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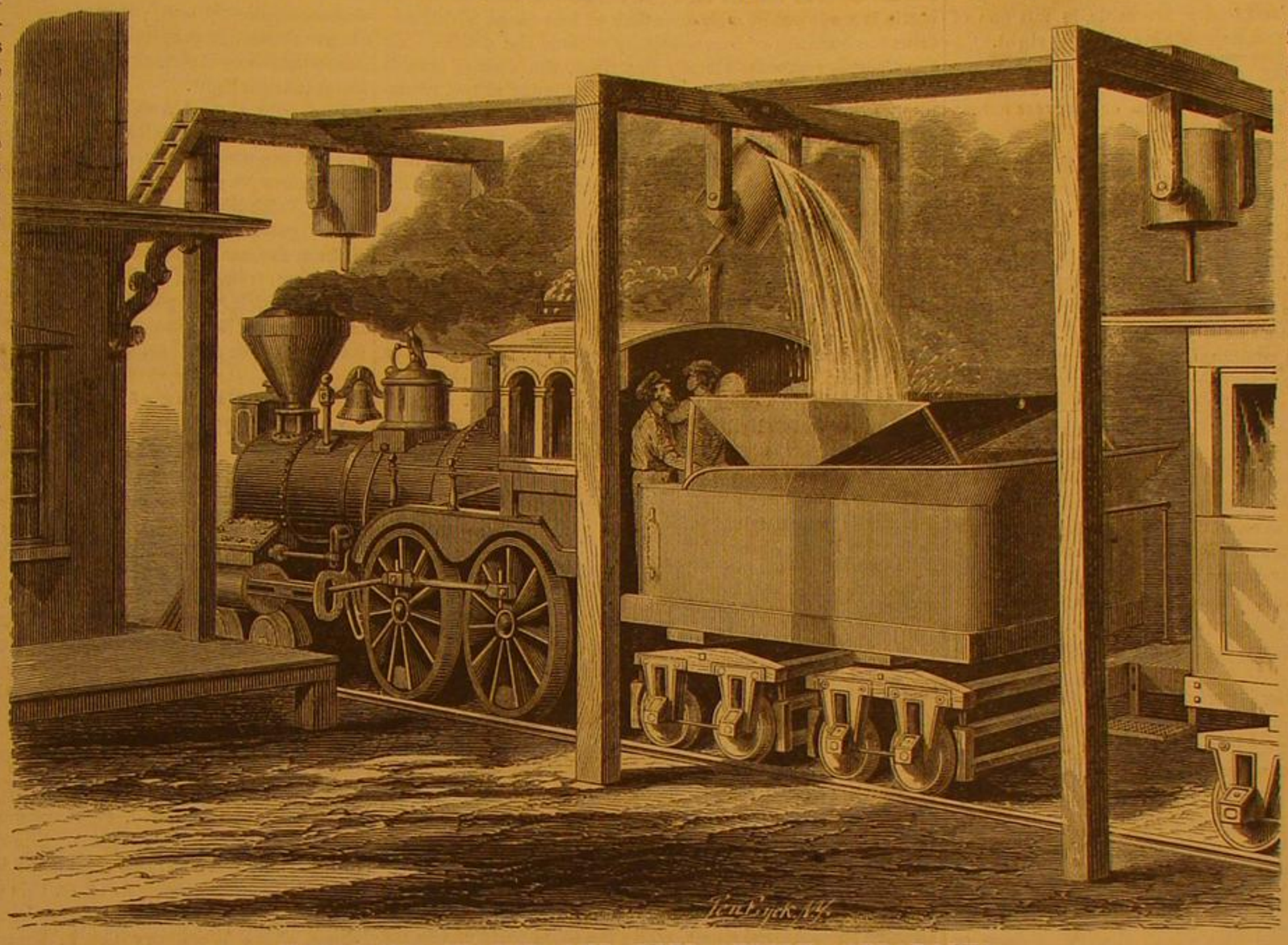
Improved Railway Supply Apparatus.

With fast running trains much time is lost in stoppages for water and fuel. The annexed engraving represents an apparatus designed to not only obviate the loss of time for taking in water and fuel, but to enable anything, as mails, express packages, etc., to be supplied to trains while running at full speed.



HARRISON'S WATER AND FUEL SUPPLY APPARATUS.

A frame work made by posts and cross beams, connected by a longitudinal girder, is erected over the track at the station from which supplies are to be taken. From each of the cross beams project downwards two arms, and between these arms is pivoted a tripping bucket of large size. The pivots are so placed that the buckets hang in a vertical position, but are so nearly balanced, when charged with water or coal, that a slight force will invert them. From the bottoms of the buckets project downward tripping arms, which, upon the passage of the locomotive, are struck by a vertical post on the top of the locomotive, attached at a suitable distance forward of the tender; this distance varying with the speed at which the train is designed to move.

The vertical post on the locomotive has a rubber buffer at the top to lessen the percussive force of its contact with the tripping arms of the buckets.

The longitudinal girder which joins the cross beams should be made of plank and sufficiently wide to constitute a walk for the attendants who fill and take care of the buckets. A hose may be employed for conveying water to the buckets, and an elevator for raising coal to the level of the buckets.

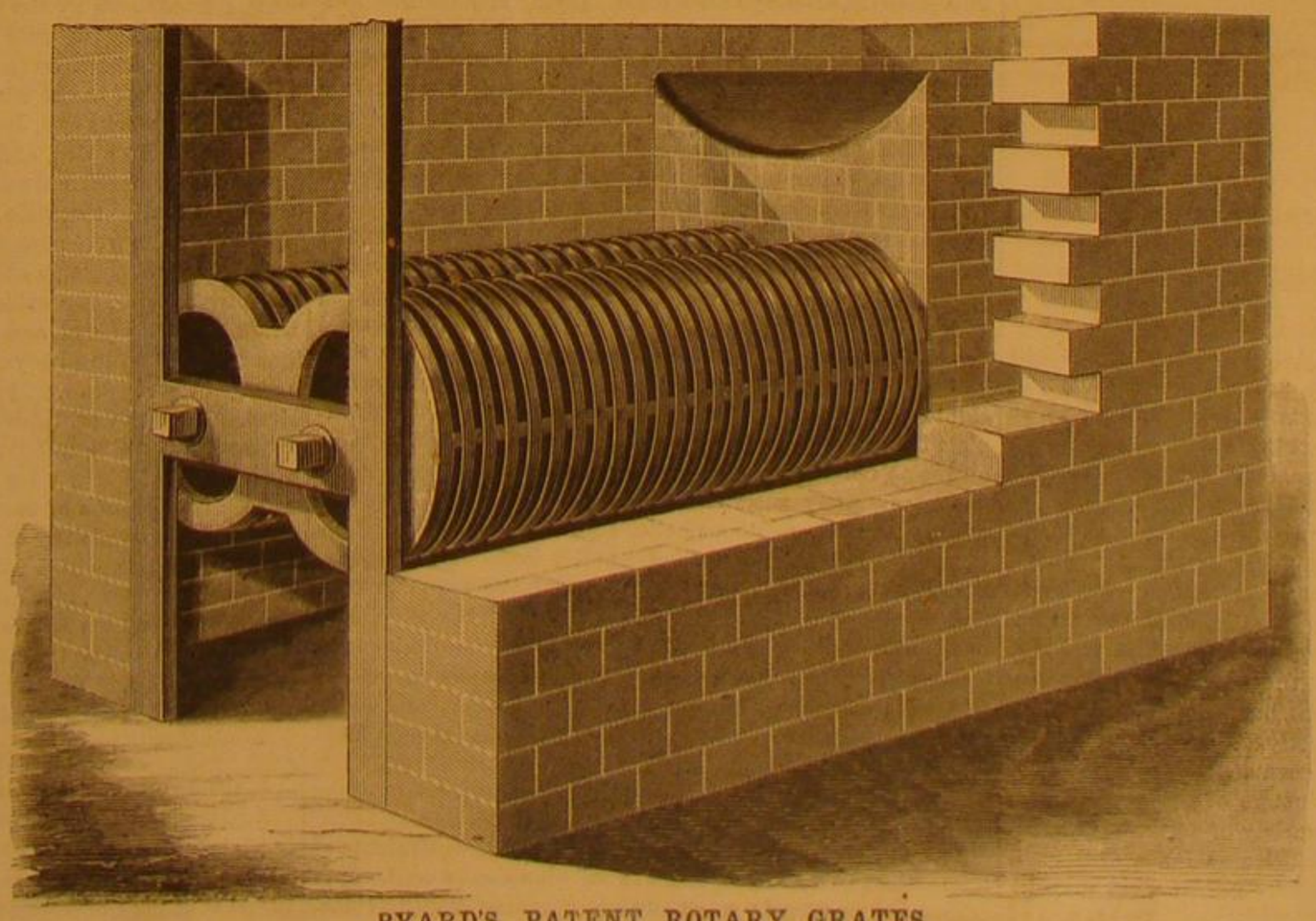
The tender is provided with a properly constructed hopper to receive the charge of fuel, water, or other material from the buckets.

This invention is very simple, and is much cheaper than some methods hitherto successfully employed to supply water to locomotives; while it is equally applicable to the supply of fuel or the other purposes above specified.

Patented in this country November 2, 1869, and also in Europe, through the Scientific American Patent Agency, by David Harrison, of Fayette, Miss.

Improved Rotary Grates.

Our engraving represents an improved form of rotary grate, the construction of which is so plainly delineated by our artist as to render a description almost unnecessary. It may be described, however, as a series of rings connected by longitudinal bars and arranged parallel to each other at right angles to a longitudinal shaft; the shaft serving to support the grate in the furnace, as shown.



BYARD'S PATENT ROTARY GRATES.

These grates have been subjected to a year's severe test in the foundery of Joseph King & Co., at Sharon, Pa., and the results of these experiments have, we are assured, established the following important claims:

First. On a stationary grate the fire rests constantly on one portion of the bar, which, as a consequence, becomes overheated and warps; while, with the rotary bar, a revolution can be made which turns the heated portion of the bar away from the fire, and, at the same time thoroughly rakes the fire.

Second. In raking the fire, when stationary grates are used, the doors of the furnace must necessarily be left open, for a time admitting the influx of cold air to the bottom of the boiler, and thus impairing the power of the steam. This is entirely obviated by the use of the rotary grates.

Third. They are claimed to last from four to six times longer than any other bar now in use.

Fourth. A much better draft is claimed, and it must be obvious that a greater extent of grate surface is secured in a fire-box of given section, than where flat grates are used, the difference being nearly the same as between the semi-surface of a cylinder excluding the ends, and the area of its longitudinal section through its axis.

Fifth. It is claimed that coal-slack, refuse lumber, saw dust etc., are effectually and economically consumed in this grate.

Sixth. Clinkers and cinders are removed much easier than from flat grates.

We have not seen this grate in use, but we have been shown a large number of testimonials from practical men which fully substantiate all that is claimed for it. Its form is well calculated to secure durability, as the mass of metal in the grate is large in proportion to the fire surface.

Patented by D. Byard, Sept. 7, 1869. For rights, etc., address Byard, Neilor & Co., Sharon, Pa.

Oxidation of Iron in Buildings.

The London *Builder* thinks the question of the mode in which iron suffers from oxidation, when included in masonry, appears likely to attract fresh attention. It is a subject on which those persons who are familiar with the repairs, or even with the demolition of old buildings, are not altogether without experience. But especial value attaches to the discoveries made on the recent occasion of the examination and repair of the tomb of King Henry VII., in Westminster Abbey, from the fact that both the date of erection and the subsequent history of the monument, are so distinctly ascertained.

After the cleansing of the statue of the Countess of Richmond, to which so much public attention was directed in last May, the curators of the tombs proceeded to examine the central monument of the Abbey, that of King Henry VII. and his queen, standing, as is well known, in the chapel founded by that sovereign under the protection of a richly-wrought *grille*.

Not only did the effigies appear to be coated and partially corroded in consequence of long neglect, but the altar-tomb itself gave symptoms of dilapidation and decay. Joints yawned, and cracks menaced, and the general appearance was such as is often produced, in similar structures, by subsidence of the foundations. The effigies were therefore carefully removed and carried into the eastern apse, or smaller chapel, where they were cleaned, and that with great science. The altar-tomb itself was taken to pieces, with a view to its replacement in its original integrity. It soon appeared that no subsidence had occurred. On the contrary, the tomb had been built on the finished pavement of the chapel, and the portion of this pavement which had thus been protected from wear was in a condition of great and original splendor, being enriched with a diapered pattern, partly polished, and partly pounced or frosted.

The actual cause of the dilapidation of the tomb then appeared. It was nothing but the oxidation of the only pieces of iron which had been employed by the builders. All the fittings were of copper, with one exception. At each corner of the tomb sits a boy angel, in gilded copper. To keep these figures in their place copper bolts were employed, which

passed through the upper portion of the ornamental work, and were secured by attachment to four plates of iron, which were built into the tomb itself, under the slab on which the effigies rested. These four iron plates, notwithstanding their protection, first by the work of the tomb itself, and, secondly, by the building which sheltered the tomb from the chief vicissitudes of atmospheric temperature, had developed, on either side of each, solid plates of rust, of from three to four times the thickness of the original iron. The slow formation of this oxide had acted as an irresistible wedge, riving the fabric asunder, and threatening in course of time the entire overthrow of this noble monument.

Specimens of these plates of oxide, as well as one of the original iron plates, were exhibited at the meeting of the Royal Archæological Institute, on the 2d of July last. The dangerous metal has now been replaced by plates of copper; and the tomb has been restored to its original beauty, but the lesson as to the conduct of iron when included in masonry or in mortar, even under circumstances which might be presumed to be more than ordinarily favorable, is not one of which any prudent architect or engineer will lose sight.

METAL SPINNING.

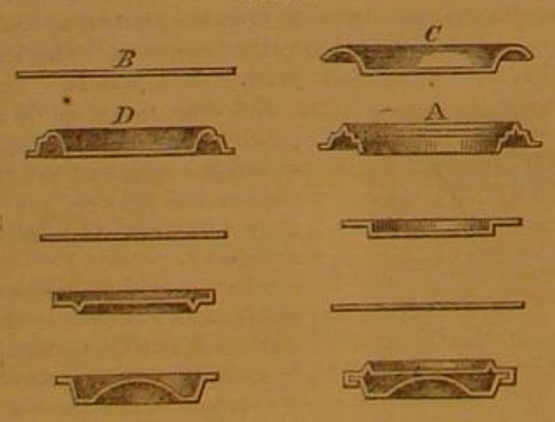
BY JOHN ANDERSON, C. E., IN THE CANTOR SERIES OF LECTURES BEFORE THE SOCIETY OF ARTS.

There is a system of operations for altering the shape of malleable metals, namely that of causing the sheet metal to conform or flow into hemispherical, oval, or irregular forms by motion, which was invented in France a few years ago, but which is now extensively adopted in England. The process is called "spinning," and is rapidly superseding the die-stamping method wherever it can be employed advantageously, because it acts more kindly on the metal. It is the result of gentle pressure combined with rapid motion, and involves a great principle; the effect is due to motion in connection with time. The chief feature in all such changing of form is the giving sufficient time for the particles to move or flow. To press the flow too rapidly would cause the sheet to tear from rupture of particles. In the operation of spinning, this tendency to tear is defeated by communicating a very rapid circular motion to the sheet of metal, and then by means of an instrument or instruments held in the hand, a gentle pressure is brought to bear on one point, thus causing a slight depression; but as the sheet is spinning at high velocity, the depression at once forms a circle, and so by continuing the pressure of the instrument it is molded into any form accordingly.

The operation of spinning is performed in a species of lathe. A mold of the required form is generally fixed on the end or face plate of the revolving spindle; the sheet or disk of metal is held by pressure from another headstock against the mold, and by the local pressure of the instrument is thus adroitly formed into the shape of the mold behind it.

On the table before us are specimens of the progressive manufacture of the lids of powder-cases, as they are made in the Royal Arsenal by this principle of operation, termed "spinning," by examining which its nature will be understood; it will also be seen how much change of form or rather movement among molecules, is requisite to produce the rigid or brittle condition that necessitates the annealing process, in order to restore the malleable and ductile property, which is required to still further change the shape. There is first the entire mouthpiece of the case in the form, here shown, in Fig. 1, ready to be attached to the flat surface of the case

FIG. 1.



top; the stationary part has reached its present peculiar shape A, through five stages. It is first cut into the flat disk, B, then the disk is spun, so far as C; it is now required to be annealed, and after this, it is turned into the third condition; it is then spun into the fourth stage, D, and from that to the finished article A. The lid which fits into A is composed of two separate pieces, both made by spinning from disks, and both pieces, when complete, are united by spinning over a lap of one upon the other. It will be observed that certain corrugations are produced by the process; these add greatly to the strength, but scarcely anything to the cost. It will also be seen how nicely the lid fits into the mouthpiece; this nice fit does not depend on the workmen, but wholly on the mold in the lathe, from which it is correctly transferred by copying, by the pressure of the spinning instrument.

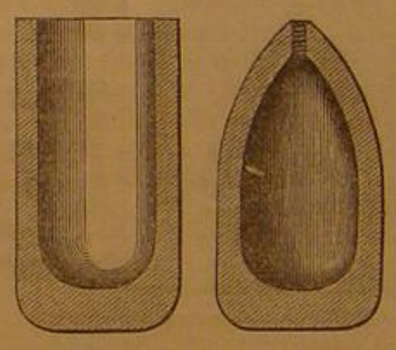
The French, who were the originators of the process, employ it with great dexterity in a variety of ways, more especially in the production of such articles as large oval dish-covers. The sheet is secured to the center of what may be called an oval chuck, and by a dexterous use of two pieces of greased box-wood held in both hands, the workman very cleverly prevents the sheet from puckering as he spins it into an oval, and finally turns over the outer edge into a border, thus giving it rigidity as well as a neat finish. The time required for the operation is so short as to be scarcely credible, and has to be seen to be appreciated.

The metal wrought-iron, as used by the smith, is also exceedingly malleable, both hot and cold, but especially when it is hot. All are familiar with this method in the condition called "tin plate," which is a thin sheet of iron spread out with rollers, afterwards cleaned, then covered with tin as a preservation from oxidation as well as for appearance, besides the facility which it affords for being united by solder in the hands of the tinman.

In the Great Exhibition of 1851, a foreign exhibitor had an iron book, in which the leaves were made of iron as thin as tissue paper; and iron may be seen of any substance or shape, every variety of bar, or, worthy of Vulcan, up to armor plates of 15 inches in thickness, or 25 feet long, 5 feet wide, and 8 inches thick, as made at the well-named "Cyclops" Works. Iron or steel may be drawn into gun barrels like dough over a mandrel, but one of the most marvelous illustrations of the malleable, ductile, and flowing properties of wrought-iron, is shown by the manufacture of quicksilver bottles. These bottles are made in various ways; in the process referred to, the bottle is made out of a circular disk of iron plate, which contains the quantity of iron necessary to form the article. By the stamping process already described, the disk of iron is gradually brought round to be of a cylinder shape, resembling the form of drinking glass called a tumbler. This cylinder is then put upon the end of a steel pin or mandrel, and by mechanical pressure, is pushed through a hole, which hole is smaller than its own dimension, thereby reducing its exterior diameter, but at the same time drawing or rather pushing the iron over the mandrel in the same manner as a piece of dough could be drawn over the finger to fit like a glove. This process is repeated through a succession of smaller and smaller holes, one after the other, until at length it becomes a long cylinder, close at one end but open at the other. The neck of the bottle has next to be formed on the same principle, by an often-repeated pressing and twisting at the open end into a conical die, by which means it is gradually and successfully brought to the form of the bottle neck, in which a screw is afterwards formed for the stopper by the ordinary means.

During the Crimean war, a large manufacture of wrought-iron shells was carried on in the Royal Arsenal, not precisely, but nearly in the same manner. They were made in an elongated form, and of an oval section, as shown on the diagram, Fig 2. These shells were made out of a single piece of iron, in which to form the cylinder, welding was so far employed, bu

FIG. 2.



were then brought to the bottle shape by what may be called hammers. The mouth of the shell was attacked simultaneously by a circle of hammers, whose united surfaces afforded the required shape, while the other parts of the machine prevented the shell from flinching during the operation, and thus it gradually came into the bottle shape without any puckering, which most men would previously have expected. Such a result was entirely due to the uniform effect of the combination of hammers, thus constituting a sort of die.

The elongation of a quicksilver bottle over a mandrel partly anticipates the nature of the ductile property, yet not entirely so. Ductility is that natural property by means of which a solid substance, such as iron, steel, and other metals, can be drawn or pulled out to almost any degree of fineness. This property, although often accompanying malleability, does not do so in some cases, such as in lead, possibly for want of tenacity, as lead can be squirted into any thread of any fineness by pressure. This natural property of ductility is taken advantage of to produce endless variety of form, but in all the mechanical principles employed are nearly alike—namely, to pull the metal through a rolling or stationary hole, and thus to alter its form or dimensions.

To take the simplest and most familiar case, that of common wire-making—the iron or other metal is first rolled out into a long bar of small diameter; the end of this bar is reduced in pointed fashion so as to enter a conical hole in a steel "draw-plate," as it is termed, the hole being smaller than the remainder of the bar; a pair of pincers worked by machinery seizes hold of the small end of the bar; the draw-plate is held rigidly; then the force applied is sufficient to overcome the unwillingness of the particles to move, but the flowing property permits the change, and the iron rod is thereby drawn out into a smaller and longer wire, which is repeated through smaller and smaller holes in succession, with occasional annealing, until at length the requisite fineness is arrived at. From this it will be seen that the shape of the wire depends on the form of the hole in the draw-plate, and may be to any pattern—sprigs of flowers for the calico printer, toothed-pinion steel wire for the watch and clock maker, or even tempered steel wire of all sizes for the pianoforte maker.

How Phosphorus is Made.

The earthy matter of bones consists of three equivalents of lime united with one equivalent of phosphoric acid. It is what chemists term "a tribasic phosphate of lime." Phosphoric acid consists of one equivalent of phosphorus united with five equivalents of oxygen. In order to obtain the phosphorus, it is only necessary to take away those five equivalents of oxygen, which we can do by mixing the compound with charcoal after some preliminary operations, and heating them together. The charcoal takes away the oxygen and forms carbonic oxide with it, while the phosphorus distils over. In this way we get phosphorus in the condition in which you are very familiar with it. It is a wax-like substance, which must be handled with care, because if you allow it to dry, the heat of the fingers would be sufficient to inflame it.

Now observe what this substance looks like. It is semi-transparent; it is soft; you can cut it like wax. It is exceedingly poisonous, and in the making of lucifer matches it is found to be a very insidious poison. Lucifer match makers are apt at first to be subject to an affection which does not draw much attention. They complain frequently of tooth-ache, but they do not know the insidious disease which is creeping upon them. The lucifer match makers who make lucifer matches from this phosphorus, are subject to the most distressing of all diseases; the jawbone becomes destroyed, and frequently disappears or becomes useless, and some of them spend the greater part of their lives in the wards of hospitals. It therefore became an important point for science to find some way by which this phosphorus should be deprived of its poisonous properties without losing those chemical characteristics which make it so useful in making matches for instantaneous light.

Prof. Schrotter, of Austria, met this want of science in a very skillful way, as follows: By taking common phosphorus and exposing it for some time to a temperature of 47°, this yellow, waxy, transparent substance transforms into a dark, brick-like substance. It is no longer so inflammable as to ignite spontaneously. It may be packed up in boxes without danger of spontaneous combustion; but what is more important, it has lost all its poisonous properties. The phosphorus, which was poisonous before, is no longer poisonous in this condition, and it is still capable of being used for making lucifer matches.

Raising of an Old War Ship.

In October 1779, says the Philadelphia *Age*, a British fleet, consisting of the *Roebuck*, 44 guns; *Meslim*, 18 guns, and a galley of 3 guns, commenced from the mouth of the Delaware a gradual approach to our city, which they proposed bombarding. To prevent this movement, the colonists had the famous little *Wasp* and the *Lexington*, with a few tenders; but they could only harass these vessels. But to prevent their upward progress, the Americans, as a further defense, constructed a fort on the lower end of Hog Island, and between that and the fort on the Jersey shore just opposite they sunk a number of hulks, thus preventing the passage up the river of any heavy vessel. On the 20th of October, 1779, the British vessels named attacked these forts, but a fleet of fire rafts drove them down the river.

On the 22d of the same month the new frigate *Augusta*, direct from England, reinforced the British force. She was one of the old-fashioned, cumbersome double-deckers, with high sides, bristling with guns. She was loaded with ammunition, shot, and a surplus armament for light ships, which the British hoped to construct on this side of the Atlantic.

The fleet, thus increased, re-attacked the fort on the Jersey shore, above Woodbury Creek, being coöperated with by 2,000 Hessians on shore, under command of General Danupe. The commander of the American galley *Chatham*, had twelve smaller galleys lying just below our city, and hearing of the approach of the British, dropped down stream, and on the afternoon of the 24th, opened the engagement with the four British frigates. This engagement lasted into the night, during which the *Augusta* grounded, and her consorts fled down the river. The *Augusta* was on the next morning discovered, attacked, and set on fire. Of the 300 men she had on board, just one half were drowned, by leaping ashore or being carried down by the frigate when she sunk. Here, in this mud bank, lying near the Jersey shore, opposite Hog Island, she has been embedded—the deposits accumulating, until the hull sat in the mire to the depth of fourteen feet.

About two weeks ago, James Powell, Jos. Moore, Geo. Murphy, Gabriel Sheppard, and Chas. Meyers, conceived the idea of raising the wreck and reaping pay for their labors by selling whatever it might contain. Submarine workers were employed; chains were passed beneath the old frame, and attached to canal boats on either side. The latter were partially filled with water, the cables passing under the hull of the wreck were tightened, and the water pumped out of the boats. The latter becoming buoyant rose up, and with them the remains of the *Augusta*, which finally were towed to Gloucester. Here, within the past few days, three of the old-fashioned guns were taken from her; a number of skulls, remnants of the ill-fated British; sixty tuns of shot, used in the small smooth bore cannon of the time; a great quantity of Kentledge ballast, consisting of blocks of cast iron, and a large number of relics, which will be highly prized. Among these were a silver spear, marked "H. W., 1748," a fat old bull's eye watch, with its works eaten up by rust, a number of guineas with a raised profile of George III., and some silver coin dated 1760. The frame of the *Augusta* is of Irish oak, and the wood is sound and proof against decomposition.

Curious Phenomenon in Artillery Firing.

A phenomenon connected with the fire of rifled artillery has lately been illustrated afresh by the experiments of the British Indian Equipment Committee. It is popularly believed that the projectiles from a rifled gun will have left the muzzle before any sensible recoil can take place; this is an error which was detected as follows: It had frequently been noticed that when rifled guns were fired point blank, or with the axis of the bore truly horizontal, the shot appeared to rise after it had left the muzzle, and the range was much greater than the theory would lead us to expect. This was

at first ridiculed; the idea of a shot rising was preposterous and contrary to the first principles of dynamics. One might as well expect Newton's apple to rise in the air instead of tumbling to the ground. Facts, however, are stubborn, and it was asserted that, although theoretically it should not, practically the shot did rise. The first careful experiments in this direction made in this country were carried out by the late Ordnance Select Committee in 1864. The 12-pounder breech-loader rifled gun of eight cwt. was fired with an elongated shot of 11½ lbs., and a charge of ½lb., at an upright wooden target of forty yards. The gun was laid with the axis of the bore truly horizontal, that is, parallel with the ground, and the exact level of the center of the muzzle was taken on the target by a theodolite. Theoretically, the shot would fall by gravity in passing over the forty yards, and its center should have struck about two inches below the level; practically, however, it was found to strike ten inches above it! This fact once established beyond all doubt, many theorists set about accounting for it; their speculations, however, cannot here be recapitulated. The probable explanation is that the recoil is sensibly felt before the shot has left the gun, and that the resultant of the forces acting on the gun and carriage tends to throw the muzzle up—thus the projectile, although seemingly fired point blank, really leaves the gun at an angle. With the 12-pounder breech-loading gun this angle was found to equal about thirty minutes, while with the 9-pounder muzzle-loading Indian gun it equals only about thirteen minutes. The difference is probably due to the projectile taking a longer time to pass through the bore of the breech-loading gun. It may be mentioned that when the gun is swung as a pendulum and fired with its axis horizontal the shot strikes below the level.—*London Globe.*

Well Boring and Pumping Machinery.

An interesting paper on the above subject was recently read before the Institution of Mechanical Engineers, at Birmingham, England, by William Mather. In the operation of excavating boreholes for wells and other purposes, the principle adopted and carried out by the writer for all depths of boring has been the use of a rope for working the boring tool in the hole; and this principle obviates the serious expense and delay attending the plan of using rods for working the tool, when great depths of boring have to be executed. In the plan described in the paper, the boring tool is worked by a flat hemp rope, which is wound around the drum of a winding engine, and on quitting the drum passes over a large pulley carried in a fork at the top of the piston-rod of a vertical single-acting steam cylinder. The boring tool having been lowered by the winding drum to the bottom of the borehole, the rope is clamped secure at that length; steam is then admitted underneath the piston of the vertical cylinder, and the tool is lifted by the ascent of the piston-rod and pulley; and on arriving at the top of the stroke the exhaust valve is opened for the steam to escape, allowing the piston-rod and carrying pulley to fall freely with the boring tool, which falls with its full weight to the bottom of the borehole. A cushion of steam prevents the piston from striking the bottom of the cylinder, and the steam and exhaust valves are worked by tappets on a plug-rod; a rapid succession of blows is thus given by the boring tool on the bottom of the borehole. The boring tool is composed of a number of chisels or cutters, fixed in the cast-iron head at the bottom of the long wrough-iron boring bar, which is guided vertically in the borehole by a couple of collars; and it is made to rotate a little between each blow, so as to strike in a fresh place each time, by means of a simple self-acting arrangement. The lifting shackle at the top of the boring bar is allowed to slide up and down through a short distance on the neck of the boring bar between two fixed collars; the upper face of the lower collar is formed with ratchet-teeth, and the under face of the top collar is formed with similar ratchet-teeth, but set half a turn in advance of the teeth on the lower collar. The intervening boss of the lifting shackle is also formed with corresponding ratchet-teeth on both its upper and lower faces, these teeth being in a line with one another. When the boring tool falls and strikes the blow, the lifting shackle, which during the lifting has been engaged with the rachet-teeth of the top collar, falls upon those of the bottom collar, and thereby receives a twist backwards through the space of half a tooth; and on commencing to lift again, the shackle rising up against the rachet-teeth of the top collar receives a further twist backwards through half a tooth. The flat rope is thus twisted backwards to the extent of one tooth of the ratchet, and during the lifting of the tool it untwists itself again, thereby rotating the boring tool forwards through that extent of twist between each successive blow of the tool; and this turning is found to be quite certain and continuous in action during the working of the tool. When a sufficient quantity of material has been broken up at the bottom of the borehole by the blows of the tool, the working of the percussion cylinder and pulley is stopped, the rope unclamped, and the boring tool wound up with great rapidity by the winding drum. A shell-pump is then lowered down the borehole by the rope, consisting of a long cylindrical shell or barrel, with a clack valve at the bottom opening inwards, and a bucket, containing flap valves opening upwards. The rope is attached to the bucket, and when the pump reaches the bottom, the bucket is worked up and down by the rope several times, so as to draw in the broken material through the bottom clack; after which the pump is drawn up again with the material contained in it, and the boring tool again lowered into the hole for continuing the boring. In the event of accidents from breakages or from any of the implements sticking fast in the borehole in rising, grappling tools with hooked claws of suitable shape are employed for laying hold of the obstacle and raising it; or if it cannot be brought up by this means, a solid wrought iron breaking bar, of very great weight is lowered into the hole, and allowed to fall upon the obstacle from a sufficient hight to break it up into fragments, which are then raised either by grappling tools or by the shell pump.

Ransome's Induration Process.

We learn from *Engineering* that Mr. Ransome's method of waterproofing walls by means of successive solutions of silicate of soda and chloride of calcium, which has been applied with so much success to many public and private buildings in England, is being used extensively in India to arrest the decay of many brick structures upon railways in that country. Among others it mentions the Waree Bunder Works, upon the Great Indian Peninsula Railway, which were constructed of such inferior material that a rapid deterioration speedily followed the construction of the works, and the crumbling of the bricks left no alternative apparent save that of rebuilding. It was, however, determined to experiment with Mr. Ransome's process, and accordingly, in 1868, it was extensively applied to the failing buildings, with the result of effectually stopping the decay, and of placing so fine and hard a surface upon the bricks that the material, which before could be crumbled by the touch, received a surface so hard as to resist the scratching from a steel point. In this manner extensive workshops and a chimney shaft were, at an insignificant outlay, rescued from destruction, and rendered sound and durable.

Heating Surface of Boilers.

The quantity of steam generally produced on every 39 inches square of surface or cylinder boilers, is from 44 to 66 pounds per hour. In marine boilers it averages about 77 pounds per hour.

For high-pressure engines, the heating surface is generally calculated, per horse power, as follows: Small boilers, 85 inches; medium size, 55 inches; large size, 40 inches, and even less.

For low-pressure engines, per horse power, as follows: Small boilers, 60 inches; medium sized, 40 inches; large size, 39 inches, and even less.

Recent comparative experiments have shown that 42 feet of boiler surface made 22 pounds of steam from 35·2 pounds of coal; 52·5 feet surface made 220 pounds of steam from 30·75 pounds of coal; 63 feet surface made 220 pounds of steam from 29 pounds of coal; 84 feet surface made 220 pounds of steam from 27·55 pounds of coal; 105 feet surface made 220 pounds of steam from 27·21 pounds of coal.—*Deby's Steam Vade Mecum.*

Preservation of Eggs.

The *Journal de Pharmacie et de Chimie* contains an account of some experiments by M. H. Violette, on the best method of preserving eggs, a subject of much importance to France. Many methods had been tried: continued immersion in lime-water or salt water; exclusion of air by water, sawdust, etc., and even varnishing had been tried, but respectively condemned. The simplicity of the method adopted in many farms—namely, that of closing the pores of the shell with grease or oil had, however, attracted the attention of the author, who draws the following conclusions from a series of experiments on this method: Vegetable oils, more especially linseed, simply rubbed on to the egg hinders any alteration for a sufficiently extensive period, and presents a very simple and efficacious method of preservation, eclipsing any methods hitherto recommended or practiced.

Watch Repairers' Shop.

A correspondent in the *Horological Journal* makes the following practical suggestions:

"How vexatious to drop a small article and spend a quarter of an hour of valuable time in fruitless search for it—getting on your knees, dirtying your pants, growing red in the face, partly from your inverted position, and partly from anger. All this may be easily avoided. Thus:

"First, sweep very clean every nook, and corner, and crack about your bench and window, then get a pound or two of putty (no matter 'what's the price of putty'), and a few strips of nice soft pine, then putty up every crevice that is large enough to conceal a jewel screw; the large cracks stop partially with bits of pine and finish with putty; don't miss a single place. The whole job won't take you longer than you will be searching for a lost second-hand, and then when anything does drop, you can find it in a moment by sweeping your floor with a little broom brush."

Our Impending Doom.

A public lecturer in this city recently argued that religion was useless because "man's existence on the earth is momentary. Science teaches us that in 6,300 years more a grand deluge will end his race and make him a fossil. You may think this an idle tale, but it is not. Astronomy shows that the earth is oscillating in the angle of its axis to the sun in periods of 21 000 years. The zones are undergoing a constant change. Now, at the North Pole it is growing colder each year, and at the South Pole warmer. Thus, an immense accumulation of glaciers or icebergs at the North Pole will result, while at the South they will not form at all. In 6,300 years the glaciers will have accumulated so much that they will suddenly over-balance the earth. Then the waters of the sea will rush from the south to the north, and there will be a deluge." Stand from under!

THE yearly mortality of the globe is 33,333,333 persons. This is at the rate of 91,554 per day, 3,830 per hour, 62 per minute.

H. W. STAPLES' AUTOMATIC LAMP-FILLER.

In our description of this invention, published on page 344, current volume (issue of Nov. 27, 1869), an important point claimed by the inventor was omitted. If the reader will again refer to the engraving he will see that the vent tube, which also acts as a brace bewteen the nozzle and breast of the can, terminates at the letter A, which represents an opening in the side of the nozzle, through which air enters while the oil is flowing out of the nozzle. As soon, however, as the oil rises in the lamp as high as the vent hole, A, it covers this hole, and the flow of oil from the filler is checked. The fluid as it flows over the end of the vent tube, produces an audible whistling sound, which ceases when the vent hole is stopped by the rising of the fluid in the lamp, as the flow then ceases.

Thus a metal lamp or one made of any opaque material, as well as one of transparent glass, can be filled without danger of its running over, the filler stopping automatically when the lamp is filled to the proper hight. The advantage of controlling the flow is gained by the simplest means, and all danger of overflow prevented.

Editorial Summary.

FROST CRYSTALS UPON DRIED GRASS.—Several persons have by this time laid up to put into bouquets the beautiful grasses which they gathered in the autumn and summer of the present year. In order to add variety and some pleasing effects to portions of such grasses, they may be covered with imitation frost-crystals, some white, others blue-green, and amber. To crystallize dry grass white, steep it in a solution of one pint of hot water containing one pound of alum. As it becomes cold, crystals will adhere to the grass, which will increase in size if left for a day or more; but small crystals look the best; and in order to keep them so, the grass should be often moved and turned about. When taken out of the solution and dried in the air, they are fit for mounting with the other grasses, and greatly add to their beauty. For the blue-green crystals use sulphate of copper, and for amber crystals use chromate of potash instead of the alum. Feathers may also be crystallized in the same way. Art and taste will arrange them into forms of beauty.—*Septimus Piesse.*

A NEW THING IN POSTAGE.—The Austrian Government has introduced a novelty in postage, which might be introduced with great benefit in all countries. The object is to enable persons to send off, with the least possible trouble, messages of small importance, without the trouble of obtaining paper, pens, and envelopes. Cards of a fixed size are sold at all the post offices for two kreutzers, one side being for the address and the other for the note, which may be written either with ink or with any kind of pencil. It is thrown into the box, and delivered without envelopes. A halfpenny post of this kind would certainly be very convenient, especially in large towns, and a man of business, carrying a few such cards in his pocketbook, would find them very useful. There is an additional advantage attaching to the card, namely, that of having the address and postmark inseparably fixed to the note.

TO CURE THE RANK SMELL OF HORSE STABLES.—Sawdust, wetted with sulphuric acid, diluted with forty parts of water and distributed about horse stables will, it is said, remove the disagreeable ammoniacal smell, the sulphuric acid combining with the ammonia to form a salt. Chloride of lime slowly evolves chlorine which will do the same thing, but then the chlorine smells worse than the ammonia. Sulphuric acid on the contrary is perfectly inodorous. The mixture should be kept in shallow earthenware vessels. The sulphuric acid used alone, either diluted or strong, would absorb more or less of the ammonia, but there would be danger of spiling it about and causing serious damages, and besides this the sawdust offers a large surface to the floating gas. The experiment is easily tried, and it may prove successful.

THE Boston *Advertiser* reports that a curious phenomenon is frequently taking place at Machiasport, Maine, in the harbor opposite the wharves. It is an upheaval, by some power altogether unknown, of vast quantities of water, mud, and stones, to the distance of many feet, and with a furious rushing noise. This phenomenon has occurred quite a number of times during the summer, and once as late as a month ago.

PATENT CLAIMS.—Persons desiring the weekly official list of patent claims, are referred to a notice concerning the supplying of them in our advertising columns. The Commissioner of Patents would deem it a special favor if parties who intend to subscribe would order immediately, so that he may know how large an edition to publish.

A CORRESPONDENT of the *Mechanics' Magazine* states that the Moncrieff system of mounting artillery, which has lately attracted so much attention abroad, was anticipated 1811, by a French officer, who published a system of mounting guns not essentially different from that of Capt. Moncrieff.

BLACK PAINT FOR IRONWORK.—A varnish for ironwork can be made as follows: Obtain some good clean gas tar, and boil for four or five hours, until it runs as fine as water; then add one quart of turpentine to a gallon of tar, and boil another half hour. Apply hot.

THE following is a German recipe for coating wood with a substance as hard as stone: 40 parts of chalk, 50 of resin, and 4 of linseed oil, melted together; to this should be added one part of oxide of copper, and afterwards one part of sulphuric acid. This last ingredient must be added carefully. The mixture, while hot, is applied with a brush.

Wire and Picket Fence.

The use of wire as a substitute for bars between posts of fences, has gone the way of plank roads. It was "weighed in the balance and found wanting." The reasons for this termination to the experiment are too well known to need discussion here. The invention shown in the annexed engraving, employs wire only as a connector between upright pickets in lieu of the rails between posts, to which pickets are ordinarily nailed, and also reduces the number of posts required as will be seen in its description below.

It is intended to furnish a cheap, neat, and durable fence, that can be rapidly constructed, and dispenses with the use of nails.

The saving in posts is claimed to be sufficient to pay for the wire, as the posts are set from twenty to thirty feet apart.

P. DAVIS' IMPROVED PATENT FENCE.

Two wires are drawn through a hole in the first post set, and through similar holes in the other posts, to any convenient distance. The wires being fastened at the first or starting post, are left slack along the line for the insertion of the pickets, and wound around the last post of the section of fence under construction to keep them from being drawn back during the insertion of the pickets. The wires are then tightened by laying weights on the slack between posts, the palings distributed along the line answering perfectly for this purpose, one end being allowed to rest upon the ground and the other lying upon the slack wire, and as many being used in a bunch as may tighten the wire sufficiently.

The slack being thus taken up, the butts of the palings are successively set in a shallow trench dug between the posts on the fence line, and the tops being inclined laterally, until they will enter between the wires from the under side, they are brought to the vertical position, the wires being crossed between each picket, care being taken to keep the same wire always at the top.

The wires may be tightened if they should ever become slack by simply putting a twist in them, using a pair of palings for this purpose, turning them in opposite directions.

As fast as the palings are inserted, their butts are held by filling in and packing the earth in the trench.

This fence is impassable to all kinds of domestic animals, as nothing but a rat or similar burrowing animal can get under it, and a squirrel is about the only living thing which would attempt to climb over it. No domestic animal could crowd the pickets apart to get through it. The palings can not be pulled off, nor can the wind blow it down. The pickets take the strain off the posts, each one being, in fact, itself a post. The corner posts only require to be of greater strength than the other posts. Each post saves a paling, and may be made to look like it. The sides of the fence are uniform in appearance.

The fence represented in our engraving is a rude farm fence made with split palings; but with sawed palings of equal widths, it can be made very tasteful in appearance, and any form of either wood or metal palings may be used, to suit the taste of the builder. The inventor states that three hands can easily put up six hundred yards of this fence per day. He estimates the actual expense of a complete farm fence with top-sharpened split palings, with butts coated with tar or petroleum, as less than fifty cents per rod.

