it necessary that they should bear that evidence home with them? Is it necessary that the face should be soiled as well as the hands, and that clothes should be smirched as well as hands and face?

In imagination we hear some mechanic exclaim, "I should like to see that editor do my work a little while, and keep himself clean! I guess he would find it harder work than sitting in his comfortable office and finding fault with us poor fellows, who have no such good luck!"

To whom we reply that, good luck or not, we often sigh for the light-hearted days, when we did just such work, and earned thereby a good appetite and the means wherewith to gratify it; and further we know that you can't get down on your knees in sand, and face your molds with powdered charcoal, and perspire amid a cloud of black dust, and keep your faces and shirts white. Bless you, we know all that, learned it years ago, but it is not *you* we find fault with. It is that slovenly chap who goes in to work at his lathe, on Monday morning, with a clean shirt on, and who, in less than half an hour, has managed to get two or three streaks of black oil down his back, and sundry patches of it on his face, while the handle to every tool on his lathe and even the lathe itself is japanned with the same unctuous material. We can see the use of the black dust and perspiration in a foundery, but we don't see the necessity of a man in a well-ordered machine shop, painting himself up like an Indian on the war-path, and carrying it home with him to the annoyance of those who are, perhaps, obliged to sit in the same seat with him, and who do not care to get into too intimate contact with black-grease and oil.

Personal cleanliness leads to order in work and business, and elevates the moral character of all who exercise it. It is a virtue second only to godliness, and exercises not only a benign influence upon moral character and physical health, but upon intellectual growth.

Would proprietors and superintendents enforce more thorough order and cleanliness in their works, and encourage it in the habits of their employés, they would get more and better work for their money, would render their help more manly and honorable in the discharge of their duties, elevate the character, and increase the welfare of the working classes throughout the world.

ANNOUNCEMENT FOR 1870.—A SPLENDID WORK OF ART AND CASH PREMIUMS TO BE GIVEN.

The SCIENTIFIC AMERICAN enters its twenty-fifth year on the first of January next, and to mark this period of a quarter of a century in which it has maintained its position as the leading journal of popular science in the world, we have purchased from the executors of the estate of the late John Skirving, Esq., and propose to issue on New Year's day, the fine steel engraving executed by John Sartain, of Philadelphia, entitled

"MEN OF PROGRESS—AMERICAN INVENTORS."

The plate is 22x36 inches, and contains the following group of illustrious inventors, namely, Prof. Morse, Prof. Henry, Thomas Blanchard, Dr. Nott, Isaiah Jennings, Charles Goodyear, J. Saxton, Dr. W. T. Morton, Erastus Bigelow, Henry Burden, Capt. John Ericsson, Elias Howe, Jr., Col. Samuel Colt, Col. R. M. Hoe, Peter Cooper, Jordan L. Mott, C. H. McCormick, James Bogardus, Frederick E. Sickles.

The likenesses are all excellent, and Mr. Sartain, who stands at the head of our American engravers on steel, in a letter addressed to us says "that it would cost $4,000 to engrave the plate now," which is a sufficient guarantee of the very high character of the engraving as a work of art.

The picture was engraved in 1868, but owing to the death of Mr. Skirving, a few copies only were printed for subscribers at $10 each. A work embracing so much merit and permanent interest to American inventors, and lovers of art, deserves to be much more widely known. We propose, therefore, to issue, on heavy paper, a limited number of copies at the original price of $10 each, to be delivered free of expense. No single picture will be sold for less than that price, but to any one desiring to subscribe for the SCIENTIFIC AMERICAN, the paper will be sent for one year, together with a copy of the engraving, upon receipt of $10. The picture will also be offered as a premium for clubs of subscribers as follows to those who do not compete for cash prizes:

For 10 names	one	year	$30	one	picture.
" 20 "	"	"	50	"	"
" 30 "	"	"	75	two	pictures.
" 40 "	"	"	100	three	"
" 50 "	"	"	125	four	"

In addition to the above premiums we also offer the following cash prizes:

$300	for	the largest	list	of	subscribers
250	"	" second	do		do
200	"	" third	do		do
150	"	" fourth	do		do
100	"	" fifth	do		do
90	"	" sixth	do		do
80	"	" seventh	do		do
70	"	" eighth	do		do
60	"	" ninth	do		do
50	"	" tenth	do		do
40	"	" eleventh	do		do
35	"	" twelfth	do		do
30	"	" thirteenth	do		do
25	"	" fourteenth	do		do
20	"	" fifteenth	do		do

Subscriptions sent in competition for the cash premiums must be received at our office on or before the 10th of February next. Names can be sent from any post office, and subscriptions will be entered from time to time until the above date. Persons competing for the prizes should be particular to mark their letters "Prize List" to enable us easily to distinguish them from others.

Printed prospectuses and blanks for names furnished on application.

WORK PERFORMED BY THE HUMAN HEART ESTIMATED IN HORSE POWERS.

That wonderful little pumping engine which we all carry around in our bosoms, and which runs without cessation till death ruthlessly closes the throttle, performs an amount of work so great as to be almost beyond belief till substantiated by arithmetical calculation.

If we scrutinize the mechanism of the heart, we shall find that it involves in its operation nearly all the principles of hydrodynamics. It may, therefore, be brought within the domain of mathematics as well as any other machine.

In the attempt to calculate the power of the human heart for a given time, we shall arrive at some curious and interesting, not to say astonishing results. Few would credit, at first, the statement that the hearts now beating in and around the city of New York, exert an aggregate power ample to propel a large steamer across the Atlantic ocean at a fair rate of speed, yet we shall be able to demonstrate that this is as much a fact, as that any of these steamers ever crossed that storm-torn sea.

Blood is heavier than water; its specific gravity being, according to Booth, of from 1·0527 to 1·057. For convenience, however, we shall consider it as being of the same weight as water, extreme accuracy not being essential to our purpose and in our computations we shall, for the most part and for the same reason, throw out fractions and use round numbers.

The pressure required at the mouth of the aorta to force the blood through the vessels of the human body, is estimated by Hales, as being equal per square inch of surface, to

that exerted by a column of blood seven and one half feet high. The pressure per square inch was estimated by Poiseuille as four pounds three ounces. Others have estimated the pressure as that of a column of water six feet in hight. The results vary in different experiments, but they are sufficiently accurate to give us an average that we may rely upon as within bounds. They are also something more than mere estimates, as this pressure has been measured by pressure gages inserted into the blood vessels.

We shall consider the pressure as that of a water column six feet in hight, the weight of which would be nearly forty-two ounces, which, for simplicity, we will consider forty-two ounces, or two pounds ten ounces avoirdupois.

The average discharge of the heart at each pulsation may be estimated at one and one half ounces, and its number of beats at seventy-five per minute; making an aggregate of 112 ounces, or seven pounds discharged per minute.

The average internal diameter of the aorta, or the first great artery through which the blood passes from the heart into the general circulation, may be taken as being in adults three quarters of an inch.

Seven pounds of blood per minute is therefore forced through this artery against a pressure of forty-two ounces, equivalent to raising seven pounds six feet each minute, equal to raising forty-two pounds one foot, or forty-two foot-pounds.

From the diameter of the aorta and the amount of blood forced through it we might compute the velocity of flow, but that is not essential to our purpose. All consideration of friction in the performance of this work is also omitted, so that the estimate of forty-two foot-pounds per minute must be considered as considerably less than the actual work performed, this result corresponding to what is called *useful work* in the performance of machines.

Forty years of this work would be equal to the work of twenty-six thousand seven hundred and fifty-seven horses for one minute of time, or the work of one horse for forty-four and one half days of ten hours.

The work of seven hundred and eighty-six adult hearts is equal to one-horse power; therefore seven hundred and eighty-six thousand hearts would perform the work of one thousand horses. The aggregate population of New York, Brooklyn, and Jersey City, was, according to the census of 1860, one million one hundred and twenty-two thousand, and it may be safely estimated now at one and one half millions. Considering this as equal to an adult population of twelve hundred thousand, their united heart-beats exert a power equal to that of one thousand five hundred and twenty-seven horses. Averaging the power of the united pulsations of adults and children as equal to that of four fifths the entire population, and taking the census of 1860 as a basis for calculation, the work done by all the human hearts in the United States nearly equals that of thirty-two thousand horses. The work done by the beating of all the human hearts on the globe is equivalent to the power of one million forty-six thousand and fifteen horses. The nominal horse power of the engines in the *Great Eastern* is four thousand; considering the actual horse power to be ten thousand, the power exerted by the united human heart-beat of the world is sufficient to propel a fleet of one hundred and four *Great Eastern's* at full speed continually. This power could only be generated in average steam engineering practice by the combustion of four thousand six hundred and eighty tuns of coal per hour.

When we reflect that the human family is small in comparison even with the great class of mammalia, of which it forms a part, and that many of the same class, as the whale, the elephant, the rhinocerous, hippopotamus, giraffe, etc., have hearts of very much greater size and power than the human heart; and when we conceive of the enormous additional work performed by the hearts of reptiles, birds, fishes, mollusks, and insects, and to this work add in imagination the power expended in the movement of the respiratory apparatus of animals, and voluntary muscular movement, necessary to obtain sustenence for these animals, we may gain some feeble conception of the enormous expenditure of mechanical power required to sustain animated existence on the earth.

PROGRESS OF INVENTION IN THE SOUTHERN STATES.

One of the most noteworthy features of the revival of industry in the Southern States, is the apparent disposition on the part of the people in that section to render themselves as far as possible independent of other sections for their supply of utensils, machines, and other essentials to the conduct of their agricultural and manufacturing pursuits.

One of the most striking evidences of this fact is found in the increased numbers of original devices calculated to advance the progress of the various branches of industry peculiar to that large, fertile, and, soon to be, most flourishing region. And not only are the Southern inventions which come under our notice in the course of our business applicable to the wants of the South, but many of them will find a widely extended application throughout all sections of the country.

This is a most encouraging sign of future prosperity, and one which all lovers of our common country must rejoice to see.

In this connection it will be interesting to notice some of the more recent and prominent Southern inventions.

A Memphis paper states that George W. Grader, a citizen of that city, has taken the bull by the horns and invented a machine for ginning cotton and relinting cotton seed and cotton motes, which promises to revolutionize the whole system of cotton ginning in the country.

Taking cotton from the boll, Mr. Grader's machine leaves no motes, the falls comprising nothing but the dirt. It cleans the seed, making them more valuable for manufacturing purposes, and saves the planter a large per centage on his crop.

The Memphis paper pronounces this invention of Mr. Grader one of the most extraordinary of the present time.

Mr. Henry Thompson of Mobile, has invented, and obtained a patent on, a submarine telescopic lantern, an ingenious design admirably adapted to the purpose of examining objects at any depth under the surface of the water, as the bottoms of vessels, foundations of piers, giving light under the water, and taking photographs of any objects, even at the bottom of the sea. At the same time it is an invaluable aid in enabling submarine divers to see how to work in laying pier or other submarine foundations, wrecking vessels, and recovering the bodies of persons drowned or valuable articles hidden under the sea.

This instrument is of simple construction, similar to a pilot's sounding pole, sectional tubes joined together with reflectors, mirror, and light at one end, so artistically arranged as to reflect objects under the water to the eye of the observer above.

The same versatile inventor has taken out patents on a life, surf, business, and pleasure boat, and, according to the Mobile *Daily Tribune*, has invented one of the most graceful, rapid and safe three-wheeled velocipedes ever devised.

The Boden safety valve is another Southern invention. According to the Louisville *Courier Journal*, it has been submitted to the most satisfactory tests, and has come out triumphant. It consists of two valves, one of which opens on the inside of the boiler and the other on the outside. Thus it will be seen by any one at all acquainted with the workings of a steam boiler, that an over-pressnre of steam will open the outside valve, and a suction or vacuum will open the inside one.

We are in receipt of numerous letters from Southern men, making inquiries in regard to projected improvements, which indicate that an active spirit of invention pervades the Southern mind.

Gen. G. T. Beauregard, of New Orleans, recently obtained letters patent through the Scientific American Patent Agency, for improvements in apparatus for propelling cars and other vehicles on land, and boats on canals or rivers, by means of overhead wire rope, operated by stationary engines or other power placed at intervals along the route.

His invention comprises novel and ingenious clamping devices and spring attachment for the same, attached to the car, for engaging and disengaging the propelling rope, in a manner to avoid shocks and jars to the cars or boats.

In a recent letter to us on the subject, he says: "Thanking you for your prompt attention in obtaining my patent, I would state that this improvement of mine is destined, I believe, to create a rapid increase in the number of street railways in and about cities, and of canals in the country, by materially diminishing their current or running expenses. Moreover, in northern latitudes, where, owing to the ice, canals remain idle part of the winter, they will be used in connection with the stationary engines and endless wire ropes of my system, as so many railways for properly constructed cars and boats. When these arrive at any locks they will be easily transferred from one level to the other by a lifting platform."

We are happy to chronicle these signs of growing prosperity among the Southern people.

HOW SHOE-PEGS ARE MADE.

Shoe-pegs were invented in 1818, by Joseph Walker, of Hopkinton, Massachusetts. At least the invention is attributed to him, though the evidence upon which this opinion is based is not altogether satisfactory. A shoe-peg is a little affair, but its invention was by no means an unimportant event. It worked perhaps as great a revolution in a most important branch of industry as was ever effected by a single device. Before its introduction the soles of all boots and shoes were attached to the uppers by sewing; now, nearly ninety per cent of all the boots and shoes manufactured are pegged.

It has given birth also to numerous other important inventions; pegging awls of improved form, rasps for cutting off the parts of the pegs inside the boot, pegging machines, which will peg on a sole almost before one can think about it, machines for cutting, polishing, and bleaching pegs, etc., etc.

It is within the memory of the writer that shoe-pegs were made by hand. The timber from which they were made was sawed into blocks across the grain, of such a thickness as would, when the block was split into pegs, make them of the right length. Slabs, or bolts, thin as the body of the pegs wanted, were then split off by the use of a long thin knife and a hammer; the knife being used like the instrument called a "*frow*" by coopers and shingle makers. The bolt or slab was next beveled on both sides of one edge. The slab thus prepared was next split into pegs one by one.

Of course such a rude method as this was destined to be supplanted by a far more rapid and perfect one, and there is probably no article so well made and finished that is sold cheaper than the modern shoe-peg.

It is worthy of remark that the same principles are applied to their manufacture by the best modern machinery, as were adopted in the hand method.

The wood must be of some hard, close-grained variety, which splits easily. Hard maple and birch are the favorite woods for this purpose; birch, however, is, we believe, the shoe-peg timber *par excellence*.

The wood is cut into lengths of about eight feet, and is sold by the cord, at three or four times the price of the same kinds of timber cut into fire-wood. The logs are received at the factory in the green state, and are worked up as wanted.

The first operation is peeling off the bark, an adze being employed for this purpose. The logs are next sawed into blocks across the grain, a little thicker than the length of a peg. These blocks are placed on a planing machine and the side which is intended for the heads of the pegs is planed smooth.

The blocks are now ready to be grooved. This is done very rapidly by a machine in which a cutting tool reciprocates rapidly across the face of the block, the block being at proper intervals of time carried along by feed rollers. After the blocks have been grooved one way, they are again grooved at right angles to the first grooves, and both sets of grooves being V-shaped, the surfaces of the blocks on one side, now present a regular succession of quadrangular pyramids, which are the points of the yet embryo pegs.

The next operation is splitting, which is done on machines operating very rapidly and with great precision. The splitting knives on these machines are pivoted at one end, and the other end is made to play rapidly up and down, the motion being similar to that of a shears-blade for trimming sheet iron. The pivoted end may be raised or lowered so that the knife may only enter the wood as far as required, the object being to not split the pegs entirely apart, but to have them hang together at the heads. The blocks are fed to the splitting knives by fluted rollers, the flutes of which fit the grooves in the blocks made by the grooving machines. The blocks are fed in with the planed side downward, and the splitting knife at each stroke enters the wood at the bottom of the V-shaped grooves with great accuracy. Thus the splitting is done from the points towards the heads of the pegs. When the block has passed through the splitting machine once, it is turned and fed through again at right angles to the direction in which it was first fed through, and after this operation the pegs are very nearly split apart, but they still hang together somewhat like a bunch of split lucifer matches. The object of keeping them thus together is to enable them to be fed to the machines in a mass. After the second feeding the block is forcibly thrown off the table of the splitting machine on to the floor, and the pegs fall asunder. The pegs at this stage are of different colors, somewhat rough on their sides, unseasoned and dusty. They are therefore dried in a tumbler heated by steam pipes, bleached with sulphur fumes till they assume a uniform white color, run through a fanning mill to free them from dust, and finally packed for market.

The extent of this manufacture is much greater than would seem possible to most people. It would seem at first, that if all the people in the world were shoemakers, they must be overstocked with pegs. There are numerous factories in the Eastern States turning out from fifty to one hundred bushels and upward of shoe-pegs per day, and still the demand keeps up. Anything in universal demand even if individually the demand is small, must foot up large in the aggregate for the civilized world. The New England States manufacture the greater part of all the shoe-pegs used, Germany, we are informed, being one of the best customers.

The Russian Exposition.

We notice that a resolution was unanimously adopted by the Louisville Convention requesting Ex-President Fillmore to appoint a delegation of six persons to attend the Russian Exposition in 1870, these Commissioners to take charge of all specimens that exhibitors in the United States may desire to send, and they are specially instructed to procure thousands of samples of cotton from various States.

The papers containing the report of this proceeding add that the suggestion came from Europe, and that a hundred thousand American specimens are asked for, to show the importance and the diversity of production in our country.

A letter from Baron Osten Sacken, Consulate General of Russia to the United States, published in another column, states that the Exposition is intended only for the display of Russian products. We invite attention to this letter. Before the Commissioners are appointed by the venerable Ex-President, it might be well to first find out if they are wanted.

A Letter from Dr. Livingstone.

There can no longer be any reasonable doubt of the safety of Dr. Livingstone, and there can be no doubt either, that if his life is spared to narrate the incidents of his last great tour in Africa, it will prove a most remarkable narration. The extracts from a letter of Dr. Livingstone, sent by Dr. Kirk from Zanzibar to Sir Roderick Murchison, contain the following information:

"Dr. Livingstone had traced a chain of lakes, connected by rivers, from the tracts south of the Lake Tanganyika to south latitude 10 degrees to 12 degrees, and he conjectures that these numerous connected lakes and rivers are the ultimate southern sources of the Nile. When he wrote he was about to travel northwards to Ujiji, on the eastern shore of Lake Tanganyika, where he expected to find some information from home, of which he had been entirely deprived for two years, as well as to receive provisions and assistance."

OUR predictions in regard to the effect of high-heeled shoes upon female health have been verified. A French physician states that this fashion "has produced distinct diseases not only of the distorted foot, but of the body. As the frame is thrown permanently into an unnatural position, it affects the spine, and as it is a question of balancing, nervous irritation sometimes occurs. You see by the expression of the face how much a woman suffers who has walked about or even stood in high-heeled boots. Besides, we have accidents from falls very frequently."

Tartaric and Citric Acids.

Tartaric acid, when pure, is in colorless, inodorous, very sour crystals. It is soluble in two parts of water, and also in alcohol. The watery solution has no smell, is perfectly limpid, and is very acid. The specific gravity is 1·59 and 1·75. Heated on a piece of metal over the flame of a lamp, it swells up, emits a very peculiar smell, and leaves a porous coal. The solution exposed to the air very soon mildews on the surface and turns to vinegar.

The composition of pure anhydrous tartaric acid is: Carbon, 36·40; hydrogen, 3·02; oxygen, 60·58 parts in one hundred, but the crystals always contain 11·84 per cent of water.

Tartaric acid is manufactured from cream of tartar (bitartrate of potassa), which latter, as we have stated in a previous article, contains 70·18 per cent of this acid. The mode of its preparation is fully described in all recent works on chemistry applied to the arts and manufactures.

It is frequently adulterated by admixtures of cream of tartar, bisulphate of potassa or lime. These are readily detected as follows;

1. The acid, if pure, dissolves without leaving the slightest sediment.

2. Alcohol must dissolve the whole of the crystals, leaving no undissolved portion.

3. After calcination, lime can be detected in the ash by its effervescing if a drop of any strong acid be allowed to fall on it.