The palings need only be set from four to eight inches in the ground, according to the character of the soil. When stones are plenty they can take the place of a trench, in which case the butts of the palings do not need any protective coating.

Whether this invention was called forth by our article on cheap fences, published on page 9, current volume, or not, we are unable to say, but it meets a want therein set forth. At any rate, men of inventive genius will find in that and the numerous similar articles we publish, hints that will guide them to important and profitable inventions.

This fence was patented through the Scientific American Patent Agency, June 29, 1869, by P. Davis, of Newport News, Va., whom address for further information.

Paper Hangings.

When an amateur attempts this kind of domestic decoration it is desirable that he should attend to the following instructions, otherwise the work, when finished, will show blemishes and stains. First, pumice-stone the wall to remove all irregularities of surface, then wash over the size, about one ounce of glue to a gallon of water, and when dry, the wall is ready to ready to receive the paper. The paste should be well boiled and then passed through a hair sieve to extract the lumps, a fruitful source of stains. If the walls are inclined to show damp, add a little corrosive sublimate to the paste to prevent mildew forming on the surface of the paper The most important matter is to allow the paper to remain pasted for about ten minutes before hanging, in order that it may be well stretched before being placed on the wall. Stout paper hangings such as the "flocks," etc., require a longer time. If these directions are attended to the thinnest papers will hang without a crease or the objectionable water stains which characterize bad workmanship.

Gluing in Veneers.

I have advised the use of waterproof cements for fine inlaying, so that dampness will not affect them, but as this is not always convenient, it is well to make the glue so that it can be used and the work finished off in a short time. This is easily done by making the glue as thick as it will run, or so that it is like a jelly. If applied in this condition, it will set hard in thirty minutes, and the work may be cut down without fear or danger of its moving. I have done this frequently, in order to see what kind of work I was making. Always put a clamp on your work wherever you can, for although the glue will adhere of itself to the wood, it adheres much more strongly if pressed down by a clamp. Also, never put a veneer on a piece of work that is uneven, for although it map set square under the pressure of the clamp, when you come to scrape it, it will give way and yield to the inequalities, and when varnished and polished, will be full of depressions.

Don't be afraid to rub down with sand paper, under the impression that you are spoiling the work, but let the varnish get thoroughly dried, and be hard before you attempt it. Be sure, also, to remove every particle of varnish if you touch it at all, otherwise that which remains will take a coat while the bare wood will not take so much, and you will have a surface full of scars and ridges. It is not necessary to touch the wood in rubbing down, but go down to the wood, so that a waxy appearance is presented, and you will have a handsome finish that will add greatly to the beauty of the work. White holly is easily soiled when used in connection with ebony, by the dust from it, and it will be necessary to rub it, or scrape it delicately, before varnishing, without touching the ebony.—*Watson's Manual of the Hand Lathe.*

TENT ROOF GARDEN CHAIR.

It must be confessed our English cousins are men of taste in all that pertains to personal comfort. The dainty garden chair we illustrate herewith must indeed be a comfortable

thing in which to recline and enjoy a fragrant Havana, after dinner. The roof is composed of a roller and two canvas shades, which are wound up or extended at will by means of a brass endless chain. Our readers will agree with us that this chair is a very enticing piece of garden or farm furniture, and as it can be imitated easily we shall expect next summer to see many of our suburban gardens adopting the luxury. An article executed tastefully like the one illustrated, will sell, and we hope some of our manufacturers will get them up ready for the next season. A few such tent chairs in a garden would obviate the necessity for a summer-house.

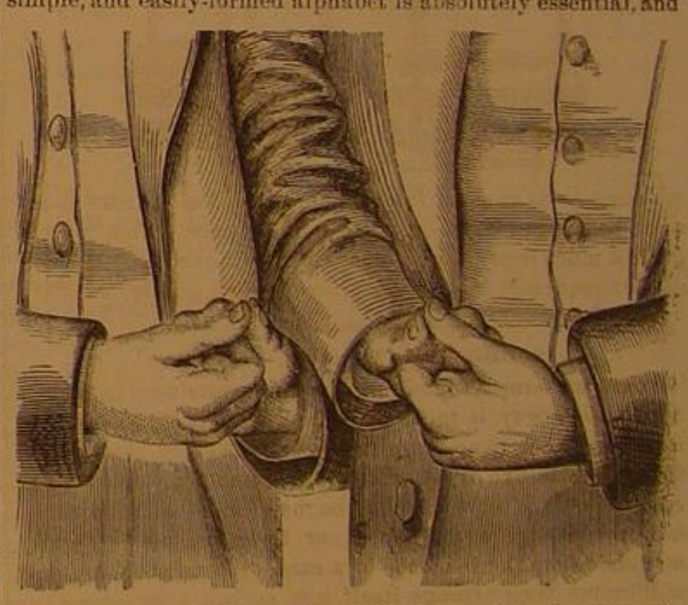
COMMUNICATION WITH AND BETWEEN DEAF MUTES

The sign language, used as a means of communication between deaf mutes, is of course unavailable in the dark, and is also unadapted to the use of blind mutes. It is, moreover unadapted for private communications, as the language spoken to one is spoken to all present who understand it. Spoken language can be whispered, or its volume can be so reduced as to be inaudible to other ears than those for which it is intended; but the force of the sign language cannot thus be modified, and when private conversations are held, written language is generally employed. Besides the tediousness of this process, it cannot always be resorted to, and therefore inventors have tried to devise means whereby conversations may be carried on under all circumstances except the fatal and insurmountable one of separation.

We have within a year or two read in some foreign journal, the name of which we cannot at present remember, of an instrument employed for effecting communication between deaf mutes, or between them and those not versed in the sign language.

We have before us a slip which describes this instrument, and which states that the invention was made by Mr. Bertram Mitford, of Cheltenham, England. "He uses a hollow case of any convenient form or size, made of wood or other suitable light material, and this case is provided with a handle by which it is to be held in the hand of the person using it. On the side of the case which faces the user there are contained the letters of the alphabet, numerals, or other signs useful to persons holding conversation with one another; and upon the opposite side, which faces the person communicated with, there is provided an opening protected by glass. In the interior of the hollow case are placed a number of slides worked by buttons which traverse along slots arranged each immediately above a different letter or sign. The upper end of each of these slides carries the corresponding letter or sign to that marked on the case opposite to the particular button; and when any slide or button is pushed along the slot, the corresponding letter or sign will be presented at the glazed aperture on the opposite side of the case. By successively raising and lowering or moving the slides it is obvious that words can be easily spelt and communication be established with the deaf and dumb without necessitating the knowledge of the signs known as the deaf and dumb alphabet."

While it is evident that this machine will answer the purpose designed; it does not, of course, supply the want we have stated. Sight is absolutely necessary to its employment. We have only noticed it as illustrating the fact that some simple, and easily-formed alphabet is absolutely essential, and



this alphabet must be capable of being read and communicated by the sense of touch.

Such an alphabet, which, so far as we know, is new, it is our present object to lay before our readers. It is the invention of a gentleman living in Brooklyn, and he permits us to make it public property.

In reading or communicating this alphabet the hands are placed, as shown in the accompanying engraving, to bring like fingers of the hands together. The hands are nearly closed as shown, and the balls of the five fingers are placed together, as indicated. The fingers of each hand may be numbered from the thumb, the thumb being called 1 and the little finger 5.

The letters are made by a quick strong pressure of the balls of the fingers of the individual communicating upon the balls of the fingers of the person addressed, the hands of the latter remaining passive; the letters being indicated according to the following system. The touches will be indicated by dots, the number of touches by the number of dots, the fingers with which the touches are made by its number; those on the right hand being further indicated by the letter R and those on the left being indicated by the letter L. Thus:

A - 1, L.	N - 5, R.
B - - 4, L.	O - 4, R.
C - - 1, R.	P - - 5, R.
D - - 2, R.	Q - 4, 5, L.
E - 1, R.	R - 2, L.
F - - 1, L.	S - 3, L.
G - - 3, L.	T - 2, R.
H - 4, L.	U - 5, L.
I - 3, R.	V - 4, 5, R.
J - - 5, L.	W - - 2, L.
K - 2, 3, R.	X - 2, 3, 4, R.
L - 3, R.	Y - 2, 3, L
M - - 4, R.	Z - 2, 3, 4, L.

The word "Brute" would be, spelled out, - - 4, L; - 2, L; 5, L,; - 2, R; - [1, R; only six motions, which can be made

in the time required for making the ordinary capital B with the pen. The number of motions required for spelling out word "Indestructibility" would require only twenty one motions, and it contains seventeen letters.

A system that could be more easily memorized might be devised, but it could not be executed so rapidly. With the alphabet we have given, it would be possible, after a little practice, to converse at the rate of one hundred words per minute, and as the motions are concealed by the position of the hands, eavesdroppers, if we may employ that term, would be counted out.

When a double letter is required, it is distinguished from other letters for which it might be mistaken by the touches being repeated more slowly. Thus, E, which is made by a single pressure of the first finger of the right hand will, when doubled, resemble C, which is made by two pressures of the same finger, unless the pressures are made full and slow.

Numbers may be spelled out, therefore no provision is made for them.

A slight twist of the wrist indicates the close of a word, and a brief hand-shake announces the close of a communication; pauses are not indicated, but ready made, as in speaking.

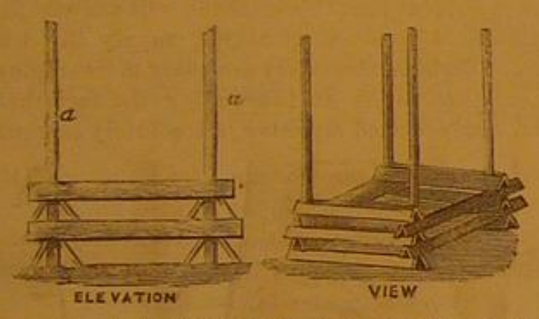
The position shown in the engraving is that adopted while persons are standing side by side, as in walking. In conversations, when persons are seated, the persons face each other, and the wrists cross; and in the reclining position, when persons face each other, conversation is practicable and easy.

The physical effort necessary to converse by this method is not nearly so great as in the ordinary sign language, a great advantage to sick mutes, who frequently are unable through failing strength to make their wants known.

We think our readers will agree with us that this is a very simple and ingenious method, and worthy the attention of those who are engaged in the care and instruction of deaf and blind mutes.

SEASONING BOARDS.

A correspondent of the *Building News* recommends the piling of floor boards as illustrated in the accompanying diagram. Four long poles are planted in the ground, and the boards are placed at an angle against them as shown. By



planting posts at short intervals between the corners many more boards can be stacked in the same space. This method gives a much freer circulation of air than the ordinary method, and consequently the drying proceeds with greater rapidity.

Sound and Electric Figures.

What are termed sound figures may be produced in various ways. One way is to fix a plate of glass at its center with Burgundy pitch to an upright support on a stand, then to dust the plate with fine dry sand or other suitable powder, such as lycopodium. If now the plate be made to vibrate by drawing over its edge a violin bow, or some horse-hair tightly stretched from the two ends of a cane well rosined, the dust will in due time arrange itself into certain forms, lines, or figures. The same will occur by tying over a broad-mouthed glass or goblet with bladder that has been moistened and allowed to dry to a drum-like surface, and dusted with lycopodium or very fine sand, and then put upon a piano. Certain lines are soon visible after the instrument has been played upon, particularly when one chord only has been struck, so as to lessen the vibration. The blowing of a cornet, using one key, or the tuning of one note of any instrument, near the stretched membrane, will cause it to vibrate, and the dust to arrange itself into form. Thus these experiments clearly exhibit the effects of sound; and by due study of the dust lines we may see what sound, one long passed, has been. A somewhat similar application of this experiment has recently been made by a German philosopher to the study of the nature of electrical discharges between metallic conductors. It is found that when an electric discharge takes place between a horizontal plate of metal powdered with lycopodium, forming the positive pole, and a ball or point placed below it, the dust remains attached to the plate on a well-determined area.—*Septimus Piesse.*

Good Cider Vinegar.

Take ten gallons of apple juice fresh from the press, and suffer it to ferment fully, which may be in about two weeks, or sooner if the weather is warm; and then add eight gallons like juice, new, for producing a second fermentation; in two weeks more add another like new quantity, for producing a third fermentation. This third fermentation is material. Now stop the bunghole with an empty bottle, with the neck downward, and expose it to the sun for some time. When the vinegar is come, draw off one half into a vinegar cask, and set it in a cool place above ground, for use when clear. With the other half in the first cask, proceed to make more vinegar in the same way. Thus one cask is to make in, the other to use from. When making the vinegar, let there be a moderate degree of heat, and free access of external air.

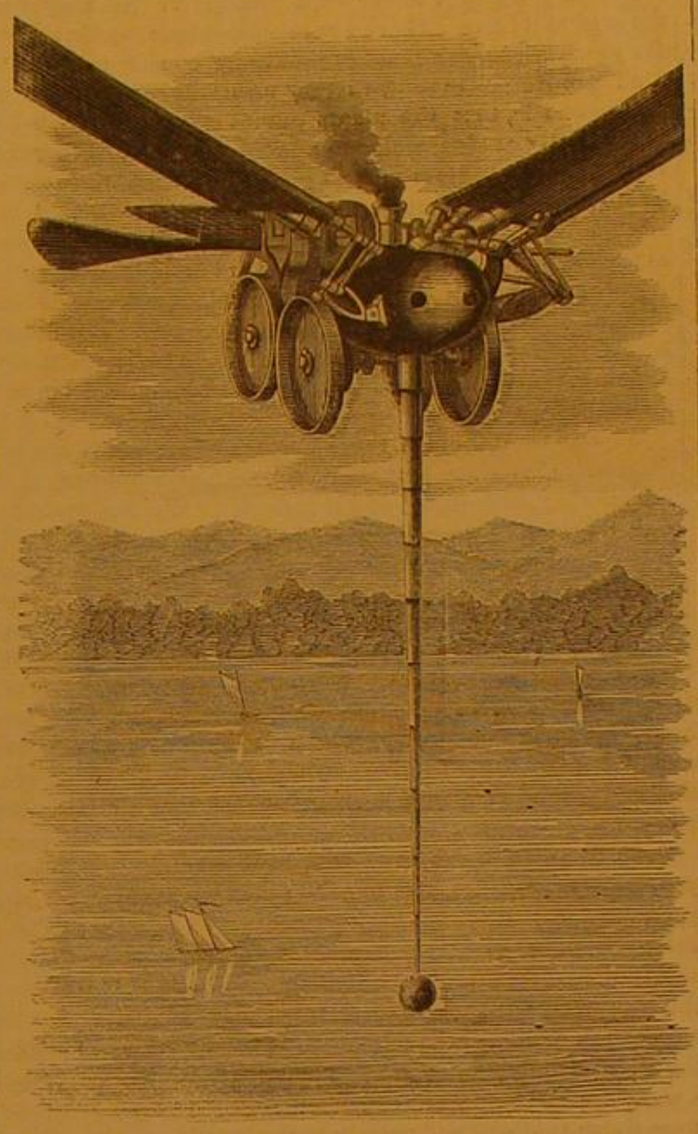
AERIAL NAVIGATION.

NUMBER FIVE.

We give herewith an account of an aerial steam machine designed by Joseph M. Kaufmann, a Glasgow engineer, an account of which we condense from *Engineering* of March 6, 1868. Only about two ninths of the wings, which are long and narrow, are represented in our engraving. From this remark the reader will understand they were of great length, and we may add that they were pointed somewhat like the wing of a swallow.

The actual machine, which the model was constructed to represent, was designed to be of the following dimensions:

From stem to stern, 12 feet; from stem to tip of tail, 14 feet 11 inches; greatest depth, 4 feet 6 inches; greatest width, 5 feet 1 inch; length of each wing, 35 feet; area of each wing, 221 square feet; length over the "gies," 17 feet 3 inches; Length of pendule, 40 feet; weight at end of pendule, 85 lbs.; total weight of machine, 7,000 lbs.; nominal power, 40-H. P.; intended speed, 40 miles per hour, the tank or tender taking a supply of oil and water sufficient for five hours.



As will be inferred from the engraving, it is intended that progress should be gained by flapping the wings, these wings being driven in such a manner that their motion resembles that of the wings of a bird as closely as possible. It is intended that when the machine is rising, the wings should make 120 strokes per minute. The pendule, which can be raised and lowered as desired, is for the purpose of keeping the machine in a horizontal position. The machine represented is exclusively for flying over land, and it is furnished with wheels on which it can run when on the ground; Mr. Kaufmann states, however, that by a few simple alterations it can be made available for traveling over water, and in case of its alighting be converted into a boat furnished with paddle wheels.

The model, to which we have already referred, weighed, complete, 42 lbs.; and during the experiments with it, its boiler, owing to its small size, was not fired, steam being supplied from an independent boiler. The model was made entirely to prove the correctness of the inventor's theory, and to ascertain if the connections to the wings could be made strong enough to withstand the violent twisting and bending strains to which they are exposed. In the model the motive power consists of a single vertical steam cylinder fitted with a piston in the usual way, the piston rod carrying a cross-head which is coupled by links directly to the wing beams. The wing beams are fitted to shafts which run for about three fourths the length of the machine. To these shafts are also connected the "regulators" by which the feathering motion of the wings is governed. Each wing is secured in four places, and has its center of oscillation directly opposite its working beam. The "gies" can be moved alternately so as to steer the machine either to the right or left without disturbing its horizontal position.

During the trial the model was securely fastened down and loaded with a considerable weight to prevent it from moving, it being at the same time raised on supports so that its wheels were clear of the ground. Steam at a pressure of 150 lbs. was then turned on, when the wings made a short series of furious flaps; but, through imperfect workmanship, the left wing suddenly gave way about two feet from its base, when the other wing, being subjected to extra strain, failed also. Mr. Kaufmann states that these accidents were in a great measure caused by the wings having been lengthened three feet previous to the trial, and being thus exposed to a greater strain than they were constructed to resist. The wings having been removed the machine was put to the final test of being run at a speed of 1,500 double strokes per minute, and it was found to be quite uninjured by this experiment. Altogether, Mr. Kaufmann considers the trials to have been satisfactory, and since the trial referred to he has been engaged in the construction of a larger machine on the same principle, but having the beams worked, through gearing and eccentrics, by a horizontal engine. This machine is also to be fitted with shifting aero-planes, and is to be accompanied by a tank-car with accommodation for two persons. It is intended that this machine should rise into the air after a short race on *terra firma*, drawing behind it the tank-carriage; it is to be of 120-horse power, and is to weigh 8,000 lbs. complete. The tender is to carry ten hours' supply of fuel and three hours' supply of water; and with this tender and three cars the machine is intended to make fifty-six miles per hour.

Correspondence.

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

The Fossil Man of Onondaga--Opinion of an Anatomist.

MESSRS. EDITORS:—I have read with a good deal of interest the accounts I have seen in your excellent paper of the "stone giant," or the fossil man, found on the farm of a Mr. Newell, by some laborers while engaged in digging a well.

Many of the accounts I have seen in the papers are fanciful and wholly imaginary. At first we were told it was a veritable petrifaction, and a full description of the same was given. Next we were informed that it was an "image," the work of the Jesuits; then again it was the work of a Canadian, made in 1868, from Onondaga plaster. Recently I saw an extract from the Syracuse *Journal*, in which was an article signed by James Hall, State geologist, and S. B. Woolworth, Secretary of the Regents of the University, in which it is maintained that it cannot be a petrifaction, because the soft parts of an animal are never petrified, decomposition taking place so rapidly. Now, Messrs. Editors, the above-named gentlemen may be men of science, in their way; they ought to be, occupying the places they do; but it is plain they are not anatomists, or they would never make the above statement.

Decomposition is ordinarily the fate of all animal substances, hard as well as soft. But we have many well-authenticated instances of human bodies, buried in certain localities, becoming petrified. It is not more than four or five years ago that we had an account in the New York papers of the removal of a man, or his body rather, that had been buried six or eight years, when it was found that complete petrification had taken place. No part had even begun to decompose except the end of the nose, and that was very slight.

Besides, I can show Messrs. Hall and Woodworth, if they will call upon me, the half of a human heart petrified, plainly and distinctly to be seen, as any one acquainted with anatomy will admit at once.

I have many other similar petrifactions in my possession.

None of these could, for a moment, be supposed the work of the cunning Jesuits or of a shrewd Canadian, hid in the earth to surprise somebody—but were picked up, some in Pennsylvania and some in Wisconsin—each partaking of the nature of rock common in the region where it was found.

The same thing, no doubt, is true of the plaster man of Onondaga. As plaster or gypsum is common in that region, petrifactions in that locality would, of course partake of the nature of gypsum. I have never seen the stone giant above referred to, but it would take more than I have yet seen to convince me that it is not a fossil man.

Dr. Westcott's communication in your last issue takes the most common-sense view of the subject of anything I have seen. One good anatomist is a better judge of the nature of the curiosity in question than a thousand State geologists or Regents of the University.

Don't let us set a shoemaker to repairing a watch—every man is a judge of his own trade. GEO. W. STONE, M.D.

Warren Center, Pa.

The New English Method of Setting Tires.

MESSRS. EDITORS:—The article headed "A New Method of Setting Tires," in the SCIENTIFIC AMERICAN, under date of Nov. 6, and which you describe as being patented in England, and as to the utility and serviceability of which you seem to have some doubts, has come to my notice.

I not only share your doubts about its general utility, but I assert that its theory is all wrong. It is, in my opinion, an imposition upon the common sense of any intelligent wheelright, and hundreds of them will bear me out in this assertion. It is a violation of the common laws of nature; this alone would be sufficient to condemn the whole thing.

The nature of iron is such that heat will expand and cold will contract it. How could nature come to the assistance of man any way more favorable, especially in that class of machines which combine wood with more or less iron.

What is more simple or requires less time, than to measure the tire, weld it, and allow a certain amount of draw, according to the size and condition of the wheel? Every intelligent blacksmith knows exactly how to govern himself in order not to let the action of the tire be too great in its contraction. I say the contraction should not be too great, as it would strain the wheel out of its natural position, and more or less injure its strength by giving it a constrained dish, which we carefully seek to avoid.

Now this new method makes necessary a procedure which is entirely injurious to the strength and stability of a sound wheel; namely, the unnatural contraction by force of the wheel in order to set the tire. A well put up wheel can only be contracted as far as its elasticity will admit, and to do this

it would require more power and consequent expense than would be profitable.

Now admitting it could be done as easy and speedily as you can turn over your hand, would that make it any better? No; Sirs. It would only turn out an imperfect and crippled wheel, and we would never get through resetting the tire on the same wheel done by this method, as the reaction of the wheel against the tire would help to loosen it.

Now as to the expense of labor saving, the old method, or the one we work by at present, will also have the advantage in my opinion.

The inventor of this new method surely cannot be a practical wheelwright, or if he is he does not understand the action of the force which the axletree of a vehicle exerts upon its wheel.

A wheel has almost as much (and sometimes more) strain to bear from the horizontal force (caused by the weight) as from the perpendicular. Now the dish in a wheel is to the effect to resist the horizontal force which is brought to bear upon the hind part of the hub, and the more dish the greater is the resistance.

An arch would illustrate this principle well. It is a fixed fact that the more crowned or rounded an arch is constructed the greater weight it can bear. So it is with a wagon wheel. Its dish should be regulated according to the weight it has to carry. Now how can a wheel be expected to stand up to its load when the dish is strained into it. Would not the reaction of the spokes favor the horizontal strain of the axle against the hub and destroy the wheel?

I could enumerate a great many more minor objections which I have to this new method, but I think I have said enough to convince any one of its entire fallacy, both scientifically and naturally.

I don't mean to say that the apparatus with which the inventor conducts his work and sets the tire, is beneath any notice. Not at all. It must be a very ingenious contrivance and well worthy of attention, if he can set a tire cold upon a wheel and do a good job. E. QUAST.

Freedom, Mo.

Railroad Accidents by High Wind.

MESSRS. EDITORS:—Occasional accidents by trains lifted by gales of wind and thrown from the track, may render a simple safeguard desirable. A recent case of this kind occurred at Boston Corners, on the Harlem Railroad. A high velocity makes the train more subject to this action of the wind than slow motion; for revolution or motion at a great velocity detracts from the weight of bodies, as a spinning top, leaning in any direction, plainly shows. This is more obvious even if the rapidly vertically revolving heavy top, or wheel, is supported only at one end of the horizontal axle, and kept in suspense till slackening of the speed permits it to drop. Locomotives are known to have leapt at a high speed horizontally across the chasm of open drawbridges, etc. The bending of the iron rails under a passing locomotive or car at low speed, may be considerable at slow motion, but imperceptible at high speed. Pieces of a bursting grindstone or fly wheel, or of an exploding boiler, or in a gunpowder explosion, are almost invariably hurled upwards. The boomerang of the New Zealander practically applies the same fact. Whatever the explanation of the phenomenon, the facts are established beyond controversy, that a great velocity of bodies detracts from their weight.

The prevention of the above railroad accidents may be found in slacking speed at places particularly exposed to the fury of a sweeping gale. R. H.

How to Braze a Band Saw.

MESSRS. EDITORS:—I send you a method of brazing band saws, which may be of some use to some of your numerous readers.

The tools required are a small portable forge, brazing clamps, etc., and a straight edge, 4 or 3 ft. long, also some small brass wire, and powdered borax. Take the saw and cut it to the proper length, scarf the ends from one half to three fourths of an inch, then put the saw in the clamp (I would say that I use a very small and simple clamp in the shape of a double vise), keeping the back of the saw out of the jaws of the vise, or clamps, and apply the straight edge to the back, as it is very necessary to braze it straight. Make the fire in as small a compass as possible, place the clamps directly over the center of the fire, and then put on three pieces of brass wire, bent in the shape of the letter U, so that they will pinch the laps together; put on as much borax as will stay on the saw; cover the whole with a piece of charcoal; let the brass melt so it will flow over the saw, before taking it off the fire, and cool very slow so as not to make the braze brittle. File off what brass remains on the saw, and it is ready for use.

I send you a piece of saw that has been in use several months, and has never broke in the braze.

RUSSELL WHITNEY.

Fitchburg, Mass.

[The sample sent is good evidence that the method described by our correspondent is an excellent one.—EDS.

The Choking of Gas Mains by Naphthaline.

MESSRS. EDITORS:—In my last communication, I endeavored to substantiate the view, that the destruction of the wood-preserving establishment, in Brooklyn, occurring on the 26th of October, must have been caused by the obstruction of the pipes, leading from the still into the chamber containing the timber, with naphthaline. In glancing over Colburn's "Gas Works of London," I find the following passage, which bears relation to the subject, and which I therefore quote here: "We ought here to notice the presence of the vapor of naphthaline in gas, and which begins indeed, to deposit in thin, micaceous-looking scales of exceeding lightness, almost at the moment when the gas leaves the purifiers. Indeed, large patches of naphthaline flakes may often, if not generally, be found on the undersides of the lids of the purifiers themselves, and this singular substance will often choke the largest main so as to almost entirely prevent the passage of the gas. A blast of steam turned into the mains will disperse the obstruction, but a sort of chimney-sweeping contrivance, called a 'cat,' is oftener employed to open the great routes of communication between the gas works and the consumers. Fortunately, too, naphthaline is seldom deposited at any considerable distance from the works, and it can generally be cleared out without going off the premises." ADOLPH OTT.

New York city.

Improvements in Farm Implements.

MESSRS. EDITORS:—During the summer you requested any of your readers to suggest improvements in farm implements, or anything else that was practically useful. In accordance with that request, allow me to make the following suggestions:

The only objection to our corn planters is that they drop the seed in a *lump*. There are two objections to this. First, the greatest enemy a plant can have is one or more of its kind growing close to it, thereby using the same nutriment. The second is, that the plants cannot be weeded or hoed as conveniently as if separated to a proper distance. I therefore suggest that inventors make a planter to drop the seed at least three inches apart in a line, thus: . 3 . 3 . A machine to do this properly will supersede all others as well as the old, yet, so far, best plan of hand dropping.

There is a great want of some practical, effective, and cheap plan of attaching three horses to one plow. It is much needed in deep or trench plowing, which, in conjunction with draining, must be resorted to in old and high-priced lands to make them pay.

We also want some of those English steam plows (it is a disgrace to inventors that we do so), with attachments, to do the mowing, harvesting, and thrashing. We can then furnish England cheaper wheat for her plows.

We want an arrangement to water beef cattle and other stock in the cars in transit from shipping points to Eastern markets. This will be a much better sanitary measure than excluding good, healthy, and cheap beef from the southwest. It seems as if the breeder of fancy stock feared the competition of Western stock, which would certainly cheapen beef for millions of operatives. The road that first adopts this plan will receive the preference over all others. This plan is in use on many of the English roads where the distances cattle are carried are short, and the climate mild compared to that of this country.

I suggested the present horse corn cutter some years ago, and now it is nearly perfect. JAS. HARKNESS.

St. Louis, Mo.

Filing and Setting Mill Saws.

MESSRS. EDITORS:—I have noticed recently several articles upon filing saws, hand and cross-cut, but nothing about mill saws.

I have been running and superintending saw mills several years, both circular and sash saws, and my experience is, that a bevel-pointed tooth is the best for general use. In filing, I hold the file at an angle of 10 degrees on the bottom or front of the tooth, and square or flat on top; changing sides or hands every alternate tooth, then bending or setting the tooth point outward sufficient to keep the saw clear. This method obviates the necessity of swaging, which is a great saving in time and labor.

I have gained much information from the SCIENTIFIC AMERICAN, but have never written you before.

Eufaula, Ala. JAMES R. POSTON.

Valuable Testimonial Letters.

MESSRS. MUNN & CO., *Gentlemen:*—Your esteemed favor of the 10th, inclosing certificates of allowance of English and French patents on my high and low-water detector, was received on Thursday.

The very satisfactory manner in which cases are prepared by your Patent Agency, and your facilities for obtaining American and foreign patents is certainly all the inventor could desire. On the 11th day of August, 1857, my first patent was issued from the U. S. Patent Office, through your Agency, since which time I have obtained *thirteen* American and *eight* foreign patents; *sixteen* of which were obtained through the Scientific American Patent Agency. In every instance I have found your drawings and tracings artistically executed, specifications able and full, and claims broad; and in no case have you failed to obtain a patent on my petition.

In conclusion, I began to assure you, that it will always be a pleasure to me to be able to advance your interests as patent attorneys and mechanical journalists, knowing as I do, that the inventors' interests will always be safe in your hands.

Very respectfully, your obedient servant,

G. B. MASSEY.

New York city, Nov. 12, 1869.

A Voice from the West.

Gentlemen: I was agreeably surprised to-day on receiving a letter from you stating that my patent was allowed. You have done your work nobly and well. I can but return you my sincere thanks for your promptitude and energy in conducting my case, and I must confess you have converted me into a walking advertisement for your interests in this wooden city of ours.

Your valuable journal and I have been companions for the last five years, and now I cannot live without it. It has grown with me from boyhood, and I've always found it instructive and entertaining in my journey through life.

Chicago, Ill., Nov. 13, 1869. J. F. DUFFY.

For the Scientific American.

OXYGEN AS A SOURCE OF HEAT AND LIGHT.

BY ADOLPH OTT.

Heat and light, in their application to the manifold purposes of life, are subjects of vast importance. As regards heat, an inexpensive process for producing high degrees is much in need; and with respect to light, it is a brighter and cheaper form of artificial light that is not liable to charge the air with carbonic acid which is wanted.

The brilliancy of illumination, as well as the high degrees of temperature afforded by the combustion of various gases in oxygen has, for many years past, led to zealous attempts to produce this gas at a cheap rate. There is, indeed, no want of oxygen; it exists in immense quantities. The atmosphere surrounding our globe consists of one fifth in bulk of this gas, and eight ninths of the weight of water, of which there is also no scarcity, is oxygen. But, in spite of all efforts bestowed upon the opening of these magazines for the uses referred to, the problem of the cheap separation of oxygen has only lately been solved.

This discovery is due to two enterprising Frenchmen, Messrs. Tessié du Motay and Maréchal; and it first excited attention at the time of the late Exhibition at Paris. Two substances, one a mineral, the other a product of manufacture—peroxide of manganese and chlorate of potash—have ordinarily been the source of oxygen; this gas can be evolved from them with ease; however, this process is too costly for use in the industrial arts. Besides this, various methods for producing oxygen have been proposed up to the year 1867. The one best known is, perhaps, that of Boussingault, which is founded upon the regeneration of the binoxide of barium. However, this process is now abandoned, chiefly on account of the cost of the crude material.

Some years ago, Messrs. Saint Claire Deville and Debray were requested by the Russian Government to search for a better process for separating platinum from its ores. This metal can only be fused before the oxy-hydrogen flame, and there being large quantities of oxygen needed, a new mode of generating it, had to be sought for. The one proposed is based upon the property of the sulphate of zinc—a by-product of the cells of galvanic batteries—to split up into oxide of zinc, sulphurous acid and oxygen, when subjected to a red heat.

The separation of these two gases is easily effected, since the one is absorbed by water while the other is not. The production of oxygen from the source referred to is very regular and unattended with danger; moreover, it is economical as compared with those commonly employed by chemists; in the experiments of Deville and Debray, the cubic meter (35·316 cubic feet) of oxygen when prepared from chlorate of potash could not be obtained for less than ten francs (two dollars in gold); from manganese for not less than four francs, and in the last-described process, the price of one cubic meter amounted to only one franc and a half. By the discovery of Messrs. Tessié du Motay and Maréchal the cubic meter of pure oxygen may now be produced for less than four cents, gold; at least it is sold to the gas companies in Paris for twenty-five centimes (five cents, gold) per cubic meter. We are consequently in possession of a process by which oxygen can be got at only one fiftieth of the cost of that ordinarily employed by chemists in their laboratories!

The process of the French chemists is founded upon the fact that the manganate of soda at a red heat gives off a part of its oxygen when steam is passed through it, and that it re-absorbs oxygen when atmospheric air is passed through it. This process may be represented by the following formula:

2 (Mn O_3 Na O) (manganate of soda) + 2 H O (water) = Mn_2 O_3 (oxide of manganese) + 2 Na O, H O (hydrated soda) + 3O (oxygen).

According to this formula, the manganate of soda is capable of producing fourteen and a half per cent of oxygen in weight, and since the oxygen is 737 times lighter than water, from one hundred pounds of the crude product there can be generated 1,348 gallons of oxygen, or something over five hundred cubic meters.

With regard to the application of oxygen for illuminating purposes, it was first made in the square fronting the Hôtel de Ville, one of the finest government buildings in Paris. This experiment, which lasted for about two months, not only met with perfect satisfaction, but also procured the patronage of his Majesty Napoleon III., who, for a second trial upon a still larger scale, ordered the court of the Tuileries to be illuminated by means of the oxy-hydric light. The grounds of that palace comprise in themselves an area of 30,000 square meters; besides, it has been introduced into one of the most spacious theaters of Paris, "La Gaité," in the Alcazar, and in various stores and workshops.

The light itself is produced by directing a jet of a mixture of oxygen and hydrogen or oxygen and street gas upon cones of zircone, a white earthy body, which has proved far superior to either lime or magnesia, that serves in the Hare, Drummond, or Calcium light.

As regards the lighting power, it is seven times greater than that produced by an equal quantity of street gas; indeed, the streets may be so brilliantly lighted with it that a newspaper can be read with perfect ease in a street car. Dr. Miller states that the oxy-hydrogen light can be seen at a distance, in a right line, of 112 miles. Navigable rivers might be cheaply and perfectly lighted their whole length;

and for churches, workshops, theaters, and other spacious rooms, there is perhaps no mode of illumination better adapted than the new light. And, since the flame, when directed upon a solid, earthy body, it produces an emission of luminous, instead of caloric rays the objection that it would heat, the room in which it is burned, falls to the ground. But, in another point of view, the new light is far preferable to any other form of artificial light—we mean in regard to health. According to experiments recently undertaken by Dr. Zoch, in Germany, the quantity of carbonic acid produced by a common gas flame in a room of the capacity of 2,540 cubic feet, may rise to the proportion of three parts to the thousand —a quantity generally supposed to be possible only in hospitals, prisons, and garrisons; and what shall be said when it is considered that, in an ordinary parlor as many as three burners are kept constantly lighted for five and six hours and with an inferior quality of gas at that? With respect to the oxy-hydric light, since the product of combustion is simply watery vapor, no vitiation of the air can possibly take place.

As regards the application of oxygen for the production of heat, it may be stated that hydrogen, when being inflamed with oxygen, generates the highest heating effect known, with the exception of that of the electric discharge. This is due to the rapidity of the combination of these gases. Some years ago, by the construction of a close furnace of lime, and the use of the oxy-hydrogen blowpipe, MM. Deville and Debray were able, not only to volatilize many of the supposed fixed impurities in commercial platinum, but with about forty-three cubic feet of oxygen they have succeeded in melting twenty-five pounds of platinum in less than three quarters of an hour, and casting it into an ingot, in a cake mold. And much larger quantities of platinum have more recently been fused by the same means. According to Brand and Taylor, silica and all metals are fused, and some of them entirely dissipated in vapor by the intense heat produced under these circumstances.

The temperatures of various flames are, according to Prof. Bunsen:

Oxy-hydrogen flame	14,541°	Fah.
Hydrogen	5,898°	"
Carbonic oxide	5,507°	"
Coal gas	4,262°	"

There remains no doubt that oxygen will soon play an important part in various branches of metallurgy, and those fully conversant with its properties, predict for it not less conspicuous uses in other branches of art.

"HOW TO OBSERVE THE SUN."

[BY J. N. FARRAR, D.D.S.]

On page 310, current volume, I noticed an article alluding to a former one on page 189, "Storms on the Sun," for the purpose of showing simultaneous "electric disturbances" about our planet, which gives further hints of a simple and good method for obtaining a comparative correctness of statistics of the solar disturbances noticed through a telescope, by means of reflecting them upon a screen. I will quote two paragraphs:

"Believing that a simple means of observing and accurately recording solar phenomena could induce amateurs as well as professionals, to keep such records, I respectfully propose the following method, which I never have heard of being thus used by any one before. Take an astronomical reflecting telescope with a Huyghenian eye piece, into a dark room, direct it on the sun through an aperture, push in the eye piece until it is between the object glass and its principal focus, now place a fine white screen at some distance from the eye piece and focus sharply, a large, clear, well defined, erect image of the sun is thus obtained, which may be enlarged or diminished at will, arrange the aperture, increasing or decreasing the light, until the finest details are visible. The sun can now be examined without darkening glasses, and by several persons at once.

"For uniformity of record I would suggest the adoption of one regular size, say a circle inscribed within one square foot divided into square inches; the space being numbered from right to left, and from top to bottom. The exact position of any disturbance observed could thus be easily ascertained and recorded."

The idea of reflecting solar spots, etc., upon a screen, is excellent but not new. While attending the Elmira Astronomical Observatory, at Elmira, N. Y., during the spring of 1862, and desiring to make some solar observations, this plan was adopted for most of them, but was not original with me. The writer is under the impression that this process is old.

I made a long series of observations on the sun at this time, and with considerable effort made a different sketch of the sun's appearance every day, when the weather would in any way permit, and at exact time. My reflected representation of the sun was about ten feet in diameter, and my pictures were made one foot in diameter. The central spot or nucleus was made with black ink, the penumbra with lead pencil, while the faculæ were represented with white crayon. It must be understood that straw colored paper is essential for the best representations.

The disturbances of the solar photosphere are very interesting to young students, and are becoming more interesting with all astronomers, as the time approaches for the great expected display of spots of 1871, when, from all accounts, the sun is to become quite "speckled," or at least great magnetic disturbances are looked for.

Sometimes (though rarely) no spots are visible on the sun, again, one may be seen, at other times quite a large number may be seen scattered all along the equatorial belt of 70 degrees in width. Spots outside of this belt are very rarely seen. The disturbances of the luminous portion of the solar atmosphere, if I may be allowed to use the term, are noticed upon the screen in curly streaks of bright light, in irregular shapes, resembling waves on a lake during a sunny, windy day, and particularly plain near and around the spots, resembling much the tumult and circular waves round a place where a large stone has been dropped into a pond of water.

I noticed, whenever I saw a good deal of facular disturbance, in any quarter, there generally followed spots in a few hours. This is so characteristic that it is easy to foretell the appearance of some larger spots, one or two days before they appear around the approaching limit, that is, before they appear in sight, as it is supposed all know the sun revolves on his axis once in 25·34 days, which continually brings new spots into view.

Some days scarcely any facular disturbance could be noticed on the ten-feet reflection on the screen, while on other days it could be distinctly seen covering the whole zone of 35 degrees each side of the equator.

On January 27th, the same season (1862) my brother, in company with myself, noticed the whole face of the solar orb covered with enormous disturbances of the photosphere, from pole to pole, and from limit to limit, entirely mottled with wave-like shades. On this occasion fifteen spots were visible, two of which were very large; undoubtedly a more powerful glass would have revealed many more. The faculæ on this occasion like most other days were more agitated and greater as they approached the equator.

The instrument used in these observations was Fitt's 8-in. Acromatic Equitorial Telescope, erected by Professor C. S. Farrar.

I used a prismatic eye piece to reflect the object upon the screen. Although these representations were very good and convenient, yet I found I could get a finer line and more correct idea from views seen directly through the telescope, by using two or three colored glasses between the eye and eye piece. This is, however, a dangerous plan, as the colored glasses sometimes break from intensity of heat, and the loss of an eye may be the result, as has been the case before. Great care should be exercised in viewing the sun directly through a powerful telescope.

The proposition of a checkered field upon which to throw the image of the solar orb seems to me good. The writer would kindly suggest in addition to the plan of the author of the article above mentioned, that the cross line check be made comparatively small and light, and be secured to the telescope, so that it will keep pace with the motion of the earth on its axis, and hold the whole picture upon the screen in juxtaposition, and not necessitate a constant adjusting anew of the telescope, as would be the case if the screen held the lines, having prepared everything in this manner, a comparatively accurate sketch of every visible disturbance can be conveniently made in a book, whose pages are correspondingly checked.

[For the Scientific American.]

THE MANUFACTURE OF LOOKINGGLASSES AND MIRRORS.

One of the most singular wants of man, but especially of woman, is to devise means to ascertain how her personal image appears. From the fountain, in which Narcissus looked at himself, to the bureau with lookingglass, many plans have been tried.

The first artificial mirrors were made of metal, and were discovered at a very early period, and must have been contemporaneous with the art of polishing flat surfaces.

At this date, lookingglasses are used every where—even as ornaments on horse collars, in Europe.