4. Sulphureted hydrogen, sulphate of lime solution, or chloride of barium introduced into a solution of pure tartaric acid, will cause neither cloudiness, change of color, nor deposit.

The uses of tartaric acid are many, large quantities being annually consumed in the manufacture of lemonades, soda waters, and other sparkling drinks, where it replaces advantageously the more expensive "citric" acid. It is also much employed by calico dyers as a special mordant.

In conclusion we will only mention that tartaric acid combines with some other substances, forming what are called "tartrates" and "bi-tartrates," many of which are valuable in the arts or in the practice of medicine.

Tartaric acid itself, finds a place in the phamacopœia.

Citric acid is found in the juices of many plants, but in none is it more plentiful than in the fruit of the lemon and its allies.

In a pure state it forms transparent, scentless, rhombic crystals, which do not alter by exposure, and have a very acid flavor. The specific gravity is 1·617. It is soluble both in water and alcohol. Dry heat soon destroys it.

Citric acid is largely used in bleaching establishments and laundries for removing rust and ink stains, and by the dyer for intensifying many red colors. The best class of artificial lemonades and sparkling acidulated drinks and powders are made from it.

Accidental impurities are, sulphuric acid and salts of lead; they are not, however, of frequent occurrence.

The "trade" adulterations are with oxalic acid, tartaric acid, and occasionally sulphate of lime.

Tartaric acid and oxalic acid, from their low prices and somewhat similar aspect and flavor, are generally found mixed in proportions varying from 30 to 80 per cent with the commercial citric acid. For the detection of this adulteration, dissolve your sample in water and add gradually, stirring all the while, a solution of sulphate or carbonate of potash. If the citric acid be pure, no deposit whatever will show itself, but if it contain either tartaric or oxalic acids, a white crystalline precipitate of tartrate or oxalate of potash will fall to the bottom and tell the tale at once.

Citric acid is manufactured from the juice of lemons, limes, citrons, and other similar fruits. Lemon juice is frequently brought to market in barrels or in bottles from the warm countries where the tree prospers. It is used in its natural state for many domestic purposes, and also by the dyer in his profession.

Lemon juice must be carefully clarified, as by neglect of this operation it will be sure to undergo fermentation and to acquire a very unpleasant odor and disagreeable taste. It is often largely adulterated by the addition of water, besides which, vinegar, sour grape juice, citric acid, muriatic acid or tartaric acid, and sometimes several of these combined, are not unfrequently added to it.

The detection of these admixtures needs the practical science of the analytical chemist.—*New York Mercantile Journal.*

Hyacinth Culture.

Many of our readers just now will be thinking of growing that beautiful winter flower, the hyacinth. A few hints given by a correspondent of the *Journal of Horticulture* may prevent failure, and consequent disappointment, in not a few cases. He says:

"I annually grow about eighteen hyacinths in glasses, and invariably place them all in water at the same time. I have tried different times in the hope of insuring a succession of bloom, but it has happened that those placed latest in the glass were among the first to bloon. I have also ceased to put the bulbs in the water so early as I used, and now do not think of putting them in till the middle or end of October. Fresh rain water is to be preferred, and the glass should be so filled that the water only just touches the base of the bulb. Rain water should not be employed unless it is quite fresh, or otherwise it soon becomes putrid, and causes the roots of the bulbs to decay. If there is no alternative but to employ hard water, if it can be exposed to the action of the sun or external air for a time, so much the better.

"My experience has taught me that hard water used directly after it is taken from the well is apt to cause the roots to become a mass of pulp, highly offensive, and fatal in its effects. Two or three lumps of charcoal placed in the glasses about two or three days before they are occupied by the bulbs, in order to allow of the charcoal becoming saturated and sinking to the bottom, will keep the water from turning rank, and prevent the necessity for its being often changed. Some of my best flowers have been in glasses, the water of which was not once changed. Place the glasses in a dark and rather cool situation until the roots have nearly reached the bottoms of the glasses, when they can be brought to the light.

"A month or six weeks' imprisonment will bring the roots to this stage of development. The most airy and lightest part of a sitting room, but as far from the fire as possible, is the best position for them. When the bulbs have been in the water about a week or ten days, the base of each should be examined, and any decaying or slimy substance removed. As the shoot of growth increases in size, evaporation will take place, therefore the water should be replenished at intervals, care being taken that what is supplied is not lower in temperature than that in the glass. The foliage of the plants should be kept scrupulously free from any dust or dirt; a small piece of sponge will remove this with but very slight trouble. When the flower spikes begin to show themselves the glasses should be kept filled to the rim with water, as at the point of flowering the bulbs absorb a great quantity of moisture."

Monckhoven's New Artificial Light.

Dr. Desire van Monckhoven recently demonstrated satisfactorily its importance before a meeting of the Vienna Photographic Society, and delivered a lecture upon its mode of application.

One of the most intense lights to be obtained by oxidizing metals or metallic compounds at a high temperature, is that derived from chloride of titanium, or chloro-chromic acid, when exposed to the action of an oxy-hydrogen flame; the light thus produced is of high actinic power, and capable of blackening chloride of silver paper to an appreciable degree in thirty seconds, the formation of titanic acid or chromic acid being brought about at a very high temperature. It is this description of light that has been chosen by Dr. M.

Several kinds of oxy-hydrogen lights have been devised from time to time; the Drummond light, in which the flame acts against a cylinder of unslaked lime, but which requires the constant presence of carbonate of lime, and the surface of the cylinder to be continually changing; the Tessie du Motay light, in which the lime cylinder is replaced by means of a compressed magnesia or zirconia cylinder; and the Carlevaris light, consisting of small parallel pipes of hard charcoal moistened with chloride of magnesium. Of all these lights that of Drummond is the best, and by substituting for the lime cylinder another composed of titanic acid, magnesia, and carbonate of magnesia, a suitable illuminating power is obtained. A cylinder of this description, measuring three centimeters (1 inch) broad and nine long (3 inches) lasts for three hours, and may be produced for the sum of threepence. Instead of hydrogen, ordinary coal gas is employed; and for the supply of oxygen, M. Deville's method of obtaining it by heating a mixture of calcined peroxide of manganese and chlorate of potash is employed.

Hoosac Tunnel.

The new railroad bridge across the Deerfield river, at the east end of the Hoosac Tunnel, has been completed, and the rock from the tunnel is now deposited on the other side of the river. The work at the west end of the tunnel progresses rapidly. Last week forty-three feet were completed, being twenty feet more than during any week under the State management. Messrs. Shanly & Co., are the contractors. The Burleigh drills are used exclusively at this tunnel, but with compressed air as the motor. The air is condensed three atmospheres, by means of Burleigh's air compressors, operated by steam power, and the condensed air is carried nearly two miles in an iron pipe before it operates upon the drills. The air which exhausts from the drills gives perfect ventilation within the tunnel.

The progress made at the Hoosac Tunnel is nearly one third greater than at Mont Cenis, notwithstanding the supposed superior and the costly nature of the French machinery

THE FIRST MAN WHO HAD CHARGE OF A LOCOMOTIVE IN THE UNITED STATES, turns out to be, not Nicholas Darrell, as stated on page 326, current volume, in an article copied from the *Rural Carolinian*, but John Degnon, 48 First street, New York. We had the pleasure of a call from Mr. Degnon a few days since, and he explained to us that he was the man who took charge of the *Best Friend* on its way to Charleston, and that he ran this locomotive three months or thereabouts, meanwhile giving Mr. Darrell the necessary instructions to qualify him for the post. The following year he executed a similar commission with a second locomotive. In proof of his statement, Mr. Degnon referred us to Horatio Allen, and other prominent engineers and manufacturers of this city. "Honor to whom honor is due."

GERMAN TINDER.—Amadou, punk, or German tinder, is made from a kind of fungus or mushroom, that grows on the trunks of old oaks, ashes, beeches, etc. It should be gathered in August, or September, and is prepared by removing the outer bark with a knife, and separating carefully the spongy, yellowish mass that lies within it. This is cut into slices, and beaten with a mallet to soften it, till it can easily be pulled asunder between the fingers. It is then boiled in a strong solution of saltpeter.

Answers to Correspondents.

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

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

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

E. N. B., of Ottawa, Ca.—No method of trisecting an angle based upon principles of plane geometry has ever been discovered, though many attempts have been made. Believing the problem impossible, the prizes offered at one time by several learned societies for its solution have all been officially withdrawn, notwithstanding ambitious geometers are still busying themselves with the problem. An attempt at its solution, recently made by Patricio M. Del. Rio, ex-professor in the Peruvian Naval Academy, has been recently published, but it has since proved to be erroneous. You will find immortal fame sooner in other pursuits than in muddling your brains with this question.

J. M., of S. C.—No simple rule has ever been found for determining the size of a second pulley, only the distance between centers, length of belt, and diameter of first pulley being given. A solution has, however, been sought by eminent mathematicians. The problem is extremely difficult, and involves the higher mathematics for even an approximate solution. The practical and proper way to work is to fix the size of both pulleys and determine the length of belt accordingly; and actual measurement is the readiest way to determine the length of a belt when the diameter of the pulleys in which it is to run are given.

J. W. M., of Ind.—The best varnish we know for the preservation of a portable boiler liable to rust through exposure to out-door influences is asphaltum. This substance readily dissolves in turpentine, which forms a good vehicle for its application. We presume you can obtain it ready mixed.

J. W. M., of Pa.—Nails are made of any size ordered, provided the order is large enough. We do not know whether the size you mention is kept on hand or not by any dealers, but are inclined to think it is not.

W. B. L., of Vt.—There is no cheap metal that will withstand the action of salt water. You can obtain all kinds of rubber tubing from any dealer in rubber goods.

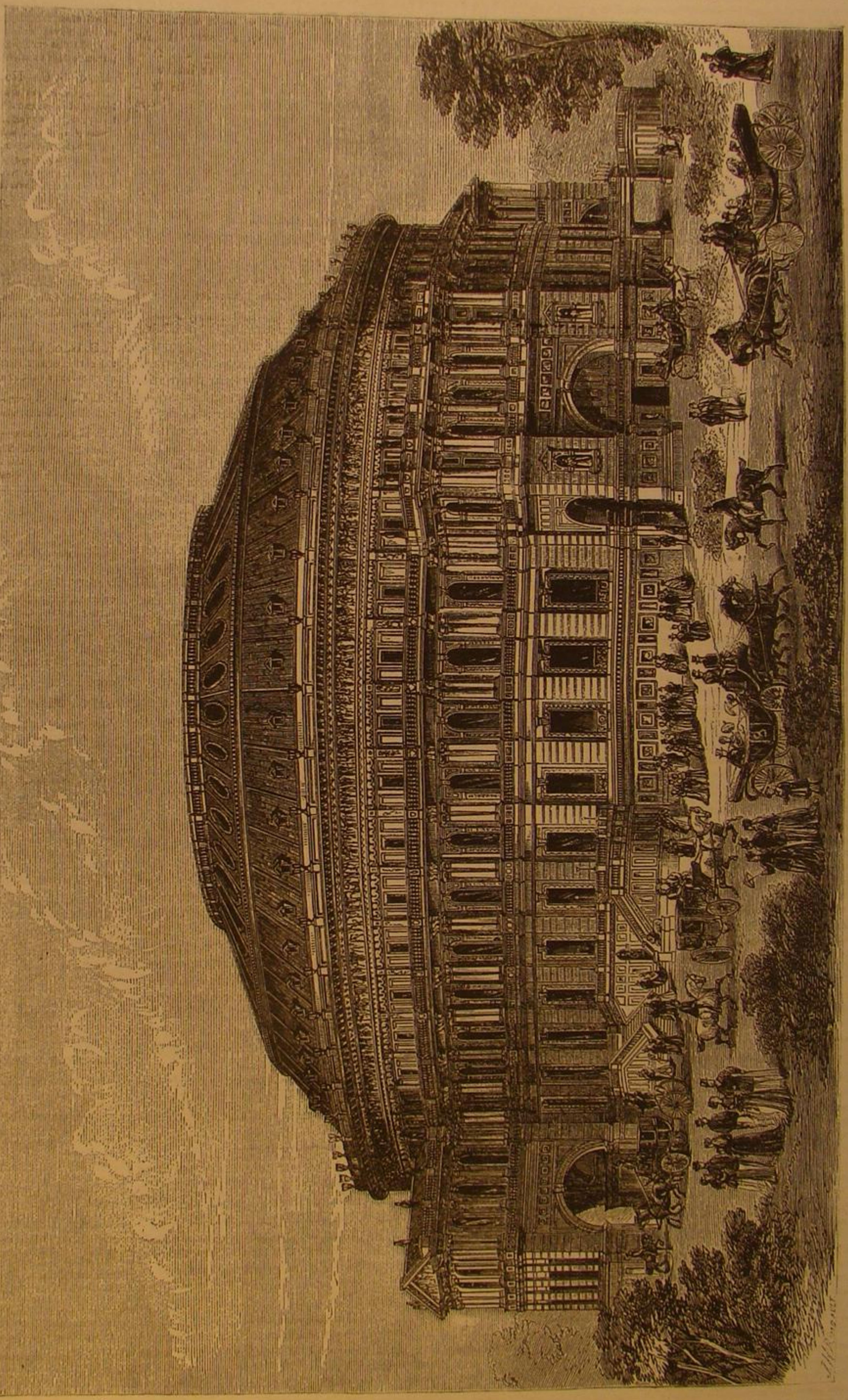
R. A. C., of Ky.—You can render brittle sheet brass tough by annealing, that is, heating it and plunging it in cold water.

G. S. R., of Mass.—There is no gain in using high steam for heating purposes. The total amount of heat in steam at any pressure is found by adding the latent heat to the sensible heat or temperature, and this is practically a constant sum for all pressures.

THE ROYAL ALBERT HALL OF ARTS AND SCIENCES.

On the 20th of May, 1867, the "first stone" of the Royal Albert Hall of Arts and Sciences, of which we present an illustration, was laid with all due solemnity and ceremonial by her Majesty the Queen; and now, at the end of little over two years, the vast building is nearly completed, and is only waiting to be covered in by its vast roof to allow of all its interior fittings and arrangements being set up. In form it bears some resemblance to a Roman amphitheater, although its material—namely, red brick faced with terra cotta—goes far to destroy the illusion. Still, it is only justice to the architect to admit that the general effect of his work is both pleasing and imposing. Its magnitude will be best indicated by giving the exact dimensions in figures. The long diameter of the outer wall is 272 feet, the shortest 238 feet, the length between the porches 338 feet, the breadth of the ellipse 332 feet, and the hight 135 feet. The interior is arranged to accommodate comfortably an audience of 8,000, to be divided as follows: In the arena, situate in the center of the building, 1,000 can be accommodated for the musical performances, and when the space is not occupied, by a flower show or an industrial exhibition. The amphitheater, which rises gradually all round the arena under the boxes, will hold 1,400, the boxes 1,100, the balcony 2,500, and the gallery 2,000. The boxes have already subscribed for it at $5,000 each, and a great number of the single seats at $500, but it is calculated that between 5,000 and 6,000 sittings will still be available as a source of revenue for carrying out the objects of the hall. The building is now complete both as to its outer and inner walls, between which, it should be mentioned, run vast and airy corridors for promenade as well as ingress and egress. The next great work will be the fixing in its place of the immense roof of iron and glass, for the purposes of which the whole interior of the building is at present filled with a perfect forest of scaffolding. This roof will be the greatest span of any work of the kind yet erected. Its long diameter will be 219 feet 4 inches; short, 185 feet 4 inches—an immense weight, it will be said, to be self-sustained. As, however, the calculations have all been made for lead, where glass is only to be used, there is every reason to calculate on its strength and durability.

The only remarkable feature remaining to be noticed is the great organ in course of erection by Mr. Willis, the builder of the organ in St. George's Hall, Liverpool. Its dimensions will be 75 feet wide at the base, 44 feet in depth, 60 feet in width, and hight 100 feet. There are to be 112 steps, and the bellows is to be kept going by two steam engines of from 6 to 8-horse power each. The largest organ at present known is the great organ at the Crystal Palace, but in the Kensington instrument the smallest pipe in the front will be longer than the longest pipe in the interior of its Sydenham predecessor. It is expected that the whole work—building, organ, and approaches—will be finished so as to open simultaneously with the projected International Industrial Exhibition in 1871, and that one of the earliest uses to which it will be put will be the ceremonial distribution of the prizes which will arise out of these exhibitions. The entire programme of its contemplated uses comprehends congresses, national and international, of science and art, performances of music on the grandest scale, distributions of prizes by public bodies, art and science conversazioni, agricultural, horticultural, and industrial exhibitions, and the occasional display of pictures and sculpture. For this latter purpose there will be an immense top-lighted gallery running all round the hall. It is satisfactory to be able to add that, in a building which is intended to accommodate assemblages of 8,000 persons, due care has been taken to provide ample facilities for entrance and exit.—*London Artizan.*



ROYAL ALBERT HALL, SOUTH KENSINGTON, LONDON.

Substitute for Fire-Brick.

Improvements in the method of using and applying certain materials in an unmanufactured state, in order to form a substitute for fire-bricks or fire-goods hitherto employed in the construction of furnaces in which fire-bricks, tiles, and other various forms of fire-goods are usually applied, have, according to the *Mechanics' Magazine*, been patented in England. Instead of using fire-bricks, lumps, stones, tiles, or other forms of materials or compounds, in construction, burnt or unburnt, powdered ganister stone, quartz, sand, mica, sandstone, or other silicious material, plumbago, lime, baryta, steatite, and magnesia, are used, alone or separately, or in varied proportions with fire-clays, or with each other, or with silicious or other solutions, mixed or not with hair, fiber, sawdust, shavings, or pulverized coke, or with other analogous materials. In applying the materials in a plastic state, wire may be used as a supporter, or a skeleton or light framework may be used to support the materials while in course of application to the furnace until the material is dry enough. Thus the furnace is built entirely of such materials in their raw or plastic state in connection with brick or other walls, the object being the substitution for fire-goods, and their consequent cost of manufacture, fuel, carriage, and skilled labor, of unmanufactured materials that can be used and applied by cheap labor more speedily and economically. Thus time and expense will be saved in construction, and it will not be necessary to keep large stocks of varied shapes of bricks, the loss of material and labor in making joints will be saved, while, in case of actual wear, additions can be supplied internally or externally to the structure so that it may be easily and speedily repaired.

Death from the Bursting of a Soda Bottle.

The *Medical and Surgical Reporter* contains an account of a death caused by the bursting of a soda bottle, published to show the terrible nature of accidents incidental to the process of filling glass bottles with carbonic acid water, and with the hope that some additional security may be suggested for the better protection of those engaged in the business. The large French-glass soda bottles, five sixteenths of an inch thick, are at present filled with a patent French apparatus with a pressure of 125 pounds. The bottle is surmounted by a metallic cap that closes with a spring when full. The workmen have heretofore been accustomed to protect the face only with a delicate wire screen, having the entire body exposed to those terrible missiles, that are liable at any moment to be hurled with deadly violence against their persons.

Facts for the Ladies.

Mrs. Bartlett, of Black River Falls, Wis., has made, with one "Wheeler & Wilson" needle, six hundred pairs of heavy canvas pants, worn by loggers, earning, within two years, upward of six hundred dollars, besides doing the work for her own and other families.

Recent American and Foreign Patents.

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

Lock and Latch.—Charles Godfrey Gumpel, Leicester Square, London England.—This invention consists in the application of pins or sliders, of any suitable section, passing through the bolt or bolts, or sliding piece or pieces, acting on the bolt or bolts, and a fixed piece or bolt guide, or pieces or guides, in or on which the bolt or bolts, or sliding piece or pieces, moves or move.

Cotton-spinning Machine.—E. M. Greeson, Americus, Ga.—This invention comprises an arrangement of a number of hoes or scrapers, at suitable intervals, in a row suspended from a beam or frame, provided with guiding handles and connected at right angles to another frame mounted adjustably on one wheel, to the front of which latter frame the animal is to be hitched for drawing the same across the rows of plants.