As ornaments, lookingglasses look beautiful, reflecting, as they do, daylight and artificial light, and thereby flooding sumptuous apartments with a deluge of light. They seem to enlarge small apartments. When not silvered, but simply polished and left transparent, they give to store fronts and windows a cleanly and bright appearance not attained by common window glass. Used between two parlors, they are one of their most beautiful applications. Since the wonderful invention of Daguerre, and especially, latterly, large quantities of small cast glasses are made for photographic purposes. As to imperfect glasses, not suitable for polishing, they are used to form walls through which light freely traverses to rooms which require to be lighted but closed; they may also be used for floors, roofs, etc., etc.

The use of lookingglasses has increased wonderfully, and this increase is owing, in great part, to a notable reduction of price, the consequence of an invention of Abraham Thérart, a French artist, who, in 1688, conceived the bold undertaking of casting glass as it was practiced with metals. This new manufacture made such wonderful strides that, three years afterwards, a company was formed to carry out this new manufacture; and, in 1691, the establishment was transferred to St. Gobain, where it is in existence to this day, and is manufacturing a very superior article. St. Gobain, by the beauty of its glasses, by their relative cheapness, and the ability of its managers, has retained the monopoly, almost exclusively, of the French market, and has, besides, maintained a rank abroad not to be excelled by others, notwithstanding the active competition of Belgium and England. This factory has six strong competitors in England, especially in lookingglasses used for windows. The oldest is located at Raven Head, near St. Helens, South Shields. The Thames Co., the British Co., and three other factories, two of them situated in Lancashire, and the last one at Smitherick, near Birmingham, with the two first named, manufacture more than two hundred thousand square meters per year. The most important factory of the Continent, after St Gobain, is situated at Sainte Marie d'Oignies, near Charleroi, in Belgium.

In 1860, St. Gobain alone manufactured two hundred thousand square meters; the six English factories, three hundred and fifty thousand meters; Belgium one hundred and ten thousand, and Manheim seventy thousand.

The lookingglass manufactures, in France, have a capital of 50 or 60 millions engaged, and employ 5,000 workmen simply on the manufacture of the glass proper, not including those employed on the separate branches of business depending upon it. This branch of manufacture has attained such a state of perfection, that, at this day, prices are 60 per cent lower than twenty years ago and 32 per cent lower than five years ago.

From experiments made, the following shows the relative position of French and Belgian manufactures.

To manufacture a square meter of glass, the following is required:

(In Sainte Marie d'Oignies, Belgium.)

To melt 118 kilogr., soft coal at 13f. 50c. tun		2f. 38c.
" polish 195 " " "	8f. 58c. tun	1f. 65c.
Total		4f. 03c.

(In St. Gobain, France.)

To melt 180 kilogr., soft coal		3f. 96c.
" polish 195 " " "		2f. 94c.
Total		6f. 90c.

If we complete the estimates of the last price by adding the price of the chemicals, the sand, the chalk, and the pot-making, and by adding the labor, we arrive at the following cost prices of one square meter:

Sainte Marie d'Oignies, Belgium	17f. 54c.
Ruquignies, France	20f. 34c.
St. Gobain	21f. 61c.
Cirey	23f. 97c.
Montlugon	21f. 61c.

By adding the interest on the capital invested, the last price is raised to 27 or 28 francs per meter, and is sold in Paris at an average of 34 to 35f.*

It is a well-known fact, that the United States, with its immense resources for this branch of manufacture, has not succeeded, yet, in producing a merchantable article in this line. What is wanting, then, to manufacture it successfully here? We have sands, beautiful and much superior to the European article, although England draws a large quantity of it all the way from Australia; we can manufacture our sodas in this country as cheap as in Europe; we have coal in plenty; we have the capital; therefore what we want is men capable of managing the work and skillful workmen. Ability and love of work are oftener wanting than capital. This class of men, however, is often left at the mercy of men unacquainted with the business, and oftentimes of bad faith, who can not, or will not, wait for the slow but sure profits of labor, and who simply take hold of the business as a speculation, as it were, caring nothing about the artistic excellence of their employés, but would part with them at any time if they thought they could make a dollar by it. These, I think, are a few of the reasons that discourage skillful men from coming to this country.

A manufacturer of lookingglasses would find it to his advantage to locate near the ocean, where he could receive his raw materials, and would be near large markets for his wares, and could, also, make up some of the materials used in manufacturing. Saint Gobain, in France, manufactures its own sodas, emery, colcothar, and tin sheets. They buy the tin in Amsterdam, from the Dutch Indian Company. This company only sells at wholesale. They get the mercury from Spain.

If we cite these facts, it is to establish a comparison between a factory located in Europe, and one in this country, and to show the advantages of a location on the ocean border. We will give an example of these advantages. Sodas might be made on the spot, and would thereby save a vast amount in freights, as soda is obtained from sea salt by transforming it into sulphate of soda, then the sulphate into carbonate. In this latter state it contains a large quantity of water—from 62 to 66 per cent—so that 100 pounds of this salt represents only 34 to 38 per cent of dry carbonate of soda. A factory, making this carbonate on the spot, would save the freight, not only of the pure carbonate, but, also, of the 6-10ths of water it contains.

We have, in some of the Southern States, sand suitable for glass-making, and, also, fire-clay suitable for making the pots (crucibles), which have not been tried properly, heretofore, but, by being properly mixed, would answer the purpose as well as the German clay that we import at a heavy cost.

We therefore say, unhesitatingly, that a lookingglass manufactory, well managed, must be profitable in this country.

Washington, D. C. J. P. COLNE.

WATCH-SPRINGS.—It has recently been discovered that the springs of chronometers and watches, which are constructed of steel, are frequently magnetic. Steel is at all times liable to become magnetized from causes beyond man's control. Watch-makers are advised to test their springs as to magnetism by placing them near to a very small and truly balanced mariner's compass. If the spring exhibits in none of its circumference any tendency to move to one pole of the compass more than the other, it may be considered free from magnetic influence; on the other hand, if the North pole moves to one part, and the South pole to the other, the spring is decidedly useless; for in whatever position the time-keeper may be placed with such a spring, it will be affected by the earth's magnetism.—*Septimus Piesse.*

*A square meter equals one and one fifth square yards, nearly. A kilogrammie is two and one fifth pounds avoirdupois nearly. A centime is on hundredth of a franc.—EDS

THE GREAT ST. PANCRAS RAILWAY STATION.

This week we give an engraving of the interior of the new St. Pancras Station, Midland Railway, London. Occupying, as it does, a site of nearly ten acres, it is undoubtedly, if not from an architectural, at least from an engineering point of view, the finest terminus in the world. Its most interesting and peculiar feature is the roof. While it has the widest span of any roof in existence, the space beneath is unbroken by ties or braces, common to all others. Its style is subdued Gothic, with segments meeting at its crown. As shown in the engraving, the roof springs from the platform level, the principal ribs each having the form of a four-centered arch, the radii of the curves being 57 feet and 160 feet, respectively. The two central curves—those of 160 feet radius—meet at an angle in the center at a hight of 96 feet above the platform level. The length of the roof is 690 feet with a clear span of 240 feet, covering five platforms, ten lines of rails, and a cab stand 25 feet wide, thus making a total area of 165,600 square feet. Its hight at the ridge is 125 feet above the level of the road. There are twenty-five principal ribs in the roof, each weighing about 50 tuns. Between each of these, which are about 29 feet 4 inches apart from center to center, are three intermediate ribs, carried by trussed purlins, constructed so as to stiffen the bottom flanges of the main ribs laterally. The station walls rise behind the spring of the principal, the space at the top being filled in with open iron-work.

The roof is glazed about 70 feet on each side of the center, and the remainder is covered with slates on boarding one inch and three eighths thick, grooved and tongued and chambered, the underside being varnished. The slates are best Welsh, and securely fastened to the boarding with copper nails weighing about 7 lbs. per 1,000. The lap is not less than 3 inches. The timber work throughout is well protected by varnishing, painting, or Burnettizing, according to the situation in which it is fixed.

The transverse girders which support the floor of the station take the thrust of the roof. They are connected so as to form continuous girders across the station. Besides being tied to them, the feet of the ribs are each secured by four 3-inch bolts to an anchor-plate built into the wall and strongly fastened.

The rail level of the station is about 17½ feet above that of the adjoining streets, thus affording very extensive cellarage. The hight of the basement story is 13 feet 6 inches, and under this basement the connection of the Midland line is carried to that of the Metropolitan system. To enable vehicles to reach the station level from the street, inclined approach roadways have been constructed on arches. Each side of the station is flanked by a row of picturesque shops and other buildings. The platforms have edges of dressed stone, and are floored with red deal planks, dressed, close-jointed, and tongued with hoop iron. The decorations include a tesselated frieze about two feet deep, inlaid with colored tiles, and a dado round the base to the foot of the principals. The molding above the frieze is surmounted by an iron cresting of floral design, the leaves to curve inward from the cornice. The lighting arrangements of the station are very effective. They were intrusted to the Messrs. Sim and Barff, of Parliament street, London, and to their patent hydrocarbon process is to be attributed the brilliant light obtained, while a saving of sixty per cent is said to be effected.

In the construction of the station about sixty millions of bricks, 80,000 cubic feet of dressed stone, and many thousand feet of glass and timber have been used. Over 9,000 tuns of ironwork have been employed, the weight of some of the principal portions of which are given as follows:

	Tuns.
Main-floor girders	500
Intermediate	300
Cross-girders of floor	1,020
Buckled plates	820
Main roof, ribs, and spandrel framing	1,270
Intermediate ribs	320
Purlins and connections between ribs	230
Cast-iron columns and caps below flooring	1,080

The traveling stage and hoisting gear, by means of which the ribs and roofing were erected, were very ingeniously designed by J. G. N. Alleyne, of the Butterley Iron-works. The principle on which he acted was never to lose hold of the main rib until the wind ties were finally fixed to the walls. The staging was divided into three sections, the center consisting of six divisions, the side ones of five divisions each, and from front to rear there were four divisions. The standards consisted of die-square backs of timber, 12 inches square; the horizontal traverse pieces were double 12 inches by 6 inches each, except the lower one, which was 12 inches square, with iron shoes bolted down to receive the feet of the standards and braces. These were connected by cross braces, and the whole was moved, either together or separately, on 123 wheels, each 2 feet 8 inches in diameter, turning on a balk of timber 18 inches square. A large hotel is being constructed at the end of the station.

THE ORIGIN OF CANDLES.

The tallow candle is the offspring of the tallow torch used in the twelfth century. When tallow candles were first introduced their cost was so great that only the most wealthy could afford the luxury, and it was not till the fifteenth century that they were sufficiently cheapened to come into general use.

Think of a tallow candle—that dripping, guttering, greasy thing, being considered a luxury. But the tallow candle, now used only where more convenient and economical lighting materials cannot be obtained, is, as we now know it, no more to be compared to the candle of the twelfth century, than the best illuminating gas to lard oil. Its wick was of tow, hard to light, and burning so rapidly as to melt a large portion of the tallow into rivers of oil, so that the drip of four candles would buy a new one.

INTERIOR OF THE FINEST

What would the quaint old revelers of that period have thought if, in the midst of one of their drinking bouts, their tallow dips with tow wicks could have been suddenly eclipsed in the splendor of the oxy-hydrogen light of to-day. Verily, way to the light of a brighter and nobler period.

Can it be that in centuries to come, the luxuries of the present will be regarded as contemptuously as we now regard the obsolete appliances of the middle ages?

LIFE-SAVING GUNS.

We find in the *Army and Navy Journal* an interesting article on "Life-saving Guns," a title that might at first seem paradoxical, as guns have been and still are employed chiefly for the destruction of life. The inventions noticed in the article are all of foreign origin. The first one mentioned is that of M. August Deloigne, of Paris. "This gun is a bronze casting, about one foot long 1 1-6 inches bore, and weighing about 66 pounds, without trunnions or carriage. Screwed into the breech is a tail-piece of iron, nine or ten inches long, which, when the piece is to be fired, is thrust into the soil at an angle of about 30 degrees. For long ranges, when firing to windward, arrows of iron are used as projectiles, and for short ranges, or for long ranges when firing to leeward, wooden arrows, which are to be preferred, as they will float. The lower or inner end of these arrows nearly fills the bore and is covered by metal which expands into a collar or rim, considerably larger than the bore, and coming nearly down to the muzzle when in place, so as to receive the full force of the explosion. Projecting out a foot, more or less from the collar, is the main body of the arrow or 'flèche,' consisting of a round or eight-sided stick of ash, about double the diameter of the bore of the gun. To this is attached the line.

"In the 'Manby mortar,' the use of which has given way to the Boxer accelerating rocket, the weight of the shot is about 1-5th that of the mortar itself, which weighs about 150 or 160 pounds. In the 'Porte Amerres,' lately got up by Deloigne, the wooden arrows are twenty to thirty meters in length, and weigh ten to twenty times as much as round projectiles, although suited to the same bore. The bore is longer in proportion to its diameter, than that of a mortar, it is actually shorter than the bore of a mortar of the same weight. The result of this is, that for the weight and caliber of the new piece, the metal is very thick, and is capable of great resistance, and therefore admits of heavy projectiles with proportionate charges. The power of resistance is greatly augmented by the peculiar mode of charging, and of firing the charge. An empty space is left behind the cartridge, varying according to the weight of the projectile, and the fire is introduced into the forward end of the cartridge.

"In 1865, Mons. Deloigne made some experiments, under the authority of the French Minister of Marine. The guns used were common 30-pound navy guns, six in number, and as nearly alike as possible. Two were charged as usual, with 7 1-2 kilos. of powder, and an elongated projectile weighing 45 kilos., an excessive charge; one of them burst at the eleventh, and the other at the twelfth fire. Two of the pieces had a space equal to 16 centimeters behind the cartridge of 7 1-2 kilos. and the shot of 45 kilos.; one of them stood 167, and the other 178 fires. The two others had a space of 20 centimeters behind the same charge; one burst at the 108th, and the other at the 162d fire, showing a great gain in firing heavy projectiles by Deloigne's process.

"The present swivels in actual use in the French 'Societe de Sauvetege,' are loaned from the public arsenals, and are not the best arms for throwing lines. They weigh about 80 kilos., and when in use as naval guns, they throw a small round ball, about one pound caliber, weighing about 500 grammes, with 130 grammes of powder. This arm when loaded by Deloigne's system, carries an iron arrow, 1 1-2 meters in length, weighing 5 kilos., with a charge of 140 grammes. No accident from bursting has ever occurred. The new gun, from its extreme simplicity, and cheapness of manufacture, being nothing but a block of gun-metal with a hole through it, with a 'monkey tail' screwed into it, is admirably adapted to the requirements of humane societies and life-saving benevolent associations. When it is to be used on the deck of a vessel, or on rocky ground, it is put upon a rough solid block of wood shaped like a quoin. This block may also be useful to use on very sandy soil, or anywhere where the heaviest charges are used. As the arrows project considerably from the gun, there is no difficulty in aiming sufficiently well to throw a line across a vessel in ordinary times.

"This system of communicating by throwing lines is not only available to establish communication with wrecks, but will be found very useful for tugs, wrecking vessels, revenue cutters, and vessels of war. The system is carried out extensively in France all along the coast, and at bathing places, and is not limited to any size of arm. The wooden arrow can be used from any gun, smooth-bore or rifle, down to a common carbine out of which Deloigne throws arrows as long as the gun itself, carrying a small line of about 100 yards. Mr. Forbes writes that he saw at Vincennes an arrow of the size of a handspike, thrown from a common 4-pound rifle field-gun, about 300 yards. Across the outer end of the arrow, when it started, were two tough iron straight bolts, 1-2 an inch to 5-8 in. diameter, and about a foot long. These bolts stand at right angles to the arrow; the shock at the start bends them to an angle of 45 degrees, and forms a grapnel.

"The 'coulant,' or 'becket,' consists of five or six turns of line round the arrow, just tight enough to allow the line which over rides these turns by a double loop, to pull it down to the butt of the arrow, and thus steady it on its mission of mercy."

...AILWAY STATION IN THE WORLD.

ANY project of the people of Washington to raise $200,000 or $300,000, or any other sum, to hold an International Exhibition in that city, is very praiseworthy. But appealing to Congress for authority to raise half a million by taxation, for the same purpose, is quite another matter.

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VOL. XXI., No. 24...[NEW SERIES.]...*Twenty-fourth Year.*

NEW YORK, SATURDAY, DECEMBER 11, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

WHAT WE HAVE DONE IN 1869, AND WHAT WE INTEND TO DO IN 1870.

We promised at the commencement of the present year to give increased value to the SCIENTIFIC AMERICAN, both in quantity and quality of the illustrations and general reading, and added the hope that with the hearty co-operation of our many friends we should greatly increase our circulation.

We have fulfilled our promise, and are happy to say that our hopes have not been disappointed. Numerous correspondents have expressed their satisfaction with our paper in such hearty terms as show our efforts in their behalf are thoroughly appreciated.

During the coming year we shall take still another step forward, and shall devote increased attention to the illustrations of foreign inventions, machines, designs for machinists' tools, and all matters of general industrial interest, at home and abroad. In doing this we shall incur a large additional expense, but we are resolved to spare neither pains nor expenditure to make our paper the most splendidly illustrated industrial journal of the age.

To reimburse us for this prospective expenditure, we must either increase our subscription list, or raise our subscription price. Our paper is now unparalleled in cheapness. Nothing approaching it in value is published anywhere in the world at our subscription price. Still we are resolved not to advance the rates. We rely upon the efforts of our friends to increase its circulation. Remember that for every subscriber you send us you will be remunerated in the increased value of the paper itself. Besides this remuneration we offer extra inducements in the cash prizes and splendid steel engraving, advertised in another column. The picture of some of the greatest geniuses of our age, is one which will adorn any gentleman's library, and nothing could be a more fitting ornament for an inventor's laboratory.

Those who intend to compete for the premiums offered in another column should be wide awake. We have already received encouraging letters from subscribers who propose to get up clubs, and the prospect is good that the work will go bravely on.

We are moving onward, Friends, and we mean to keep moving, and we here pledge ourselves that the SCIENTIFIC AMERICAN for 1870 shall keep march with the age in all that can adorn or improve it.

BRAIN AND MUSCLE.

It is an old proverb that what "one has not in his head he must have in his heels." This proverb is applicable to those whose memories are so treacherous that they find it necessary to go many times to perform what might have been done in once going. This old saw might have been made more comprehensive, at the expense of alliterative force, by changing it to "what one does not possess in inventive forethought he must make up for by muscular strength."

The intelligent, contriving workman, though his physical frame may be slight, is more than a match for the stupid, unthinking one, in any kind of work depending upon aught except blind strength. The former rises and the latter sinks in the scale of value, just as naturally as oil rises to the surface of water.

A man may expend a vast amount of muscular energy and do little work, and *vice versa*.

On one occasion we had a novel piece of work to get done, and took it to several shops, where its accomplishment was unsuccessfully essayed. After much trouble and expense we met a German friend, who being informed of our predicament, recommended us to a shop where he assured us we could get our work performed satisfactorily.

Being rendered somewhat skeptical by our previous experiences, we made some inquiries about the facilities of the shop recommended, and were told by our Teutonic adviser, that it possessed a tool not to be found in any of the shops previously tried, by which all sorts of difficult work impossible to the others could be quickly and excellently executed. We were curious to see this remarkable machinists' tool, which our imagination pictured as quite out of the usual run of lathes, planers, and common paraphernalia of the machine shop, but were at once informed that it would not be shown.

We sent our order to this shop by the hands of our adviser, and duly received it, just the thing we wanted. It was so satisfactory, that seeing the same gentleman a few days after, we pressed him for some description of the machine by which such a marvel of delicate and accurate work could be performed. He avowed that he could not describe it but he could give us its name. "Well what *is* the name?" cried, we.—"Brains" was the laconic reply.

Ah! what, not essentially impossible, can not be done with this great tool which the Almighty has bestowed upon man. But to use it skillfully requires practice. The commonest cause of failure is not want of natural mental ability but want of training; training that might have been attained through personal effort had its value been known. In fact all training, whether of brain or muscle, must be attained by personal exertion. The most that teachers can do is to direct, and give the best methods in which the process may proceed.

We are of those who believe the kind of training should be adapted to the intended life-occupation of the student. To the mechanic, or to any man whose occupation is connected more or less with constructive mechanics, inventive ability is of the first consequence. Not that by its exercise all will be enabled to make great improvements upon existing methods, or to strike out entirely new and original devices; but that all will, by its aid, be rendered more efficient mechanics, farmers, manufacturers, or chemists, as the case may be.

The farmer grubbing up the big stump in yonder field, is engineering on a small scale. The next stump he essays can not be got out in precisely the same way. He must modify his plan somewhat. He must *invent* a way to do it. Whether it will be the best way or the worst way, will depend upon the degree to which his inventive talent has been trained or neglected. He may break his chains and kill his team, or by skillful management uproot the unsightly stub which cumbers the ground.

This training may be constantly going on during the ordinary avocations of life. Every mechanic should feel that it is not enough to simply do a thing; it should be done in the best way possible. Studying how to do things is the best and surest way to get proper mental training. Where living teachers can not be obtained books may be. The nineteenth century in free America offers no excuse for ignorance.

THE SPIRIT OF THE AGE.

Certainly those papers which have assumed to condemn the establishment of a chair of positive philosophy at Harvard, and the publication of lectures of Professor John Fiske, the able expounder of "positivism" in that institution, by the New York *World*, have greatly mistaken the spirit of the age.

The thinkers of the period are struggling by every possible means to arrive at truth. They have disembarrassed themselves of all superstitious reverence for old doctrines and old beliefs, and have entered into their work with the determination to recognize nothing as true merely because it has long been accepted as such. They are obeying the injunction of St. Paul: "Prove all things."

The clamor of bigots against free thought and free discussion avails no more to stem the current of thought, than the howling of the wind below Niagara to stay the mighty cataract. If some—if all the men who are molding the thought of the age, are wrong in their conclusions, the prohibition of discussion in our public institutions is the very best way to perpetuate their errors. It has been in all ages by prohibiting discussion that falsehood and quackery have flourished. And no essentially false theory can ultimately outlast the scrutiny which is brought to bear upon it by free discussion.

Therefore, if positivism is a false philosophy, it has been brought to execution in its introduction to the thought which pervades our universities, and its enemies should ask no greater advantage than is given through its public exposition by one of its acknowledged champions, in the columns of a widely circulated journal. It thus offers itself to general attack, and its defeat is morally certain if it has not truth for its basis. Those who refuse to confront it are moral cowards, who do so only in the fear that their favorite creeds will suffer in the conflict.

PROGRESS OF LABOR.

In the reign of Henry VIII., artificers and laborers were compelled to eat horse-corn, beans, peas, oats, tares, and lentils. They slept on coarse straw covered with canvas, and lived in straw-thatched hovels of mud and wood, with the bare earth for a floor. They ate their food from wooden trenchers, and their clothing was of the coarsest possible materials. The laborer of to-day lives in what would have been considered a palace at the time of which we speak. He eats food which would have been deemed fit for a lord of Henry VIII.'s court, and commands furniture, clothing, books, and other mental and physical wealth which that monarch's kingdom could not have purchased.

In the three centuries which have since elapsed, labor has been constantly progressing more rapidly than capital, until at the present time the supremacy of the latter has become extremely doubtful, and many of the most careful thinkers of the age prophesy the speedy arrival of the day, when the present wages system must be abandoned for a co-operative system, in which labor shall enter into partnership with capital, and share profits according to its productive value.

THE STEAM ENGINE INDICATOR.

We are in receipt from the publisher, D. Van Nostrand, Nos. 23 Murray street and 27 Warren street, New York city, of a copy of a work on the steam engine indicator; being the treatise of Charles T. Porter, revised and adapted to American practice, by F. W. Bacon, M. E., Member of the American Society of Civil Engineers, with an appendix containing useful formulas and rules for engineers.

Were we called upon to prescribe the best method whereby a student could gain, not only the most easy but the most thorough theoretical knowledge of the laws which govern the formation and expansion of steam and the application of steam to the performance of work in engines, we should unhesitatingly recommend a course of study with the indicator. The indications of this beautiful instrument not only tell what is going on in the cylinder of an engine, but in doing this they lead the mind to the consideration of the fundamental principles of steam generation, as well as the doctrines of expansive force, latent heat, temperature, laws of condensation and radiation, and the subtile relations which all the phenomena of steam bear to each other.

Mr. Bacon has, in his revision of Mr. Porter's work, done the American engineering public a great service, and has supplied a valuable hand-book of reference and instruction. Mr. Porter's treatise has been for some time out of print, and the present revision has offered a good opportunity for the addition of much valuable matter, and the adaptation of the work to American practice.

The work commences with a full description of the indicator and the mode of applying it, and we are glad to see that Mr. Bacon has in this department been profuse in practical details which are apt to embarrass a novice. Next follows a discussion of the interpretation of indications, given in a plain and concise style, and perfectly comprehensible to men of ordinary intelligence. This part of the work contains a number of tables, by the use of which much of the labor in reducing indicator cards is avoided.

Mr. Bacon's method of determining where the true theoretic curve on a card intersects the ordinates is very clear, and will greatly assist beginners; the numerators of the fractions being constantly the number of the ordinate where the steam is cut off, and the denominator the number of the ordinate, the length of which is sought. This is well illustrated by a special diagram.

A great variety of diagrams is given. A careful study of these diagrams cannot fail to interest all who desire to understand the working of the indicator.

We herewith produce two of them, one of which was taken from an English locomotive engine, and the other from an American locomotive.

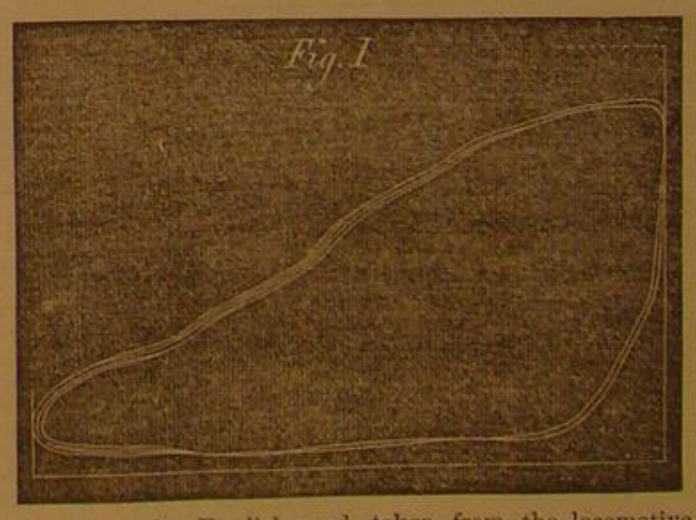

Fig. 1 is the English card, taken from the locomotive "Eagle," on the London and Southwestern Railway, in April, 1863. This diagram, with three others given by the author, are fair samples of a large number taken from the same locomotive.

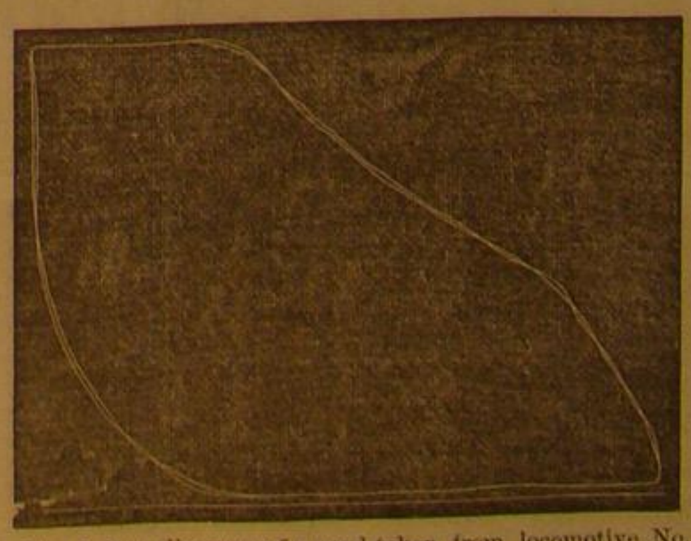

Fig. 2 is a diagram of a card taken from locomotive No. 50 on the Philadelphia, Wilmington, and Baltimore Railroad, in 1867. It was taken at sixty miles per hour, the piston making 1,222 feet per minute, with 305·46 revolutions.

In regard to this diagram, the author remarks: "Notwithstanding this extraordinary speed the lines are all well defined showing distinctly the points of cut-off and release. A remarkable point in the diagram is, that though the pencil passed over it certainly twice or more, the lines are very near to each other, showing that even under this unprecedented speed of piston, the instrument was uniform and reliable in its action. This is not a selected diagram, all others taken on the same trip show the same characteristics.

Leaving the interpretation of these diagrams to engineers, we pass to the appendix, which contains much useful information.

We shall also make a single extract from this portion of the work, which will sufficiently show its practical character. The extract relates to the measuring of steam used for heating.

"The engineer is often called to determine the amount of steam that is used to heat apartments, liquids, etc. This the indicator does not reveal directly, no further than it shows how much steam it requires for a horse power; varied, of course, by the point of cut-off and its efficiency.

"Under these circumstances we have followed the rule of Watt, which is to allow one cubic foot of water per hour for each horse power; hence we measure the water condensed in the heating pipes in a given time, and estimate accordingly.

"If it is inconvenient to reduce the water to cubic feet, it may be weighed, allowing 62·5 lbs. to the cubic foot, or it may be measured by the gallon, or 7·48 gallons per cubic foot.

"When the steam pipe enters the vessel, and it discharges the steam directly into the liquid to be heated, the water then cannot be caught to be measured; in that case we measure the increment of its contents, and thereby find the quantity of steam condensed."

On the whole, the work is one well adapted to the use of scientific and practical engineers, and cannot fail to be an important help to any who seek a complete knowledge of steam and its applications.

TO KEEP CELLARS FROM FREEZING.

An agricultural friend, at our suggestion, has tried an experiment with a cellar of an out-house, in which on several occasions vegetables have frozen, although the cellar was fortified against frost by a process known to farmers as "banking." The walls and the ceiling were pasted over with four or five thicknesses of old newspapers, a curtain of the same material being also pasted over the small low windows at the top of the cellar. The papers were pasted to the bare joists overhead, leaving an air space between them and the floor. He reports that the papers carried his roots through last winter, though the cellar was left unbanked, and he is confident they have made the cellar frost-proof.

We do not counsel the special use of old newspapers for this purpose. It is just as well or better to use coarse brown paper. Whatever paper is employed, it will be necessary to sweep down the walls thoroughly, and to use a very strong size to hold the paper to the stones. It is not necessary to press the paper down into all the depressions of the wall; every air space beneath it is an additional defense against the cold.

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.

NEW PUBLICATIONS.

A MANUAL OF THE HAND LATHE. Comprising Concise Directions for Working Metals of all kinds, Ivory, Bone, and Precious Woods; Dyeing, Coloring, and French Polishing, Inlaying by Veneers, and various Methods Practiced to Produce Elaborate Work with dispatch and at a small expense. By Egbert P. Watson, Late of the SCIENTIFIC AMERICAN, Author of "The Modern Practice of Machinists and Engineers." Illustrated by Seventy-eight Engravings. Philadelphia: Henry Carey Baird, Industrial Publisher, 406 Walnut street. London: Sampson, Low, Son & Marston, Crown Buildings, 188 Fleet street. Price $1·50.

This work is eminently practical, and the information given is based upon the experience of the author. A brief extract from the work on the "Gluing in of Veneers," published in another column, will give a good idea of the plain and practical character of the book, and when we add that the subjects enumerated in the title above set forth are treated in the same clear and practical manner, we have said enough to convince the common-sense mechanic of the value of the work.

THE CHEMICAL FORCES—HEAT, LIGHT, ELECTRICITY. With their Applications to the Expansion, Liquefaction, and Vaporization of Solids; the Steam Engine, Photography, Spectrum Analysis, the Galvanic Battery, Electro-Plating, the Electrical Illumination of Light-Houses, the Fire Alarm of Cities, the Atlantic Telegraph, an Introduction to Chemical Physics. Designed for the Use of Academies, Colleges, and Medical Schools. Illustrated with numerous Engravings, and containing Copious Lists of Experiments, with Directions for Preparing them. By Thomas Ruggles Pynchon, M. A., Scovill Professor of Chemistry and the Natural Sciences, Trinity College, Hartford, Conn. Published by O. D. Case & Co.

A scientific book adapted to the student as well as the general reader is difficult to prepare. The author of this work has, however, shown himself skillful in meeting the difficulties of his task, though we think he displays something too much of caution in his discussion of modern views of the nature of molecular forces. In fact he can hardly be said to discuss them, contenting himself with their enunciation merely. In a work of this kind it would have been more satisfactory to have seen some more space given to this important subject. The correlation, convertibility, and equivalency of the physical forces are, however, well discussed. As the title promises, the industrial application of the chemical forces are noticed at considerable length, and it has been the aim of the author to produce a book not requiring of its reader an extensive knowledge of mathematics; it is well adapted to the use of the general reader. We notice that points liable to give difficulty to those not familiar with the subject are treated with special care, and are elucidated as only a teacher who has been accustomed to show pupils the way out of such difficulties could elucidate them. This is a valuable feature of the work, and one which will be appreciated by Mr. Pynchon's readers. We recommend the work as one of the best text-books we have met with upon the subject of which it treats.

STUDIER I GRUFBRYTNINGSVETENSKAP No. 2. UEBER GESTEINSBOHRMASCHINEN. Von Dr. phil. F. M. Stapff, Ascultant in der Bergabtheilung des Commercecollegiums. Mit Atlas enthaltend 11 theils Lithografirte theils ueberdrueckte Tafeln. Stockholm: A. Bonnier, 1869. [A TREATISE ON ROCK-DRILLING MACHINERY. By F. M. Stapff, *Ascultant* in the Mining Department of the Royal Commercial College. With an Atlas containing 11 sheets of Lithograph Plates. Stockholm: A. Bonnier, Publisher, 1869.]

This is a very copious and comprehensive treatise in the German language on rock drilling and cutting, with especial reference to mining, tunneling, etc., etc. The methods employed in the most celebrated works of this character are described, and the machinery discussed and illustrated in detail. The atlas sheets are large folio, each containing a large number of finely-executed drawings. The work is one admirably adapted to the use of engineers, and well merits an English translation.

THE AMERICAN BUILDER. Published by Charles D. Lakey, Chicago, Ill. Terms, $3·00 per annum.

The above is one of our most interesting exchanges, and we are pleased to learn that it is meeting with well deserved success.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

The losses by fire in the United States, from last January to October, inclusive, amount to the large sum of $33,554,000.

M. Delaurier states that oxygen may be obtained very economically from manganate of lime, as this salt when heated gives off that gas very abundantly.

A surveying party of the San Diego, El Paso, and Memphis Railroad have passed the summit of the range of mountains between San Diego and Fort Yuma. They report the grade to be less than 100 feet per mile.

A writer in *Comptes Rendus* says that if articles made of copper be immersed in molten sulphur having lamp-black in suspension, they assume the appearance of bronze, and can be polished without losing that aspect.

It is stated that Mr. A. T. Stewart has purchased the block lying between North Twelfth and North Thirteenth streets, and First street and the East river, Brooklyn, for $300,000, and that he intends to build thereon a depot for the proposed railway to Hempstead.

Water collected from roofs or kept in tanks covered with zinc has been found by M. Zuirck to be so much contaminated by that metal as to prove detrimental to health, when used for domestic or industrial purposes. He recommends that such tanks or roofs be painted with asphalte varnish.

Chicago is going into the iron manufacture on a large scale, and with Lake Superior ores. A number of capitalists there have formed a company and contemplate the erection of a large mill at Joliet. Wrought iron gas and water pipes will form one feature in the production of the establishment.

The miners of the Wilkesbarre (Pennsylvania) Coal and Iron Company have a fund of five thousand dollars for the use of those of their number who may be disabled in any way. It was raised by each miner and the company giving the earnings of one day; one thousand dollars is to go to Avondale, and the balance in the above manner.

The Darien canal project is reviving. The United States steamer Nipsic, attached to the South Atlantic squadron, is under orders to proceed to the Isthmus of Darien to make surveys and explorations, with a view to determine the best location for an inter-oceanic canal. A similar survey on the Pacific shore of the Isthmus will be made at a future day. It is asserted that President Grant will recommend the early construction of this Darien ship canal in his forthcoming message. What truth there may be in the statement it is difficult to say, as never before has a president been so successful in preventing a premature publication of the contents of the annual communication to Congress.

M. Móne says that when woods of a naturally white color are painted over with a concentrated aqueous solution of permanganate of potassa, they assume the appearance of walnut wood. Different woods behave in a different manner when acted upon by this solution. The woods of the pear tree and the cherry tree are readily stained, while the white woods (the acacia, for example) resist a longer time, and resinous woods, as the fir, are still more difficult to affect. The *rationale* is that the permanganate of potassa is decomposed by the woody fibers; brown peroxide is precipitated and fixed by the potassa, which is afterwards removed by washing with water. The wood when dry is varnished, and is not easily distinguished from woods of a naturally dark color.

Correspondents of the *Chemical News* give two methods of constructing foot-paths: (1.) One part of Portland cement mixed with seven or eight parts of gravel, or old, hard rubbish, such as brick-bats, broken stones, etc., will make a neat, cheap, permanent garden walk, impervious to wet, and not readily affected by changes in the weather. (2.) A very good, and comparatively cheap foot-path may be made by laying down, first, a layer of coarsely broken-up old bricks, next, some middling coarse gravel, and over that a layer, from two to four inches in thickness, of small sea-shells. If care be taken to beat or roll the broken-up bricks and gravel into a somewhat solid mass, the shell-covered surface may be advantageously rolled in with a heavy iron roller, and will form even on soft sub-soil, a durable and inexpensive roadway.

GROOVED WHEEL RAILROAD BRAKE.—A novelty in railroad brakes, which seems to us to possess much merit, is the subject of a recent patent granted to R. d'Heureuse, whose address is Box 6,344, New York. Grooved wheels are employed between the running wheels of the truck, raised just enough to clear the rails, when it is desired that the speed be unimpeded; but when the motion is to be arrested or retarded, the grooved wheels are depressed upon the rails and the brake blocks forced down into the grooves, thus quickly effecting the purpose. This system of brake is operated by either hand or steam power, and with but a small expenditure of force. A model exhibited at the late American Institute Fair, worked well, and seemed to be a step in the direction of improvement. As the grooved wheels are arranged in the middle of the truck, the weight of the car would be sustained by them, in the event of an ordinary running wheel or its axle being broken, and many of the accidents so frequently occurring would thus be prevented.

Recent American and Foreign Patents.

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

IMPERMEABLE PAPER COLLARS, CUFFS, ETC.—It is proposed to make these of paper which has been partially converted into vegetable parchment. It is well known that water has little or no effect on paper so prepared, and colors and patterns can be applied with the greatest facility.

PRESERVING ANIMAL AND VEGETABLE SUBSTANCES, ETC.—Mr. G. W. Perry, of Melbourne, Australia, treats the substances to be preserved as follows. They are first washed in a solution of bisulphite of lime and magnesia, and then dipped into a boiling solution of gelatin and bisulphite, and so, when dry, the substance is coated with an air-tight covering. In order to preserve animals, without removing the skin or feathers, a hot solution of bisulphite of lime and magnesia, with the addition of ten per cent of common salt must be injected into the blood vessels as soon as the blood is drained from the body, and before the carcase has become set. The viscera may then be removed, and the inside thoroughly cleansed and washed with the bisulphite solution. Fish, to be preserved, should be cleansed, the viscera removed, and then packed in barrels, filled with a pickle composed of salt and bisulphite solution. Liquids, too, such as ale and wine, or other fermented liquors, it is said, can be preserved in vessels, the inside of which have been washed with bisulphite of lime and magnesia.

MANUFACTURE OF SULPHURIC ACID.—This invention consists in the employment of ammonia, or carbonate of ammonia, to condense the nitric acid vapors escaping from the exit of the vitriol chambers. To accomplish this, ammonia, or carbonate of ammonia, is caused to come in contact with the escaping fumes, either in a cone tower or chamber. The fluid, thus resulting, is again afterwards decomposed with sulphuric acid, and the escaping nitrous fumes are returned into the vitriol chamber for the oxidation of the sulphurous acid. The patentee of this invention is Mr. Konrad Walter, Wicklow, Ireland.

MACHINERY FOR MANUFACTURING SEMOLINA AND FLOUR.—G. A. Buchholz, Shepherd's Bush, England.—The invention relates to a novel arrangement of apparatus for reducing hulled wheat to semolina, which apparatus by slight modifications, may be used to reduce the same to flour, the object being to effect such operations rapidly, and, when designing to manufacture semolina, to produce it with concurrent formation of a minimum proportion of flour or wheat dust. It is also designed to economize space in the mill by rendering the apparatus more compact than heretofore.

GRINDING MILL.—G. A. Buchholz, Shepherd's Bush, England.—This invention consists in the use of pairs of grooved rollers which are nicely adjusted to their work, and are speeded so that one roller will rotate from five to six times as fast as the other roller, and thereby reduce by a cutting in contradistinction to a crushing action, the ripped corn into particles of the required size.

TREATING CORN FOR PANIFICATION.—By this process corn is prepared for bread-making without grinding, and it is asserted, that by it, all the nutritious portions of the grain are retained, and only the outer pellicle is removed. The corn is first steeped in water to remove dust and foreign matter; in this way defective grains can be removed, as they will be found floating on the surface. After steeping for half an hour, the water is to be run off, and the grain is introduced into a metal cylinder with rasp-like projections on its inner side, which remove the outer pellicle. The grain is then placed in a receptacle filled with water, at 68° Fah., about 400 lbs. of water being employed to about 200 lbs. of grain, so that there may be a certain quantity of water above the grain, about 2 lbs. of semi-dried yeast, and from ·15 lb. to ·2 lb. of glucose, having been previously mixed with the water, this fermentable matter acts by degrees upon the grain, which, after about twenty or twenty-four hours immersion, is ready for fermentation as bread, having absorbed from fifty to seventy per cent of water. The water is then drawn off, and the grain is placed in a hopper, which, by means of a distributor, causes it to pass between rollers, where it is reduced to a pasty condition. The pasty mass is then mixed with water, to which the requisite amount of salt has been added, and the dough is then made up into loaves and baked.

A NEW SWEETMEAT.—It is often amusing to notice the very simple and ordinary matters which are sometimes made the subject of a patent, the following is one of them. M. Francois Arond, of Lyons, France, has provisionally patented a method of manufacturing a *veritable* sweetmeat. He mixes seven ounces of sugar, one ounce of marmalade, eleven drams of rum or other spirit, eleven drams of extract of *meat*. After thorough incorporation, the sweetmeats are molded, dried, and finally candied.