Ditching Machine.—J. W. McGehee, Fayetteville, Texas.—This invention consists essentially of a boring or ditching auger, suspended from the frame of a truck, and having an enlarged head projecting in advance of the truck, and rotated so as to bore out a groove as the truck is moved along, securing the earth taken back through a trough to an elevator, which carries it up to a spout chuting it to one side.

Combined Stove Pipe, Shelf, and Clothes Horse.—W. C. Burnham, Blooming Grove, N. Y.—This invention relates to an improved stove pipe attachment, for use as a stove pipe, shelf, and clothes horse, or frame, for holding clothes around the pipe for drying while serving as a shelf; also, for holding vessels containing food to be kept warm.

Ax.—Ernest Quast, Freedom, Mo.—This invention consists in making the polls in two parts, divided in the plane of the cutting edge, and shaped so that when put together and joined by rivets, a groove will be formed dovetailed at the base, for holding the bits which are fitted to it, so that a part of the rivets will pass through the tongues fitted to the said grooves.

Filter Rack.—E. C. Andrews, Seneca Falls, N. Y.—This invention relates to improvements in racks for chemists' use, in supporting the funnel-shaped paper filters used by them for filtering liquids, and it consists of a skeleton frame, made of wire or other suitable substance, and so arranged as to expose the greatest possible amount of the surface of the paper to the air while filtering, or to prevent the contact of the paper with the side of the common funnel when used for straining into a bottle, by placing the rack in the said funnel.

Water Wheel.—Denison Chase, Orange, Mass.—This invention consists in an improved form of the buckets and of the bottom of the wheel, calculated to facilitate the discharge of the water, and to obtain a greater per centage of power by the said discharge. The invention also comprises an improved arrangement of the gate, and the supports and adjusting devices of the bridge tree, which improvements are also applicable to other wheels.

Combined Cane, Umbrella, and Seat.—Gillespie Sweeney, New York city.—This invention relates to an improved cane, seat, and umbrella combined together in one article, in an arrangement capable of adjustm ent for use in the capacity of either one of the said articles, and consists of a sheath answering for the cane, divided into three parts, and inclosing in one part the umbrella from the point below the lower ends of the ribs when folded, the stock is enlarged at this point and provided with ribs, braces, and a web of canvas stitched across the ends of the ribs, which spread out similarly in some respects to the umbrella, and form a seat when the top is placed on the ground; this latter part is inclosed within the part of the sheath forming the handle, which is divided longitudinally from the top down and hinged to the aforesaid enlargement of the stock. These two parts fasten together with a strong cord.

Winding and Setting Attachment for Watches.—Charles Spiro New York city.—This invention comprises the attachment to the fusee of a ratchet clutch permanently fixed to it, and a drum carrying a movable clutch and a gear wheel, to which a folding handle of peculiar construction is connected, whereby the movable clutch may be pressed down into gear with the fixed clutch, and the latter turned to wind the watch, or the movable clutch is moved up out of connection with the other, so as turn independently of it, at the same time bringing the toothed wheel into gear with a train of gears connecting with the hands for setting.

Cooking Stove.—James Grimes, Portsmouth, Ohio.—This invention relates to new and useful improvements in cooking stoves, and consists in the arrangement of the flues beneath and back of the oven, and in the divided cross center and in air tubes.

Car Coupling.—John D. Kerrison, New York city.—Tihs invention relates to a new and useful improvement in couplings for railroad cars, whereby many of the objections to ordinary car couplings are obviated.

Washing Machine.—Herrmann Cramer, Sonora, Cal.—This invention relates to a new and useful improvement in machines for washing clothes, and consists in a hollow revolving cylinder with open rim, serrated on its inner surface, placed in a suitable tub with a heating furnace connected therewith.

Thill Coupling.—W. H. Cox and Theophilus Larouche, Williamstown, Y.—This invention relates to a new and useful improvement in devices coupling thills to buggies or other vehicles.

Umbrellas and Parasols.—Miss Maggie Clyde, Brady Post Office, Pa.—This invention consists in making the staff of the umbrella or parasol in sections jointed together, and in a gutter around the rim of the umbrella, for conducting the water to one point, with a single opening for its discharge.

Self Supporting Gate.—J. R. Davis, Covington, Ga.—This invention relates to a new and useful improvement in the method of hanging and supporting farm and other gates.

Tube Wells.—Asa Waters, Mobile, Ala.—This invention relates to a new and useful improvement in "Tube," or "Drive wells," and consists in covering the perforated well tube with wire cloth, and in protecting the wire cloth covering with a perforated metallic shield.

Water Elevator.—G. W. Dickerson, Prairietown, Ind.—This invention relates to new and useful improvements in the method of raising water from wells and cisterns.

Combination Envelope Opener.—C. B. Stevens, Riverton, Conn.—This invention relates to a new and useful improvement in an instrument for opening the envelopes of letters, public documents, etc., and consists in a peculiarly formed cutting blade and handle, and combining these with an ink and lead eraser.

Turbine Water Wheel.—Philip O. Palmer, Swoope's Depot, Va.—The object of this invention is to save the water, and to improve the construction of the gates so that they can be more easily operated and adjusted than heretofore.

Composition for Destroying Insects on Flowers, Plants, etc.—John Ahearn, Baltimore, Md.—This invention consists of a composition for destroying insects on flowers, plants, vines, and bushes. It is made in liquid form and applied by sprinkling, either with a wisp of hay or a watering pot.

Thill Coupling.—Cyrus Fisher, Canton, Mass.—This invention has for its object the fastening of the thills of a carriage to its forward axle, so that they can be readily and easily detached, when desired, and it consists in a strap bolt attached to the rear end of each of the thills and fitting a hole in a trunnioned block, which is confined between clips on the axle, the said strap bolt having a screw-threaded end, by means of which and a nut, casual detachment of the thills is prevented.

File.—Albert Thompson, Norway, Maine.—This invention consists in making a file with two sets of teeth on opposite sides, one set inclined in a direction the reverse of the other, in order that when a stroke in one direction has been made, the file may be turned over, and a return cutting stroke be made with it, thus very much expediting the labor of filing a saw or other article.

Scroll-sawing Machine.—William Oller, Scenery Hill, Pa.—This invention consists in making a saw in a frame consisting of two pairs of metallic levers, one pair at each side of the saw, said levers having their fulcra at the top and bottom of vertical metallic bars, placed one at each side the saw, and said levers being connected with the lower pair at their outer ends by means of extensible rods, by which the frame may be tightened or loosened at pleasure, and is made at once strong, flexible, and elastic, so as to admit of all the necessary movements of the saw.

Elevated Oven Range.—Philip Rollhaus, Portchester, N. Y.—This invention relates to a new manner of arranging the pipes between the water-back and the boiler, with an object of allowing them to be made with a short turn to enable the use of brass pipes.

Corn Sheller.—Henry P. Watts, Lynchburg, Va.—This invention has for its object to furnish an improved machine for removing corn from the cob both when dry and when green, which machine shall be simple in construction, easily and conveniently operated, and effective in operation.

Bedstead.—D. M. Estey, Brattleborough, Vt.—This invention has for its object to so improve the construction of bedsteads that the slats may be secured in place without the use of ledges or strips attached to the inner sides of the rails, and which shall, at the same time, allow the said slats to be conveniently taken out and put in when required.

Combined Double Shovel and Two-Horse Cultivator.—S. G. Rayl, Agency City, Iowa.—This invention has for its object to furnish a simple, convenient, and effective two-horse cultivator for cultivating plants planted in rows, and which shall be so constructed and arranged that the double shovel plows may be easily and quickly detached from the carriage and adjusted for use as single-horse cultivators.

Beams and Girders.—Richard J. Gatling, Indianapolis, Ind.—This invention has for its object to furnish improved girders and beams for fire-proof buildings and other uses, which shall be so constructed that the flooring and laths can be nailed directly to said beams and girders, and which may at the same time be constructed with less powerful machinery and at less expense than when made in the ordinary manner.

Forming Bits and Augers.—James Swan, Seymour, Conn.—This invention has for its object to furnish an improved method of upsetting and turning the lips and forming the screw points of double, curved-lipped bits and augurs from the pressed and crimped blanks by means of a pair of duplicate dies.

Machine for Making Horse Shoes.—Frederick D. Althause, Morrisania, N. Y., and John F. Allen, Tremont, N. Y.—This invention has for its object to furnish an improved machine for forming horseshoes which shall be so constructed and arranged that the hot bars may be fed in at one end of the machine and come out at the other end in the form of perfect shoes.

Circle, or Fifth Wheel for Vehicles.—C. St. James, Pittsfield, Mass.—This invention has for its object to furnish an improvement in the construction of the circle, or fifth wheel of vehicles, so as to avoid the use of a king-bolt, and which, at the same time, shall be so constructed as to allow the wear to be conveniently taken up to keep the parts always close and firm.

Can Opener.—H. C. Alexander, New York city.—This invention has for object to furnish a simple and convenient instrument for opening cans, sardine boxes, etc.

Letter Carriers' Alarm.—Edward H. Ripley, Boston Highlands, Mass.—This invention has for its object to furnish an improved attachment for the doors of houses, offices, etc., which are kept constantly or occasionally locked or bolted, which shall be so constructed and arranged as to enable the letter carrier to pass letters and other small packages through said door, and at the same time will notify the inmates of their delivery.

Washing Machine.—Isaac Erb, Bowmansville P. O., Lancaster, N. Y.—This invention has for its object to furnish an improved washing machine, which shall be so constructed and arranged that while washing the clothes quickly, thoroughly, and without injury to the fabrics, it will enable the cover and presser to be turned back out of the tub and out of the way while putting in and taking out the clothes, and which will, at the same time allow a steam-tight cover to be applied to the tub.

Corn Cultivators.—A. J. Grush, Springfield, Ill.—The object of this invention is to provide a cultivator capable, by a slight adjustment, of adaptation for use and for guidance, either for the operator to ride upon it or walk behind it. It is also designed to provide certain adjusting devices for the plow beams for governing the depth of plowing and their distance apart; also an adjustable arrangement for the plow handles, and an arrangement of means for suspending the plows above the ground.