BLIND MORTISING MACHINE.—Martin Buck, Lebanon, N. H.—This invention consists in arranging the levers which move the slides carrying the stiles to be bored and mortised, to or from the boring or mortising tools, for adjustment, so that the said slides may have a greater or less movement as required by the nature of the work. It also consists in an arrangement of interchangeable ratchet bars with ratchet teeth of different pitch, for varying the movement of the stiles past the cutter for different kinds of work. It also consists in an adjustable arrangement of the reciprocating boring and mortising tool carrying carriage for varying the angle of the slots.

MODE OF PACKING EGGS, FRUIT, ETC.—A. S. Smith, Lawrence, Mass.—The invention consists in the employment of pockets made in pairs of strips of stiff paper, leather, or bark, folded, and joined in a way to make two pockets of one strip and by one fastening, and of the proper size to receive one article each, the said pockets being open at each end, and arranged in tiers in a box, barrel, or case, with dividing boards between each tier, constituting the end walls of the said pockets when in position.

WASH BOILER.—G. E. Calkins, Rock Island, Ill.—This invention relates to improvements in wash boilers such as are arranged to cause a circulation of hot water and steam from the bottom upward through pipes or passages, and has for its object to provide an improved construction and arrangement of the false bottom or rack, whereon the clothes rest for keeping them above the bottom, to provide space for generating the steam.

BLACKING BOXES.—C. H. Gatchell, Oldtown, Maine.—This invention relates to improvements in blacking boxes, and consists in providing pointed tacks projecting downward from the bottom for holding the box from being moved around on the table or other board whereon it sets, when rubbing the brush on the blacking to charge it for applying to the shoe.

WELDING, TEMPERING, TOUGHENING, AND PURIFYING IRON AND STEEL.—J. F. Beazel, Uniontown, Pa.—This invention relates to improvements in welding, tempering, toughening, and purifying iron and steel, and consists in working the same in the presence of a flux of caustic soda, known in commerce as "ssponifier," or "concentrated lye."

STUMP EXTRACTOR.—Alexander McLeod, Black River Falls, Wis.—The object of this invention is to furnish a simple, convenient, powerful, and effective machine for extracting stumps from the ground, and it consists in a combination and arrangement of mechanical appliances by means of which the object in view is attained.

MACHINE FOR MAKING WOOD PULP.—Frederick Burghardt, Curtisville, Mass.—This invention relates to a new and useful improvement in machines for reducing wood to pulp for use in manufacturing paper, and consists in a wheel with one or both of its sides provided with grating, rasping, filing, or roughened surfaces, in contact with which the wood to be reduced is brought.

KNIFE SHARPENER.—W. H. Howland, San Francisco, Cal.—This invention relates to a new and useful improvement in an article for sharpening knives, whereby that necessary operation is greatly facilitated, and it consists in the employment of two conical disks, composed of emery or of some equivalent grinding composition or material, secured together in a suitable stand or support by means of a screw or bolt.

BEEHIVE.—W. A. Elam, Milan, Tenn.—This invention relates to new and useful improvements in beehives, whereby they are rendered more useful than they have hitherto been, and consists in the construction and arrangement of parts.

WAGON SEAT SPRING.—Cyrus C. Carter, Exeter, Ill.—This invention relates to a new and useful improvement in seats for lumber and other wagons, and consists in the novel arrangement of adjustable springs.

HARROW.—John H. Miller and F. A. Pickering, Niantic, Ill.—This invention relates to new and useful improvements in harrows, whereby the parts which carry the harrow teeth are made adjustable, so that obstructions may be avoided and so that the harrow will adjust itself to the surface of the ground over which it passes.

COMBINED PLATE LIFTER AND BREAD TOASTER.—T. D. Keith, Mayville, Wis.—This invention relates to a new and useful improvement in an article for kitchen use, designed for lifting plates and toasting slices of bread, and it consists in the use of a slide on two or more long hooks secured to a handle.

BABY WALKER.—John C. Goulding, Trenton, N.J.—This invention has for its object to so construct baby walkers that it will fit the child like a garment, allow the same freedom of motion while supporting it, and be simple, light, and cheap at the same time.

STAIR ROD FASTENER.—Josef Stuehler, Brooklyn, N.Y.—This invention relates to a new stair rod fastener, which is so constructed that the rod can be readily applied and removed, and securely retained in proper position.

GANG SAW MILL.—William Penny, Milton, Fla.—This invention relates to a new manner of constructing and arranging the frames of gang saw mills, with a view of producing a simple, effective, and compact machinery which may be readily transported, and which will combine all the requisites of a full working mill.

BASKET.—C. Benne and F. Landenberger, New York city.—The object of this invention is to construct a basket so that it will indicate the weight of the articles contained in it, to enable housekeepers and other parties buying goods to judge whether the correct weight has been measured out to them.

ANIMAL TRAP.—Robert Tompkins, Clarksville, Tenn.—This invention consists of a cylinder of wire netting, mounted upon trunnions so as to easily revolve, having a hole at one end for the entrance of the victim, and, near the other, the hook holding the bait. The weight of the animal, as soon as he enters the cylinder, causes the latter to rotate until such rotation is checked by a stop at a point where an egress is afforded from the cylinder into a retaining box, immediately upon which egress of the animal, the cylinder, relieved of its weight, rotates back to its original position and is reset.

BILLIARD-TABLE CUSHIONS.—Mathew Delany, Virginia City, Nevada.—This invention relates to improvements in billiard-table cushions, and consists in the combination with the india-rubber cushions, of wires or cords embedded in the edges, running from end to end thereof, and strained by straining keys, or other devices, in a way as to impart a superior springing quality to the said cushions.

HULLING MACHINE.—G. A. Buchholz, Shepherd's Bush, England.—This invention consists of a cylindrical case fitted at its opposite sides with panels of wire gauze or pierced metal to facilitate ventilation within, and armed on its inner periphery at the parts not occupied by the panels with sets of steel blades fixed radially in segmental groups; within the cylindrical case is mounted a series of drums, say four, the number preferred for ordinary working, which are keyed upon a central rotating shaft; these drums are armed on their peripheries, with blades made like those on the case of flat steel plates. The drums are cast with radial wings, extending from the boss to the periphery, and holes are formed through the drums to allow of a down draft being created and distributed through the case by the wings as the drums are rotated. The drums instead of being inclosed, as heretofore, in separate cylindrical chambers have interposed between them horizontal rebated ring plates, which form part of the case. These ring plates and also the bottom plate of the case are cast with annular-flanged projections, which are intended to receive steel blades rebated at the back to fit the flanged projections.

PHOTOSCOPE.—George Brownlee, Princeton, Ind.—This invention relates to a new apparatus for displaying successively any suitable number of photographic or other pictures. The object of the invention is to construct a case, not much larger than necessary to hold the pictures, and without any machinery, and still to allow all pictures to be displayed in the required succession by the motion of the case.

APPARATUS FOR TEMPERING STEEL.—C. B. Cottrell, Westerly, R. I.—This invention relates to a new apparatus for conveniently and rapidly tempering small tools or other articles made of steel.

KEY AND KNOB SHANK GUARDS.—Max E. Berolzheimer, New York city.—This invention consists of a sliding guard having a notch or slot in the end for sliding over the plain sided shanks of the keys or knobs so as to hold them in the manner of a wrench, to prevent them from being turned; the said slides may be provided also with pins for passing through holes in the shanks, or they may hold the same wholly by the pins if preferred. They are also provided with caps fastened to the lock plate or door for the reception of the ends, to confine them against efforts which may be made from without to force them away from the door by strong rods inserted in the keyholes and forced against them. They may also be provided with any preferred means to hold them from sliding back, to disengage the shanks, and when applied to the keys they are made broad enough to cover the whole of the keyhole.

A NEW RAILWAY BRAKE has been invented in England which acts automatically when the connections between the parts of a train are any of them ruptured to bring both portions of the train to a stand-still. The details of its construction are not given in the papers which announce the invention except that the brakes are thrown into operation by the rupture of a small chain which passes under the train from end to end.

LATHE ATTACHMENT FOR TURNING OVALS.—Ramsey Lawson, Shelburne Falls, Mass.—This invention has for its object to furnish an improved device for attachment to lathes, by means of which oval handles for tools, and other oval work may be turned with the same ease and rapidity as round work.

COMBINED PLANTER AND CULTIVATOR.—John A. Rockwood, Kinderhook, Ill.—This invention has for its object to furnish a simple, convenient, strong, durable, effective, and cheap machine, which shall be so constructed and arranged that it may be easily and quickly adjusted for use as a planter or cultivator, as may be required.

TURBINE WATER WHEEL.—A. M. Harding, Oregon City, Oregon.—This invention has for its object to furnish an improved water wheel, which shall be simple in construction and effective in use, being so constructed and arranged as to economize the water and enable its admission to be more conveniently regulated and controlled.

CULTIVATOR.—S. W. Brock, Niantic, Ill.—This invention has for its object to furnish an improved cultivator, which shall be simple in construction, effective in operation, and easily adjusted to work closer to or farther from the plants and to turn the soil towards or from the plants, as may be desired.

HAND CORN SHELLER.—Charles M. O'Hara, Bolivar, Tenn.—This invention has for its object to furnish a simple, convenient, and effective device, by means of which the corn may be shelled quickly and easily, and which shall be particularly adapted for shelling corn for seed or meal, where only part of the kernels are to be removed from the cob.

COMBINED SCOOP AND SIFTER.—Cephus Beneus, Waupun, Wis.—This invention has for its object to furnish a simple and convenient instrument, by means of which flour, and other substances, may be lifted and at once sifted without its being necessary to handle them two or three times before getting them sifted and into the place or vessel where they are to be used.

CULTIVATOR.—I. N. Gates, Burnside, Ill.—This invention has for its object to furnish an improved device for connecting the plow beams to the truck frame of a cultivator, which shall be simple in construction, strong and durable, and effective in operation, permitting a free vertical and lateral movement of the plows, and at the same time holding the plow beams loosely and steadily, preventing all tendency of the plow to wallow or tip when plowing crooked rows.

COMBINED BED AND KEY BOARD MUSICAL INSTRUMENT.—John McDonald, New York city.—This invention has for its object to furnish a key-board musical instrument, which shall be so constructed that it may be opened up to serve as a bed, and which, when closed, shall have every appearance of, and may in fact be, a real instrument, suitable to be placed in a parlor or sitting room.

COMBINATION POCKET RULE.—This invention consists in a combination of twelve tools in one instrument, to be carried in the vest pocket and weighing less than one ounce. It is a pocket rule, ruler, square, bevel, screw driver, chisel, compasses, scissors, button-hole cutter, paper knife, eraser, and pencil sharpener. The instrument is finished in various styles—plain steel, silver, or gold plated. It is a most convenient and useful article. It will be found advertised on our last page by the Combination Tool Co., 95 Mercer street, N. Y.

BENDING MACHINE.—David Pierce, Almont, Mich.—This invention comprises an apparatus for first bending the edges of the strips of sheet metal for eavestroughs to receive the wire; also, an arrangement of apparatus for bending the sheet into the finished form and for wiring the edges; and also an apparatus for bending the sheets for the conductors, and for forming a part of the locks for uniting the edges.

BRIDGE.—H. W. Cass, Lodi, Wis.—This invention consists in an arrangement of counter chords at the center thereof, and braces between the ends of the said counter chords and the upper chord, whereby the upper and lower chords are braced by a series of inverted arch-shaped braces. The invention also comprises, in connection with the above, an arrangement of lateral brace rods.

GARDEN IMPLEMENT.—Henry Miller, Roadside, Va.—This invention consists in the manner of connecting the handle with stock, whereby the former is rendered removable, and, also, capable of being kept always tight.

CURRYCOMB.—J. E. Yager, Barboursville, Va.—The object of this invention is to construct a currycomb in such a manner, that, when it gets out of order from any cause, it can be readily taken apart and adjusted or repaired.

SHOVEL PLOW PLATE AND POINT.—Henry Miller, Roadside, Va.—This invention consists of a plow plate, or mold, to be secured to any plow stock, its face being concave, lengthwise, and flat crosswise, and the mold having seats at its ends into which are placed reversible points of shape suited to the seats.

FIREPLACE HEATER.—Benjamin F. Conley, Tunnelton, West Va.—This invention relates to improvements in hearths for fireplaces, and consists of a new and improved manufacture of hearths of cast metal, in place of ornamental designs, and of any size or shape for application to fireplaces of all dimensions or shapes.

HULLING MACHINE.—G. A. Buchholz, Shepherd's Bush, England.—This invention relates to the employment of improved machinery for manufacturing semolina. In carrying out this manufacture, the wheat intended to be converted into semolina is first hulled in a novel construction of apparatus, the acting surfaces of which are formed of metal blades which, when the apparatus is set in motion give to the grain the friction requisite for removing the outer skin or the greater portion thereof. When the grain has passed through this hulling machine, the bran or hull is separated therefrom in any approved manner, and afterwards the grain is submitted to the action of a novel construction of roller mill whereby a large portion will be reduced to semolina fit for the market. This is separated by sieves or other suitable means, and the remainder is reduced in any known or approved manner to flour which may be dressed and finished as usual for the market.

MACHINE FOR BORING AND TENONING.—Thos. Place, Alfred Center, N. Y.—This invention relates to improvements in machines for boring felloes and tenoning spokes, such as patented to the same inventor March 12, 1867, No. 62,883, and consists in an improved arrangement of the turntable for holding and centering the hub on the carriage, for holding up to the auger and spoke holder.

BUCKLE.—Henry R. Swan, Norwalk, Conn.—The object of this invention is to confine the cloth, which supports the buckle, exactly in the center of the hook, so as to prevent its crowding to one side or the other when subjected to a lateral or oblique pull.

HOISTING MACHINE FOR RUNNING UP SLOPES.—Geo. Martz, Pottsville, Pa.—This invention relates to the propulsion of cars laden with coal from the gangway of a mine, up an inclined way, to the surface, by means of a motive truck, separate from the cars, and running upon a track above them.

Business and Personal.

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

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,685.—PUMP.—J. W. Douglas, Middletown, Conn. Sept. 14, 1869.

3,091.—SEWING MACHINE NEEDLES.—Mrs. H. G. Suplee, San Francisco, Cal. October 25, 1869.

3,118.—MANUFACTURE OF SHEET IRON.—S. Parker and H. S. Pratt, Hartford, Conn. October 27, 1869.

3,125.—ELECTRO-DEPOSITION OF NICKEL.—Isaac Adams, Jr., Boston, Mass. October 28, 1869.

3,133.—SHAFT COUPLING.—M. Clemens, Boston, Mass. October 28, 1869.

3,137.—SPRING.—J. Trent, Millerton, N. Y. October 29, 1869.

2,919.—AXLE BOXES.—D. H. Dotterer, Philadelphia, Pa. Oct. 8, 1869.

2,942.—MEANS OF LOCOMOTION.—Thomas Luders, Olney —, U. S. October 8, 1869.

3,067.—ROTARY BLOWING ENGINE.—P. H. Roots and F. M. Roots, Connersville, Ind. Oct. 21, 1869.

3,093.—DRY WHITE LEAD AND WHITE LEAD PIGMENT FROM METALLIC LEAD.—G. T. Lewis, Philadelphia, Pa. Oct. 25, 1869.

3,095.—ADHESIVE COMPOUND.—S. P. Conner, Philadelphia, Pa. October 25, 1869.

3,115.—WIRE DRAWING, ETC.—D. F. Maltby, Waterbury, Conn. Oct. 27, 1869.

3,132.—AXLES FOR VEHICLES.—J. M. Bequa, New York city. October 28, 1869.

3,131.—DRAWING FRAMES.—Chas. Wall, New York city. October 28, 1869.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING NOV. 23, 1869.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

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Patent Solicitors, No. 37 *Park Row, New York.*

97,021.—HORSESHOE MACHINE. — Wesley Anderson, Pittsburgh, Pa.
97,022.—MOUTH PIECE OF BRIDLE BITS.—A. P. Baldwin, Newark, N. J.
97,023.—WELDING IRON AND STEEL.—John F. Beazel, Uniontown, Pa.
97,024.—KEY GUARD.—M. E. Berolzheimer, New York city.
97,025.—SCOOP AND SIFTER FOR FLOUR, ETC.—Cephus Beucus, Waupun, Wis.
97,026.—MAGAZINE FOR BASE-BURNING STOVES.—B. C. Bibb, Baltimore, Md.
97,027.—FIREPLACE STOVE.—B. C. Bibb, Baltimore, Md.
97,028.—FIREPLACE STOVE.—B. C. Bibb and Philip Klotz, Baltimore, Md.
97,029.—FIREPLACE STOVE.—B. C. Bibb and Philip Klotz, Baltimore, Md.
97,030.—CHISEL-HOLDER FOR FILE-CUTTING MACHINES.—W. J. Birdsall, Newark, N. J.
97,031.—SLEEPING CAR.—H. S. Blood, Jefferson parish, La.
97,032.—CULTIVATOR.—S. W. Brock, Niantic, Ill.
97,033.—STENCH TRAP.—Jesse Brown, San Francisco, Cal.
97,034.—PICTURE CASE.—Geo. Brownlee, Princeton, Ind.
97,035.—DRAIN-PIPE MACHINE.—Isaac C. Bryant, Washington, D. C.
97,036.—MANUFACTURE OF SEMOLINA. — G. A. Buchholz, Shepherd's Bush, England. Patented in England Nov. 19, 1862.
97,037.—MANUFACTURE AND MEANS OF ASSORTING SEMOLINA AND FLOUR.—G. A. Buchholz, Shepherd's Bush, Eng. Patented in England March 28, 1867.
97,038.—MACHINERY FOR MANUFACTURING SEMOLINA AND FLOUR.—G. A. Buchholz, Shepherd's Bush, Eng. Patented in England Sept. 4, 1867.
97,039.—HULLING MACHINE. — G. A. Buchholz, Shepherd's Bush, Eng. Patented in England Aug. 12, 1868.
97,040.—BLIND-MORTISING MACHINE.—Martin Buck (assignor to himself and A. H. Cragin), Lebanon, N. H.
97,041.—MACHINE FOR MAKING WOOD PULP.—F. Burghardt, Curtisville, Mass. Antedated Nov. 15, 1869.
97,042.—WASH BOILER.—G. E. Calkins, Rock Island, Ill.
97,043.—WAGON-SEAT SPRING.—Cyrus C. Carter, Exeter, Ill.
97,044.—DRAWBRIDGE.—H. W. Cass, Lodi, Wis.
97,045.—COMPOUND FOR INSULATING.—A. H. Castle, Ann Arbor, Mich.
97,046.—MANUFACTURE OF CAST-METAL DIES.—Luke Chapman (assignor to Collins Co.), Collinsville, Conn.
97,047.—VEGETABLE CUTTER.—M. H. Chrysler, Kinderhook, N. Y. Antedated Nov. 18, 1869.
97,048.—STEAM COOKING APPARATUS.—James O. Clay, Hudson, Wis.
97,049.—COMBINED BUTTER CUTTER AND STAMP.—Nathan Clough, Lowell, Mass.
97,050.—FIREPLACE.—Benjamin F. Conley, Funnelton, West Virginia.
97,051.—MERCURIAL GAS REGULATOR FOR NITROUS OXIDE APPARATUS.—J. B. Coolidge, Boston, Mass.
97,052.—MERCURIAL REGULATOR FOR VULCANIZING AND OTHER HEATERS.—J. B. Coolidge, Boston, Mass.
97,053.—BUTTER MOLD AND PRINT.—Jas. S. Corya, Dupont, Ind.
97,054.—APPARATUS FOR TEMPERING STEEL.—C. B. Cottrell, Westerly, R. I.
97,055.—HIVE FOR RAISING QUEEN BEES. — Jewell Davis, Indianapolis, Ind.
97,056.—STEAM ENGINE GOVERNOR.—Rollin Defrees, Newark, N. J., assigns to J. D. Defrees, A. Defrees, and T. Percival three fourths of his right. Antedated Nov. 19, 1869.
97,057.—BILLIARD-TABLE CUSHION.—Mathew Delany, Virginia City, Nevada.
97,058.—PORTABLE STILL.—L. A. De Lime, St. Louis, Mo.
97,059.—APPARATUS FOR OBTAINING EXTRACTIVE MATTER FROM SUGAR CANE AND OTHER MATERIALS.—Louis A. De Lime, St. Louis, Mo.
97,060.—METHOD OF CONSTRUCTING ORNAMENTAL WOODWORK.—Joseph Dill and H. E. Jordan, Grand Rapids, Mich. Antedated Sept. 22, 1869.
97,061.—BAG FOR GATHERING FRUIT.—N. B. Dixon and M. W. Sprague, Rochester, N. Y., assignors to N. B. Dixon.
97,062.—HARVESTER CUTTER.—G. L. Du Laney, Mechanicsburg, Pa.
97,063.—CHAIR AND FAN.—Abraham Dyson, St. Louis, Mo.
97,064.—STEAM ENGINE VALVE GEAR.—T. Dyson and Geo. Smith, New York city. Antedated Nov. 19, 1869.
97,065.—WATER WHEEL.—A. A. Easton, Killingly, and A. J. Harrington, Plainfield, Conn.
97,066.—COOKING STOVE.—Richard Eaton, London, England, and Joseph Marks, Boston, Mass.
97,067.—BEEHIVE.—W. A. Elam, Milan, Tenn.
97,068.—EXCAVATING MACHINE.—William H. Elliott, New York city.
97,069.—LAMP BURNER.—J. B. Fuller, Norwich, Conn.
97,070.—GRAIN CONVEYER. — John Gardiner, Philadelphia, Pa.
97,071.—TICKET PUNCH.—John Gardner, San Francisco, Cal.
97,072.—BLACKING BOX.—C. H. Gatchell, Oldtown, Me.
97,073.—CULTIVATOR.—I. N. Gates, Burnside, Ill.
97,074.—HAND-GUIDE FOR PIANOS.—Marie Gether, St. Louis, Mo.
97,075.—COMBINED ROLLER AND ICE SKATE.—A. J. Gibson, Cincinnati, Ohio.
97,076.—DIAL TELEGRAPH APPARATUS.—E. T. Gilliland, Cincinnati, Ohio, assignor to himself and Peter Neff, Jr.
97,977.—DIGESTER FOR COFFEE POTS.—W. L. Gilroy, Philadelphia, Pa. Antedated Nov. 12, 1869.
97,078.—BABY WALKER.—John C. Goulding, Trenton, N. J.
97,079.—FIRE-PROOF SAFE.—John Pevear Greely (assignor to himself, Russell Arnold Ballou, Sanford Greely, and Jonathan Pierce), Boston, Mass.
97,080.—COAL DRILLING MACHINE.—John Grimm, Darlington township, Pa.
97,081.—CLIP OR PAPER HOLDER FOR PHOTOGRAPHERS.—V. M. Griswold, Peekskill, N. Y.
97,082.—PHOTOGRAPHERS' DRIPPING AND DRYING RACK.—V. M. Griswold, Peekskill, N. Y.
97,083.—COFFEE ROASTER.—T. J. Hall, Bryan, Texas.
97,084.—COOKING STOVE.—J. D. Harden, Troy, N. Y.
97,085.—TURBINE WATER WHEEL.—A. M. Harding, Oregon, City, Oregon.
97,086.—POST-HOLE DIGGER.—B. B. Herrick and C. W. Wicker, Duquoin, Ill.
97,087.—COMPOSITION FUEL.—Frank N. Hopkins, Baltimore, Md.
97,088.—CONGLOMERATE FOR PAVING, ROOFING, AND SIMILAR PURPOSES.—Frank N. Hopkins, Baltimore, Md.
97,089.—WHOOPING COUGH PLASTER.—Frederick Hower, Booklyn, N. Y.
97,090.—KNIFE SHARPENER.—W. H. Howland, San Francisco, Cal.
97,091.—LUBRICATOR.—J. J. Hoyt, Chelmsford, Mass.
97,092.—PANELING MACHINE. — Nicholas Jenkins, New York city.
97,093.—PLATE LIFTER AND BREAD TOASTER.—T. D. Keith Mayville, Wis.
97,094.—FIRE PLACE STOVE.—Philip Klotz, Baltimore, Md.
97,095.—MACHINE FOR WINDING THREAD ON BOBBINS, ETC —L. J. Knowles, Warren, Mass.
97,096.—LATHE FOR TURNING OVALS.—Ramsey Lawson Shelburne Falls, Mass.
97,097.—FLUID METER.—H. B. Leach, Boston, Mass.
97,098.—GRINDSTONE. — Thomas Loring, Blackwoodtown, N. J.
97,099.—COMBINATION POCKET RULE. — Joel Manchester New York city.
97,100.—AERIAL STEAM CAR.—Fred. Marriott, San Francisco, Cal.
97,101.—COMBINED BED AND MUSICAL INSTRUMENT BOARD. —John McDonald, New York city.
97,102.—STUMP EXTRACTOR. — Alex. McLeod, Black River Falls, Wis.
97,103.—CHURN.—Friedrich Miller, Frostburg, Md.
97,104.—HARROW.—J. H. Miller and F. A. Pickering, Niantic, Ill.
97,105.—WATER CLOSET.—G. R. Moore, Philadelphia, Pa.
97,106.—POWER LOOM FOR WEAVING INGRAIN CARPETS.—Wm. Murkland and J. W. Murkland, Lowell, Mass.
97,107.—TIRE-BENDING MACHINE.—John Naugle, Moresville, Ind. Antedated Nov. 10, 1869.
97,108.—COVERING FOR STEAM BOILERS.—Chas. M. O'Hara, New York city.
97,109.—HAND CORN SHELLER.—Chas. M. O'Hara, Bolivar, Tenn.
97,110.—VELOCIPEDE. — Joseph Ives Pease, Stockbridge, Mass.
97,111.—FIFTH WHEEL FOR CARRIAGES.—J. A. Peck (assignor to himself and W. L. White, Jr.), Taunton, Mass.
97,112.—SAW MILL.—Wm. Penny, Milton, Fla.
97,113.—BENDING MACHINE.—David Pierce, Almont, Mich.
97,114.—DERRICK.—J. W. Piper, Chicago, and W. J. Hanger and J. S. Hanger, Taylor, L.I.
97,115.—MACHINE FOR MAKING WHEELS.—Thomas Place, Alfred Centre, N. Y.
97,116.—SUSPENDER.—T. O. Potter, Boston, Mass.
97,117.—MACHINE FOR ROLLING BARS FOR HORSESHOES.—Abram Reese, McClure township, Pa.
97,118.—HORSESHOE MACHINE.—Jacob Reese and A. Reese, Pittsburgh, Pa.
97,119.—WEIGHING BASKET.—C. Renne and F. Landenberger, New York city.
97,120.—PAPER-CUTTING MACHINE.—Thomas C. Robinson, Boston, Mass.
97,121.—COMBINED PLANTER AND CULTIVATOR.—J. A. Rockwood (assignor to himself and S. Morris), Kinderhook, Ill.
97,122.—PORTABLE GAS APPARATUS AND CARBURETER.—M. A. Root, Philadelphia, and J. D. Custer, Norristown, Pa.
97,123.—SECURING THE CANNON PINIONS OF WATCHES.—E. Sandoz, Hudson City, N. J. Antedated Nov. 15, 1869.
97,124.—BEEHIVE.—Riley Sanford, Marion, N. Y.
97,125.—FLUTING MACHINE.—H. C. Sergeant, Newark, N. J.
97,126.—MOWING MACHINE.—W. H. Seymour, Brockport, N. Y.
97,127.—PADLOCKS.—Thomas Slaight, Newark, N. J.
97,128.—WORK BOX AND DESK.—C. W. Small, Worcester, Mass.
97,129.—DEVICE FOR PACKING EGGS FOR TRANSPORTATION. —A. S. Smith, Lawrence, Mass.
97,130.—APPARATUS FOR BUILDING SOD FENCES.—Cyrus W Smith, Morrisville, N. Y.
97,131.—APPARATUS FOR MANUFACTURING CHEESE.—P. W. Strong, Evans' Mills, N. Y.
97,132.—STAIR ROD.—Josef Stuehler, Brooklyn, N. Y.
97,133.—BUCKLE.—H. R. Swan, Norwalk, Conn. Antedated Nov. 8, 1869.
97,134.—BALANCING MILLSTONE. — George S. Thompson, Philadelphia, Pa.
97,135.—CLOSE STOOL AND CLOSET.—C. True, Pecatonica, Ill.
97,136.—WINDMILL.—W. I. Tustin, San Francisco, Cal.
97,137.—SEEDING MACHINE.—W. A. Van Brunt, Horicon, Wis
97,138.—REVOLVING SCALE.—Hermann Von Schlagintweit-Sakunlunski, Munich, Bavaria.
97,139.—CORN PLANTER.—D. F. Wagner, West Hanover, Pa.
97,140.—PAPER-CUTTING MACHINE.—F. L. Walker, Boston, Mass.
97,141.—MACHINE FOR MAKING NAILS FOR HORSESHOES.—Wm. Wickersham, Boston, Mass.
97,142.—WAGON LADDER.—Isaac Williams, Bucyrus, Ohio.
97,143.—PROCESS OF BREWING BEER.—Chas. Abresch, New York city.
97,144.—Isaac Adams, Jr.—Suspended.
97,145.—CURING AND PRESERVING FISH.—R. A. Adams, Cambridge, Mass.
97,146.—PROPELLING APPARATUS.—J. F. Alexander, New York city.
97,147.—SPINDLE FOR LOOM SHUTTLES.—N. I. Allen and J. C. Moody, Brunswick, Me.
97,148.—STEP LADDER.—E. R. Austin, Elmira, N. Y.
97,149.—CONCRETE PAVEMENT.—D. W. Bailey, Chelsea, Mass.
97,150.—SLEIGH.—S. R. Bailey, Bath, Me.
97,151.—MACHINE FOR SAWING SHINGLE BOLTS.—D. H. Ball, Sinnamahoning, Pa.
97,152.—KNIFE AND FORK.—James Ball, Brooklyn, N. Y.
97,153.—PROGRESSIVE RECIPROCATING MOTION FOR STAMPING AND OTHER MACHINES.—R. L. Barclay, Brooklyn, E. D., N. Y.
97,154.—POCKET KNIFE—F. H. Barnard and W. L. Brace, Hartford, Conn.
97,155.—CONFECTION FROM RAISINS.—Joseph B. Bidwell, Grand Rapids, Mich., assignor to himself and J. C. Knoblock, South Bend, Ind.
97,156.—METHOD OF FORMING SLEEVE BUTTON SHANKS.—W. H. Blake, Waterbury, Conn.
97,157.—HORSE RAKE.—Olpha Bonney, Jr., San Francisco, Cal.
97,158.—LOOM.—J. L. Branson, Pittsburgh, Pa.
97,159.—SAFE.—Martin Briggs, Rochester, N. Y.
97,160.—PIPE TRAP.—C. H. Burleigh, Worcester, Mass.
97,161.—BEE-MOTH INSTRUMENT.—R. P. Buttles, Mansfield Pa.
97,162.—PLOW.—F. M. Caldwell, New York city.
97,163.—RAILWAY FROG.—F. J. Calhoun, Boston, Mass.
97,164.—DITCHING MACHINE.—Henry Carter, Cleveland, Ohio.
97,165.—SYRINGE.—P. F. Cederholm, Stillwater, Minn.
97,166.—EXTENSION BIT.—H. P. Chapman, Essex, assignor to the Centre Brook Manufacturing Company, Centre Brook, Conn.
97,167.—BREECH-LOADING FIRE-ARM.—A. A. Chassepot, Paris, France.
97,168.—FRUIT-DRYER.—W. R. Clark, Indianola, Ill.
97,169.—BAG FOR GUANO, PHOSPHATES, AND OTHER FERTILIZERS.—B. R. Croasdale, Philadelphia, Pa.
97,170.—BALING PRESS.—William Deering, Louisville, Ky.
97,171.—HORSE HAY FORK.—J. J. De Grummond, Knoxville, Ill.
97,172.—HAY RACK.—Geo. Denis and Geo. Grassal, Osceola, Iowa.
97,173.—MACHINE FOR MAKING CHAINS.—Wm. Dennison, Cambridge, Mass.
97,174.—FRUIT DRYER.—Elias Dilday, South Pass, Ill.
97,175.—LOOM.—Geo. Duckworth, Wm. Duckworth, James Duckworth, and J. C. Duckworth, Pittsfield, Mass.
97,176.—VELOCIPEDE WHEEL.—Wright Duryea, Glen Cove, N. Y. Antedated Nov. 12, 1869.
97,177.—CARPENTERS' GROOVING PLANE.—Theodore Duval, Hartford, Conn.
97,178.—MACHINE FOR POUNCING HATS.—Rudolph Eickemeyer, Yonkers, N. Y.

97,179.—CHURN.—E. R. Embry, Richmond, Ky.
97,180.—LINIMENT.—E. C. Evens, Forrest Hill, Ind.
97,181.—DINNER PAIL.—J. O. Fairbairn, Milwaukee, Wis.
97,182.—MODE OF RECOVERING THE SPENT ACID FROM OIL REFINERIES.—L. S. Fales, New York city, assignor to the American Fertilizer Company.
97,183.—DITCHER AND GRADER.—E. L. Foreman (assignor to Edward Foreman), Rantoul, Ill. Antedated Nov. 15, 1869.
97,184.—VEGETABLE CUTTER.—Warren Gale, Peekskill, N. Y.
97,185.—PRINTING PRESS.—Merritt Gally (assignor to A. P. Carpenter), Rochester, N. Y.
97,186.—INDICATOR FOR MAIN-SPRING OF WATCHES.—Joseph Gardner, Jr., Boston, Mass.
97,187.—LOOSE GRAIN FORK.—Hiram Gary, Croton, N. J.
97,188.—MOLDING MACHINE.—A. S. Gear, New Haven, Conn.
97,189.—PAPER FELT OR WADDING.—W. W. Glentworth, Philadelphia, Pa., and W. H. Gandey, Lambertville, N. J.
97,190.—MACHINE FOR NAILING SHOE-SOLES WITH WIRE.—Louis Goddu (assignor to Elmer Townsend), Boston, Mass.
97,191.—MACHINE FOR NAILING SHOE-SOLES WITH WIRE.—Louis Goddu (assignor to Elmer Townsend), Boston, Mass.
97,192.—MACHINE FOR NAILING SHOE-SOLES WITH WIRE.—Louis Goddu (assignor to Elmer Townsend), Boston, Mass.
97,193.—ANIMAL POWER.—J. B. Hall, Cheshire, N. Y.
97,194.—SHUTTER FASTENING.—Randolph Hayden (assignor to himself and J. C. Ferrell), Middletown, Conn.
97,195.—MODE OF CUTTING SHOES.—H. P. Hayward (assignor to himself, H. C. Mahurin, Ira Holt, Levi Sherwin, L. J. Brown, and C. N. Wilson), Fitchburg, Mass.
97,196.—LOCK.—Alexander Inglis (assignor to himself, C. W. Tyer, and John Inglis), Indianapolis, Ind.
97,197.—NECK-YOKE.—John Jacobs, Oneida, Ill.
97,198.—BRAID HOLDER.—A. F. Jennings, Fredonia, N. Y. Antedated Nov. 11, 1869.
97,199.—EVAPORATING PAN FOR SORGHUM JUICE.—A. J. Johnson (assignor of one half his right, to James Wilhelm), Louisville, Ky.
97,200.—CORN PLANTER.—Daniel Keethler, Mount Oreb, Ohio.
97,201.—CULTIVATOR.—A. B. King, Camden, Ohio. Antedated Nov. 17, 1869.
97,202.—BORING MACHINE.—F. L. King, Worcester, Mass.
97,203.—FLYER FOR SPINNING.—Wm. La Banister and C. W. Ricker (assignors to C. W. Ricker and S. S. Wilson), Charlestown, Mass.
97,204.—CAR REPLACER.—B. S. Lawson, New York city.
97,205.—COMBINED HARROW AND CULTIVATOR.—John Lerch, Uhlersville, Pa.
97,206.—COMPOSITION BOOT AND SHOE HEEL.—Frank Marquard, Newburyport, Mass.
97,207.—COAL CAR AND TRACK.—George Martz, Pottsville, Pa.
97,208.—CAR COUPLING.—Charles Maus, Danville, Pa.
97,209.—TABLE SLIDE.—Seymour May and John Hooper, Waterloo, N. Y.
97,210.—MOLDING MACHINE.—Wm. McConnell, Clarksville, N. J.
97,211.—LOCOMOTIVE HEAD-LIGHT.—Lewis Michaels, Cincinnati, Ohio.
97,212.—CAR COUPLING.—J. T. Middleton (assignor to himself and M. M. Harvey), Harveysburg, Ohio.
97,213.—SHOVEL-PLOW PLATE AND POINTS.—Henry Miller, Roadside, Va., assignor to himself, S. P. H. Miller, J. G. H. Miller, H. H. Miller, and J. H. Kite.
97,214.—INHALING APPARATUS.—James Montgomery, New York city.
97,215.—BUFFER FOR INSERTING COILED WIRE AROUND THE EDGES OF LAMP-DEFLECTORS.—M. H. Mosman, Waterbury, Conn.
97,216.—COOKING RANGE.—C. D. Newton, Troy, N. Y.
97,217.—GRIDIRON.—M. V. Nobles, Elmira, N. Y.
97,218.—DEVICE FOR FORMING THE SHED IN WEAVING WIRE.—M. V. Nobles, Elmira, N. Y.
97,219.—KITCHEN SINK.—A. B. Nott, Fairhaven, Mass.
97,220.—MANUFACTURE OF SOAP.—Nelson Orcutt (assignor to D. D. Gregory), Syracuse, N. Y.
97,221.—MACHINE FOR PRINTING AND EMBOSSING PAPER HANGINGS.—E. S. Ormsby, New York city.
97,222.—MACHINE FOR HULLING RICE, COFFEE, ETC.—Enoch Osgood, Boston, Mass.
97,223.—HOISTING APPARATUS AND DERRICK.—Enoch Osgood, Boston, Mass.
97,224.—CONSTRUCTION OF RAILWAY.—J. H. Phillips, Washington, D. C.
97,225.—STEAM WATER ELEVATOR.—W. E. Prall, Washington, D. C.
97,226.—STEAM WATER ELEVATOR.—W. E. Prall, Washington, D. C.
97,227.—LOCK.—Franz Prockert, New York city.
97,228.—WATER INDICATOR.—Henry Reynolds (assignor to Reynolds & Co.), New Haven, Conn. Antedated November 12, 1869.
97,229.—CORN PLANTER.—John W. Ricketts, Charleston, Ill. Antedated November 13, 1869.
97,230.—MACHINE FOR MAKING WOOD SCREWS.—Cæsar A. Rodney, Wilmington, Del.
97,231.—RECIPROCATING STEAM ENGINE.—John B. Root, New York city. Antedated November 12, 1869.
97,232.—METHOD OF RENOVATING THE CUTTING EDGES OF HARVESTER GUARDS.—Jacob Rummel, Jr. (assignor to himself and F. V. Floor), New Middletown, Ohio.
97,233.—SEWING MACHINE.—Jacob Rupertus and Thomas R. Wright, Philadelphia, Pa.
97,234.—MACHINE FOR SPINNING TUBES OF SHEET METAL.—Frederick J. Seymour, Wolcottville, Conn.
97,235.—CUTTER FOR MOWING MACHINES.—Henry F. Shaw, West Roxbury, assignor to James A. Woodbury, Boston, Mass.
97,236.—SIDE SADDLE TREE.—John Shelly (assignor to John J. Grimsley), St. Louis, Mo.
97,237.—STEAM GENERATOR.—Edwin Sheppard, Philadelphia, Pa.
97,238.—SPRING TURNBUCKLE FOR WIRE RIGGING.—Wm. H. Shock, Baltimore, Md.
97,239.—RAILROAD SPIKE.—W. S. Shoemaker, Towsontown, Md., and E. H. Shoemaker, Columbus, Ohio.
97,240.—MECHANISM FOR CONVERTING RECIPROCATING MOTION INTO ROTARY MOTION.—Wm. Simpson and Alfred Gardner, Ilford, England.
97,241.—ELECTRIC FUSE.—H. Julius Smith, Boston, Mass.
97,242.—RAILWAY CAR COUPLING.—A. Lewis Spear (assignor to himself, John Stephens, Jr., and Royal L. Lewis), Flint, Mich.
97,243.—LIME KILN.—James B. Speed, Louisville, Ky.
97,244.—PLATE FOR ARTIFICIAL TEETH.—John A. Straight, Albion, N. Y.
97,245.—CLOTHES MANGLE.—Esau D. Taylor and David Cohn, Hornellsville, N. Y.
97,246.—LANTERN.—Nathan Thompson, Brooklyn, E.D., N. Y. Antedated November 10, 1869.
97,247.—GAS MACHINE.—Howard Tilden, Boston, Mass.
97,248.—ANIMAL TRAP.—Robert Tompkins, Clarksville, Tenn.
97,249.—MACHINE FOR NAILING SHOE SOLES WITH WIRE.—Elmer Townsend, Boston, and Louis Goddu, Lowell, Mass.
97,250.—CAR COUPLING.—Henry B. Verrie and Daniel G. Wightman, North Kingston, R. I.
97,251.—HARNESS.—David Waldhauer, New York city.
97,252.—DUMPING MACHINE.—Benjamin Walton, Farisburg, Ill.
97,253.—SCALE BEAM.—John Weeks, Buffalo, N. Y. Antedated November 9, 1869.
97,254.—MACHINE FOR POLISHING WOOD.—Daniel Westley (assignor to himself and E. W. Buss), Corry, Pa.
97,255.—CIGAR MACHINE.—John Wettstein (assignor to himself and John Thomas Hennaman), Baltimore, Md.
97,256.—SHUTTLE SPINDLE.—Henry H. Wheeler and Oliver H. Reed, Lowell, Mass.
97,257.—COMBINED COTTON AND CORN PLANTER.—A. R. Wiggs, Iuka, Miss.
97,258.—CURRY COMB.—Judson E. Yager, Barboursville, Va.
97,259.—PLANT PROTECTOR.—J. M. Watson, Sharon, Mass.
97,260.—WIRE FOR FASTENING SOLES TO SHOES, ETC.—Wm. Wickersham, Boston, Mass.
97,261.—DEVICE FOR RELEASING STANDING RIGGING.—Frederick Wittram, San Francisco, Cal.
97,262.—LUBRICATING COMPOUND.—Cyrus S. Moore, Erie, Pa.

REISSUES.