Dress Protector.—Mrs. A. H. Graton, Lawrence, Kansas.—This invention consists of a short annular sack, preferably of water-proof substance, shaped and adapted for receiving the lower parts of the skirts, and to hold them up out of the water and mud, by being suspended at the outside by straps from a belt around the waist, and at the part inside the skirts, by straps hooking upon the hoop skirt or other under skirt.

Farm Gate.—George F. Bissell, Oneonta, N. Y.—The object in this invention is to improve and perfect the farm gate, various styles of which are in use, and the invention consists in the method of supporting and operating it.

Apparatus for Measuring Water and other Liquids.—John Winsborrow, Livermere Road, Dalston, England.—The object of this invention is to obtain uniformity in the pressure upon the several parts of a meter, and, consequently, greater accuracy, with a minimum of wear and tear in working, together with correct measurement of the liquid passed through.

Folding Chair.—Nicholas Collignon and Claudius O. Collignon, Closter, N. J.—This invention relates to chairs which fold up into a small space, whereby they are rendered much more convenient for transportation and storage than chairs of ordinary construction.

Stud and Button Fastening.—C. L. Horack, Willimantic, Conn.—This invention relates to a new and useful improvement in a device for fastening studs and buttons to shirt bosoms and wristbands and for all similar uses.

Convertible Writing Desk.—Frederick Robbin, Hudson City, N. J.—This invention consists in so constructing and arranging the top and the case containing the drawers and pigeon holes, that a writing desk or a table may be formed at will.

Field Press.—E. J. Marsters, Shaw's Flat, Cal.—This invention relates to a new hay or cotton press, which is arranged so that it can be readily transported from one place to another, to press the material directly on the field or wherever it may be desired. The invention consists in the general construction of the apparatus, which is mounted upon a wagon, and which is so got up by the application of toggle levers and other devices, that a powerful press is obtained.

Earth Closets and Urinals.—Augustus Fraser Baird, Pimlico, London, England.—This invention consists in constructing an earth closet which is provided with a receptacle beneath the seat for receiving the deposits with which the earth is to be mixed, and with a shoot or passage opening into the said receptacle for conveying the earth into the same, and at the other end to that opening above mentioned, another opening by which the earth is supplied from a hopper to the said shoot.

Foundery Molding.—Thomas G. Lucas, Middletown, Conn.—This invention relates to a new and useful improvement in the manner of molding patterns for making castings of iron or other metal, and consists in the use of draft plates (one or more) in combination with the pattern.

Composition for Destroying Insects on Fruit Trees.—John Ahearn, Baltimore, Md.—This invention consists of a composition of six simple and inexpensive ingredients for application to the roots, trunks, and limbs of trees, to destroying grubs and worms, and to prevent the ravages of insects. It is also said to be an excellent fertilizer.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING NOV. 16, 1869.

Reported Officially for the Scientific American.

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96,761.—Can Opener.—H. C. Alexander, New York city.
96,762.—Horseshoe Machine.—Frederick D. Althause, Morrisania, and John F. Allen, Tremont, N. Y.
96,763.—Reversible Die-box for Nut Machines.—Wesley Anderson, Pittsburgh, Pa.
96,764.—Machine for Making Match Blocks.—Emery Andrews, Portland, Me., and Wm. Tucker, Philadelphia, Pa.
96,765.—Filter Rack.—E. C. Andrews, Seneca Falls, N. Y.
96,766.—Tubing Clutch.—Joel N. Angier, Titusville, Pa.
96,767.—Earth Closet.—Augustus Fraser Baird, Pimlico, England.
96,768.—Antonio Barli.—Suspended.
96,769.—Railway-rail Splice.—Jason T. Bartlett (assignor to himself and Edward E. Batman), Boston, Mass.
96,770.—Potato Digger.—Joseph Belknap, Adrain, Mich.
96,771.—Farm Gate.—Geo. F. Bissell, Oneonta, N. Y.
96,772.—Lantern.—Wm. H. Bonnell, Buffalo, N. Y.
96,773.—Stove-pipe Shelf and Clothes Dryer.—W. C. Burnham, Blooming Grove, N. Y.
96,774.—Combined Seed Planter and Cultivator.—Geo. W. Carpender, Butler, Ind.
96,775.—Water Wheel.—Denison Chase, Orange, Mass.
96,776.—Combined Screw and Pipe Wrench.—J. W. Close, Buffalo, N. Y.
96,777.—Umbrella.—Maggie Clyde, Brady Post Office, Pa.
96,778.—Folding Chair.—Nicholas Collignon and Claudius O. Collignon, Closter, N. J.
96,779.—Apparatus for Tying Fleeces.—Solon Cooley (assignor to himself and Ceylon M. Kelly), Caro, Mich.
96,780.—Washing Machine.—Herrmann Cramer, Sonora, Cal.
96,781.—Apparatus for Unloading Cars.—John Dable, Chicago, Ill. Antedated November 5, 1869.
96,782.—Machine for Rolling Car Coupling Pins.—Frederick W. Davidson, Cleveland, Ohio.
96,783.—Gate.—John R. Davis, Covington, Ga.
96,784.—Track-clearing Car.—Augustus Day, Detroit, Mich.
96,785.—Water Elevator.—G. W. Dickerson, Prairietown, Ind.
96,786.—Washing Machine.—Isaac Erb, Lancaster, N. Y.
96,787.—Bedstead.—D. M. Estey, Brattleborough, Vt.
96,788.—Cabinet for Ladies.—Alexander J. Forbes, San Francisco, Cal.
96,789.—Rigging Ships.—Robert B. Forbes, Boston, Mass.
96,790.—Process for Reducing Rebellious Ores of the Precious Metals.—Alfred I. Frick and Jean Baptiste Le Clerc, San Francisco, Cal.
96,791.—Machine for Cutting Pasteboard.—H. A. Gage, Manchester, N. H.
96,792.—Calendar Clock.—Daniel J. Gale, Sheboygan Falls, Wis.
96,793.—Beam.—Richard J. Gatling, Indianapolis, Ind.
96,794.—Gavel Fork.—Thos. R. George, West Dryden, N. Y.
96,795.—Sewing Machine Fan.—D. W. Glassie, Nashville, Tenn.
96,796.—Wind Wheel.—Luman M. Godfrey, Colon, Mich., assignor to himself and George S. Sheffield.
96,797.—Dress and Skirt Protector.—A. H. Graton, Lawrence, Kansas.
96,798.—Grate Bar.—C. A. Greenleaf, Indianapolis, Ind.
96,799.—Cooking Stove.—James Grimes, Portsmouth, Ohio.
96,800.—Machine for Tenoning Spokes.—Milburn Gunn, Jeffersontown, Ky.
96,801.—Corn Cultivator.—A. J. Grush, Springfield, Ill.
96,802.—Door Lock.—Charles Godfrey Gumpel, Leicester Square, England.
96,803.—Machine for Bending Thills.—James S. Hamlet, Portsmouth, Ohio.
96,804.—Bread Machine.—John E. Hawkins, Lansingburg, N. Y.
96,805.—Portable Fence.—Lewis Hazlett and Samuel D. Hazlett, Winfield township, Pa.
96,806.—Heating Stove.—Chas. Hempel and Joseph Schaum, Detroit, Mich.
96,807.—Carpet Sweeper.—R. C. Higgins and Abraham Fuller, Boston, Mass.
96,808.—Button.—C. L. Horack, Willimantic, Conn.
96,809.—Hemmer for Sewing Machines.—E. Howell, Ashtabula, Ohio.
96,810.—Horse Hay Fork.—Amos B. Hunt, Matteson, Mich.
96,811.—Lath Mill.—John S Hyde, Pentwater, Mich.
96,812.—Apparatus for Preventing Horses from Kicking in the Stable.—Werner Itschner, Philadelphia, Pa.
96,813.—Railway Car Coupling.—John D. Kerrison, New York city.
96,814.—Fence.—Andrew Kull, Jr., Bloomfield, Wis.
96,815.—Manufacture of Plastic Veneer.—Chas. Kuttler, West Hoboken, N. J.
96,816.—Railway Car Coupling.—Leo Laley, Goshen, Ind.
96,817.—Heel-cutting Machine.—Richard C. Lambart, Raynham, assignor to David Whittemore, North Bridgewater, Mass.
96,818.—Machine for Cutting Fellies.—Wm. A. Lewis, and Geo. W. Butler, Joliet, Ill.
96,819.—Flask for Molding.—Thos. G. Lucas, Middletown, Conn.
96,820.—Fluting Machine.—Hannah Luchs, Washington, D. C.
96,821.—Animal Trap.—Wm. Luker, Kalamazoo, Mich.
96,822.—Field Press.—E. J. Marsters, Shaw's Flat, Cal.
96,823.—Soda Water Draft Apparatus.—John Matthews, Jr., New York city.
96,824.—Ditching Machine.—James W. McGehee, Fayetteville, Texas.
96,825.—Grain Drill.—Wm. H. Moore, Jr., Blooming Grove, Ind.
96,826.—Cooking Stove.—W. N. Moore, Neenah, Wis.
96,827.—Manufacture of Pig Iron.—Charles Motier Nes York, Pa.
96,828.—Beverage.—Constantine Nessi, San Francisco, Cal.
96,829.—Drag.—John W. Newton, Geneva, Wis. Antedated November 1, 1869.
96,830.—Sample Card for Liquids.—Henry Nustedt, New York city.

96,831.—Propelling Apparatus for Vessels.—Amos D. Owen, Thorntown, Ind., and John D. Sherman, Paw Paw, Mich.

96,832.—Rubber Hose.—Edward Livingston Perry (assignor to Combination Rubber Company), New York city.

96,833.—Barrel-filling Apparatus with Whistling Indicator.—Hiram S. Phillips, Sewickley, Pa.

96,834.—Edgar M. Potter.—Suspended.

96,835.—Mechanism for Raising Top Roller Weights in Spinning Machines.—Geo. W. Prentice, Whitinsville, Mass.

96,836.—Harrow.—Elijah J. Preston, Eureka, Mo.

96,837.—Ax.—Ernest Quast, Freedom, Mo.

96,838.—Combined Double Shovel and Two-horse Cultivator.—S. G. Rayl, Agency City, Iowa.

96,839.—Cooking Range.—Philip Rollhaus, Port Chester, N. Y.

96,840.—Stable Hook.—Geo. W. Sanderson, Shirley, Mass.