94,058.—MECHANICAL VELOCIPEDE.—Dated August 24, 1869; reissue 3,739.—Arthur M. Allen, New York city.
63,220.—SOLDERING MACHINE.—Dated March 26, 1867; reissue 3,740.—Edward T. Covell, Brooklyn, N. Y.
55,658.—MACHINE FOR PRESSING AND MOLDING PLIABLE MATERIALS.—Dated June 19, 1866; reissue 3,741.—George C. Howard, Philadelphia, Pa.
90,549.—APPARATUS FOR DRYING SUGAR AND OTHER LIKE ARTICLES.—Dated May 25, 1869; reissue 3,742.—Gustavus A. Jasper, Charlestown, Mass.
41,929.—BOLT-MAKING MACHINE.—Dated March 5, 1864; reissue 3,251, dated January 5, 1869; reissue 3,743.—William J. Lewis, Pittsburgh, Pa.
74,613.—MANUFACTURE OF TIN-LINED LEAD PIPE.—Dated February 18, 1868; antedated February 6, 1868; reissue 3,744.—Peter Naylor, New York city, assignee of Wm. Anthony Shaw.
57,195.—HAND SCREW CLAMP.—Dated August 14, 1866; reissue 3,745.—Hermann Schmidt, New York city.
79,040.—WIRE SPRING MATTRESS.—Dated June 16, 1868. Patented in Saxony, March 6, 1865; reissue 3,746.—The Woven-wire Mattress Company, Hartford, Conn., assignees, by mesne assignments, of Franz Rudolph Wegman.
42,520.—LANTERN.—Dated April 26, 1864; reissue 3,747.—Wm. Westlake, James F. Dane, and John P. Covert, Chicago, Ill., assignees of Wm. Westlake.

DESIGNS.

3,756 and 3,757—CENTER PIECE.—Henry Berger, New York city. Two patents.
3,758.—SCHOOL DESK.—P. Born, Selin's Grove, Pa.
3,759.—GLASS WARE.—John Bryce, East Birmingham, Pa.
3,760.—PITCHER.—John Fleming and John Hamilton, Pittsburgh, Pa.
3,761.—PLATE OF A COOKING STOVE.—Luther W. Harwood (assignor to Fuller, Warren & Co.), Troy, N. Y.
3,762.—COFFIN.—Samuel Hillier, Allegheny, Pa.
3,763.—STOVE.—R. P. Myers, B. F. Rouse, and J. M. Osborn, Cleveland, Ohio.
3,764.—BORDER FRAME OF A FIRE-PLACE.—J. R. Rose and Edward L. Caley, Jr., Philadelphia, Pa., assignors to Wm. E. Wood & Co., Baltimore, Md.
3,765.—FIRE-PLACE STOVE.—J. R. Rose and Edward L. Caley, Jr., Philadelphia, Pa., assignors to William E. Wood & Co., Baltimore, Md.
3,766.—FORK OR SPOON HANDLE.—George Sharp, Philadelphia, Pa.

APPLICATIONS FOR EXTENSION OF PATENTS.

HORSE RAKE.—Nathan Martz, of Berwick, Pa., has applied for an extension of the above patent. Day of hearing Feb. 9, 1870.

PRESSURE BELLS.—Margarette L. Barton and Charles A. Buell, of Chatham, Conn., administrators of the estate of Jason Barton, deceased, have petitioned for the extension of the above patent. Day of hearing March 23, 1870.

PROCESS AND APPARATUS FOR COOLING BEER AND OTHER LIQUIDS.—Jean Louis Beaudelot, of Harancourt, Empire of France, has applied for an extension of the above patent. Day of hearing, March 30, 1870.

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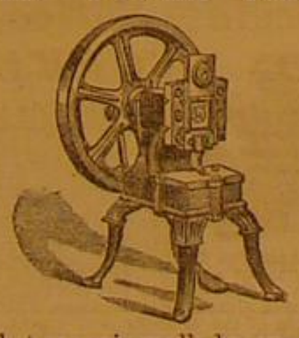

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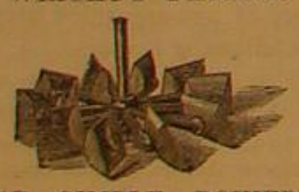

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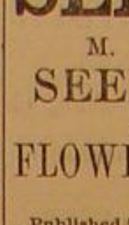

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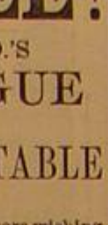

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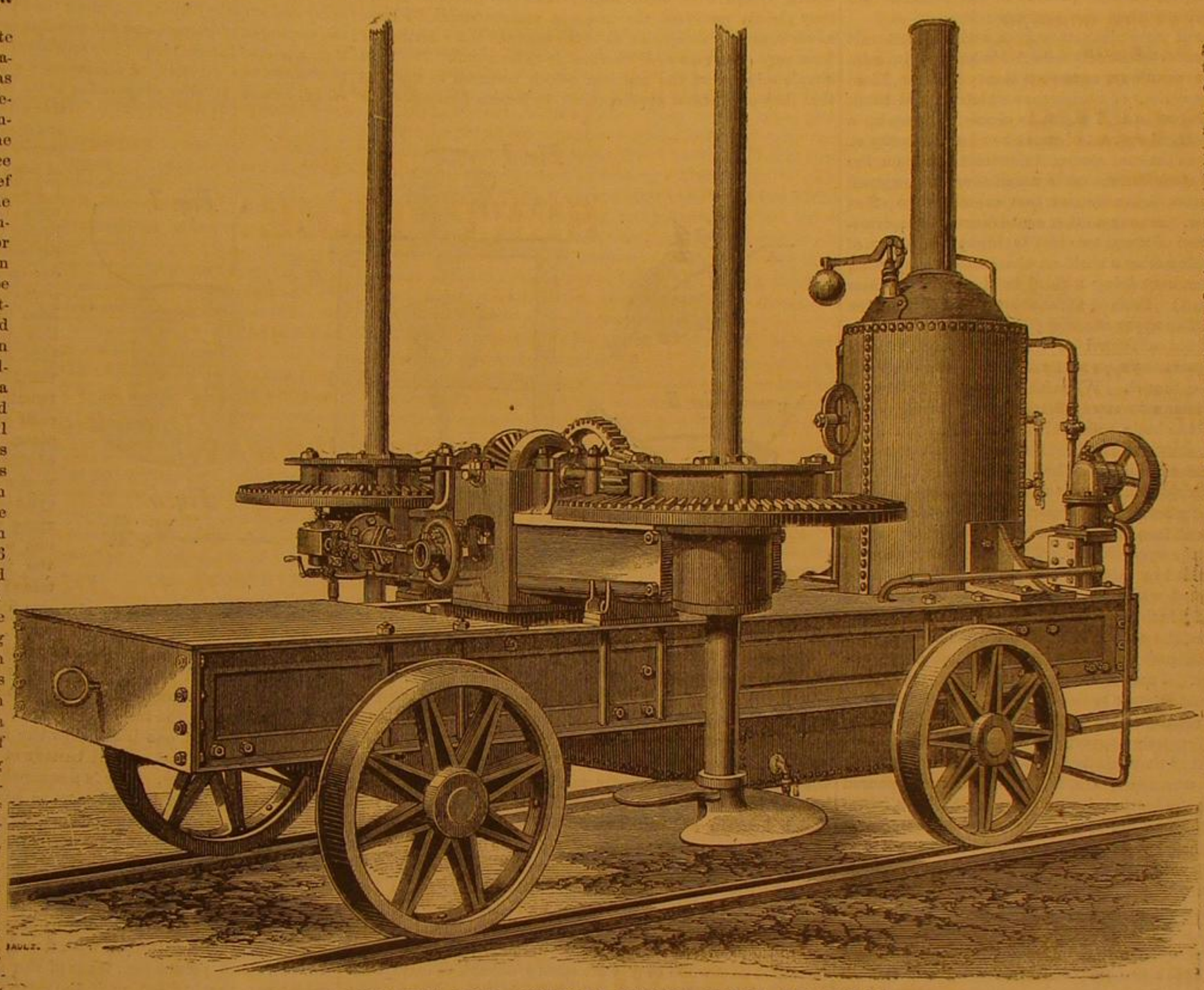
SCIENTIFIC AMERICAN

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

Vol. XXI.---No. 25. [NEW SERIES.] NEW YORK, DECEMBER 18, 1869. $3 per Annum. [IN ADVANCE.]

Sinking Screw Piles.

We illustrate herewith a machine which has been lately designed by an English firm, at the request of H. Lee Smith, Esq., chief engineer for the Punjaub Northern Railway, for screwing down the piles to be used in constructing bridges and flood openings on that line of railway. Fig. 1 is a perspective, and Fig. 2 a sectional end view. This machine consists of a wrought-iron under-carriage mounted upon wheels of 5 ft. 6 inch gage, and carrying a vertical boiler at one end. A strong cast-iron beam in the center carries a cylinder in which works a ram, to the top of which a strong crossbeam is bolted which carries the machinery for operating on the piles. This consists of a horizontal steam engine bolted to the side of the crossbeam, and driving a pinion and train of spur and bevel wheels which impart motion to two large horizontal wheels carried in bearings at each end of the crossbeam. A friction clutch is carried in the center of each of these wheels, through the boss of which the shaft of the pile to be screwed is passed. The shafts are rolled with feathers or ribs on each side, which, passing through corresponding recesses or keyways formed in the boss of the friction clutch, form the means of imparting the rotary motion from the horizontal wheels to the piles.



APPARATUS FOR SINKING SCREW PILES BY STEAM.

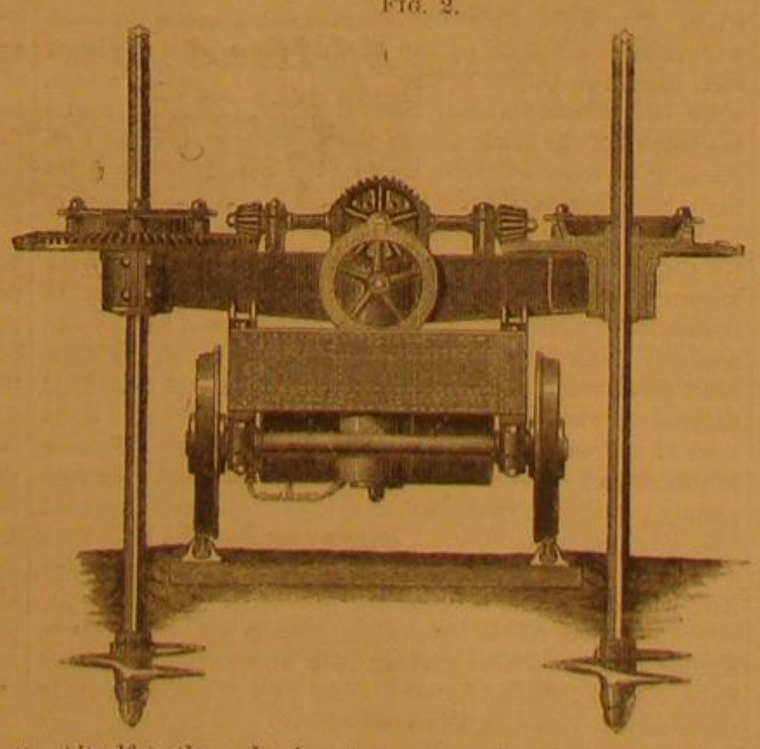
Steam is brought from the boiler through the center of the ram and cylinder which carries the crossbeam by means of a telescope joint, which allows the ram to be raised without interfering with the steam pipe; and a small donkey engine is provided which can pump from a tank situated between the frame, either into the boiler or into the cylinder under the ram which carries the crossbeam. When the machine is at work the crossbeam is held firmly by means of cotter bolts to the frame.

The *modus operandi* is as follows: A temporary road being laid on the center line of the proposed structure, piles are pitched by passing the shafts through the wheels on each side of the machine, and keying them into the screws which are placed in a small hole excavated to receive them. The engine is then set to work, and the piles screwed down as far as possible. The cotters holding down the crossbeam are then removed, and it is raised by the donkey engine pumping into the cylinder in the center of the machine, and lifted off the piles. The machine is then moved forward to the center line of the next piles, and the operation takes place as before.

Should a pile meet with any obstruction, or be found fast enough without screwing down to the estimated depth, it may be either unscrewed by reversing the engine, or the shaft may be cut off to the right hight, so that the crossbeam may be lifted clear, a slide rest and tool holder being provided, which is actuated by the horizontal wheels.

At a trial of this machine, the Editor of *Engineering* recently witnessed two piles screwed into stiff clay 10 feet deep in 23 minutes, and withdrawn at the rate of 3 ft. in 2½ minutes with a mean pressure of 90 lbs. steam in the boiler; and to test the efficiency of the cutting apparatus one pile was cut off in 29 minutes. The machine altogether does great credit to its designer, and from its great handiness and the rapidity with which it performs its work, it will no doubt recommend itself to those having to erect such structures as those on which it is intended to employ it.

FIG. 2.



FIFTEEN HUNDRED DOLLARS, in cash, are to be paid by Munn & Co., February 10, 1870, to the successful competitors for prizes. Send in the names as early as possible that we may know how large an edition to print at the commencement of the new volume. Competitors for cash prizes should write conspicuously "Prize List" on every list of names sent. Circulars and blanks for names sent on application. Those first in the field will stand the best chance.

Acid Rivers.

The Rio Vinaigre, says the Boston *Journal of Chemistry*, in South America, has its source nearly two miles above the level of the sea on the volcano named the "Purace." M. Humboldt was the first to ascertain that its waters contain free sulphuric and muriatic acids. According to Boussingault, this river empties into the Rio Cauca, into which it falls from a hight of about 400 feet, discharging daily 34,784 cubic meters of water, containing 37,611 kilgr. (more than 40 tuns) of strong sulphuric acid, and 31,654 kilgr. (nearly 35 tuns) of strong muriatic acid. No fish are found in the Rio Cauca for more than ten miles below the point where it receives these acid waters.

In the island of Java there are several small streams and lakes which contain free sulphuric and muriatic acids; and on the island of Sumatra there is a lake which contains free nitric acid. All these phenomena are the result of volcanic action.

Test for the Quality of Soap.

To estimate the quantity of non-saponified fatty matter in soap, Dr. Boley gives the following formula:

"Dry the soap at 100°, in order to eliminate, as much as possible, any water it contains. Treat the soap, after having been previously reduced to thin shavings, or powder, if possible, with rectified benzole, or petroleum naphtha. Boil the soap for several hours with this fluid placed in a retort, and take care to pour back into that vessel any of the hydrocarbon which distils over. Next filter the liquid, and evaporate on a water bath. 11·3 grms. of Marseilles soap (this is made with inferior kinds of olive oil and soda) treated in this manner left a residue, on evaporation, weighing 0·145 grm., or 1·3 per cent; this quantity consisted of the non-saponified fatty matter, and a very small quantity of soap which had been dissolved. On igniting the residue just mentioned, it left 0·002 grm. of ash, equal to 0·13 per cent of the soap submitted to analysis.

The Whitworth Metal.

When it is announced that this metal will withstand any shock or strain that can be brought to bear against it, it ought not to be wondered at that so extravagant and indefinite a statement meets with incredulity. There is, perhaps, little doubt that Mr. Whitworth has succeeded in producing iron and steel of superior strength by his method of subjecting these metals, while in a molten state, to enormous pressure, by which it is claimed all the air bubbles are got rid of and the metal is rendered homogeneous. It will be slow work, however, convincing iron masters that the extravagant results claimed are to be relied upon. If they are even approximated, the proof can only be extended trials under varied circumstances of difficulty, and for ourselves, we had rather wait the test of time than to accept at present what we are asked to believe in regard to it.

A GOOD LIP-SALVE.—Equal parts of sweet lard and suet melted together, colored with alkanet root, and perfumed with essence of bergamot.

THE CELEBRATED CROSSE EXPERIMENTS.

In 1836, Mr. Andrew J. Crosse, while conducting some experiments in the formation of artificial crystals, discovered in a caustic solution a large number of insects of the *acarus* tribe—mites—the announcement of which made a considerable sensation in the scientific world. These mites, since called the "Crosse mites," were never claimed by Mr. Crosse to have been spontaneously generated, although he was charged with impiously trying to imitate creative power. He believed the insects to have originated from germs conveyed by some unknown means into the solution. He repeated the experiment, and his own account of this discovery taken from a magazine of that day, together with an engraving of the simple apparatus he employed, we now present to our readers. He says:

"In the course of my endeavors to form artificial minerals by a long continued electric action on fluids holding in solution such substances as were necessary to my purpose, I had recourse to every variety of contrivance which I could think of, so that, on the one hand, I might be enabled to keep up a never-failing electrical current of greater or less intensity or quality, or both, as the case seemed to require; and, on the other hand, that the solutions made use of should be exposed to the electric action in the manner best calculated to effect the object in view. Amongst other contrivances, I constructed a wooden frame, of about two feet in hight, consisting of four legs proceeding from a shelf at the bottom, supporting another at the top, containing a third in the middle. (Seen in section in Fig. 1) Each of these shelves was about seven inches square. The upper one was pierced with an aperture in which was fixed a funnel of Wedgwood ware, within which rested a quart basin on a circular piece of mahogany placed within the funnel. When this basin was filled with a fluid, a strip of flannel wetted with the same, was suspended over the edge of the basin and inside the funnel, which, acting as a siphon, conveyed the fluid out of the basin through the funnel in successive drops. The middle shelf of the frame was likewise pierced with an aperture, in which was fixed a smaller funnel of glass, which supported a piece of somewhat porous red oxide of iron from Vesuvius, immediately under the dropping of the upper funnel. This stone was kept conconstantly electrified by means of two platina wires on either side of it, connected with the poles of a volatic battery of nineteen pairs of 5-inch zinc and copper single plates, in two porcelain troughs, the cells of which were filled at first with water and 1-500th part of hydrochloric acid, but afterwards with water alone. I may here state that in all my subsequent experiments relative to these insects, I filled the cells of the batteries employed with nothing but common water. The lower shelf merely supported a wide-mouthed bottle to receive the drops as they fell from the second funnel. When the basin above was nearly emptied, the fluid was poured back again from the bottle below into the basin above, without disturbing the position of the stone. It was by mere chance that I selected this volcanic substance, choosing it from its partial porosity; nor do I believe that it had the slightest effect in the production of the insects to be described. The fluid with which I filled the basin was made as follows: I reduced a piece of black flint to powder, having first exposed it to a red heat, and quenched it in water to make it friable. Of this powder I took two ounces and mixed it intensely with six ounces of carborate of potassa, exposed it to a strong heat for fifteen minutes in a blacklead crucible in an air furnace, and then poured the fused compound on an iron plate, reduced it to powder while still warm, poured boiling water on it, and kept it boiling for some minutes in a sand bath. The greater part of the soluble glass thus fused was taken up by the water, together with a portion of alumina from the crucible. I should have used one of silver, but had none sufficiently large. To a portion of the silicate of potassa thus fused, I added some boiling water to dilute it, and then slowly added hydrochloric acid to supersaturation.

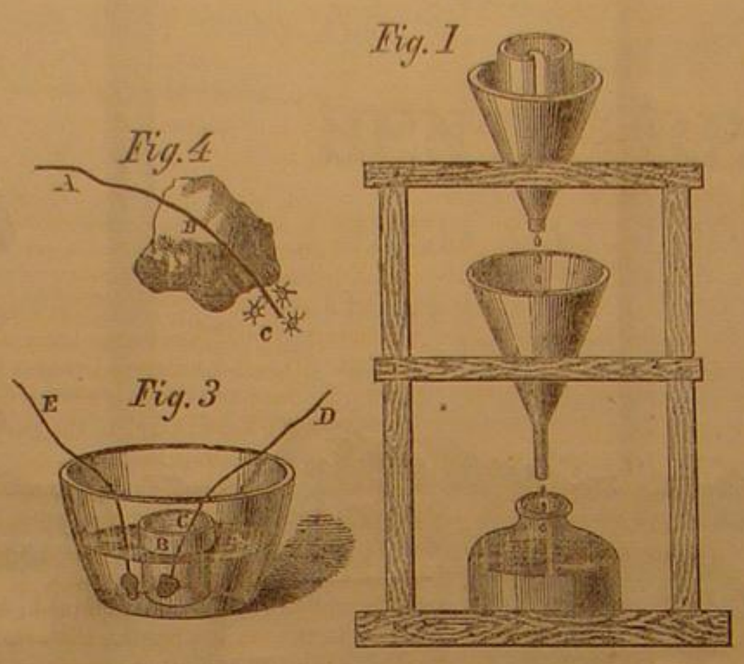
"A strange remark was made on this part of the experiment at the meeting of the British Association at Liverpool, it being then gravely stated that it was impossible to add an acid to a silicate of potassa without precipitating the silica! This of course must be the case! unless the solution be diluted with water. My object in subjecting this fluid to a long-continued electric action through the intervention of a porous stone, was to form, if possible, crystals of silica at one of the poles of the battery, but I failed in accomplishing this by those means.

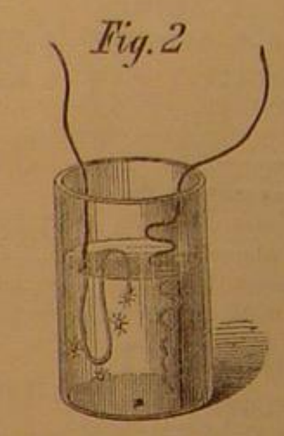
"On the fourteenth day from the commencement of the experiment, I observed, through a lens, a few small whitish excrescences, or nipples, projecting from about the middle of the electrified stone, and nearly under the dropping of the fluid above. On the eighteenth day these projections enlarged, and seven or eight filaments, each of them longer than the excrescences from which it grew, made their appearance on each of the nipples. On the twenty-second day, these appearances were more elevated and distinct, and on the twenty-sixth day, each figure assumed the form of a perfect insect, standing erect on a few bristles which formed its tail. Until this period I had no notion that these appearances were any other than an incipient mineral formation; but it was not until the twenty-eighth day, when I plainly perceived these little creatures move their legs, that I felt any surprise, and I must own that when this took place, I was not a little astonished. I endeavored to detach some from their position on the stone, but they immediately died, and I was obliged to wait patiently for a few days longer, when they separated themselves from the stone and moved about at pleasure, although they had been for some time after their birth apparently averse to motion. In the course of a few weeks, about a hundred of them made their appearance on the stone. I observed that at first each of them fixed itself for a considerable time in one spot, appearing, as far as I could judge, to feed by suction, but when a ray of light from the sun was directed upon it seemed disturbed, and removed itself to the shaded part of the stone. Out of about a hundred insects, not above five or six were born on the south side of the stone. I examined some of them with the microscope, and observed that the smaller ones appeared to have only six legs, but the larger ones eight. It seems that they are of the genus *Acarus*, but of a species not hitherto observed. I have had three separate formations of similar insects at different times, from fresh portions of the same fluid, with the same apparatus.

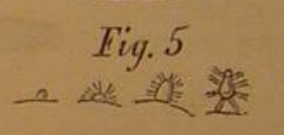
"As I considered the result of these experiments rather extraordinary, I made some of my friends acquainted with it, among whom were some highly scientific gentlemen, and they plainly perceived the insect in various states. I have never ventured an opinion as to the cause of their birth, and for a very good reason—I was unable to form one. The most simple solution of the problem which occurred to me was that they arose from ova deposited by insects floating in the air, and that they might possibly be hatched by electric action. Still I could not imagine that an ovum could shoot out filaments, and that those filaments would become bristles; and, moreover, I could not detect, on the closest examination, any remains of a shell. Again, we have no right to assume that electric action is necessary to vitality until such fact shall have been most distinctly proved. I next imagined, as others have done, that they might have originated from the water, and consequently made a close examination of several hundred vessels filled with the same water as that which held in solution the silicate of potassa, in the same room, which vessels constituted the cells of a large voltaic battery, used without acid. In none of these vessels could I perceive the trace of an insect of that description. I likewise closely examined the crevices and most dusty part of the room, with no better success.

"In the course of the same month, indeed, these insects so increased that when they were strong enough to leave their moistened birthplace, they issued out in different directions, I suppose in quest of food; but they generally huddled together under a card or piece of paper in their neighborhood, as if to avoid light and disturbance. In the course of my experiments upon other matters, I filled a glass basin with a concentrated solution of silicate of potassa, without acid, in the middle of which I placed a piece of brick, used in the neighborhood for domestic purposes, and consisting mostly of silica. Two wires of platina connected either end of the brick with poles of a voltaic battery of sixty-three pairs of plates, each about two inches square. After many months' action, silica, in a gelatinous state, formed in some quantity round the bottom of the brick, and as the solution evaporated I replaced it by fresh additions, so that the outside of the glass basin being constantly wet by repeated overflowings, was of course constantly electrified. On this outside, as well as on the edge of the fluid within, I one day perceived the well known whitish excrescence, with its projecting filaments. In the course of time they increased in number, and as they successively burst into life, the whole table on which the apparatus stood was at last covered with similar insects, which hid themselves wherever they could find a shelter. Some of them were of different sizes, there being a considerable difference in this respect between the large and smaller; and they were plainly perceptible to the naked eye, as they nimbly crawled from one spot to another. I closely examined the table with a lens, but could perceive no such excrescence as that which marks their incipient state on any part of it.

"While these effects were taking place in my electric room, similar formations were making their appearance in another room, distant from the former. I had here placed on a table three voltaic batteries, unconnected with one another. The first consisted of twenty pairs of two-inch plates, between the poles of which I placed a glass cylinder filled with a concentrated solution of silicate of potassa, in which was suspended a piece of clay slate by two platina wires connected with either pole of the battery. A piece of paper was placed on the top of the cylinder, to keep out the dust. After many months' action, gelatinous silica in various forms was electrically attracted to the slate, which it coated in rather a singular manner, unnecessary here to describe. In the course of time I observed similar insects in their incipient state forming around the edge of the fluid within the jar, which, when perfect, crawled about the inner surface of the paper with great activity. The second battery consisted of twenty pairs of cylinders, each equal to a four-inch plate. Between the poles of this I interposed a series of seven glass cylinders, filled with the following concentrated solutions: 1st, nitrate of copper; 2d, subcarbonate of potassa; 3d, sulphate of copper; 4th, green sulphate of iron; 5th, sulphate of zinc; 6th, water acidified with a minute portion of hydrochloric acid: 7th, water poured on powdered metallic arsenic, resting on a copper cup, connected with the positive pole of the battery. All these cylinders were electrified, and united together by arcs of sheet copper, so that the same electric current passed through the whole of them. After many months' action, and consequent formation of certain crystalline matters which it is not my object here to notice, I observed similar excrescences with those before described at the edge of the fluid in every one of the cylinders, excepting the two which contained the carbonate of potassa and the metallic arsenic; and in due time a host of insects made their appearance. It was curious to observe the crystallized nitrate and sulphate of copper, which formed by slow evaporation at the edge of the respective solutions, dotted here and there with the hairy excrescences. At the foot of each of the cylinders I had placed thick paper upon the table, and on lifting them up I found a little colony of insects under each, but no appearance of their having been born under their respective papers, or on any part of the table. The third battery consisted of twenty pairs of cylinders, each equal to a 3-inch plate. Between the poles of this I interposed likewise a series of six glass cylinders, filled with various solutions, in only one of which I obtained the insect. This contained a solution of silicate of potassa. A bent iron wire, one fifth of an inch in diameter, in the form of an inverted siphon, was plunged some inches in this solution, and connected it with the positive pole, while a small coil of fine silver wire joined it with the negative. This instrument is represented in Fig. 2.







"I have obtained the insects on a bare platina wire, plunged into fluo-silicic acid, one inch below the surface of the fluid, at the negative pole of a small battery of two-inch plates, in cells filled with water. This is a somewhat singular fluid for these insects to breed in, who seem to have a flinty taste, although they are by no means confined to silicious fluids. This fluo-silicic acid was procured from London some time since, and consequently made of London water, so that the idea of their being natives of the Broomfield water is quite set aside by this result.

"The apparatus was arranged as follows: Fig. 3, a glass basin (a pint one), part filled with fluo-silicic acid to the level. A B is a small porous pan, made of the same materials as a garden-pot, partly filled with the same acid to the level, B, with an earthen cover, C, placed upon it, to keep out the light, dust, etc. D is a platina wire connected with the positive pole of the battery, with the other end plunged into the acid in the pan, and twisted around a piece of common quartz; on which quartz, after many months' action, are forming singularly beautiful and perfect-formed crystals of a transparent substance, not yet analyzed, as they are still growing. These crystals are of the modification of the cube, and are of twelve or fourteen sides. The platina wire passes under the cover or fourteen sides. The platina wire connected with the negative of the pan; E is a platina wire connected with the negative pole of the same battery, with the other end dipping into the basin, an inch or two below the fluid, and, as well as the other, around a piece of quartz. By this arrangement it is evident that the electric fluid enters the porous pan by the wire, D, percolates the pan, and passes out by the wire, E. It is now upward of six or eight months (I cannot at this moment put my hand on the memorandum of the date) since this apparatus has been in action, and though I have occasionally lifted out the wire to examine them by a lens, yet it was not till the other day that I perceived an insect, and there are now three of the same insects in their incipient state, appearing on the naked platina wire at the bottom of the quartz in the glass basin of the negative pole. These insects are very perceptible, and may be represented thus (magnified): in Fig. 4, A is the platina wire, B the quartz, and C the incipient insects. It should be observed that the glass basin, Fig. 3, has always been loosely covered with paper. The incipient appearance of the insects has already been described. The filaments which project are in course of time seen to move before the perfect insect detaches itself from the birth place. Fig. 5 shows the insects in their various states, magnified."

Brain Work and Manual Labor.

Our excellent cotemporary, the *Herald of Health*, thus discourses on the combining of mental and physical force to the relief of both mind and body:—"The worker with his brains would love brain work more if he had a couple hours of hand work to do every day. If such persons could have their gardens and shops to run to when their heads were tired, they would soon recuperate, and the muscular toil not being in excess would soon be a delight. If, on the other hand, the toiler with the hand could do daily some mental labor, it would add greatly to his happiness. The sharpening

of the brain by culture would add effectiveness to the hand. The reason for this, is because man is a composite being. His muscles were not made for non-use more than his brain, and the right use of each is a pleasure and not a pain. After a few generations we shall have what is now the prayer of thousands, more culture for the laboring man, and more physical labor for the cultured man. This will establish a harmony between the two, which will add greatly to the prosperity, happiness, and health of both."

RAILWAY CARRIAGES IN DIFFERENT PARTS OF THE WORLD.

Chambers' Journal complains that railway fares are with few exceptions higher in England than in any other country, and argues therefrom that English people ought to get better accommodation than is afforded in other countries. It asserts, however, that such is not the case, and to make good its assertion, facts are given in relation to royal and luxurious railway carriages, luncheon carriages, sleeping cars, etc., etc., used in various parts of the world, some of which will interest our readers.

"The most right-royal production in the world in this way is the imperial train of France. It may be that each of the great French companies has a similar train of its own; but at any rate the one which is selected as an example is on the Paris and Orleans line—the highway to Biarritz. It is a veritable train, not merely one carriage in a train. First, after the engine and tender, comes a luggage-carriage—not an uninhabitable van, but a structure which, besides ordinary luggage, contains pantry arrangements for refreshments, and accommodation for some of the company's and imperial servants. Next is a carriage adapted as a dining-room—or at least as a refreshment room—with a center table, arm-chairs, and hinged seats; and when, at night, the seats are drawn away from the wall, they fall back so as to form bedsteads for the attendants. Third in the list stands an open or platform carriage which may be opened or closed at the sides at pleasure, and used either as an open-air-look-out or as a refreshment room. Then comes the grand carriage, the imperial saloon, with a retiring room attached, and doors at the sides and ends. All that luxury can do is here done in the provision of couches, arm-chairs, folding-chairs, movable chairs, small tables and stands, curtains, wire-gauze blinds to exclude dust when the windows are open, a time-piece, pendent lamps, and mirrors. The fifth is a sleeping-carriage, divided off into seven distinct compartments; these comprise a sleeping-chamber or bedroom, two dressing rooms, two rooms for the empress' ladies, one for the emperor's valet, and a retiring room. The sleeping chamber contains two beds, on opposite sides of a compartment nine feet wide. Next to the sanctum of the imperial papa and mamma is a carriage for the Prince Imperial, with numerous snuggeries for sleeping, dressing, and attendants. Lastly, there is a luggage carriage the counterpart of the one at the head of the train. All the carriages have doors at the ends, and platforms which make a convenient gangway from carriage to carriage; and there are electric bells from the imperial saloon to all the other carriages and to the engine-driver and guards.

"The Czar of all the Russias should by rights have everything as grand as the Emperor of the French; but instead of an imperial *train*, he has only an imperial *carriage*. Such a carriage, however—no less than eighty-five feet long! The saloon for the emperor and empress, in the center of the carriage, has all the luxuries which curtains and carpets, sofas and settees, timepieces and chandeliers, can give it; the emperor's study is a little more like a gentleman's own room, while the empress' boudoir is all that a boudoir should be; and beyond that are rooms for attendants—gentlemen next to the emperor's study, ladies next to the empress' boudoir—with all the knick-knackeries and comforts to make a journey go smoothly. As this carriage is made for comparatively short lines of railway near St. Petersburg, there is no provision for sleeping or night-journeys."

Our American sleeping car system comes in for a good deal of well-merited praise, ispecially mentioning the celebrated sleeping car, Omaha, whfch cost $28,000, and which "carries luxury to the extent o a small organ in the middle of the chief saloon; whereby a passenger, whether or not he has rings on his fingers or bells on his toes, can at least have music wherever he goes."

From these extremes of northern luxury, the writer plunges us suddenly into East Indian heat, dust, and squalor, introducing us to the two storied cars, which "are in use on the Bombay and Central India Railway; constructed to hold a hundred and twenty passengers each—seventy on the lower story, and fifty on the upper. As nineteen out of every twenty railway passengers in India are third class (they would travel fourth, fifth, or any other class if cheapness could be thereby obtained), these two-storied carriages are crammed with Hindus of all castes (for the Brahmin and the Rajpoot may be poor as well as the Pariah), who squat on their hams as a compact mass of humanity; seeing that some of the carriages, like the third class originally used on our Greenwich line, are without seats. On the western and eastern railways of France (Paris to Brest, and Paris to Strasbourg), two-storied carriages are used on some of the branches, where slow speed would render loftiness possible without danger. Some of these carriages are composite, the lower story having first and second class compartments, and the upper third class; some are third class throughout, the upper having open sides, and the lower closed with windows and glazed panels. These carriages accommodate about eighty passengers each. They are nearly fourteen feet in hight by nine broad, and would therefore be unavailable under low-crowned arches and bridges."

THE TOAD AS AN ENTOMOLOGIST.

(BY A. S. RITCHIE.)

The toad is of a retiring disposition, loving dark corners and shady places. It has a slow, crawling motion, and is of a very timid disposition. Numerous instances might be cited of pet toads, and of their becoming quite tame.

The toad differs in some respects from the nearly related frog. The structure of the mouth is, however nearly the same. The tongue is attached by the root, as it were, to the base and front of the mouth, the tip being reversed and pointing down the throat when the animal is at rest.

The moment it sees an insect its eyes brighten and sparkle, the toes twitch, and quicker than the eye can follow, the tongue is thrown out, the insect transfixed, and withdrawn into the mouth.

Unlike the frog, the toad does not spring after its prey, but remains seated. Having kept frogs in the aquarium, I have noticed that they will spring two or three times their own length from the moss to catch a fly on the glass, using their tongue, as it were, on the jump. They seldom miss their mark. As far as my experience goes, neither of these animals will eat anything without life or motion. I have, however, often deceived a frog by moving a dead fly in the sight of the creature, which it always took readily. Many stories have been told of toads in rocks, and reasons have been given by authors as to the way in which they have become so embedded. My subject has, however, nothing to do with these "old great toads," but to one of our own day and generation. After this digression, I shall now introduce my friend, the toad, in his capacity as a collector of beetles.

The true naturalist, in the pursuit of his study, is a very teachable individual; he never refuses assistance from any one, whatever his station in life is, or however meager his knowledge of the science may be. The many ways he uses the animal creation to advance his knowledge, in the particular branch of study, may be illustrated as follows:

The conchologist wearies for the pleasant days of summer, to take a trip to the sea-side, with his dredges and lines, his bottles and store-boxes, where he adds to his collection many interesting and perhaps new forms of molluscan life.

A trip to the sea-side is not always easily obtained; but the naturalist may be seen in the market buying the several species of flat fish, such as flounders and other species which live and feed at the bottom of the sea. Knowing them to be good collectors, he takes advantage of this fact to procure many and sometimes rare species, and thus adds to his cabinet, without the trouble of dredging for them.

The entomologist, likewise, has recourse to different methods to obtain the object of his interesting study. The following is one of many:

Starting at six o'clock one morning, in the summer of 1864, for a walk to our beautiful mountain, to collect insects, provided with the requisite apparatus, a wide-mouthed bottle, with spirits, for beetles, and a small flat box, lined with cork, for butterflies, etc., my success was particularly good. The first captures were eleven specimens of carrion beetles, comprising three species, viz., *Silpha peltata*, *S. marginales*, and *S. inæqualis*. These were obtained from the body of a dead hawk-owl (*Surnia ulala*). Having secured them in the bottle, and walking leisurely along, I noticed a toad (*Bufo Americanus*) sitting contentedly at the root of a basswood-tree (*Tilia Americana*). Having never made use of my dingy friend as an insect-collector, although aware of his propensity that way, my mind was made up to press him into the service—but how? He must be dead first. As he sat looking at me with his beautiful eyes (for although his appearance is not very prepossessing still those beautiful, bright, yet languid eyes go a great way to improve his appearance), I had certain qualms of conscience about taking life; still it was in the cause of entomology, and for the furtherance of science his life was sacrificed. Now he was dead; how was I to proceed? I had cut up and dissected many insects as well as birds, but to cut up a toad, and before breakfast—"there's the rub"—that gray, warty toad, no beautiful eyes now. One slash of the knife through the skin, another through the walls of the stomach, and the poor creature's breakfast was exposed.

I was a little disappointed at first, as one or two common forms of beetles presented themselves, that might have been obtained without sacrificing the poor animal; still, I reasoned as he had been up nearly, or perhaps all night, collecting, and I had not, he must have taken some species not in my collection. Having scraped the contents of his stomach into my bottle of spirits, I started home, resolved to see what the insects were before breakfast.

I spread them out on a sheet of blotting paper and counted them; the result being thirteen perfect specimens.

I have killed several toads since, with similar results; one, I may mention, had the stomach filled with a species of *Chrysomelidæ*, *Doryphora trimaculata*, amounting to eleven specimens. He had evidently come across a colony of that insect, and made a hearty breakfast. I may state that this insect was in great abundance, during 1864, on the Island of Montreal. The same may be said of last summer, 1868; taking them by the score on the Mountain, along the river at Hochelaga.

The earlier you go out in the morning the better; before sunrise, if possible, before the process of digestion has gone too far.

Latent Heat of Metals.

The quantity of heat latent in the metals, and which becomes apparent when they are compressed, is admirably illustrated by the faint flash of light which is emitted when a bullet from a steam gun strikes a wrought-iron target. The bullets are completely flattened, and when directed against a plate of lead placed in front of the target, the two surfaces of lead become firmly united as if melted or soldered together. The flash of light is only visible in a darkened room. Another still more striking illustration is seen in the flash of light produced when the 80-lb. hexagonal bolts fired from the Whitworth gun strike the thick iron-plated sides of a floating battery: "Notwithstanding the immense resisting power of the iron plates, the hexagonal bolt passed completely through them. The shot when discovered was found to be so hot that no one could touch it, and was ascertained to have been compressed to the extent of an inch in length. It was noticed that at the instant of concussion between the shot and the vessel, a broad sheet of intensely bright flame was emitted, almost as if a gun had been fired from the vessel in reply."

The same effect has been repeatedly noticed when the balls from the heavy Dahlgren guns of the monitors struck the stone fortifications against which they were directed. The heat, in these cases, was that previously latent in the iron, made sensible by the compression of the metal and the diminution of its specific heat. In like manner, the intense heat which is evolved when iron bars are subjected to the process of rolling, and not unfrequently by the axles of cars and carriages when in rapid motion, and in the processes of boring and planing metals, is due to the same cause. It is the heat previously latent in the metals, evolved and converted into heat of temperature by the diminution of their specific heat in consequence of compression. The heat set free in the simple operation of boring a hole with a gimlet, is sufficient to inflame a friction match. The heat produced by the rapid drawing of a string tightly around the neck of a glass flask, is sufficient to crack it. And in the whale fishery, the heat evolved by the inconceivably rapid motion of the rope over the side of the boat, after the whale is struck, would be sufficient to set it on fire if it were not kept cool by the continual pouring of cold water. In the best constructed steam engines, the bearings of the shafts are made hollow, and a steady stream of cold water caused to circulate through them, in order to prevent them from becoming excessively heated, and the axles from expanding to such a degree as to be incapable of moving. These are illustrations of a general principle. Whenever any body is expanded, heat is absorbed and temperature sinks. Whenever any body is compressed, latent heat is given out and temperature rises. This is true of solids, liquids, and gases. Liquids, if compressed, grow warm; if relieved from compression, they grow cold again. Gases, if compressed, grow hot; if released from compression, temperature declines. So, in like manner, when bodies change from the solid to the liquid or gaseous state, there is an absorption of heat, because of the large amount which is expended in making the change. The difference between the same substance as a solid and as a liquid, is, that in the latter case the particles are so far removed that they can slip readily upon each other. This separation can only by maintained by the addition of a large amount of heat. Consequently, whenever a solid is liquefied there is an immense absorption of heat, and temperature sinks: whenever a liquid is solidified, the reverse takes place and temperature rises. The latent heat, no longer required, becomes sensible. When a liquid is vaporized, heat is absorbed, and temperature sinks. When a vapor is condensed into a liquid latent heat is given out, and temperature rises.—*Pynchon's Chemical Forces.*

What a Man Knows.

What a man can write out clearly, correctly, and briefly, without book or reference of any kind, that he undoubtedly knows, whatever else he may be ignorant of. For knowledge that falls short of that—knowledge that is vague, hazy, indistinct, uncertain—I for one profess no respect at all. And I believe there never was a time or country where the influences of careful training were in that respect more needed. Men live in haste, write in haste—I was going to say think in haste, only that the word thinking is hardly applicable to that large number who, for the most part, purchase their daily allowance of thought ready made. You find ten times more people now than ever before who can string words together with facility, and with a general idea of their meaning, and are ready with a theory of some kind about most matters. All that is very well as far as it goes, but it is one thing to be able to do this and quite another to know how to use words as they should be used, or really to have thought out the subject which you discuss.—*Lord Stanley.*

An Ingenious Method for Drying Vegetable and Animal Substances.