96,841.—Detachable Buoyant Ship's Deck.—Jos. Sawyer, Sebewaing, Mich.

96,842.—Apparatus for Carbureting Air.—Ira W. Shaler, Brooklyn, N. Y.

96,843.—Trunk Tie and Clasp.—A. D. Smith, Grafton, assignor to David Rose, Rawsonville, Ohio.

96,844.—Watch-winding and Setting Attachment.—Charles Spiro, New York city.

96,845.—Envelope Opener.—Charles B. Stephens, Riverton, Conn.

96,846.—Fifth-wheel for Carriages.—Clement St. James, Pittsfield, Mass.

96,847.—Die for Forming Bits and Augers.—James Swan, Seymour, Conn.

96,848.—Combined Umbrella, Cane, and Seat.—Gillespie Sweeney, New York city.

96,849.—Wood Pavement.—A. Van Camp, Washington, D.C., and M. M. Hodgman, St. Louis, Mo.

96,850.—Concrete for Pavement and for other Purposes.—A. Van Camp, Washington, D. C., and M. M. Hodgman, St. Louis, Mo.

96,851.—Holdback for Carriage Thills.—Peter Spohn Van Wagner, Saltfleet township, Canada.

96,852.—Adjustable Trace Fastening.—Peter Spohn Van Wagner (assignor to himself and Alfred E. Carpenter), Stony Creek, Saltfleet township, Canada.

96,853.—Water Wheel.—Alonzo Warren, Boston, Mass.

96,854.—Tube Well.—Asa Waters, Mobile, Ala.

96,855.—Cooking Stove.—George Wellhouse, Akron, Ohio.

96,856.—Fruit Box Crate.—James White, Cleveland, Ohio.

96,857.—Wash Boiler.—George W. Wilson, Freeport, Ill.

96,858.—Liquid Meter.—John Winsborrow, Livermere Road, Dalston, England.

96,859.—Fence.—Stephen A. Wood, Cardington, Ohio.

96,860.—Harness Pad Block.—J. Zimmer, Jr., Haltday, Ill.

96,861.—Composition for Destroying Insects on Flowers, Plants, and Bushes.—John Ahern, Baltimore, Md.

96,862.—Hose Pipe Nozzle.—Albert F. Allen, Providence, R. I.

96,863.—Hose Ladder Strap.—Albert F. Allen, Providence, R. I.

96,864.—Washing Machine.—William Arnold, Pawtucket, R. I.

99,865.—Reversible Safety Pinion for Watches.—Benjamin Bacon, Morrison, Ill., assignor, by mesne assignments, to National Watch Company.

96,866.—Chain Elevator and Bucket.—John Augustus Ball, Grass Valley, Cal.

99,867.—Seaming Machine.—Charles E. Bancroft, Montpelier, Vt.

96,868.—Saw Mill.—Simon Barnhart, Chillicothe, Ohio.

96,869.—Fruit Jar.—Edwin Bennett, Baltimore, Md.

96,870.—Wood Pavement.—Albert Betteley, Boston, Mass.

96,871.—Preserving Fruits, Meats, and other Substances.—V. W. Blanchard, Bridport, Vt.

96,872.—Furnace and Process for Treating and Reducing Ores, etc.—V. W. Blanchard, Bridport, Vt. Antedated November 6, 1869.

96,873.—Fastening for Fruit Jars.—Eliam Boorse, Philadelphia, Pa.

96,874.—Process and Apparatus for Annealing Metals.—J. M. Bottum, New York city.

96,875.—Gang Plow.—W. J. Boyce and G. W. Haines, Maine Prairie, Cal.

96,876.—Fire Extinguisher.—John F. Boynton, Syracuse, N. Y.

96,877.—Washing Machine.—Charles B. Bristol, New Haven, Conn.

96,878.—Grain Meter.—Thomas Brocket and J. J. Brown, Davenport, Iowa.

96,879.—Snow Shovel.—G. W. Brown, Providence, R. I. Antedated Nov. 10, 1869.

96,880.—Carriage Jack.—Daniel Bull, Amboy, Ill.

96,881.—Bit Brace.—C. L. Butler, Greenfield, Mass.

96,882.—Drying Car.—J. K. Caldwell, Allegheny City, Pa.

96,883.—Corn Planter.—Joseph Patten Campbell, Danville, Pa.

96,884.—Stripper for Carding Machines.—L. M. Capron, (assignor to Alexander Bigelow and George Barber), Worcester, Mass.

96,885.—Steam Boiler.—Geo. Clark, Buffalo, N. Y.

96,886.—Sewing Machine.—P. J. Clever, Goliad, Texas.

96,887.—Carriage.—I. A. Clippinger, Newton, Iowa. Antedated Nov. 8, 1869.

96,888.—Washing Machine.—Geo. Combs, Utica, N. Y.

96,889.—Bail or Handle for Pails, etc.—E. T. Covell, Brooklyn, N. Y. Antedated Nov. 10, 1869.

96,890.—Manufacture of Nozzle and Screw Caps for Oil Cans, etc.—E. T. Covell, Brooklyn, N. Y.

96,891.—Thill Coupling.—W. H. Cox and Theophilus Larouche, Williamstown, N. Y.

96,892.—Hay Tedder.—T. C. Craven, Albany, N. Y., assignor to W. L. and H. K. Boyer.

96,893.—Steam Cloth Press.—John J. Crawford, Glasgow, Scotland.

96,894.—Horse Hay Fork.—Jeptha Cummins and C. E. Cummins, Perry, Mich.

96,895.—Water Governor.—Henry Curtner (assignor to himself and Eli Ragon), Anna, Ohio.

96,896.—Combined Harvester and Thrasher.—W. G. Davis and L. T. Davis, McMinnville, Oregon, assignors to Daniel McCreary, J. B. Davis, and L. T. Davis.

96,897—Lantern.—Cyrus Dean, Buffalo, N. Y., assignor to J. A. Blake, Port Robinson, Canada.

96,898.—Carriage Fifth Wheel.—D. D. Decker, Saugerties, N. Y., assignor to himself and W. B. Dubois.

96,899.—Kiln for Revivifying Bone Black.—J. O. Donner, Jersey City, N. J.

96,900.—Vacuum Pan and Similar Apparatus.—J. O. Donner, Jersey City, N. J.

96,901.—Hemmer for Sewing Machine.—T. H. Eulass, Mason City, Ill.

96,902.—Base-burning Stove.—M. G. Fagan (assignor to himself and J. B. Wilkinson), Troy, N. Y.

96,903.—Link-motion Device for Steam Engines.—E. Faron (assignor to Reaney, Son & Co.), Chester, Pa.

96,904.—Carriage Thill Coupling.—Cyrus Fisher, Canton, Mass., assignor to himself and A. G. Fisher, New York city.

96,905.—Manufacture of Iron and Steel.—F. P. Fletcher and V. W. Blanchard, Bridport, Vt.

96,906.—Churn Dasher.—J. M. Fletcher, Sidney, Ohio.

96,907.—Plow.—Asahel Franklin, Springfield, Ohio.

96,908.—Sash Holder.—J. G. Garretson and O. S. Garretson, Buffalo, N. Y.

96,909.—Lamp-shade Holder.—E. P. Gleason, New York city.

96,910.—Machine for Cutting Threads on Bolts.—J. J. Grant (assignor to Charles H. Stockbridge), Northampton, Mass. Antedated Nov. 6, 1869.

96,911.—Casting Copper Tubes.—James F. Guthrie, Somerville, Mass.

96,912.—Tube-cutting Machine.—Samuel Halliwell, New Haven, Conn.

96,913—Friction Clutch.—Moses Hawkins (assignor to himself, R. M. Bassett, and T. S. Bassett), Birmingham, Conn.

96,914.—Pipe Coupling.—Rowland Hill, East Boston, Mass.

96,915.—Carpet.—David Hirschberg, Baltimore, Md.

96,916.—Method of Lining Rings, Buckles, etc.—John P. Hisley (assignor to himself and Henry L. Duquid), Syracuse, N. Y.

96,917.—Horse Rake.—H. W. Holcomb (assignor to himself and W. F. Hughes), Northville, Mich.

96,918.—Wooden Pavement.—Phinehas Howard (assignor to J. S. Josselyn, W. B. Lake, and B. F. Josselyn), San Francisco, Cal. Antedated Nov. 3, 1865.

96,919.—Cotton Seed Planter.—O. P. Humber, Greenville, N. C.

96,920.—Brick Machine.—D. J. Hunter, Exeter, N. H.

96,921.—Facing for Buildings—Thomas A. Hunter and John Blewitt, New York city.

96,922.—Iron Front for Buildings.—P. H. Jackson, New York city.

96,923.—Water Filter.—J. C. Jewett, Buffalo, N. Y.

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96,925.—Mechanism for Operating the Jacks in Looms.—C. H. Knowlton, Camden, N. J.

96,926.—Grain Drill.—Benj. Kuhns, Dayton, Ohio.

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96,931.—Needle Polisher, Sharpener, and Lubricator.—H. W. Little, Muncie, Ind.

96,932.—Railway-car Coupling.—Frank B. Lord, Cincinnati, Ohio.

96,933.—Grain Binder.—J. W. Loveless and C. H. Shaffer, Clark's Hill, Ind. Antedated Nov. 3, 1869.

96,934.—Fence.—Clovis Lowe, Randolph, N. H.

96,935.—Thill Shackle.—John Madden and Upson Bushnell, Cleveland, Ohio.

96,936.—Composition for Preventing Oxidation of Metallic Water or Gas Pipes.—George Albert Mariner and Folsom Dorsett, Chicago, Ill.

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96,938.—Corn Sheller.—W. M. Mayall, Gray, Me., assignor to himself and J. C. Mayall, Boston, Mass.

96,939.—Brewing Ale, Beer, etc.—Jas. McCormick, Boston, Mass.

96,940.—Vapor Bath Apparatus.—John McNeven, New York city.

96,941.—Bag Holder.—Jas. McPhail, Charles City, Iowa.

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96,949.—Seam for Tin Cans.—C. R. Otis, Chicago, Ill.

96,950.—Blind Slat Operator.—Oscar Paddock, Watertown, N. Y.

96,951.—Corset.—L. A. Palmer (assignor to himself and F. E. Hibbard), Boston, Mass.

96,952.—Water Wheel.—Philip O. Palmer, Swoope's Depot, Va.

96,953.—Lip Shield.—E. C. Philbrick, Bath, Me.

96,954.—Fabric for Shirt Collars.—C. F. Pidgin, Boston, Mass. Antedated Nov. 3, 1869.

96,955.—Weighing Scale.—William P. Pierce, New York city.

96,956.—Hanging Lower Topsail Yards.—E. J. Pinkham, Portland, Me.

96,957.—Pipe Wrench.—Charles Pomeroy, Mattoon, Ill.

96,958.—Oil Can.—Charles Pratt, New York city.

96,959.—Hydrant.—Washburn Race and S. R. C. Mathews Lockport, N. Y., assignors to S. R. C. Mathews.

96,960.—Machine for Shearing Angle Iron.—Thomas Reaney, Chester, Pa.

96,961.—Stand for Exhibiting Photographs, etc.—J. S. Reid, Orange, Ind.

96,962.—Coupling for Hollow Shafts.—P. W. Reinshagen (assignor to himself and J. H. Buckman), Cincinnati, Ohio.

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96,968.—Hasp Lock.—C. W. A. Romer, Newark, N. J.

96,969.—Sash Pulley.—Benoit Roux (assignor to himself and George Haupt), Cincinnati, Ohio.

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96,973.—Broiler.—G. S. Saxton (assignor to himself and J.M. Saxton), St. Louis, Mo.

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96,975.—Machine for Rolling Tubes.—G. H. Sellers, Wilmington, Del.

96,976.—Railway Car Coupling.—G. Shatswell, Waukegan, Ill.

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96,978.—Apparatus for Curing Meat.—M. B. Sherwood, Jr., Buffalo, N. Y.

96,979.—Cultivator.—James Simpson, Cordova, Ill.

96,980.—Blind Rack.—C. E. Smith, Goffstown, N. H.

96,981—Buckle for Clothing.—E. A. Smith, Waterbury, Conn.

96,982.—Jointed Pipe Connection.—Hiram Smith, Norwalk, Ohio.

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96,986.—Lamp.—R. H. Smith (assignor to J. S. and T. B. Atterbury), Pittsburgh, Pa.

96,987.—Top for Sirup Pitchers.—Thomas Smith, Jr., Boston, Mass.

96,988.—Composition for Pavements.—H. F. Snow and J. H. Davis, Dover, N. H.

96,989.—Means for Ventilating, Cooling, and Warming Beds.—D. E. Somes, Washington, D. C.

96,990.—Paging Machine.—Samuel W. Soule, Milwaukee, Wis.

96,991.—Coal Screen.—William Sparks, New York city. Antedated Nov. 5, 1869.

96,992.—Telegraph Sounder.—Henry Splitdorf, New York city.

96,993.—Packing for Pistons and Valves.—W. M. Stevenson and Austin Pearce, Harmony, Pa., assignors to themselves and G. E. Handy, Boston, Mass.

96,994.—Baking Powder.—John Stowell, Charlestown, Mass.

96,995.—Brick Machine.—R. Stuckwisch, Terre Haute, Ind.

96,996.—Hay Elevator.—Hirom C. Stouffer, East Lewiston, assignor to George Smith, Lowellville, Ohio. Antedated May 17, 1869.

96,997.—Still for Distilling Naphtha and Petroleum.—A. H. Tait, Jersey City, N. J.

96,998.—Process of Preparing Grain for Distillation.—Henry Tauszky, New York city, assignor to Eli D. Bannister and Rudolph Tauszky.

96,999.—Safety Valve.—Henry Taylor and J. M. Coale, Baltimore, Md.

97,000.—Machine for Grinding the Cutters of Mowing Machines.—A. P. Thayer, Syracuse, N. Y.

97,001.—Mode of Collecting and Storing Carbonic Acid for Extinguishing Fires.—Eli Thayer, Worcester Mass., assignor to himself and M. Cowling, New York city.

97,002.—File.—Albert Thompson, Norway, Me., assignor to himself and G. T. Wheeler, Ridgway, Pa.

97,003.—Book Rack.—J. P. Tibbits, New York city.

97,004.—Artificial Marble.—Christian Volckmann (assignor to Otto Dresel, John Seltzer, and P. A. Schlapp), Columbus, Ohio.

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97,008.—Corn Sheller.—H. P. Watts, Lynchburg, Va., assignor to himself and J. A. Cooley.

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97,010.—Bit-Stock Fastening.—C. P. Whitman, Charlemont, Mass., assignor to himself and W. C. Dodge, Washington, D. C.

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97,012.—Handle for Brushes, Cards, etc.—Daniel Witt and Aaron Wait, Hubbardston, Mass.

97,013.—Mode of Attaching Seats to Wagons.—D. J. Wilcoxson (assignor to himself and A. J. Mowry), Milan, Ohio.

97,014.—Sewing Machine for Button Holes.—George B Woodruff and George Browning, London, England, assignors to "The Singer Manufacturing Co.," New York city.

97,015.—Die for Making Shears.—S. H. Woods, Berlin, assignor for one half to R. S. Gladwin, West Meriden, Conn.

97,016.—Signal Light for Railroad Cars.—H. A. Wright Logansport, Ind.

97,017.—Process of Manufacturing Steel.—James Johnston (assignor to himself, Alexander Postley, S. H. Nesbit, J. C. Pershing, Lewis Peterson, and Thomas Fawcett), Allegheny, Pa., and John Hunter, Alliance, Ohio.

97,018.—Washing Machine.—G. L. Witsil, Philadelphia, Pa., assignor to himself and Charles Merrill, Detroit, Mich.

97,019.—Device for Grating Green Corn from the Cob, etc.—G. L. Witsil (assignor to himself and R. D. L. S. Gutgesell), Philadelphia, Pa.

97,020.—Street Railway.—A. Van Camp, Washington, D.C., and M. M. Hodgman, St. Louis, Mo.

REISSUES.

78,569.—Composition for Destroying Insects on Fruit Trees.—Dated June 2, 1868; reissue 3,728.—John Ahearn, Baltimore, Md., assignee of B. Best.

71,706.—Safety Pocket.—Dated Dec. 3, 1867; reissue 3,729. Joseph Colton, New York city.

34,182.—Skeleton Skirt.—Dated January 14, 1862; reissue 3,730.—Division A.—Marks Fishel, Adolph Opper, and Leo Popper, New York city, assignees of Marks Fishel.

34,182.—Sheleton Skirt.—Dated Jan. 14, 1862; reissue 3,731.—Division B.—M. Fishel, Adolph Opper, and Leo Popper, New York city, assignees of Marks Fishel.

12,780.—Shuttle for Looms.—Dated May 1, 1855; reissue 3,355; dated March 30, 1869; extended seven years; reissue 3,732.—Liberty Ditchfield, F. C. Litchfield, and L. M. Litchfield, Southbridge, Mass., assignees of Lydia W. Litchfield, administratrix of the estate of Laroy Litchfield, deceased.

20,192.—Expansive Bit.—Dated May 11, 1858; reissue 3,516, dated June 22, 1869; reissue 3,733.—William A. Clark, Woodbridge Conn.

29,690.—Machine for Dressing and Finishing Thread—Dated Aug. 21, 1860; reissue 3,734.—Origin Hall, Willimantic, Conn., and T. Merrick, Holyoke, Mass.

92,050.—Printing Press.—Dated June 29, 1869; reissue 3,735.—R. M. Hoe and S. D. Tucker, New York city.

94,005.—Washing Machine.—Dated Aug. 24, 1869; reissue 3,736.—Alex. King and G. H. King, Painesville, Ohio.

94,428.—Compound for Curing Cholera in Hogs and Chickens.—Dated Aug. 31, 1869; reissue 3,737.—A. C. McMahon, Lincoln, Ill.

72,561.—Machine for Folding Tinned Plates.—Dated Dec. 24, 1867; reissue 3,738.—O. W. Stow, Plantsville, Conn.

DESIGNS.

3,750.—Sign.—Emil Ney, New York city.

3,751.—Trade Mark.—W. F. Sayles and F. C. Sayles, North Providence, R. I.

3,752.—Cotton Knife.—G. A. Seaver, New York city.

3,753.—Floor Oil Cloth.—C. W. Strout, Hallowell, Me.

3,754.—Tea Service.—H. Vasseur (assignor to Simpson, Hall, Miller & Co.), Wallingford, Conn.

3,755.—Perforated Banner.—Wm. S. Worthington, Newtown, N. Y.

EXTENSIONS.

Machine for Manufacturing Corks.—Mary F. Crocker, of West Winsted, Conn., administratrix de bonis non of W. R. Crocker, deceased.—Letters Patent No. 13,714, dated Oct. 30, 1855.

Process for Making Zinc White.—Samuel Wetherill, of Baltimore, Md.—Letters Patent No. 13,806, dated Nov. 13, 1855.

Planing Machine.—Jas. A. Woodbury, of Boston, Mass.—Letters Patent No. 13,808, dated Nov. 13, 1855.

Lathe Chuck.—Eli Horton, of Windsor Locks, Conn.—Letters Patent No. 13,787, dated Nov. 13, 1855.

Tobacco Presses.—R. Kingsley, of Springfield, Mass.—Letters Patent No. 13,790, dated Nov. 13, 1855.

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APPLICATIONS FOR EXTENSION OF PATENTS.

Cultivator Teeth.—Charles H. Sayre and George Klinck, Utica, N. Y. have applied for an extension of the above patent. Day of hearing Jan. 26, 1870.

Manufacture of Iron and Steel.—Henry Bessemer, of London, England, has petitioned for the extension of the above patent. Day of hearing, Jan. 26, 1870.

Gearing for Feed Rollers of Planing Machines.—Charles Burleigh, Georgtown, Colorado Territory, has applied for an extension of the above patent. Day of hearing, January 26, 1870.

Refining Iron.—Christian Shunk, Philadelphia, Pa., has applied for an extension of the above patent. Day of hearing Jan. 26, 1870.

Sealing Preserve Cans.—R. H. Lewis, Sacramento, Cal., has petitioned for an extension of the above patent. Day of hearing Jan. 26, 1870.

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