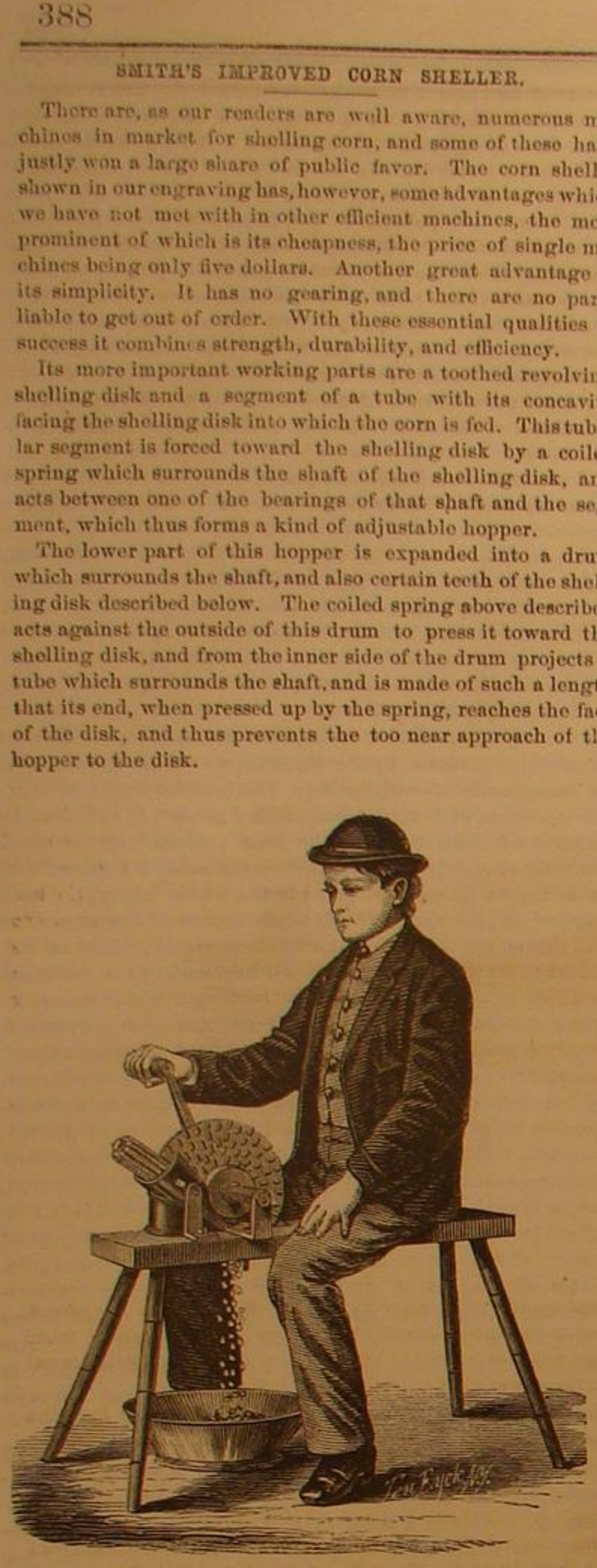
A method recently adopted for drying vegetable and animal substances, consists in filling a vessel half full with fused chloride of calcium, pouring ether upon it, and then placing above it a vessel containing the material to be dried. The vessel is placed upon a glass plate, and over this a bell glass, fitting completely to its surface. The chloride of calcium abstracts the moisture from the ether, which then constantly takes away a new quantity from the substance in the vessel above, until it is quite dry. Articles dried in this manner have quite a different appearance from those from which the moisture is removed by the ordinary process; vegetables retaining their natural color, and animal substances their elasticity and flexibility.

SMITH'S IMPROVED CORN SHELLER.

There are, as our readers are well aware, numerous machines in market for shelling corn, and some of these have justly won a large share of public favor. The corn sheller shown in our engraving has, however, some advantages which we have not met with in other efficient machines, the most prominent of which is its cheapness, the price of single machines being only five dollars. Another great advantage is its simplicity. It has no gearing, and there are no parts liable to get out of order. With these essential qualities of success it combines strength, durability, and efficiency.

Its more important working parts are a toothed revolving shelling disk and a segment of a tube with its concavity facing the shelling disk into which the corn is fed. This tubular segment is forced toward the shelling disk by a coiled spring which surrounds the shaft of the shelling disk, and acts between one of the bearings of that shaft and the segment, which thus forms a kind of adjustable hopper.

The lower part of this hopper is expanded into a drum which surrounds the shaft, and also certain teeth of the shelling disk described below. The coiled spring above described acts against the outside of this drum to press it toward the shelling disk, and from the inner side of the drum projects a tube which surrounds the shaft, and is made of such a length that its end, when pressed up by the spring, reaches the face of the disk, and thus prevents the too near approach of the hopper to the disk.



The sheling disk is armed with teeth, as shown in the engraving, which, engaging with the ear of corn as it is pressed forward by the hopper, tear off the grains from the cob. Between the drum of the hopper and the tube which surrounds the shaft above described, and which gages the approach of the hopper to the disk, are long teeth arranged concentrically with the shaft and parallel to it; and the concave part of the hopper extending down past these teeth enables them to seize the ear and feed it down, thus bringing all parts of the ear under the action of the shelling teeth.

The end of the tube which limits the approach of the hopper to the shelling disk is notched, so that grains of corn may fall through and not interfere with the action of this feature of the device by their lodgment around the shaft.

The whole is attached to a wooden bench in the manner shown, upon which the operator sits, the shelling disk and its attachments being actuated by a winch.

The inventor states that the machine may be advantageously used for shelling green corn, though it will not accomplish the work as fast as it will shell ripe corn.

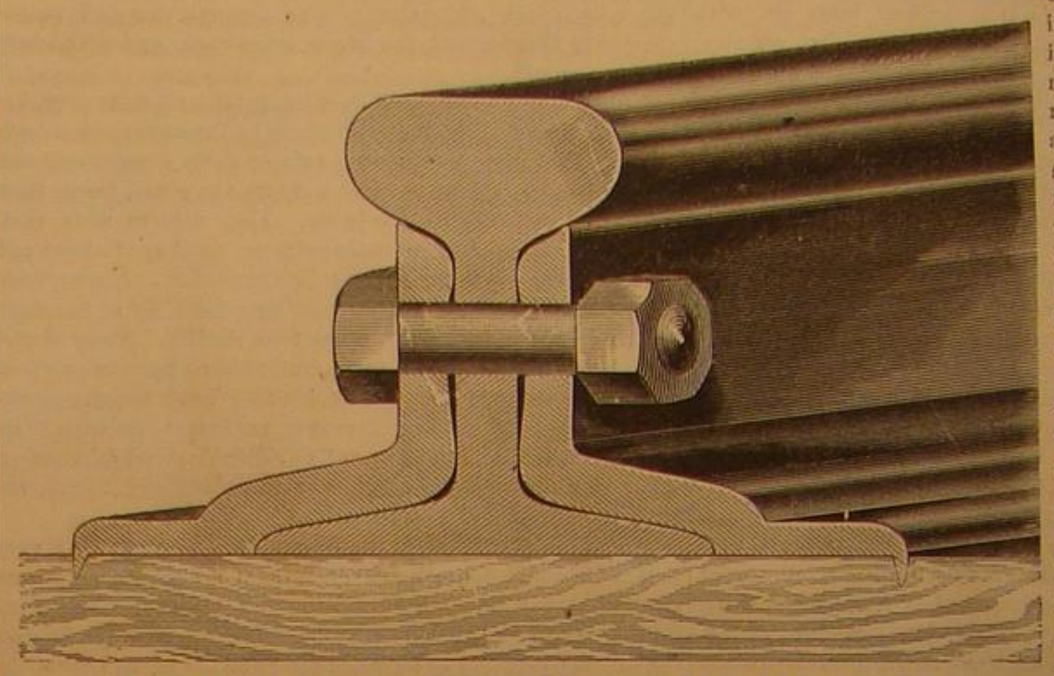
Patented June 22, 1869, by J. P. Smith, whom address at Hummelstown, Pa.

Brazilian Flour.

The *St. Louis Republican* says that, at the request of the Union Merchants' Exchange, E. D. Morgan, Esq., of New York, shipped them two barrels of flour used generally by the higher classes in Rio de Janeiro—one barrel manufactured at Pesth, Hungary, and the other at Trieste, Austria—samples of which were exhibited on 'Change yesterday. The flour is very much like our Minnesota flour in the "feel," being exceedingly high ground, but is much whiter and entirely free from specks. We are indebted to Mr. Frank Feiner, of the Southern Mills, who was formerly a miller in Hungary, for a description of the process of its manufacture. The wheat is first dampened and remains so for twenty-four hours, when it is hulled, then run through a set of burrs that simply crack it; then through a cleaning apparatus where it is cleaned and dusted; then through another set of burrs; then bolted, cleaned again, and back through the same process some fifteen times. During the first four runs there is nothing taken out but the feed and coarse black flour; after that the best flour commences to bolt through. The flour, it is asserted, will keep any length of time in a hot climate, but the process of making it is so slow and so costly, that we have no idea that it will ever be made in this country, and we doubt whether its keeping or breadmaking qualities are any better than our best brands of St. Louis flour. A mill with six run of burrs will only grind about 400 bushels of wheat in twenty-four hours; while in St. Louis, a mill of the same capacity can flour over 2,000 bushels of wheat. The barrels that contain the flour are poor and not near as good in the cooperage as those sent from our mills.

Improved Railway-Rail Splice and Chair.

The use of fish-joints on railways is daily increasing, and there can remain no doubt in the minds of practical men that the employment of even the most costly forms which have been found desirable in all respects except cost, is economy in the long run. The invention we herewith illustrate,



THOMAS J. ADAMS' COMBINED FISH-BAR AND CHAIR.

is, however, a combination of fish-joint and chair, and it is claimed that while it is an excellent and permanent joint, it can be made at scarcely greater cost than ordinary fish-plates, without the chair, and that its use therefore saves a large proportion of the cost of chairs.

The engraving is a section of the joint and rail, where one of the bolts, which hold the fish-plates flush to the sides of the rails, is placed.

There are two of these bolts; one on each side of the point where the rails meet. The upper edges of the plates support the heads of the rails, and their lower parts are formed into outward projecting flanges, as shown, lapping over the base of the rails and extending over and resting upon the sleeper.

The outer edges of the projecting flanges are curved downward and formed into sharp ribs which enter into and engage with the wood of the sleeper, and resist lateral displacement.

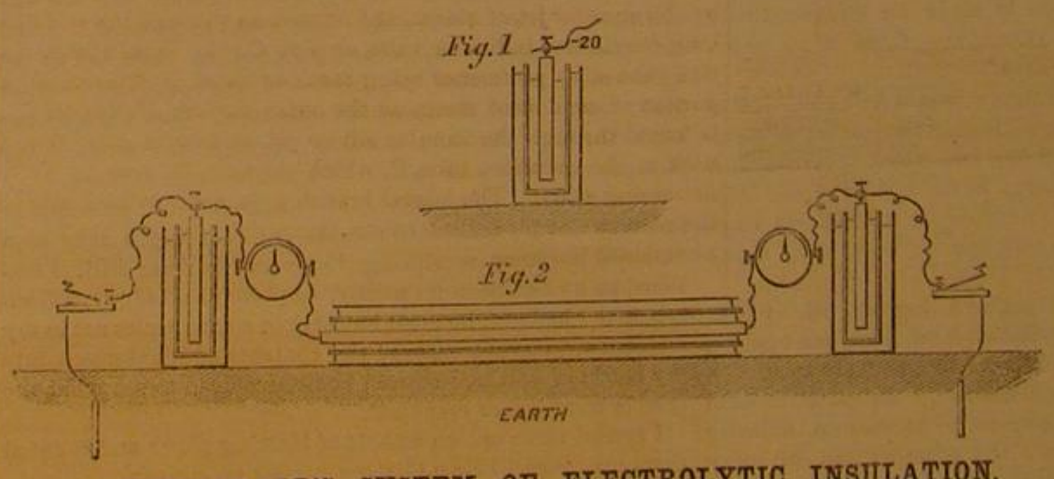
The strain is thus equally divided between the rail, chair, and sleeper, and does not, as in many forms of fish-plate heretofore used, come directly upon the bolts. Thus the nuts on the bolts do not so readily work loose, and when the device is well spiked down to the sleeper, it would seem almost impossible that the joint should not keep tight.

Each plate with its ribbed base can be rolled in one piece, and is therefore strong and reliable.

This invention was patented, through the Scientific American Patent Agency, August 10, 1869, by Thomas J. Adams. Address patentee at Marietta Iron Works, Marietta, Ohio, for further information.

Electrolytic Insulation.

In this system, patented by D. G. Fitzgerald, which is equally applicable to aerial, underground, and submarine lines, no insulating material, properly speaking—that is to



FITZGERALD'S SYSTEM OF ELECTROLYTIC INSULATION.

say, no dielectric—is employed; the lateral passage of the signaling current being prevented by a combination of metallic and electrolytic conductors, so arranged as to generate an electromotive force which opposes the escape to earth of the current. The principle upon which is based this somewhat startling innovation in telegraphy, will be seen on reference to the accompanying diagrams. Fig. 1 represents a battery of two cells. The outer vessel is of lead or copper, the inner vessel of the same metal, covered externally with zinc, and the central element is a cylinder of zinc. The two cells may thus be said to be included in one. Supposing the tensions of the poles of a single couple constructed of similar elements, and excited with dilute acid or a saline solution, to be respectively + 5 and — 5 when the couple is insulated, the tension of the zinc pole of the battery here represented will be — 20 when the outer vessel is in contact with earth. The same will be the case if hemp, slightly impregnated with a good electrolytic conductor, be interposed between the metallic elements in lieu of the ordinary exciting fluid.

It is to be observed that the zinc pole of this arrangement constantly retains its minus charge, although it is directly connected with earth by a series of metallic and electrolytic conductors. In the case of ten cells, similarly arranged, the free negative pole would constantly retain a charge at the tension of — 100; and under no circumstances could electricity at this or a lower minus tension escape to earth by traversing the conductors intervening between earth and the central zinc element. It is evident, therefore, that a series of metallic and electrolytic conductors, disposed as shown in the diagram, is capable of effecting the insulation, or preventing the passage to earth of a negative charge, or of a current from the negative pole of a battery. In order to distinguish this mode of insulation from that which is effected by non-conductors of electricity, Mr. Fitzgerald terms the former "electrolytic insulation," and the latter "dielectric insulation."

The rationale of the construction and working of an electrolytically-insulated telegraph line will be explained by Fig. 2, in which an underground cable, constituting an elongated battery analogous to that which has been above described, is supposed to extend between two signaling stations. The central conductor, both in the cable and the station batteries, will here acquire a negative tension, precisely as in the case of the battery shown in Fig. 1, since the arrangement may be regarded as simply a longitudinal extension of this battery.

Until the signaling key at either station be depressed, no current can traverse the line and influence the receiving instruments; the conductive circuit being otherwise incomplete, or the negative pole of the longitudinally-extended battery insulated from earth. To trace the effect of depressing the key at the right side of the figure, for instance, it is necessary only to consider that this key is in connection on the one hand with the line conductor, that is to say, with the negative pole of the battery on the left side of the figure, and on the other hand with earth, that is to say, with the positive pole of this battery, which is in contact with earth. By working the key at one station, therefore, the circuit of the battery at the other station is completed through the line, instruments, and earth, and signals are thus transmitted to the latter station. The fact that the circuit is completed in the case of the batteries at both stations, does not influence the result; were it otherwise, it would be easy to insulate from earth the positive pole of the battery at the signaling station by the same movement of the key which completes the circuit of the battery at the receiving station.

The electrolytic conductor employed in the construction of the cable, is hemp or other vegetable fiber which has been saturated with a saline solution and subsequently dried, though it still retains sufficient moisture to allow of its generating, by contact with dissimilar metallic surfaces, the electromotive force which opposes and prevents the lateral passage of the signaling current. In overland lines, the electrolytic insulation of the conductor, instead of being continuous, is effected only at the points of support along the line, the dielectric air being, as in the ordinary system of overland construction, the principal insulating medium.

Galvanized Iron Tiles

A new kind of metal roofing has been introduced in France. The covering, instead of being continuous, like corrugated iron, zinc, or lead, is composed of separate tiles formed of galvanized iron, and shaped something like our ordinary pantiles, but susceptible, of course, of various forms, according to convenience or fancy. The tiles are remarkably handy. The metal being thin, they are easily cut to fit a sloping line of roof, corners, etc.; and they are fastened by a single nail of galvanized iron, with which is used a small leaden washer, to render the nail-hole perfectly tight. The advantages of such tiles are numerous. In the first place, they are not affected by fire, like zinc; they do not oxidize, and their dilation and contraction have no effect on the roof. They cost from 3f. to 3f. 25c. per square meter, with 50c. for laying, making in all 3f. 50c. to 3f. 75c., without the scantling. This is about half the cost of a zinc covering. If the new tile presented any tone or picturesqueness, we should recommend them strongly; as it is, we think nothing could be better adapted for roofs out of reach of the eye. Their lightness and durability are invaluable qualities. It is right to add that the new tiles are patented by a company at Montataire.—*London Architect.*

THE EJECTOR CONDENSER.

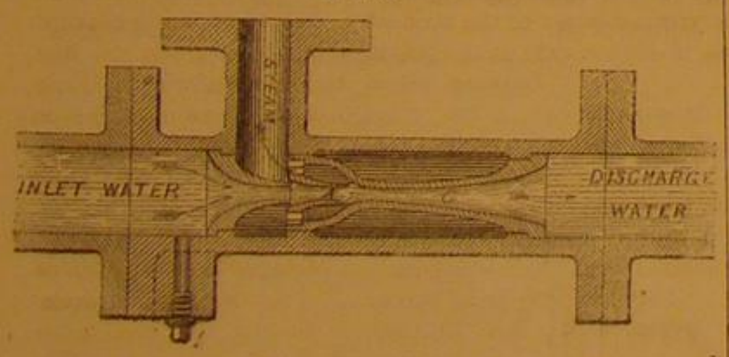
This instrument is the invention of Mr. Alexander Morton, of Glasgow, Scotland. It has been before the public scarcely a twelvemonth, yet in that brief time it has taken rank among the most remarkable improvements in steam engineering of modern times. It is seemingly paradoxical in its operation, and therefore its action is somewhat difficult of comprehension. The principle of its operation is, however, very plainly stated in the following extract from a paper, by James K. Napier, F. R. S., read before the Franklin Institute, Oct. 20th:

"It is well known that the ordinary jet condenser requires a pump to remove the air and the water used in condensation. Mr. Morton, while experimenting on a Giffard's injector, discovered that the pump could be dispensed with; that the exhaust steam itself could do that work, that the steam after forcing its piston to the end of the cylinder had sufficient energy left to take itself, and any air with which it might be combined, out of the cylinder and produce a vacuum equal to that produced by the best condenser and air-pump of the ordinary construction.

"The apparatus which he invented to enable the steam to do this work, he calls an Ejector Condenser. It is very similar in arrangement and mode of action to a Giffard's Injector. The cold water wanted for condensing the steam, if below the apparatus, is raised by a jet of steam in the same manner as in Giffard's or Sellers' Injectors."

As soon as a vacuum is formed in the cylinders of the engine the steam jet is stopped by means of a double piston valve arrangement, which is adjustable as will be shown below. The condensed steam, condensing water, and air are received into a chamber or "hot well," from which the water may be drawn to supply the boiler; the surplus contents of the well being discharged as is shown in the following from the London *Artizan:*

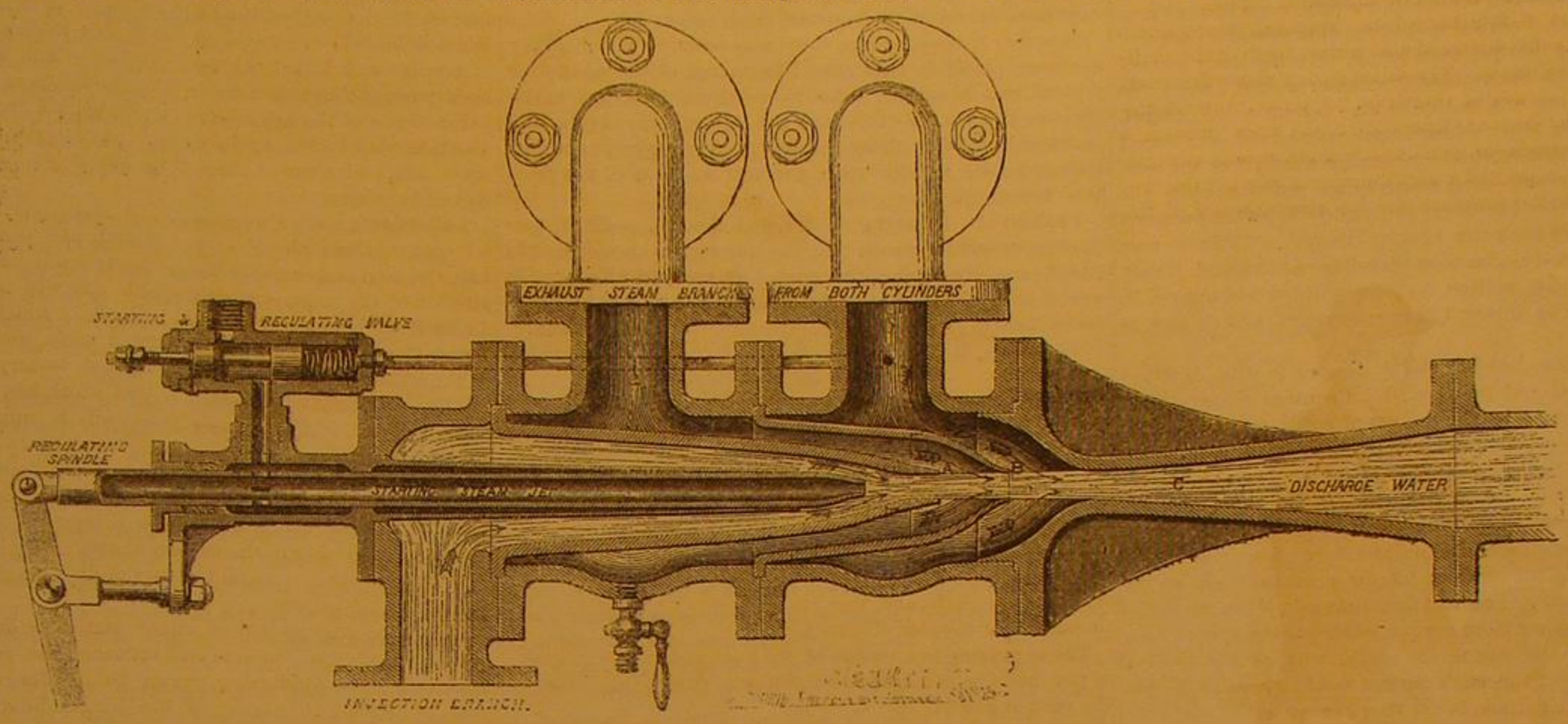
FIG. 2.



"The large engraving, Fig. 1, is a complete longitudinal section of the condenser, in the act of being started by a small starting and regulating steam jet shown open, but which is closed automatically by the vacuum as soon as that is formed and enabled to draw and discharge its own injection water, the valve being used to restore the vacuum when required. This regulator is considered an important part of the practical application of the apparatus, and has been remarked as such by most engineers who have seen it, although other arrangements for a regulating valve might be made, and equally well worked by the action of the vacuum, for the same purpose.

"The exhaust steam, entering from the exhaust steam branches, after surrounding the injection branch passes on to the parts A and B respectively, where it meets the condensing stream of water, and is condensed and carried away through the pipe C. The starting and regulating valve is remarkably ingenious. It consists of a piston valve for regulating the admission of steam from the boiler or main steam pipe into the steam jet, for the purpose of assisting the current of injection water when the vacuum is not so perfect as to effect this in sufficient quantity, unaided. The chamber behind the piston of the regulating valve is connected by a small pipe with one of the exhaust pipes, as shown; so that the vacuum when strong enough shuts the valve against the power of a small helical spring, which is so adjusted as to admit the initial steam the moment the vacuum falls below what is necessary to keep up a sufficient stream of condensing water through the condenser. Thus a jet of fresh steam is instantly supplied when necessary. A small spindle on the piston passes out through the end of the chamber, with a thumb-screw on it, by which the valve may be held open to enable the engines, after standing still, to work with full power and vacuum at any moment, being made self-acting again after the engines are fairly at work. The starting steam jet, conducting the steam to the point of the water nozzle, is formed conoidal at the point, and actuated by a handle to regulate the quantity of injection water allowed to pass through this nozzle. To prevent the injection water condensing the steam in the steam jet, it is surrounded by a hollow casing to prevent the direct metallic contact of the hot and cold surfaces.

"Fig. 2 is a vertical section of a somewhat similar apparatus, constructed for the lifting and forcing of water. This apparatus is placed in the main range or length of pipes through which the water is to be raised, at any distance above the surface of the water within the limits of the atmospheric pressure. The hight to which the water can be raised in the pipes above it, depends wholly on the velocity of the actuating steam passing through the branch pipe, as shown, and regulated by a valve or cock attached to that branch, so as to act with any desired lateral force through the annular narrow jet around the end of the central nozzle. The water passes up by the inlet water pipe, and is forced or drawn in through the short induction central tube or nozzle by the annular jet of steam, and thence up through the main long curvilineal induction tube, or pipe C; the small induction tube *a*, by preference being cased as shown. The small portion of condensed steam on the outer surface of the tube is forced through the annular slit or jet at its end, into the neck of the induction tube, C, which expands in area in an increasing curve. The lateral branch pipe, made to lead into the main water pipe, close below the nozzle, is only for experimental purposes.



THE MORTON EJECTOR CONDENSER.

"The action of this new condenser, although very different from that of the ordinary condenser and air pump is even more simple. The injection water in rushing into the condenser through the conoidal nozzle, attains a velocity proportional to the vacuum, and this velocity, which the jet of water retains, is found sufficient to enable it to discharge itself through the induction tube C, which is so formed, that its area increases inversely with the velocity of the issuing jet. As the result of many experiments, the inventor has adopted the parabolic curve shown in the engraving. The jet of water in passing through the 'ejector condenser' no doubt loses some of its energy by friction in the nozzles, but this loss is made up by the alternate discharges of exhaust steam, from the cylinders in the same direction with, and surrounding the water jet. In maneuvering the engines ahead or astern, the piston starting valve is set open, so that the central steam jet maintains a constant vacuum whether the engines be at work or not; consequently they may be stopped for any period of time, and instantly started at full power when required. As soon as the engines are fairly at work, the starting valve is disengaged, and the vacuum, as before described, shuts off the starting steam jet. The vacuum in the condenser then becomes the regulator of that valve; and should any person open a grease cock, or otherwise admit air into either cylinder, or into the condenser, to impair the vacuum, that instant the starting valve opens and admits a jet of steam to dispel such air, and keep up the stream of injection water until the vacuum is restored. The point of the central spindle through which the starting steam jet passes, serves the purpose also of an injection valve, whereby more or less water is admitted by its insertion into, or withdrawal from the water nozzle by the hand lever."

The accompanying indicator diagrams were taken from the lower end of each of the two cylinders of a steam engine, having their exhaust pipes connected with the exhaust steam branches of one of their instruments. It will be observed the vacuum is maintained remarkably steadily.

The original form of the nozzles was somewhat different from those shown in the engraving. With the present form no difficulty is experienced in maintaining an average vacuum of 26½ inches of mercury.

Professor Rankine has shown that by the use of this instrument all the power required to work an air-pump is saved. He estimates this saving at four per cent of the indicated power of the engine upon which he experimented.

Fig. 3.

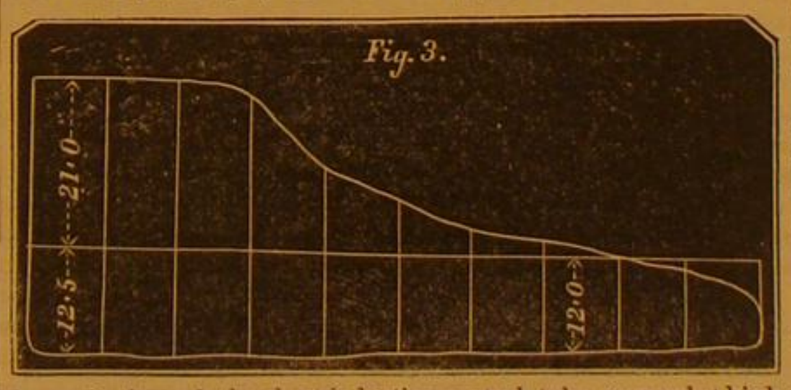
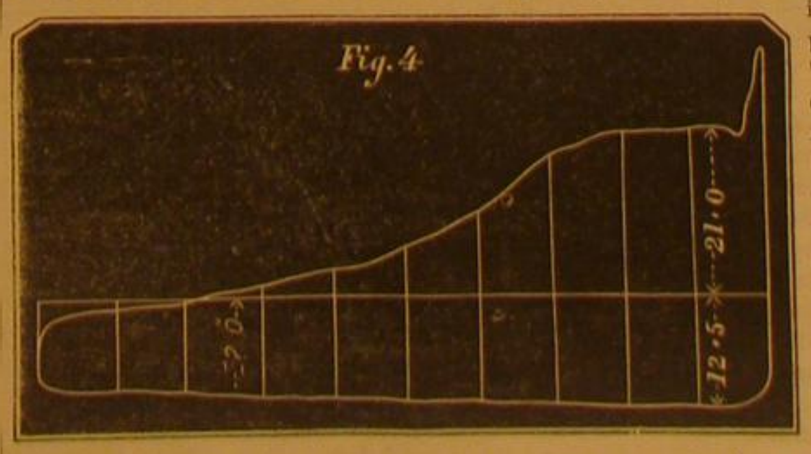


Fig. 4



Reserve Power.

It is not wise to work constantly up to the highest rate of which we are capable. If the engineer on the railroad were to keep the speed of his train up to the highest rate he could attain with his engine it would soon be used up. If a horse is driven at the top of his speed for any length of time he is ruined. It is well enough to try the power occasionally of a horse or an engine, by putting on all the motion they will bear, but not continuously. All machinists construct their machines so that there shall be a reserve force. If the power required is four-horse, then they make a six-horse power. In this case it works easily and lasts long. A man who has strength to do twelve honest hours of labor in twenty-four and no more, should do but nine or ten hours' work. The reserve power keeps the body in good repair. It rounds out the frame to full proportions. It keeps the mind cheerful, hopeful, happy. The person with no reserve force is always incapable of taking on any more responsibility than he already has. A little extra exertion puts him out of breath. He cannot increase his work for an hour without danger of an explosion. Such are generally pale, dyspeptic, bloodless, nervous, irritable, despondent, gloomy—we all pity them. The great source of power in the individual is the blood. It runs the machinery of life, and upon it depends our health and strength.

A mill on a stream where water is scanty can be worked but a portion of the time. So a man with a little good blood can do but little work. The reserve power must be stored up in this fluid. It is an old saying among stock raisers, that "blood tells." It is equally true that blood tells in the sense in which we use the word. If it is only good blood, then the more of it the better. When the reserve power of an individual becomes low it is an indication that a change is necessary, and that it is best to stop expending and go to accumulating, just as the miller does when the water gets low in the pond. Such a course would save many a person from physical bankruptcy.—*Herald of Health.*

DOUBT, discontent, deceit, and debt, are deadly foes to peace of mind.

Correspondence.

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

Origin of the Solar Spots.

MESSRS. EDITORS:—I notice in No. 23, current volume of your journal, the speculations of various persons on the origin and nature of the spots on the surface of the sun. I have also noticed more or less speculation on the subject in different publications for some years past. None of them seems to have resulted in anything reliable or satisfactory. Not being myself fully acquainted with the entire field of scientific research, it is possible that a true and satisfactory explanation of this solar phenomenon may exist; but judging from the hypothetical character of the speculations offered, and the spirit of inquiry that is yet abroad in the matter, and seemingly unsatisfied, especially among more learned men by far than I am, I am led to believe that a true solution of the problem has not yet been found. Having long noticed and meditated on the various theories presented, I am led to offer the following unscientific (it may be) yet to me, plausible theory on the topic, which I have maintained ever since I became acquainted with the "nebular theory" of the creation, and which may—and seems to me must—explain the above phenomenon. My theory is certainly in perfect harmony in its principles with the nebular theory of Laplace, now generally accepted as the most plausible; and though it may not be scientifically written, its force will not be impaired in consequence. The theory I have entertained, and do now, is as follows:

According to the nebular theory the sun is what is left of the raw material out of which all the other planets were formed. Allowing that the process of creation is still going on, it is reasonable to presume that the method is the same. It follows then that as the surface of the sun becomes cooled, it contracts, and as it contracts, it becomes condensed, also rendered more opaque, thus obstructing more or less, according to the extent of such condensation, the fierce flames and light which emanate from such an intensely heated body as the sun is known to be. You will doubtless ask, if the surface of the sun on becoming more opaque, obstructs the flow of heat and light from the sun to the earth, why, as the cooling and contracting of the sun's surface would probably be uniform on its entire surface, is not the phenomenon of such cooling and condensation uniform also? Because the surface of the sun must necessarily be constantly subject to violent commotion and upheavings of volcanic character, and should a uniform crust be formed, it could not remain intact long, but being burst asunder by the central fires and gases, this opaque matter would be thrown aside, and large vents would be created for the escape of these gases. But being thrown aside it is not lost for the purpose in view, but must still continue large additions of opaque matter consequent upon the further cooling of the sun; this matter once cooled must remain so, and increase, and the now very large vents must gradually diminish in size, until the condensed matter has so accumulated that its superincumbent weight could not be supported by the central gases, then it would break off and a new planet be formed; or, in case it did not so break off, the sun would gradually cool down, and in so doing the opaque or solid matter would constantly increase, and the vents constantly diminish, and in time would present the same appearance as that of our earth, allowing for the loss of the influence of a sun shining upon it. The proportionate size of its vents or volcanoes, would some day, far in the future, be about the same as that of the earth at the present time.

Granting that this cooling process will ever continue—and the nebular theory is founded on this process—the sun will eventually become as cold as the earth is now, though owing to its size it must consume a longer period in doing so. That another planet will at some future time be born of the sun, is more probable than that it will cool down in one large mass. The probability consists in the fact that the sun is so much larger than any of the other planets already born of the sun, that there is plenty of material in the sun for several more planets of large size, and there would still be enough left to give the new born planets and the old ones light and heat.

In case another planet should break off from the sun, it might possibly affect the earth less than the formation of subsequent ones. Undoubtedly the spots on the sun will continue to increase, and their effect will be felt on our earth until a new planet is formed, then the light and heat from the central and remaining portion will pass out into space unobstructed, until other accumulations of condensed matter obstruct it again. It is fair to presume that for a limited period our earth would be warmer and lighter after the formation of a new planet, than just before. The unobstructed heat and light from the sun, together with that from the new and uncooled planet, which would probably be nearer to us than the sun, would materially add to the heat received on the surface of the earth. How long it will be before another planet is formed (if more are to be created from the sun) is of course uncertain. Scientific men are better able to note the increase in size and opaqueness of the spots on the sun than I am, but could the intervals between the formation of other planets by the nebular process be found, the time that must elapse before another will come forth could be ascertained with tolerable certainty. These intervals are subjects worthy of inquiry among scientific men.

But, in case the sun cools down without parting with any more of its material, it is evident, as before mentioned, that the light and heat from it will continue to decrease, that the condensed matter will continue to increase, covering more and more of the sun's surface; at the same time being continually tossed and upheaved by the forces within, until sufficient is accumulated to partially resist the expansion of these forces. They will, however, find vent in the weakest point. Constant cooling will increase and strengthen the strong points, and they will gradually encroach on the vents; the central fires of the sun gradually narrowing down at the same time the central forces growing weaker, their vents, in time will become similar to the vents, or volcanoes, of our earth, though all on a larger scale, perhaps. Should the sun retain all its material, and its two antagonistic forces—heat and cold—continue to war with each other, and could we be near enough to see, what a picture of grandeur, what a scene of magnificence would the struggle present, until one of the mighty warriors should succumb to the more mighty strength of the other, till one shall gradually lose its strength, and the sun's light become fainter and fainter; its warmth and vigor gradually diminishing until its former mighty influence upon others of the universe is no longer felt.

However erroneous these views may seem, or may be, they are more plausible than some I have seen published in your journal, and in various other publications, in regard to the spots on the sun. As this is an age of persistent inquiry and investigation, every theory, however extravagant, or vague, may stimulate inquiry until a correct solution of the problem is obtained.

I submit the foregoing theory, and though, perhaps, containing scientific errors, yet the principles on which it is based, and with which it harmonizes, are just as plausible as any embraced in the famous nebular theory itself, so generally accepted.

C. A. HOPPIN.

Worcester, Mass.

Ventilate your Sewers---A Cheap Deodorizer.

MESSRS. EDITORS:—I was much interested reading an article in your paper of 27th November, headed "Ventilate your Sewers." One such article may be of more direct benefit to a family than all the pages of general news published in a thousand daily papers.

It is a serious question of direct application. Are the majority of low fevers and putrid diseases in cities and villages owing to, or caused by gases arising from sewers, drains, and out-houses? My family physician has traveled through many foreign cities, and his experience corresponds with the article you copied from the *New York Medical Journal*. When called to attend a family suffering from any lingering or periodical disease, he at once examines all the waste pipes leading to sewers or vaults, and almost universally finds a local cause, and orders it at once remedied, and so checks the spread of the disease. There is scarcely a family that would not be directly benefited and made happy by the use of a cheap deodorizing material. Most of the articles used are too expensive or have an unpleasant smell of themselves. Caustic lime or chlorine has a too active effect, liberating a gas that irritates the lining membranes of the throat and nose, which perhaps are already partially diseased, and the immediate effect is catarrh, asthma, etc.

The present ventilation of sewers is only through the pipes and imperfect traps under, and leading up into our houses, poisoning the inmates. The pipe ventilators separate from the house, and delivering the gas above the houses, would at least reduce the poison and obviate its worst effects.

I would suggest that no waste but water be allowed to enthe sewers. In France a clay marl is used for deodorizing the waste matter, and one quart each day answers for an ordinary family. The clay marl can be had near to most of our cities. Here it can be put on to New York Central or New York & Erie cars at five dollars for the tun or 2,000 lbs. It is composed of about equal parts of alumnia, silica, and calcareous powder. Pure clay is too plastic, and requires mechanical mixing, while the marl readily dissolves and combines with any acid matter or gas until the whole is converted into a fine mold and valuable fertilizer. Our present out-houses are nuisances most of the time, and can be kept free from all smell at one half the price paid for cleaning, and even made a source of revenue. I have tried the clay marl, and find it answers the purpose perfectly. The moment it is touched by acid matter it begins to fry or effervesce until every particle is used, and by its own nature of affinity, bringing every particle of clay in contact with the matter to be deodorized. Stone, or pure lime, or sand marls would not act by their own chemical and mechanical arrangement.

O. COBB.

Buffalo, N. Y.

Shooting Fish Under Water and Flattening the Bullets.

MESSRS. EDITORS:—Some months ago myself and a companion were out sporting when we accidentally discovered a school of fish at the bottom of the flume, at the outlet of a pond. The number of fish in the school was about forty, and they lay as close together as they possibly could on the bottom of the flume at a depth of just eighteen inches below the surface of the water. We had no fishing tackle with us, and we much desired to capture this prize. Myself and companion had with us each a fine sporting rifle, and we were not strangers to the use of the weapon. We had, many times before, killed fish by shooting them under water, but not at so great a depth.

At length we concluded to try the effect of our rifles, and, having first secured the passage of the stream below so that the fish could not escape, we commenced operations by discharging our pieces directly at the center of the finny tribe. We fired shot after shot, until more than thirty shots had been fired, and, in the mean time, we had only disabled two or three fish, and none of these was struck by bullets. We shot at these fish, sometimes at an angle with the surface of the water, and sometimes directly downward.

We were disappointed and laid down our arms and waded into the stream. With the aid of our hands and some skillful engineering, we caught nearly all the fish. It now occurred to me that we had used quite too heavy charges of powder to kill fish at so great a depth under water, and on looking carefully into the water, I discovered several of our bullets lying on the bottom of the flume. I again entered the water and gathered up six of them, and, to my surprise, I found them all flattened out by striking the surface of the water, very similar to what they would have been had they been shot directly against a rock.

The balls we used were elongated ones, with flat points. These balls were flattened the instant they struck the surface of the water. The points of them were upset and driven back toward the butt, and spread out until they were twice the diameter of the butt, and very much resembled a low-crowned hat; while the butt of the ball remained in perfect shape. We now loaded our rifles with just one half the usual charge of powder, and killed the two remaining fish at a depth of twenty-two inches under water, by making two shots at each fish, and one of the fish received a ball directly through him. The next day I went again to the place and killed several more fish, and some of them at a depth of more than two feet under water.

I afterwards made a number of experiments by shooting at a target that was placed at the bottom of a large watering tub, eighteen inches under water, and found the average penetration of the balls, in a pine target, to be one half an inch. I also tried round balls, under the same circumstances, and found the penetrations in the target nearly as great, while, at the same time, they went more truly.

The quantity of powder used in these experiments was just sixteen grains, which was just one half of the usual quantity used for common sporting purposes. The bore of the rifles used was just 130.

The reason that 16 grains of powder would cause the deepest penetration in water was, that this quantity was the greatest that could be used without upsetting the point of the ball. I also found that this same quantity of powder for a charge, when shot in the air, only caused a penetration of two and one half inches in a pine target. I also found, in shooting at a target, under water, at an angle of 45° with the surface of the water, that, in order to strike the mark, I was obliged to aim under the mark (apparently) at least one inch for every six inches that the mark was below the surface. This was to compensate for the refraction of the rays of light as they left the surface of the water.

I will here remark, that when a fish, or other object, is seen in the water, it is always at a far greater depth than it appears, and, oftentimes, nearly double that amount; hence, the great difficulty of aiming correctly at a fish in the water. Yet, with a little practice, a rifleman can kill fish, quite often, at a depth of from one to two feet under water. It is not necessary that the fish should be struck by the bullets, for if the ball should pass close by the fish, the violent agitation of the water, caused by the ball, instantly stuns and renders the fish insensible, and it immediately turns over on its back.

I send you two samples of bullets, which were shot with full charges of powder. One of these bullets was shot at an angle of about 45° with the surface of the water, and the other was shot directly downward. You will instantly perceive which is which. Every bullet, shot with full charges of powder, was found flattened at precisely the same angle that the bullet touched the surface of the water; hence, it is plain, that this flattening of the bullets all takes place at the surface, and before they enter the water at all.

JOHN S. DUTTON.

Jaffrey, N. H.

Letters from Inventors.

MESSRS. MUNN & CO., *Gentlemen:*—I have received my patent, dated Nov. 9, 1869, and I am highly pleased with the way in which the business has been done. The ability which carried it through and the scrupulous care bestowed on its preparation are worthy of praise, and I will gladly intrust to your hands any further business I may have to do.

I remain, very truly yours, SAMUEL BONSER

Dover, N. H., Nov. 15, 1869.

Gentlemen:—I have just received my patent, and I am very much pleased with your promptitude in securing it. I can assure you that any of my friends who contemplate taking out patents—if I have any influence—will take them out through your Agency. Respectfully yours,

J. RICE.

Middletown, Ind., Nov. 23, 1869.

Gentlemen:—I have just arrived home after being absent for some time. Permit me to express my gratification in being so fortunate as to obtain your professional services in securing my patent. For the prompt and highly satisfactory manner in which you have conducted my business at the Patent Office, please accept my thanks. I cannot too highly commend your mode of doing business to any one who may need your services. Yours very truly,

DAVID P. STEWART.

Spruce Creek, Pa., Nov. 27, 1869.

Gentlemen:—The letters patent on my animal trap are received. You will please accept my thanks for the prompt, gentlemanly, and satisfactory manner in which the business has been accomplished through your Agency. I have examined the claims thoroughly, and could not add or take away a single word to make them better.

Very respectfully yours,

C. G. FRUSHOUR.

Lagro, Ind., Oct. 29, 1869.

For the Scientific American.

THE MANATEE: THE HUMAN FISH.

[BY I. CANTINI.]

To believers in the Darwin theory it will be of interest to know that in the quiet bays and rivers on the eastern coast of Central and South America there lives an animal, which might be rightfully considered as the connecting link between men and fish. It is the manatee, the water siren, the sea-calf, or sea-cow, as this strange animal is sometimes called. It belongs to the order of the Cetacea, and is altogether herbivorous; living on grass which grows under water, or on herbs which it seeks on shore.

The body is pisciform, and measures some fourteen or more feet in length; the skin being very thick, without hair, and of a dark color. The upper part of the body, especially of the females, much resembles that of a woman, the breasts being of the same form. In place of the fins of the ordinary fish, the manatee has a short arm of only one joint, which terminates in a sort of hand, on which the nails are distinctly visible, and which the animal uses with much dexterity, in moving about when on land, and in carrying its young. This limb has caused this animal to be called manatee, from the Latin word "*manus*" the hand.

The writer, who for several years resided in those countries where these animals abound, has seen the animal, and has been told repeatedly by the natives, that the female holds her cub to suckle as the mother does her babe.

The tail of the manatee is shaped like an open fan, and the close observer will perceive ten divisions, which mark the ten toes.

Manatees swim by the help of this broad tail, which moves up and down, and not from right to left like that of the fish. This limb, which at first sight appears to be a mere fin or nerve, melts almost entirely into butter when fried in a pan, and is highly prized by the natives for ointments and for other medicinal purposes.

The animal weighs from a thousand to fifteen hundred pounds, and the meat is considered a great relish. It looks and tastes much like pork, and needs a good deal of cooking. It is a strange fact that the flesh keeps longer from decay than any other, and it is therefore salted and preserved like pork.

They are caught with harpoons by the Indians, who know their haunts and customs, and it seems as if they were becoming more scarce every year.

Much has been fabled about these water sirens, that needs corroboration from scientific men, who seem to have taken but little interest in these strange animals. Some have assured me that their voice resembles the bellowing of an ox, others that it was perfect music. I am induced to believe the latter, as they are well known under the name of "sirenia," or "sirens," which appellative they could only derive from their charming voice. Whether this be so or not, remains yet to be confirmed, like the harmonious song of the dying swan.

HOW TRAINS ARE MOVED BY TELEGRAPHIC SIGNALS.

From the Evening Post.

The importance of the telegraph in connection with railways, was recognized many years ago; but the first practical application of telegraphic signals in moving trains was made on the Erie line in 1850. Previous to that time, locomotive engineers and conductors were distrustful, and there are several instances on record of their positive refusal to obey telegraphic orders, especially when their trains were directed to proceed beyond stations, to meet and pass trains going in opposite directions, except in cases where such orders were plainly expressed in printed orders upon their regular time-tables. In 1850, however, when the Erie road had but a single track between Piermont and Elmira, it was plainly demonstrated to the superintendent (the late Charles Minot) that the telegraph would be a great assistance to the road, and it became plainly evident that the telegraphic service must eventually be adopted upon all main trunk lines.

When the first telegraphic message was sent over the Erie wires a train filled with western bound passengers was lying at Turner's Station, awaiting the arrival of an eastern-bound train, which, by the time-table, should meet and pass at that point; but owing to an accident two hundred miles west, it could not possibly arrive until five or six hours later. Mr. Minot was a passenger upon the train lying at Turner's. He immediately decided to test the accuracy of the telegraph, and make a beginning of the plan of ordering trains to proceed to points further in advance, and not further delay the stationary train when the track was known to be clear as far as Port Jervis, a distance of one hundred and fifty miles further west. Orders were accordingly sent over the wire to the station agent at Port Jervis to hold all easterly-bound trains until the arrival of the western train. This order was given in order to make all safe, and prevent a collision in case the former should arrive at Port Jervis before the latter. An answer was immediately given by the station agent, announcing that he fully understood the order and would do as directed. All appeared safe, and the engineer was ordered to start west; but, to the astonishment of Mr. Minot, he positively refused to move the train from Turner's upon any such arrangement. Mr. Minot immediately mounted the locomotive, pulled out the throttle valve and ran the train himself, assisted by the fireman, and reached Port Jervis according to programme.

The ice was broken, and since that time the telegraph has been acknowledged as a positive necessity on all long railroad lines in this country. The form of giving the necessary directions, however, has been somewhat changed; and now the conductors and engineers of each train who receive telegraphic directions are telegraphed the name of the particular point at which they are to meet, and answers are required from them to ascertain whether they understood orders, before any movement is made.

The following is the form of message required to be sent and received:

By telegraph from ——— station to conductor and engineer: You will run to ——— station regardless of train number ——. 31. ——— Dispatches.

The numeral abbreviation means "How do you understand?"

The answer to this dispatch must read as follows:

32. (I understand I am to) run to ——— station regardless of train number ——. ——— Engineer. ——— Conductor.

Upon receiving the announcement from the receiving operator that all is right, the trains are started without further orders.

All special orders for the movements of trains are required to be communicated in writing, and extraordinary precautions are taken against the possibility of misunderstanding directions. Not more than one person on a division at the same time has power to issue train orders. The telegraph operator is required to read the messages aloud, in the hearing of the conductor and engineer addressed. Trains when in motion must approach stopping places in the supposition that another train is there to be met. Whenever a passenger train receives orders to meet and pass a freight train at a specific station, the conductor must not leave the depot until notice is received from the conductor that his train is safe upon the side track, out of the way.

No orders are given to move a slow train in the same direction, on the time, and ahead of a faster train, unless it has started—if a passenger train—at least ten minutes; and if freight, not less than twenty-five minutes in advance of the time the faster train may be reasonably expected to arrive at the station from which the slow train is first started. In cases where a slow train is moved by telegraph the following form of order is given to the conductor of said train:

To —— Conductor and —— Engineer:

You will run ahead of train No. —, to ——— station, conditioned as follows: Should you from any cause be unable to make *your running time*, you must as soon as you discover such to be the case leave your flagman to warn the following train in advance of which you are running, and report your arrival at the next telegraph station, 31.

In case of an accident where orders cannot be obtained by telegraph, the station agent has power to stop trains. The speed of live-stock and freight trains is restricted to eighteen miles an hour; and extra freight trains, commonly called "wild cats," which have no time upon the regular table, are not permitted to attain a higher rate of speed than fifteen. Coal trains' time average twelve miles an hour. The latter cars being very light, cannot be kept upon the track at a high rate of speed.

Many of these orders and forms were original with Col. D. C. McCullum, formerly superintendent of the Erie road, and during the late war were in general use while he was military superintendent of all the railroads in the United States. Vast armies were moved in this way in a very successful manner.

A chronometer in the principal depot is the standard time of the road, and the time is telegraphed to all stations at precisely twelve o'clock each day. Fresh engines and men are attached to all through trains at the end of each division.

The salaries of division superintendents average $5,000 a year; conductors and engineers, $100 a month; of baggage masters, $75 a month; brakemen, $1·75 a day; telegraphers, from $60 to $125 a month; station agents, from $500 to $2,000 a year.

The Hartford Steam Boiler Inspection and Insurance Company.

This Company makes the following report of inspections for the month of October:

During the month 540 visits of inspection have been made; 817 boilers examined, 715 externally and 156 internally; while 73 have been tested by hydrostatic pressure. The number of defects in all discovered are 280, of which 23 are regarded as especially dangerous. These defects in detail are as follows: Furnaces out of shape, 11; fractures in all, 19—3 dangerous.

One of our inspectors remarks as follows on fractures which he discovered: In the fracture marked dangerous, a rip seam occurred 36 inches long, which I attribute to three causes; first, defect in plate at rivet seam; second, blowing water out of boiler while hot; and third, bridge wall too high, allowing fire to concentrate too much at one point.

The blowing out of boilers while hot, and especially filling up directly with cold water, are not unfrequently attended serious consequences. The unequal contraction strains joints, looscns tubes and flues, preparing the way for leaks, which, in time, are the occasion of no little trouble and danger. Another inspector finds the upper tube sheet of an upright boiler badly fractured, and the boiler generally so badly strained as to be unfit for use, and hardly worth repairing.

Burned plates, 18—2 dangerous; new crown sheets were necessary; blistered plates, 43—1 dangerous. A blister was found on a crown sheet some two feet long and four inches wide, taking away nearly half the thickness of plate. Blisters are occasioned by a want of homogeneity in the iron. From various causes sheets become laminated in rolling, and the surface over the fire receiving the greatest heat, expands most, and bulges down. Sometimes these blisters are three, four, and even six-leaved. All such defects should be carefully examined, and the blisters trimmed off by an expert. If the portion of the plate remaining is sound, and the plate has been effected but little, it may not be dangerous; if, however, the plate is considerably reduced in thickness, it should be repaired at once.

Cases of internal corrosion and grooving, 6; external corrosion, 22—4 dangerous; incrustation and scale, 55—3 dangerous; water gages out of order, 22—1 dangerous. While water gages are very convenient boiler appliances, they should not be depended on to the exclusion of *gage cocks*. The first thing an engineer should do in the morning is to try his gage cocks, then proceed to unbank and start up his fires. Blow apparatus out of order, 3—1 dangerous; safety valves overloaded and inoperative, 29—5 dangerous; five of these were in such bad condition that they had to be taken entirely off, and the valve "backed out" with a bar fitted for that purpose. We have frequently referred to the neglect of safety valves. They should be raised carefully every day to see that they are in good working order. Pressure gages out of order, 52, varying from 12 to +20; improper staying, 3—all dangerous; boilers condemned as unsafe and beyond repair, 1.

The Doom of the Maories.

"As the Pakeha fly has driven out the Maori fly;
As the Pakeha grass has killed the Maori grass;
As the Pakeha rat has slain the Maori rat;
As the Pakeha clover has starved the Maori fern
So will the Pakeha destroy the Maori."

These mournful words of a well-known Maori song, are considered both by the Maories themselves, and by the Pakehas, or European settlers, as prophetic of the fate to which the native race of New Zealand is doomed. We trust the prophecy will fail in its fulfillment. We are well aware that in giving expression to our hope in regard to this matter, we are running counter to the ideas entertained by the majority of men at the present day—a majority composed of the thinking and the unthinking alike. Even intelligent travelers, like Mr. Wentworth Dilke, regard the fulfillment of the prophecy as certain. "Nature's work in New Zealand," he says, "is not the same as that which she is quickly doing in North America, in Tasmania, in Queensland. It is not merely that a hunting and fighting people is being replaced by an agricultural and pastoral people, and must farm or die. The Maori does farm; Maori chiefs own villages, build houses which they let to European settlers. We have here Maori sheep-farmers, Maori ship owners, Maori mechanics, Maori soldiers, Maori rough-riders, Maori sailors, and even Maori traders. There is nothing which the average Englishman can do which the average Maori cannot be taught to do as cheaply and as well. Nevertheless the race dies out. The Indian dies because he cannot farm; the Maori farms and dies." As a mere matter of fact, destruction has no doubt gone on to such an extent as to threaten extinction; but is the utter extinction, therefore, inevitable; if so, is it the result of a divine law, and how is it such a result? That is the question we ask.

Now, as it must surely be admitted that the extinction of any race involves a wrong, we are compelled to inquire if there be no remedy applicable before the process of wrong has reached its consummation? The ruin of races which have perished aforetime, has been owing to the unrestricted operation of what, in Bible language, is called the law of sin; in the language of civic life, vice and crime; in the language of economists, self interest; and in that of our modern *savans*, the law of natural selection and struggle for existence. Grant full swing to the operation of any or all of these principles of human nature or laws of human action, and the Pakeha will, as a matter of course, crush his Maori brother, just as the strong beats the weak all the world over, and as the strong have done through all ages since the day of Cain. But is there no other force than that of the strong, no other principle than that of self interest, no other law than that of a mere selfish struggle for existence? Is it in vain that Christianity has proclaimed a higher law of fraternity between man and man, rich and poor, between race and race, a law of justice or respect for equal rights, and above all a law of philanthropy or kindness towards the weak, the helpless, and the erring? Talk as they will of the lower races of humanity dying out by operation of a natural law, it would be a more scientific way of putting it to say that their destruction, whenever it does occur within the reach of Christian civilization, is owing to the violation, by a professedly Christian people, of the laws of Christian ethics. In a word, the superior race on coming in contact with the inferior, has repudiated not only fraternity and kindness, but common justice.—*Illustrated Australian News.*

Improved Railway.

The object of this invention is to enable cars to be run with safety at great speed, to give sure warning of their approach to a station, and to permit the ready ascension of steep grades.

Our readers are well aware that the smooth traction wheel, though answering admirably for such ordinary grades as are employed on railways, fail when applied to the ascension of very steep grades, examples of which are found in the Mount Washington railway in New Hampshire, and Fell's railway over Mont Cenis, in Switzerland. They are also aware that the danger of running off the track increases with the speed of the train; any slight obstruction or unevenness in the track under such circumstances causing the wheels to bound, as it were, vertically.

For the ascension of steep grades many devices have been employed, among which may be mentioned a central toothed rail with horizontal wheels gearing into both sides. This device necessitates considerable complication in the construction of the locomotive, which it is desirable to avoid.

The plan shown in our engraving, while it does not require much variation from the form of locomotive employed at present, so that the wheels may be used as ordinary smooth traction wheels on level or slightly ascending grades, provides for additional tractive power when steep grades are reached.

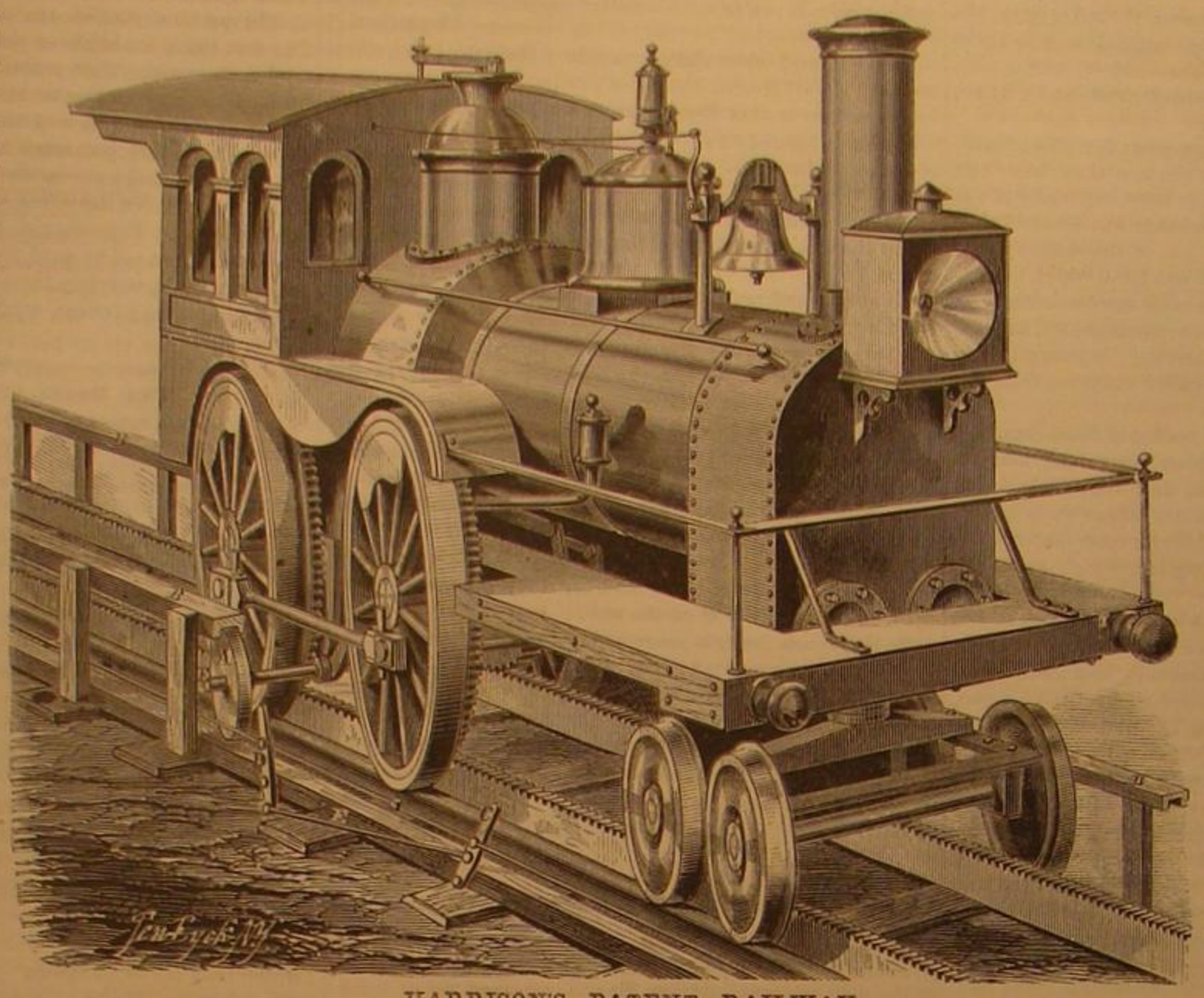
The first object desired to be attained in this form of construction, is to secure safety at high speed. To this end the locomotive is provided with extra wheels, A, attached to a shaft connected with the engine in the manner shown, or in any other suitable and convenient manner; which wheels run along the grooved under side of elevated rails, B, connected with and supported from the sleepers just outside the principal rail upon which the locomotive runs. Cars are provided with wheels attached to and playing upon the ends of the axles, to which the ordinary wheels are attached.

At stations and other places where these rails are not required, they may be interrupted; the entrances to their grooves being made flaring to insure the easy entrance of the wheels, A.

The adaptation of locomotive and track to the ascent of heavy grades is accomplished by placing toothed rails on the inner sides of the ordinary rails at such grades, into which toothed wheels fixed to the axles of the driving wheels, and on the inner sides of the driving wheels, mesh and prevent slipping which would otherwise occur. On exceedingly steep grades, where even the toothed wheels would otherwise be liable to slip from the teeth of the rails, the elevated rails above described hold them to their work.

To give warning of the approach of a train to a station, wires running parallel to the track and extending a mile or more from the depot, but interrupted at intervals and connected with systems of levers, C D, are employed; the end of the wire at the station being connected with a bell. The levers are pivoted to a support placed along the side of the track and are joined by a connecting rod, E, in such a manner that when the projecting end of the axle, F, strikes the one more remote from the station, D, it draws the one at C nearer to the station, into a vertical position which in its turn is depressed; and thus a reciprocating movement is imparted to the wire, and through it to the bell at the station, which is thus sounded. The length of time through which the bell will ring, depends, of course, upon the number of the pairs of levers, and the frequency of its strokes upon their proximity to each other.

A patent on this improvement was obtained through the Scientific American Patent Agency, October 5, 1869, by David Harrison, of Fayette, Mississippi, the inventor of the railway supply apparatus illustrated and described in our last issue.



HARRISON'S PATENT RAILWAY.

Improvement in Velocipedes.

In the ordinary method of applying the power of the feet to the propulsion of velocipedes, each foot has to pass through the arc of a semi-revolution of its respective crank beneath the center of the shaft, during which time it can exert no propulsive force upon the vehicle, while a large proportion of muscular force is required to carry the leg through this arc.

If this motion could be utilized in propulsion, it is clear there would be a great gain. This cannot be done, however, with the ordinary crank, and with a loop over the foot so that the force of the flexor muscles could be applied to the crank, there would be but a slight gain, as these muscles are very weak in comparison to the extensors. The loop is, however, inadmissible for several reasons.

The invention we herewith illustrate is a novel and unique method of applying the power of the foot to a crank motion, and might perhaps be called a radially-expanding and contracting crank motion. It has for its object the application of the extensor muscles of the leg, with the advantage of a long leverage, while the circumferential motion of the foot and crank wrist is not increased.

The method employed to secure this result is ingenious and will be admired for the simple manner in which the required motion is attained.

LEWIS' IMPROVED VELOCIPEDE.

A grooved circle is attached to the standard, as shown in the engraving, eccentric to the action of the wheel, and strengthened by lateral braces. The arm of the crank passes through a hole in the end of the axle, but is not fastened to it. In the groove of this circle plays a small friction roller attached to the crank behind the foot-piece, which causes the crank to slide through the hole in the axle to and from the center during each revolution; its nearest approach to the center being during the time it passes under the center.

Thus a greater leverage is obtained for the forward thrust of the foot, and as the grooved circle can be made of the same size as the circle described by the common velocipede crank, the motion of the leg is no greater than before. But the leg during the forward thrust is more extended and a more advantageous application of the muscular power can be made than when the leg is more flexed.

The inventor claims that the increased ease with which a velocipede can be propelled with this attachment, will be found a great aid in ascending grades, and will greatly mitigate the fatigue of velocipede travel on ordinary roads.

The inventor of this ingenious device is Mr. Edward A. Lewis, of St. Charles, Mo., to whom was granted a patent for it, through the Scientific American Patent Agency, October 26, 1869.

The Foot Lathe.

The foot lathe—the terms hand and foot lathe are synonymous—is generally used, at the present time, by small machinists, manufacturers of gas fixtures, amateurs, etc.; men who do not work a lathe constantly, but are called to braze or solder, or, perhaps, to fit some detail with a file. For these uses the foot lathe is one of the cheapest of tools; for the same person that does the work furnishes the power also, so that a man working on a foot, or hand lathe, as it is often called, ought to have first-class wages. Moreover, a first-rate foot lathe turner is always a good mechanic, for it takes no small degree of dexterity to perform the several jobs with ease and dispatch and certainty. To always get hold of the right tool, to use the same properly, so that it will last a reasonable time without being ground or tempered, to rough-turn hollow places with a square edge, to chase a true thread to the right size every time, without making a drunken one, or a slanting one, to make a true thread inside of an oil cup or a box—all these several tasks require good judgment, dexterity, and a steady hand. Of course, where a slide-rest is used, the case is different. We allude, specially, to a cutting tool managed by the hand.

To do all these things, however, it is necessary to have tools, and good ones, or none. It is an old saying, that a bad workman quarrels with his tools, but a good workman has a right to quarrel with bad tools if he is furnished with them through chance or design. It is impossible to execute good work with a dull tool, one badly shaped or unsuited to the purpose, and, therefore, it is important to set out right at the beginning.

There is no tool more efficient in the hands of a good workman, than the diamond point. For roughing off a piece of metal, for squaring up the end, for facing a piece held in the chuck, for running out a curve, or rounding up a globe, it is equally well adapted. It may be truly called the turner's friend.—*Watson's Manual of the Hand Lathe.*

A Valuable Cement.

A correspondent, J. M. Benthall, finds the following recipe good. He says: "I have used the compound of glycerin, oxide of lead, and red lead, for mending a large cast-iron kettle that had been fractured across the bottom by allowing water to freeze in it, with the happiest results. It takes some little time to dry, but turns almost as hard as stone, and is fire and water-proof. For mending cracks in stone or cast-iron ware, where iron filings cannot be had, I think, it is invaluable.

"My method was as follows: Take litharge and red lead, equal parts, mix thoroughly and make into a paste with concentrated glycerin to the consistency of soft putty, fill the crack and smear a thin layer on both sides of the casting so as completely cover the fracture. This layer can be rubbed off if necessary when nearly dry by an old knife or chisel."

"If this will be of any service to the readers of your valuable paper they are welcome to my experience."

DURING the gale, on the night of the 19th ult., the water rose in the Niagara River at the rate of two feet per hour till the gale reached its hight. The new suspension bridge was severely tried. Some of the guys were broken, and the structure swayed two and fro like a reed, and it was regarded by many as certainly doomed to immediate destruction. It was closed against the public, but if it had not been no one would have ventured upon it while the gale lasted.

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VOL. XXI., No. 25...[NEW SERIES.]...*Twenty-fourth Year.*

NEW YORK, SATURDAY, DECEMBER 18, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

The next number will terminate the present volume, and with it will expire several thousand subscriptions. We have never had the intention to force our journal upon any one who does not wish it, or who does not feel it to be money well laid out; hence we apply, in all cases, the strict business rule of discontinuing the paper when the term paid for runs out. This we think is the best plan.

Our subscribers don't want to be dunned to pay up, and we do not wish to undertake a duty so unpleasant as to dun them.

We believe that the SCIENTIFIC AMERICAN has been worth during the past year, more than it has cost any one of its subscribers—indeed, it is almost a wonder to ourselves how we have been able to give a weekly journal of the size and quality, at so low a price. We are anxious to increase our circulation, and we know that thousands more would be glad to take it, if some one would but invite their attention to it. No other journal has had better friends in this respect than the SCIENTIFIC AMERICAN. We feel grateful for all the solid interest which has been shown to us in this respect, and we propose with the new year to reward our friends for making an extra effort, with cash prizes, and an elegant work of art as a premium for clubs. Read the announcement on another page, and be kind enough to let us hear from you on the subject. Successful competitors for the prizes will be sure to get their money when pay-day arrives.

A REMEDY FOR STRIKES.

We have often thought that most of the difficulties between employers and employés resulting in strikes and consequent distress to workmen and their families, with embarrassment as well as loss to the employers, might be adjusted by some system of arbitration, in which both parties should be ably and equally represented, and the result of which should be regarded as binding upon each. The difficulty has been to suggest a feasible plan for such a system, as it is always easier to point out faults than to suggest remedies for them. We have therefore been, and doubtless our readers will be, interested in an account of two different systems now in very satisfactory operation in England. Both these systems are based upon the principle of direct and equal representation of all the masters and workmen of the particular trade for which boards of arbitration are formed. In one system both masters and workmen choose their own mode of conducting elections. In the other, elections are conducted according to prescribed rules.

In one system the president is an independent umpire, whose decisions are final upon all points upon which the board is equally divided; in the other he is a member of the board, but has the casting vote in case of a tie.

The London *Mining Journal*, to which we are indebted for the particulars of these organizations, states that "another difference in practice between the two systems, is, that in the first the board meets at fixed periods, whether any dispute has arisen or not; and under the last it only meets to settle some dispute then pending. A third difference is, that on the Wolverhampton plan the board forms a code of trade rules, which are to be taken to be the foundation of the contract of service in the particular trade for a given district; while on the Nottingham system the trade rules are not incorporated with, and do not form part of, the constitution of the arbitration system. As to these three heads of difference, it is found, as the result of a now very extensive experience, that the best parts of each of the two systems are generally combined. In reference to the first, an independent umpire is usually preferred. The system of regular meetings is undoubtedly best. In fact, where meetings have been held at fixed periods it has been found that differences of opinion are reconciled, and disputes prevented, before any warmth of feeling is excited between the contending parties. Upon the third point the difference is rather in form than substance. Where workmen pass frequently from one locality to another it is found expedient to have written codes of trade rules, but where the whole trade is grouped in and about one center, then by a tacit understanding certain regulations are accepted as binding, without being formally declared to be so by the arbitration board."

In one system all compliance with the action of the board on the part of individuals is voluntary; in the other the submissions to the decisions are considered as absolutely binding upon individuals.

Many such boards of arbitration, organized in accordance with one or the other of these systems, have been established in England, and have proved admirably adapted to the amicable settlement of trade disputes.

The question as to whether such boards will be able to permanently settle the relations of labor and capital, need not, we think, be raised at this time. It would certainly seem that a long step is taken toward such a settlement, when labor and capital can thus meet on common ground, acknowledging a community of interest, and by equal representation tacitly admit equal rights for both.

We should rejoice to see the plan of arbitration tried in America, as we believe it to be, even if considered in the light of an experiment, one which tends to bring labor on to a higher plane, and which, by the promotion of free discussion of labor topics, must inevitably result in the enlightenment of both labor and capital.

CAUSES AND PREVENTION OF FIRES.—THE METROPOLITAN FIRE DEPARTMENT.

The president of the Metropolitan Fire Department, Gen. Shaler, has recently written a letter on the causes and prevention of fires. The season for the employment of all kinds of heating apparatus, and also for the increased use of lighting materials has commenced, and as the careless use of such apparatus and materials is, perhaps, the most fruitful cause of fires, we deem it important to aid in giving currency to the opinions and valuable suggestions of Gen. Shaler.

The most frequent cause of fires is considered to be the use of inferior kerosene oil. Gen. Shaler thinks no law can be enacted to reach personal carelessness in the use of this material, but suggests that those who sell it ought to be taught that "honesty is the best policy," by the infliction of severe penalties for the sale of any article of the kind which will vaporize below 100 degrees, Fahrenheit. To this suggestion every right-minded citizen who is acquainted with the subject, will say Amen!

Gen. Shaler regards the present law, regulating the sale of such oils, as defective, and urges the passage of such laws by the incoming Legislature, as shall render the use of inflammable fluids comparatively safe.

He mentions as another frequent cause of fires "gas burners, unprotected by globes or shades, in close proximity to window curtains. It is not uncommon to see a side burner in workshops, and even in large warehouses, where the surroundings are light woodwork, without a guard or protection of any kind."

With regard to means for extinguishing fires, he says, "The Commissioners are continually devising means by which fires may be reached at the earliest possible moment. The use of a portable fire extinguisher, carried by one man, for catching fires in their inception, was long since adopted; and it is now under contemplation to multiply them throughout the city, wherever convenient and desirable locations can be found. The introduction of a new and perfect fire alarm telegraph, with alarm boxes located not more than two or three blocks apart, and accessible to citizens as well as policemen and firemen on street patrol, thereby securing the earliest possible notice of a fire, is quite certain to contribute greatly to the successful working of the Department. The establishment of a complete system of street patrols by firemen, having for its object the discovery and extinguishment of fires, was one of the earliest means adopted to reduce the losses by fire.

"The heavy steam fire engines formerly used by the Department have been replaced by lighter ones. The horses have no difficulty in drawing these through the streets as fast as it is safe for them to travel. And as for the time consumed in hitching up, preparing to leave the houses, making connections to the hydrant after reaching the vicinity of the fire, stretching in and starting the water, under the present system of instruction, it is so incredibly short that the movements must be witnessed to be appreciated. Certain it is that no apparatus on wheels and worked by hand, however light and portable, such as are used by Captain Shaw, in the London Fire Brigade, can get an effective stream of water on a fire in less time."

The water is kept hot in the boilers and a run of a few blocks suffices to get up a working steam pressure. The facility and rapidity with which engines are started out is so great that Gen. Shaler avers he has witnessed the hitching up of a team, preparatory to leaving, inside of fifteen seconds, and it is not uncommon for a company to perform all preliminary work and issue from its quarters in thirty seconds from the first sounding of an alarm. He says even "at night, when all but the patrols are in bed asleep, a company, favorably situated, that occupies more than a minute after receiving the alarm in leaving quarters, would be ashamed to acknowledge it."

We feel sure that any one who has witnessed the prompt, rapid, and skillful evolutions of the members of the Metropolitan Fire Department in case of fire, will be willing to admit that a more efficient organization does not probably exist. The proof is, that except under rare and extraordinary circumstances, a fire is never permitted to reach beyond the building in which it originates, and in a large number of cases it is checked before extensive damage accrues. And this is done without noise and bluster, and in the best manner to obviate unnecessary damage by flooding.

THE ASSERTED SUPERIORITY OF THE RIGHT HAND.

Our article on the Education of the Hand, published on page 297, current volume, has called forth some criticism from those who seem to be ready to believe anything, provided it is printed in a book. We have been asked to remember a very absurd argument in Bell's Bridgewater Treatise, going to prove that there is a natural cause for the common preference of the right hand for ordinary purposes.

This argument is based upon the fact, that the left side of the body is generally weaker than the right, both in regard to muscular strength and in its vital or constitutional qualities.

We do not deny this fact, with reference to adults, and it is to adult opera dancers, and the measurement of adults by tailors and shoemakers that the author in question refers for his illustrations of the comparative weakness of the left side. We differ from him, however, in regarding this weakness as an *effect*, not a cause, of the greater use of the right limbs.

There are, however, some statements made in this connection by the same author, which we dissent from. We admit, that "in walking behind a person we seldom see an equalized motion of the body," but we deny, that if we look at the left foot, we shall find that the tread is less firm upon it than upon the right, in the majority of cases. We are confident that the right foot will be found by the careful observer to "toe in" as often as the left foot, and will shuffle quite as often. We deny that these defects are "more apparent in women than in men, because the elasticity of the female step depends more upon the ankle than the haunches." And we most emphatically deny, that "no boy hops on his left foot unless he be left handed." These assertions are not supported by facts, as we have observed them, and we do not believe any candid person will find himself convinced of their truth by observation.

The other argument used by this author to prove a natural superiority in the right side is scarcely less absurd than the one we have stated. What does the adaptation of implements to the use of the right hand prove, other than that because we have, by education and habit, acquired a preference for that hand, and increased power to use it deftly, we like to use it better, and, therefore, require our tools to be constructed in accordance with our *acquired preference?* We educate those who naturally prefer to use the left hand in spite of the tendency to unconsciously imitate those who surround them—we educate, we say, such children to use the right hand. Who believes that, if the attempt were made we could not educate all children to prefer the left hand? And how would the tools be made then? And which side would be the weaker then? Had it been the custom to educate children thus, so illogical a reasoner as Bell would have employed the same line of argument to prove the superiority of the left side. Think of a learned writer trying to prove that God has made man a lop-sided, unsymmetrical being, and this for a wise and obvious purpose.

Starting with the effort to prove an all-wise design in all things, as they exist, it is no wonder a man like Bell drew erroneous conclusions. He would, had he written upon the subject, have shown that the general want of power in the human race to move the muscles of the external ear was, also, the result of benevolent prevision, though "the obvious purpose" has proved a puzzle to anatomists.

The truth is that no reason for the peculiarity can be found in the anatomy of the human form, nor in the characteristics of the human mind, as will be amply demonstrated if physical educators ever turn their attention to the subject; but even were it found to be natural, it could be viewed in no other light than a defect, which it is expedient to remove, not a blessing bestowed upon man for a wise purpose, as Bell would have us believe.

THE SUEZ CANAL.

The accomplishment of this greatest engineering work of ancient or modern times, has taught important lessons to both hemispheres. It has shown that capital and skill together are all-powerful in subjugating natural obstacles to commerce. It has taught the Western hemisphere that a similar opening must be cut somewhere in the neck of land which connects North and South America, and the lesson must be heeded. It has given to the world important inventions, which will greatly aid in the performance of any similar work hereafter; and has more than all demonstrated the fact, that climate can be controlled by human agency, so that arid deserts may be literally made to "blossom like the rose." The whole work has been performed within ten years from its commencement, an instance of rapid work, unparalleled, except in the history of the Pacific Railroad. These works have helped to enforce the truth that the greatest rapidity in the execution of such enterprises, consistent with thorough

ness, is the most economical way to prosecute them. But the Suez Canal has had obstacles to overcome that the Pacific Railroad did not encounter. It struggled with diplomatic troubles till 1864, had its laborers scattered by cholera in 1865, and in 1867 found itself at the bottom of its purse, and at its wit's end to obtain a loan of 100,000,000 francs, necessary to complete the work. The indomitable courage and perseverance of M. Lesseps, his skillful financial management, which at this juncture saved the enterprise, are they not written? The grand celebration which inaugurated the work has passed into history. It must not be long ere the completion of a similar work shall be celebrated on this continent.

THE SPANISH GUNBOATS.

The Spanish gunboats, thirty in number, recently seized by the United States Government, are perhaps an instance of the most rapid naval construction on record. As anything pertaining to these vessels is now a matter of current interest, and will be of historical importance in the future, we have visited the Delamater Iron Works, at the foot of Thirteenth street, North River, this city, where the fleet is at present lying, and have gained the following particulars.

The contract was entered into May 5th, and the first keel was not laid until the 19th of the month; yet on the 23d of June the first vessel was launched, and by the 3rd of September the last of the thirty was floated.

They are all built after one design, prepared by Capt. Ericsson, of monitor fame. They are twin screw steamers, 103 feet in length, 22 feet beam, and their depth of hold is 8 feet. Their maximum draft is, we are informed, to be 5 feet. The screws are 5 feet 10 inches in diameter, and are each driven by two steam cylinders, the length of stroke being 14 inches, and the diameter of the pistons 15 inches.

The arrangement of the steam machinery is the most compact we have ever seen, the whole, including pumps, surface condenser, fresh water generator, etc., resting on a surface of ten feet square and rising from this surface only six feet. The nominal horse-power of the engines in each boat is 140. They were set up in the works, and placed bodily on board the gunboats in the following manner: A model of the bed plate of the machinery was made of wood, this was taken into the vessel through the boiler hatch, and lined properly, when it was taken out, and the engines were in turn let down, hauled aft by steam, and fastened down. So expeditious was this process, that on a single afternoon, between one and six o'clock, the machinery was placed in three boats.

There are other peculiarities of the engines which it might be interesting to notice, but we must pass to other features of these in some respects unique war vessels.

The lines are made full at the bow, in order to support a heavy bow gun. This gun is to be an improved 100-pound parrott rifle, mounted upon Capt. Ericsson's new gun carriage. This carriage and the arrangement of the engines above described, are novel and striking features of these boats.

The rigging is of wire, and the masts and smoke-pipe are given more rake than usual. A peculiarly light and graceful appearance is thus imparted.

A preliminary trial of the gunboat first finished was made in September, and the official trial took place Oct. 25th. The results of both these trials were very satisfactory. The ground selected for the official trial was from Fourteenth street to One Hundred and Twenty-Ninth street, on the Hudson River, a distance of 5·81 statute miles. The run up the river against the tide occupied 32 minutes and 35 seconds, and the return trip was made in 29 minutes and 35 seconds. Total distance, 11·62 miles. Total time, 62 minutes, 10 seconds. Considering the small size and full lines of these gunboats, the speed attained is considered remarkable. The vessel was loaded with pig iron during the trial, to her intended maximum draft.

The execution of so large a contract in so brief a time by a single establishment, is a marvel of rapid work, but when it is remembered that the inside finish is much more elaborate than that usually given to boats of this class, and that the contract included the entire outfit of the fleet, it must be considered as almost an unparalleled achievement in its way.

THE RIGHTS OF THE GOVERNMENT AND PATENTEES.

Charles W. S. Heaton and William H. Webb, recently brought suit, in the United States Circuit Court, against George W. Quintard, and others of this city, for an infringement of Heaton's patent, of April 14, 1863, for a system of defensive armor for marine and land batteries.

Such system is described in the specification of the patent as consisting of iron armor plates, laid in the usual way against the longitudinal or outer timbers of a vessel, such timbers being such as to form a sufficient backing to rigidly support the armor plates, and of an outer layer of timber covering the armor plates, and only bolted on sufficiently to hold it to its place, and of a plate or thin sheath on the outer surface of the timber.

The Government ordered the contractors, Quintard & Co., to apply substantially this arrangement of armor to the *Onondaga*, whereupon the owners of the patent brought suit to recover damages.

Judge Blatchford dismissed the bill on the ground that the defendants were acting under the order of the Government in what they did, and were but agents of the Government.

In the course of the proceedings before Judge Blatchford, it appeared that the defendants subsequently bought back the vessel from the Government, and it remains now to be determined how far such after purchase protected them in the use of the Heaton armor plate. If the Government has a reserved right to make and use a patented invention, then it is clear that the defendants had such right also. That question was not, however, involved in this suit, which was commenced before the later purchase took place.

The Judge cites an English case, decided in 1865 (which, by the way, also arose out of a patent for armoring vessels), in which it was held that the Crown had the right to use any article, notwithstanding its being patented. It is quite clear, that if the Government is not called upon to deal with a patentee, as having a sole right to his invention, such patents as this will be, in connection with Government work, of no advantage to the inventor.

The idea of such an assumption on the part of our Government as against the rights of a patentee, is simple monstrous. In time of war the Government possesses the right to seize any man's property, on the plea of public safety, by paying for it; but in times of peace no such right exists, and we do not believe that our federal courts will sanction any such outrage of the rights of a patentee.

MEN OF PROGRESS:—CELEBRATED AMERICAN INVENTORS.

A sketch of the lives of the celebrated men whose portraits, engraved in Sartain's best style, after the original painting by Schussele, are offered this year among our subscription prizes, will be read with interest by all our readers.

Their inventions, and the wonderful energy with which they prosecuted their labors against discouragements and trials of no ordinary character, stamp them as men of superior genius; and we defy the world to produce the same number of men whose countenances give more unmistakable marks of intellectual strength than these.

The artist has chosen to represent the group as surrounding a table on which rests a Morse telegraph instrument, which is a subject of animated discussion among those immediately surrounding the stand, to which those standing a short distance away are listening with absorbed attention. At the extreme left stands Mr.

JAMES BOGARDUS.

This prolific inventor was born in Catskill, New York, March 14, 1800. He was a descendant of Dominee Bogardus, one of the early settlers, and engaged in farming. At the age of fourteen, James was apprenticed to a watchmaker, and subsequently became a skillful workman. By close application he became a good die sinker and engraver. Desiring to see something of the world, in 1820 he went to Savannah, Ga., and there worked at engraving. He afterward returned to New York, engaged in watchmaking, and invented a three-wheeled chronometer clock, for which he received the highest premium at the first Fair held by the American Institute. One of these clocks has been in good running order for more than thirty years without needing cleaning. In 1828 he invented the ring flyer for cotton spinning, now in general use. In 1829 he invented the eccentric mills, which differ from all other mills; the grinding-stones or plates running the same way with nearly equal speed, but eccentric to each other. In 1832 he invented and patented a dry gas meter; this received the gold medal from the American Institute. He also invented a machine for transferring bank note plates for Messrs. Rawdon, Wright, and Co., which invention is in universal use for that purpose. In 1836 he invented an improved dry gas meter, overcoming difficulties which had appeared in the meter patented in 1832, and this meter has been extensively used. In September, 1836, he visited England, and, in competition with English and French engravers, made a machine that excelled all others in engraving the head of Ariadne in relief, and which would also from the same medal twist the face in a variety of comic shapes. This same machine engraved a portrait of the Queen, Sir Robert Peel, and others. While in England he contracted with a company in London to build a machine for transferring bank note plates and other work, and also a machine for engine-turning, which machine was to copy engine-engraving. A reward being offered in England for the best plan of carrying out the penny post system, Mr. Bogardus' plan was adopted over 2,600 applicants, and is now universally used. Returning to New York in 1840, he invented machines for pressing glass tumblers, etc., now in common use, and also a machine for cutting india-rubber into fine threads. He also made improvements in drilling machines, and important improvements in the eccentric mills, adapting them to almost every purpose. In 1847 he put into execution his long cherished ideas of iron buildings; constructing a large factory in New York city entirely of iron, five stories high, ninety feet long, and the first cast-iron building in the world. Since then iron buildings have been erected in nearly all the principal cities of the United States and elsewhere. This invention formed a new branch of business for mechanics, benefited nearly every foundery in the country, and gave an immense impetus to the manufacture of iron.

The likeness of Mr. Bogardus given in our prize engraving admirably portrays the peculiar reflective cast of countenance characteristic of great inventors.

In the middle background, listening to the discourse of Professor Morse, but as though he was familiar with its details, not looking directly at the apparatus, stands

JOSEPH SAXTON,

who was born in Huntingdon, Pennsylvania, in the year 1799. His early educational advantages were slight. At thirteen years of age he was apprenticed to a watch and clock maker, John McKennon, who died in about a year after. Mr. Saxton continued the business till 1818; when he went to Philadelphia and worked at his business for a short time. He next worked for M. W. Baldwin and Co., at machinery. In 1823 he worked again at watchmaking, and invented the machine for giving the epicycloidal form to the teeth of wheels. In 1825 he made an astronomical clock for Mr. J. Gamery, of Burlington; in which was an improved escapement and tubular compensation pendulum rod. For adjusting the compensation rod he invented the reflecting pyrometer and comparater. This was applied to the State House clock in Philadelphia. In 1829 he went to London, remaining there until 1837, and inventing the magneto-electric machine, and was there associated with Wheatstone in experiments for measuring the velocity of electricity. On his return to Philadelphia he was employed at the United States Mint, where he improved the medal ruling machine, and with it engraved the plates for a book on coins published by the assayers. He afterward went to Washington, and took charge of the making of standards for adjusting the weights, measures, balances, etc., used in the United States Custom Houses. He also invented a self-registry tide-gage, a deep sea thermometer, a break circuit, and clock register used in astronomical observations, a dividing machine for dividing the scale on standard yards, and an hydraulic printing press with flexible platen. He also made other useful inventions, in connection with the Coast Survey Office at Washington.

Bending over the table, and pointing to a portion of the instrument stands the form of

PETER COOPER,

whose fine, benevolent countenance reflects his character. He was born in the city of New York, Feb. 12, 1791. His father was a lieutenant in the war of the Revolution, after the the close of which he established a hat manufactory, in which his youthful son Peter aided to the extent of his strength. During his youth, his father's undertakings being attended with little success, Peter had to work very hard. He attended school only half of each day for more than a year, and beyond the humble knowledge thus gained, his acquisitions are all his own. At the age of seventeen he was placed with John Woodward, to learn coachmaking, and served out his apprenticeship so much to the satisfaction of his master, that he offered to set him up in business, which Mr. Cooper declined. He successfully followed his trade; and subsequently the manufacture of patent machines for shearing cloth, which were in great demand during the war of 1812; the manufacture of cabinet ware, the grocery business in the city of New York, and finally engaged in the manufacture of glue and isinglass, which he has carried on for more than thirty years. Mr. Cooper's attention was early called to the great resources of this country for the manufacture of iron, and in 1830 he erected extensive works at Canton, near Baltimore. He erected subsequently a rolling and wire mill in the city of New York, in which he first successfully applied anthracite to the puddling of iron. In 1845, he removed the machinery to Trenton, N. J., and erected the largest rolling mill then in the United States, for the purpose of manufacturing railroad iron, and at which, subsequently, he was the first to roll wrought iron beams for fire-proof buildings. While in Baltimore, Mr. Cooper built after his own designs the first locomotive engine that was turned out on this continent, and it was operated successfully on the Baltimore and Ohio Railroad, thus identifying his name with the early history of railroads. Having taken great interest also in the extension of the electric telegraph, he was chosen President of the New York, Newfoundland, and London Telegraph Company. Mr. Cooper was one of the earliest and most persistent advocates of the present free school system, but finding that no common school system could supply a technological education, he determined to establish in his native city an institution in which the working classes could secure that instruction for which he, when young and ambitious, sought in vain. Accordingly, the "Union for the Advancement of Science and Art," commonly called the Cooper Institute, was erected in New York city; which building covers an entire block, and cost over $500,000. This celebrated institution and its objects are familiar to our readers.

As an inventor, Mr. Cooper is not generally known to the American public. Nevertheless, he possesses inventive talent of a high order. A recent summary of his inventions, published in the New York *Herald*, states that among his very earliest inventions was a self-rocking cradle. After he was married, and a cradle became one of the necessities of his household appointments, they were too poor to keep a servant, and the result was that he was called upon to rock the cradle with inconvenient frequency. He therefore invented a self-rocking cradle, and not only that but a fan attachment to fan the infant and keep off the flies, and last, and not least, important of all, a diminutive calliopean arrangement to soothe with its sweet harmonies the infant to repose. He took out a patent for this and sold it to a Yankee.

One of his inventions was to demonstrate the loss of power by use of a crank in rotary motion. Ten years ago, through the medium of an endless chain three miles in length, and on the same principle now in extended use in England and France, he conveyed iron ore to one of his furnaces over rough and impassable gorges. When a boy at home he ripped up an old shoe and, discovering how it was made, soon made lasts and shoes for the family. He made a machine for grinding plate glass of any size to a perfect plane. During his apprenticeship he made a machine for making hubs of carriages similar to those now in use. Another of his inventions is a cylindrical machine for puddling iron and for reducing ore and pig metal to wrought iron, an invention somebody else has just brought out in England, and is making a fortune from. Twenty-two years ago he filed a caveat and specifications for this invention. There is, in fact, scarcely any end to his inventions. He also—as long ago as when an apprentice—invented a process of utilizing condensed air as a propelling power. At one of these experiments at Fulton ferry—that is, where Fulton ferry is now—the great Fulton who made the first steamboat was present,

and expressed himself highly pleased with the result. Fifty-seven years ago he made a model of a mowing machine, embracing the principle of mowing machines now in use.

It was largely owing to his perseverance, and readiness to risk his fortune that oceanic telegraphy was successfully introduced. His is, as it deserves to be, one of the most prominent figures in this group of noble men.

JORDAN L. MOTT

was born in New York in 1798. His ancestors came to America in 1636, and filled very important positions in the government of the colony. Mr. Mott in his youth was in too delicate health to permit of close application to business, and as, fortunately, his means were too ample to necessitate his selecting any avocation, he was brought up without any profession. The revulsion of 1818, however, left him dependent on his own energies, and stimulated the exercise of his talents. Already, at the age of fifteen, he had invented a machine for weaving tape, and now a new field for his ingenuity was open to him. The anthracite coal in Pennsylvania was, about this time, exciting much interest. It was partially introduced for domestic use, but only the larger lumps were considered available in grates, the smaller coal being cast aside as refuse. Mr. Mott determined to apply his mind to invent a means of rendering this seemingly worthless fuel serviceable to the poor, and succeeded in producing a more perfect combustion than had ever before been attained. The iron founders not casting his stoves to suit him, with the assistance of a friend he started in business and manfactured them for himself. These difficulties surmounted, he had still another to overcome, the prejudice in favor of the long-cherished firewood, and opposition to the new fuel, which at first, but only for a short time, interfered with his success. A very large quantity of refuse coal had accumulated on the banks of the Schuylkill, at Philadelphia. This was bought by Mr. Mott, and the purchase first established the fixed value of small coal. Mr. Mott has had many testimonies to the merit of his inventions. A Patent Office report says: "Mott's stoves for burning refuse coal produced a distinct era in fuel saving." Gen. Harvey, in 1847, testified that "Mott's admirable arrangement for burning small coal caused its speedy introduction for domestic, mechanical, and manufacturing purposes." Mr. Mott took out more than forty patents connected with apparatus for burning coal, and the adaptation of iron to many useful purposes. His portable caldron furnace has become indispensable to the farmer, while extensively used by the manufacturer. The public are indebted to Mr. Mott for the change from blast furnaces to the cupola, in making stoves and other light castings. His factory and shop were destroyed by fire in 1846; only the engine house and cupola stack being saved, but, nothing daunted, in six days he was melting iron again in a new building erected around the stack. He was the pioneer in starting the villages of Morrisiana and Mott Haven; the J. L. Mott Iron Works, an incorporated company, being located at the latter place. Mr. Mott died at his residence in this city about two years ago.

The portrait of the American physicist,

PROFESSOR JOSEPH HENRY,

occupies the middle background. He was born in Albany, N. Y., Dec. 17, 1797. He received a common school education, and for some years pursued the occupation of watchmaker in his native city. In 1826 he was appointed Professor of Mathematics in the Albany Academy. A strong taste for scientific pursuits led him in 1827 to begin a series of experiments in electricity. In 1828 he published an account of various modifications of electro-magnetic apparatus. Previous to his investigations the means of developing magnetism in soft iron were imperfectly understood; he was the first to prove, by actual experiment, that in order to develop magnetic power at a distance, a galvanic battery of intensity must be employed to project the current through the long conductor, and that a magnet surrounded by many turns of one long wire must be used to receive this current. He was also the first to actually magnetize a piece of iron at a distance, and he invented the first machine moved by the agency of electro-magnetism. In March, 1829, he exhibited to the Albany Institute electro-magnets which possessed magnetic power superior to that of any before known, and subsequently he constructed others on the same plan, one of which, now in the cabinet of the college at Princeton, N. J., will sustain 3,600 pounds, with a battery occupying about a cubic foot of space. In 1831, in some experiments at the Albany Academy, he transmitted signals by means of the electro-magnet through a wire more than a mile in length, causing a bell to sound at the further end of the wire. In 1832 he was called to the chair of Natural Philosopy, in the College of New Jersey, at Princeton, where he continued his experiments and researches. In his first lecture in that institution in 1833, he mentioned the project of the electro-magnetic telegraph, and explained how the electro-magnet might be used to produce mechanical effects at a distance adequate to making signals of various kinds. He did not, however, attempt to reduce these principles to practice. In February, 1837, he went to Europe, and in April of that year, he visited Prof. Wheatstone, of King's College, London, to whom he explained his discoveries and his method of producing great mechanical effects at a distance, such as the ringing of church bells 100 miles off by means of the electro-magnet. In 1846, on the organization of the Smithsonian Institution, at Washington, Prof. Henry was appointed its Secretary, a post which he still holds, and which gives him the principal direction of the institution. Prof. Henry has published "Contributions to Electricity and Magnetism," and is the author of many scientific papers in the "American Philosophical Transactions," in Silliman's *Journal*, and in the *Journal of the Franklin Institute*. He is an assidnous student, and ranks smong the first of American scientists.

In the right of the picture sits

ISAIAH JENNINGS,

who was born in Frankford, Connecticut, 1782, and who began work at an early age as a blacksmith, in making by hand, thimbles for sailors, used in sails and rigging; which led him to invent a machine for making thimbles and eyelet holes, the perfection of which cost him much time and labor. He went to Liverpool in 1808 and started the business; but war breaking out, his plans were frustrated, and he returned to the United States. Having made some money in England, he commenced business in Southport, Connecticut, taking a partner, but the partner took his money and broke him up. He next invented his cigar boat, consisting of two hollow air-tight tubes, with a space of six feet between, the work framed on sleepers and worked by hand. It ran in opposition to the Brooklyn horse ferry, crossing in less than half the time. In 1810, he invented a thrashing machine, the first that did not destroy the straw, and the first one put in operation in Duchess County, New York. In 1812 he invented a steam boiler to stand the pressure of 500 pounds, which was approved by Oliver Evans. During the war he worked at Leggert's foundery on cannon. He subsequently invented a new pump and sent it to Washington. A Mr. Perkins, of London, copied it and took out a patent. Mr. Jennings was too poor to prosecute him and the Government refused to protect him. In 1822, he made a repeating gun with twelve charges, one barrel, sliding stock. In 1823, he invented a steam engine on the same principle as locomotive boilers now in use. He built this engine before Stevenson started his manufactory; and it has been claimed both Stevenson and Perkins took their ideas from Mr. Jennings' invention. In 1323 and 1824, he invented instantaneous matches, called afterwards "Loco Foco." He sold out three fourths of his right to Mr. Bernan, of New York, and the receipt to Mr. Jones, of London, for $1,000, realizing in all some $11,000. He next obtained a patent for fluid for lamps. The Mechanics' Institute, in 1837, awarded Mr. Jennings a medal for the best carbureted alcohol and burner for producing light, and in 1848, Mr. J. received two medals for portable liquid gas lamps. He died in 1862.

At Mr. Jennings' left hand sits

THOMAS BLANCHARD,

who was born in Sutton, Worcester county, Mass., June 24, 1788. From a strong bias for mechanical employments, he joined his brother, who was engaged in the manufacture of tacks by hand, a very slow and tedious process, and at the age of eighteen commenced his invention of a tack machine. It was six years before he could bring it to the desired perfection. Finally, so effective was the machine, that by placing in the hopper the iron to be worked, and applying motive power, 500 tacks were made per minute, with better finished heads and points than had ever been made by hand. For this machine, Blanchard secured the patent, and sold the right to a company for $5,000. About this time various attempts were made in several of the United States armories to turn musket barrels with a uniform external finish. Mr. Blanchard undertook the construction of a lathe to turn the whole of the barrel from end to end by the combination of one single self-directing operation. He succeeded perfectly in his invention, and this remarkable machine with modifications and improvements, is in use in the national armories as well as in England; and in various forms is applied to many operations in making musket stocks, such as cutting in the cavity for the lock, barrel, ramrod, butt plates, and mountings, comprising, together with the turning of the stock and barrel, no less than thirteen different machines. Mr. Blanchard was also interested at an early day in the construction of railroads and locomotives, and in boats so contrived as to ascend the rapids of the Connecticut, and rivers in the Western States. He has took no less than twenty-four patents for different inventions. He died at Boston, April 17, 1864.

REPORT OF THE JUDGES OF DEPARTMENT OF STEAM ENGINEERING AT THE AMERICAN INSTITUTE FAIR.

The following is a Report of the Judges, in department 5, group 1, of the Thirty-eighth Annual Fair of the American Institute, held in the city of New York, October, 1869:

No. 51. HARRIS' STEAM ENGINE (CORLISS).—For best results on net effective power shown at the trial, being from one to two per cent better than any other on competition, and for superiority of workmanship and general arrangement of valves and valve gearing. (1st medal and diploma).

No. 848. BABCOCK AND WILCOX STEAM ENGINE.—For the most perfect and automatic expansion valve gearing on exhibition. The judges are of the opinion that, had the principles upon which the engine was based been properly carried out in its construction, it would have performed much better. Also, it was evident that during the trial of the Harris engine the steam was dryer than in the trials of the other engine. (1st medal and diploma).

I hereby certify that the above is a true copy of the Report on file, as far as the same relates to Nos. 51 and 848.

JOHN W. CHAMBERS, Secretary.

Truly the mountain has labored and brought forth a mouse. It has taken this committee some four weeks to come to the conclusion, that of two engines out of all exhibited at the recent fair, each is better than the other. The Corliss engine having better valve gear than the Babcock & Wilcox engine, the valve gear on the latter is the best; or it is the other way. How is it? Will somebody help us out of our confusion. We do not comprehend this mystery.

What can the public gather from such a meager and inconsistent report as this? It was not to be expected that out of all the engines exhibited more than two could gain the *first* prize, of which we suppose each triumphant exhibitor may claim the equal undivided half; but it is to be supposed that other engines had merit enough to receive some mention, honorable or otherwise; and a more minute statement of the work performed by each would have enabled the public to determine whether the action of the judges was based upon good grounds. We put it as an intricate problem for our mathematical readers to solve, that if it has taken the judges four weeks to make the above *elaborate* report on engines, when may we expect the one on boilers?

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.

NEW PUBLICATIONS.

WORK AND PLAY.

Messrs. Milton, Bradley & Co., Springfield, Mass., contemplate issuing an illustrated monthly magazine for the young, containing sixteen pages, at a subscription price of one dollar per annum. This firm is an enterprising one, and has abundant facilities for producing an instructive and amusing journal. Send for a prospectus, which gives full particulars.

THE RAILROAD TRAVELER'S JOURNAL is the title of a new, handsomely printed, and well-edited weekly paper printed at Philadelphia, Pa. We wish it success. Babcock, Trowbridge & Co., publishers. $3·50 per annum.

PATENT DECISION.

UNITED STATES DISTRICT COURT, SOUTHERN DISTRICT. BEFORE JUDGE BLATCHFORD.—PATENT LOCKS—COMPLETED INVENTION.

Paul C. Coffin vs. *James B. Ogden and Lucius Woodruff.*—This was a suit for infringement of letters patent reissued to Charles A. Miller, assignee of Wm. S. Kirkham, the inventor, January 27, 1863, for an improvement in locks and latches, and assigned to the plaintiff. The object of the invention is stated in the specification to be, to render a door latch readily applicable to either right or left-hand doors. The defenses set up were that the invention was previously made by one Barthol Erbe, at Birmingham, in Pennsylvania; that the claims of the reissued patent are not for any patentable invention, nor for any mechanism arranged for a particular purpose, or to produce a particular effect, but are for an effect or function, irrespective of any particular mechanism, and that the patent is therefore void; that if the patent is valid the defendants have not infringed it.

Held by the Court.—That the lock made and sold by the defendants is, in its mechanical construction, substantially the same as the lock described in the plaintiff's patent, with only such variations as the skill of a mechanic would suggest, the invention of Kirkham being taken in its mechanical construction and arrangement. This being so, and the invention of Kirkham, as described, being infringed, the rules of law require that the plaintiff's patent shall, if possible, be so construed as to make it valid with reference to the defendant's lock—*ut magis valeat quam pereat.* Upon this principle there is no difficulty in so construing the claims of the patent as to relieve them from the objection made that they claim results or effects; for the claims must be construed in connection with the descriptive parts of the specification, and with reference to what is seen to be the real invention. (Case vs. Brown, 2 Wallace, 320). As to the question of novelty, the reversible latch claimed to have been invented and made by Erbe, prior to Kirkham's invention, undoubtedly embodied the inventions claimed in the plaintiff's patent as above construed. The question then arises whether the Erbe lock antedates as a completed invention the Kirkham lock. The weight of evidence shows that Kirkham did not make his invention at an earlier date than March 1, 1861. Erbe made his invention in the latter part of the year 1860, and soon after exhibited it to three persons experienced in making locks. He did not make a second lock of the kind till he made one which was deposited in the Patent Office in 1864, in connection with an application for a patent. Nor did he put any such lock into use on a door until after he had so applied for a patent. On these facts it is claimed by the plaintiff that the lock made by Erbe prior to Kirkham's invention rested only in experiment, and was not a completed invention. This position cannot be maintained. The lock made by Erbe in 1860 was put in a practical form, and was ready for use. It was, therefore, a completed invention, and the imparting a knowledge of its construction by Erbe to the three persons connection with the business of lock making, who saw it and understood its arrangement was the giving to the public such a knowledge of it as a completed invention as to deprive Kirkham of the right to be considered in law as the first inventor of such invention, though he was an original and independent inventor of it. An invention may be completed and ready for practical use without being actually in use, in the usual acceptation of the word. Use is not necessary to show completion, though it is generally strong evidence of it. These views are confirmed by the most carefully considered cases on the subject. (Reed *vs.* Cutter, 1 Story, 590; Bedford *vs.* Hunt, 1 Mason, 302; Curtis on Patents, sec. 87, Whitely *vs.* Swayne, 7 Wallace, 685). Kirkham's invention was, therefore, fully anticipated by that of Erbe.

Bill dismissed with costs.

For the plaintiff, G. Gifford; for the defendants, B. F. Thurston, and S. D. Law.

Recent American and Foreign Patents.

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

EGG BEATER, ETC.—H. G. Fougen and A. C. Fougen, Cape Girardeau, Mo.—This invention has for its object to furnish an improved machine for beating eggs, churning, mixing liquids, and other similar uses, which shall be simple in construction and effective in operation.

SAD IRON.—M. W. Montgomery and E. H. Votaw, Springfield, Mass.—This invention has for his object to furnish an improved sad iron, which shall be so constructed and arranged that the handle may be readily attached and detached for convenience in heating and using the sad irons.

EXPANDING PLOW.—A. W. Wilkins and S. T. Eskridge, Rome, Ga.—This invention has for its object to improve the construction of expanding plows in such a way that the standards may be moved toward and from each other squarely, and in such a way that the pitch of the plows may be adjusted as required.

ICE PITCHERS, ETC.—Kingston Goddard, Richmond, N.Y.—This invention has for its object to furnish a simple, neat, durable, light, and inexpensive ice pitcher, which shall have all the beauty and durability of a solid silver pitcher, and may be manufactured at trifling cost.

SINCH OR BELLY-BAND FASTENER FOR RIDING AND PACK SADDLES.—C. H. Horne, Astoria, Oregon.—This invention has for its object to furnish an improved fastener for sinching up riding and pack saddles, which shall be simple in construction and convenient and effective in use.

SEED PLANTER.—John M. Shaw, Water Valley, Miss.—This invention has for its object to furnish an improved seed planter, designed more particularly for planting cotton and corn, which will open the furrow, drop the seed, and cover it, leaving the top of the ridge rounded and smoothed off, and which may be easily adjusted for planting either kind of seed.

DITCHING MACHINE.—J. W. Weston and M. H. Weston, Windsor, Ill.—This invention has for its object to furnish a simple, convenient, and effective machine for digging ditches, grading roads, raising hedge rows, and similar uses.

BED FASTENING.—Nickolas Zins, Evansville, Ind.—This invention has for its object to furnish a simple, strong, durable, and convenient fastening for connecting the rails to the posts of a bedstead, and one which shall be so constructed as to be held securely in place without screws or other fastenings.

COMBINED RAKE, WEEDER, AND SMOOTHER.—A. F. Duckwitz, New York city.—This invention has for its object to furnish an improved instrument, which shall be so constructed as to adapt it for use as a rake, as a weeder for cutting off the weeds in walks and other places, and as a smoother for smoothing off the surface after it has been properly raked.

UMBRELLA AND DRESS SUSPENDER.—Messrs. McDougall and Eden, Manchester, Eng.—This invention relates to a new umbrella and suspender. It is made in the following manner: A piece of elastic cord, rather longer than would be required for a dress suspender merely is employed; the ends are connected in any suitable manner, when it is placed round the waist. A metal plate is then provided in which eight holes are pierced in a line, and near to each other. The elastic cord is then passed backward and forward through these holes alternately, leaving a loop of the same between the two center holes. This loop forms the umbrella suspender, and may be lengthened or shortened by drawing the elastic cord through the holes. A button or tassel is attached to the loop, for facility for drawing out or expanding the loop when the umbrella is removed from it.

ADJUSTABLE BENCH CLAMP.—O. L. Fenner, Rochester, N. Y.—The inventor has constructed a new adjustable bench clamp, to be used by carpenters and other mechanics.

VELOCIPEDE.—Charles A. Maynard, St. Louis, Mo.—This invention relates to a new three-wheeled velocipede, which is propelled by the weight of the rider, placed alternately upon one of two oscillating frames, so that the rider may, by alternately sitting down and standing up, impart the requisite motion to the vehicle.

VELOCIPEDE.—S. M. Bailey, Cottage Grove, Minn.—This invention relates to a new velocipede, which is to be lighter, easier made, cheaper, and more substantial than those heretofore in use.

COMBINED SEEDER, ROLLER, AND DRAG.—John V. B. France, Boscobel, Wis.—This invention relates to a new agricultural implement, which is so constructed that it will serve to scatter the seed on the ground and to work the same into the soil, all by one operation.

PHOTOGRAPHIC PRINTING APPARATUS.—L. J. Marcy, Newport, R. I.—This invention relates to a new instrument for printing photographic pictures, on, more particularly, transparencies by the aid of artificial light. Such plates are used as slides for magic lanterns and other purposes. The invention consists of a lamp of novel construction, placed into a frame, or case, so that the light will be projected towards the negative through a narrow aperture of the case. The invention consists, also, in the general arrangement and construction of the aforesaid case or frame.

OPERATING GRINDSTONE.—Hamilton Pray, Sharon, Conn.—This invention relates to a new and improved mode of operating revolving grindstones, whereby one person is enabled to turn or revolve the stone and to hold the article to be ground.

DUPLEX DOUBLE SIPHON FORCE PUMP.—Samuel B. B. Nowlan, C.E., New York city.—This invention relates to new and important improvements in force pumps for raising and forcing water.

TELEGRAPH WIRE INSULATOR.—W. D. Guseman and E. C. Bright, Morgantown, Va.—This invention relates to a new and useful improvement in insulators for telegraph wires.

CONDENSING VALVE.—Charles Hughes, Yng Flor De Cuba, Colen, Cuba.—This invention relates to a new and useful improvement in valves for spreading and spraying the water in jet and surface condensers.

COMBINED JET AND SURFACE CONDENSER.—Charles Hughes, Yng Flor De Cuba, Colen, Cuba.—This invention relates to a new and useful improvement in condensing vessels, whereby they may be used for either jet or surface condensation, so as to use the water for the boiler supply, or as injection water, or for other purposes.

MACHINE FOR TURNING WOODEN WARE.—John C. Bryant and A. W. Turner, Gardner, Mass.—This invention relates to a new and useful machine for turning and squaring the ends of wooden pails, tubs, kegs, and other wooden ware.

PRESERVING EGGS AND OTHER ARTICLES.—Mrs. S. Brunner, Marshall, Mo.—This invention relates to a new and useful invention and discovery, whereby eggs may be kept perfectly good and sound for an indefinite period of time.

AUTOMATIC BOILER FEEDER.—Silas Cook, Magnolia, Iowa.—This invention relates to a new and important improvement in the method of supplying steam boilers with water, whereby a uniform hight of water in the boiler is automatically maintained.

HINGE.—Louis Frühinsfeld, Newark, N. J.—This invention relates to a new and useful improvement in hinges for hanging the covers of trunks and chests, and for all purposes, to which the ordinary butt hinge is adapted, but which is more especially designed for trunks and similar articles.

STEM-WINDING WATCH.—Edward Bourquin, New York city.—This invention relates to various improvements in the setting, winding, and entire working apparatus of watches, and consists in the construction of the various devices pertaining thereto, with an object of obtaining greater power with less friction than could heretofore be produced, and also to provide far greater facility of controlling the whole movement.

SCHOOL DESK AND SEAT.—B. W. Arnold, Des Moines, Iowa.—This invention relates to improvements in combined desks and seats for use in schools, such as have the desks arranged upon the backs of the frames for the seats, and are arranged for folding the seats up and desks down. The invention consists in certain improvements in the hinge joints for both the seat and the desk.

HAY ELEVATING FORK.—Samuel G. Simpson, Mill Creek, Pa.—This invention consists in the attachment to the suspending yoke, which is pivoted to the outside tines, about one third of the distance from the head towards the points of a curved bar and spring tripping catch, which work through a slot in the handle, the spring catch engaging with the handle to hold the fork in the position for elevating a load; also, of a curved suspending bar, projecting in the opposite direction towards the point of these teeth, and which, when the suspending yoke is set for elevating, is thrust forward into the hay on the tines in a manner to hold the same from slipping off.

MACHINERY FOR PROPELLING CARS AND BOATS.—G. T. Beauregard, New Orleans, La.—This invention relates to new and useful improvements in machinery and apparatus for propelling cars, and other vehicles, on land, and boats on canals or rivers, by means of overhead wire, or other rope deriving motion from stationary engines, or other power, at intervals along the route.

PLOW.—P. Burns, Indiana, Pa.—This invention relates to improvements in cast iron or steel plows, and consists in forming the mold board, landside, and point or spreader in separate parts, and joining them together by bolts; also, in dovetailing the point or spreader to the moldboard in a manner to sustain the shocks caused by the points striking large stones, and other obstructions, in a way to relieve the bolts by which the point is connected to the moldboard, of the strain of such shocks. The object of forming the plows in the several parts, as stated, is to make the work of molding more simple and easy than when cast together.

APPARATUS FOR COOKING.—This invention consists of a vessel, having a jacket or inner lining of tin, or other proper metal. The jacket has a nozzle or lip, and being filled with water, is placed on the fire; by this means the inner space or compartment of the jacketed vessel is heated with dry heat, and so adapted as to receive a partially roasted joint of meat, or any other substance requiring to be completely cooked. The whole of this apparatus is inclosed in a vessel which is covered with some substance which is a bad conductor of heat, and is termed by the inventor a heat retainer. By this combination a great saving of heating material is effected, and the meat is never rendered hard, as is often the case in the ordinary methods of cooking.

HYDRAULIC CEMENT, OR ARTIFICIAL STONE.—This invention consists in the production of an hydraulic cement, which may be white or tinted, and which perfectly resists the action of water, and is suitable for ornamental purposes for the decoration of buildings. The principal components of this compound are lime, silica, and alumina, the two latter being extracted from refractory clays. In order to bring about the formation of the double silicate of lime and alumina, sulphuric and boracic acid are added in small quantities. The proportions of the constituents are varied, as the cement is required to set slowly or more quickly. For producing the cements the substances in an anhydrous state are employed in the following proportions:

Fat lime of first quality.....	67·956 to 74·6555	per cent	by weight
Refractory clay.....	27·182 to 42·889	"	"
Sulphate of lime.....	4·757 to 9·055	"	"
Boracic acid.....	0·105 to 0·401	"	"
	100		

The cements formed between these limits varying in the rapidity with which they set, but are of equal quality, and attain in the course of time the same degree of hardness. The substances are mixed after being ground to a fine powder, they are then made into bricks with water, and are baked at a white heat; after this they are reduced to an impalpable powder. This powder, mixed with water, is then used as the cement, either plain or colored, and can be molded as required. The inventor is M. Jules Antoine Dubus, of Paris.

CLOTHES LINES.—P. C. Johnson, Central City, Col.—This invention has for its object to do away with the props or sticks commonly used to support clothes lines at or near the middle, to prevent them from hanging too low.

DOUBLE SUPPLY ATTACHMENT TO PUMPS.—D. F. Dodge, Lowville, N. Y.—The object of this invention is to provide a device by means of which water or other liquids can from either one of two reservoirs be guided to one pump. The invention will be particularly useful in households, where the same pump can be used to obtain water from a well and from a cistern, as may be desired. The invention consists in the application of a plug within a chamber, which communicates with the suction pipe of the pump, and with the two supply pipes leading to the two reservoirs. The plug has two apertures through it; either one of which can be brought in communication with the suction pipe. One aperture will connect one suppy pipe and the other aperture the other supply pipe with the pump. A slight turn of the plug will therefore serve to bring either the cistern or well into connection with the pump.

BEDSTEAD FRAME.—J. N. Farnham, Hartford, Conn.—This invention relates to a new frame for single and double bedsteads, which are provided with elastic or flexible sheets for the support of the bedding. The invention consists in the use of slotted or double inclined end pieces in which the ends of the fabric are clamped, and in the employment of longitudinally adjustable standards to which the said end pieces are secured. By this arrangement the fabric is securely held and can be stretched or slackened at will.

BOOK AND MUSIC STAND.—Edward Conley, Cincinnati, Ohio.—This invention relates to a new book or music stand which is adjustable in every respect, so that it can be set at any suitable hight, and in any desired position to suit the position of the reader, and which can also be used as a nursery table, and for other purposes.

SUBMARINE TELEGRAPH CABLES.—M. G. Farmer, Boston, Mass.—This invention consists in combining a strengthening wire or wires with the central electrical conductor or conductors; thus dispensing with the use of strengthening wires upon the exterior of the insulating substance.

MILLSTONE DRESS.—John Fairclough, St. Joseph, Mo.—The object of this invention is to provide an arrangement of the furrows, or "dress" of millstones, whereby the draft will be greatest at the eyes, where the grinding movement of the surfaces is less, gradually diminishing towards the periphery as the movement of the said surfaces increases.

STEAM PUMPS.—W. W. Gilbert, New York city.—This invention relates to improvements in steam pumps, and has for its object to provide certain improvements in the arrangement of the steam piston, for cheapening the construction and simplifying the adaptation of the same for use, in opening and closing the parts of a steam actuated piston valve; also to provide certain improvements in the construction of the pump valves.

CLOVER AND FLAX THRASHING MACHINE.—S. H. Lintan, Burrows, Ind.—This invention relates to improvements in machines for thrashing and separating clover and flax, and has for its object to provide a more simple and cheap machine than those now in use. It consists of an improved construction of the teeth or beaters and its case; and also of an improved arrangement of the separating devices.

STAYS AND CORSET.—H. A. Lyman, London, England.—The object of this invention is to provide a well-fitting and convenient corset.

SEWING MACHINE FAN.—D. W. Glassie.—This invention relates to a device which may be attached to the balance wheel of a sewing machine, or in any suitable manner to an actuating wheel driven by any convenient power, and is provided with fans which may be caused simply to rotate, or to have a compound motion, reciprocating and rotary; and it consists in a certain combination of mechanical means for operating the fans, whereby a lady can operate the sewing machine and fan herself simultaneously, without being sensible of the greater exertion of power she is required to make.

BED SPRING.—F. J. Gardner, Washington, N. C.—This invention has for its object to furnish a simple, convenient, and very elastic bed spring.

PLOW.—C. C. Ansley, Americus, Ga.—This invention has for its object to furnish a light, simple, convenient, and effective plow, and one which may be easily made, and will be of light draft.

DOUBLE TAPERED PLATE FOR THE MATERIAL OF BLANKS FOR CULTIVATOR TEETH, ETC.—W. H. Singer, Pittsburgh, Pa.—This invention consists in a plate of the proper metal, run between rolls of such shape as to give it the required double transverse taper, such plate being of any desired or practicable length, and serving as the material out of which blanks may be cut for immediate formation into shovels, plows, or cultivator teeth.

ROLLING MACHINE AND PRODUCT.—W. H. Singer, Pittsburgh, Pa.—This invention consists in placing tapering rolls upon shafts for the purpose of producing beveled edges upon agricultural and other tools; such edges having heretofore been produced by hammering or grinding, and in combining with such tapering heads a sliding rest for supporting the blanks while going through the beveling operation.

SPRING BED BOTTOM.—Peter W. Kniskern, Ft. Smith, Ark.—This invention relates to improvements in spring-bed bottoms, the object of which is to produced an improved spring bed bottom, and to construct the same wholly, or mostly, of wood, and in a simple and inexpensive manner.

FEED-WATER HEATER.—John Fairclough, St. Joseph, Mo.—The object of invention is to provide feed-water heaters for steam boilers, having greater heating capacity, and adapted, also, for filtering the water, and to have great condensing capacity for returning the steam, as feed water, for use where the feed water is not always abundant, and particularly adapted for portable traction engines.

BRIDGE.—Samuel Ensign, New Franklin, Ohio.—The essential feature of this invention consists in the construction and arrangement of the chords, which are made up of bars or slabs of either rolled or cast metal, bolted together, and so shaped as to permit them to be cheaply formed and joined together. Another part of the invention consists in the arrangement of the braces, suspension rods, and posts, and the supporting blocks for the same.

FLUE CLEANER.—John Fairclough, St. Joseph, Mo.—This invention relates to an improved arrangement of pointed metallic tubes for taking steam from the steam dome, or other part of the boiler, and discharging it in jets into the flues of the boiler for forcing out the collections of soot and other matters in them, and scouring the surfaces of the flues, the arrangement being such that the nozzle may be directed against all parts of the said surfaces.

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.

M. E., of Conn.—The grand discovery of atmospheric pressure was made only a little more than two hundred years ago—in 1643—by Torricelli, a pupil of Galileo. Torricelli's announcement that the air had weight, that its pressure sustained the mercurial column, and that every body went about, bearing upon their persons an air burden of fifteen tuns, was received with scorn and ridicule by many of the scientific men of his day. But Pascal, a French *savant*, acknowledged its correctness "If," said he, "it be really the weight of the atmosphere under which we live that supports the column of mercury in Torricelli's tube, we shall find, by transporting this tube to a loftier point in the atmosphere, that in proportion as we leave below more and more of the air, there will be a less column of mercury sustained in the tube." He carried the tube to the peak of Puy-de-Dome, a lofty mountain in Central France, and found that the mercury gradually fell in the tube in proportion as he ascended. In 1646, at Rouen, Pascal showed that a column of water, 34 feet high, was sustained by atmospheric pressure. 30 inches of mercury, and 34 feet of water have nearly the same weight.

T. H. J., of Texas.—The best lubricant for iron spur gearing, is undoubtedly good sperm oil. The following proportions for teeth may be considered good practice: Depth of pitch line—three tenths of the pitch. Working depth of tooth sixth tenths of the pitch. Bottom clearance one tenth. Whole depth to the root of the tooth seven tenths. Thickness of tooth five elevenths of the pitch width of space six elevenths. Other proportions are however used.

B. W. S. C., of Ind.—You can run a steam saw mill successfully from a counter shaft under your saw mill, said counter shaft to be driven from a pulley 7 feet in diameter on a main shaft thirty feet distant but your belts will need to be well proportioned. In short you will need a man of experience and skill to adjust everything so as to insure success.

J. N., of Ohio.—You will find in our advertising columns, advertisements of safety valves and other steam apparatus. It will be evident to you upon a moment's reflection, that it is not our place, even were we disposed, to recommend any of these to the exclusion of others. If you need counsel, able engineers, who also advertise with us, will give it to you.

W. N. G., of N. Y.—Both the plumber and yourself are partly wrong. No water can be forced into a range boiler, or any other boiler so long as the pressure of steam in the boiler is greater than the pressure of the water. The pressure of water poured in through a funnel put into either the hot or the cold water pipe, near the top of your boiler would not be enough to force it in against a slight pressure of steam. The funnel used for filling the boiler during the low water, should have been placed in the cold water pipe, and the faucet of the hot water pipe should have been opened while the filling was going on, to relieve the boiler from steam pressure.

W. H. C., of Ill.—The rule you refer to for computing the horse power of steam engines is correct. Your engine would, according to your statement, have 19·04 horse power. We recommend you to get "Bacon's Revision of Porter's Work on the Steam Indicator," noticed in another column, and "Auchincloss' Link and Valve Motions." Both works are published by D. Van Nostrand, 23 Murray and 27 Warren streets, New York.

C. M. T., of Mass.—The suggestions you make are valuable but as we have recently published an illustrated description of a safety heating apparatus for railroad cars (see page 40 current volume) together with similar suggestions, we respectfully decline your communication.

W. H. E., of Pa.—The soap test for water referred to is a tincture of soap, made by dissolving fine soap in 75 parts of water by weight and then adding an equal volume of rectified alcohol. The amount of the tincture which makes a permanent lather when added to water is an indication of the hardness or softness of the water.

J. S. E., of Mass.—The furrow in the tough sod after the severe storm of which you write us, is evidently the work of lightning. Such occurrences are not unfrequent, and the peculiar hissing sound of lightning you mention has also been often observed.

T. E. T., of Ga.—A compass needle is deflected by beds of iron ore but such a needle would not assist you in the search for gold or silver The divining rods of which you speak are in our opinion humbugs.

J. M. D., of Ill.—To specify all the uses of peroxide of manganese would occupy much space. Both it and phosphate of iron are used in medicine.

P. H. D.—It is a well known property of loaf sugar that it becomes luminous when rubbed with a hard substance in the dark. The subject has been frequently referred to in this column.

C. H. C., of Ill.—There is no doubt in the minds of scientific men of the existence of atmospheric tides, caused by the attraction of the moon in the same way that ocean tides are produced.

S. M. A., of Conn.—You will find an account of ancient tools in "Appleton's American Cyclopedia," with references to authors upon the subject in article "Copper."

J. C., of Ill.—Your communication does not suit us. It is offensively personal.

J. A. L., of Ohio.—You may learn to translate the French language into English by the aid of books, but to speak it you will need the aid of a living teacher.

Business and Personal.

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

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

3,132.—STEAM GENERATOR.—Silas C. Salisbury, New York city. October 29, 1869.

3,139.—STEAM GENERATORS AND SURFACE CONDENSORS.—J. A. Miller, Boston, Mass. Oct. 29, 1869.

3,144.—CIGAR MACHINERY.—J. Wettstein and J. T. Hennaman, Baltimore Md. Oct. 29, 1869.

3,218.—GENERATING STEAM, ETC.—Noah Shaw, Eau Claire Wis. Nov. 8, 1869.

3,226.—MACHINE FOR HECKLING HEMP.—George Webber, Boston, Mass November 9, 1869.

3,077.—MACHINE FOR MANUFACTURING BRUSHES.—W. A. Foskett and H. Tyler, New Haven, Conn. October 22, 1869.

3,308.—SEWING MACHINE NEEDLES.—P. H. Newbill, Los Angeles, Cal. Nov. 5, 1869.

3,220.—MEANS OF SECURING CORKS IN BOTTLES.—H. Scholfield, Guatemala, Central America. Nov. 6, 1869.

3,248.—PROCESS OF BREWING.—James McCormick, Boston, Mass. Nov. 11, 1869.

3,254.—TREATMENT OF CAOUTCHOUC, GUTTA-PERCHA, AND ANALOGOUS GUMS FOR THE PRODUCTION THEREFROM OF ARTICLES OF UTILITY AND ORNAMENT.—J. B. Newbrough and Edward Fagan, New York city. Nov. 11, 1869.

3,250.—LOCK.—A. B. Vandemark, Southington, Conn. Nov. 11, 1869.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING NOV. 30, 1869.

Reported Officially for the Scientific American

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Patent Solicitors, No. 37 Park Row, New York.

97,263.—SASH BALANCE.—J. C. Anderson, Webster, Pa.

97,264.—REFRIGERATOR FOR CONDENSING VAPORS FROM FERMENTING VATS IN BREWERIES.—Lawrence Angster, Newark, N. J.

97,265.—COMPRESS.—C. W. Armstrong (assignor to himself and T. H. Armstrong), Detroit, Mich.

97,266.—VULCANIZING PRESS.—Joseph Banigan, Smithfield, assignor to Woonsocket Rubber Co., Woonsocket, R. I.

97,267.—LOGGING SLED.—Albert R. Baxter, Peck Post Office, Mich.

97,268.—MODE OF CURING BACON, HAMS, AND SHOULDERS.—W. G. Bell, Charlestown, Mass.

97,269.—VENTILATING WINDOW BLIND.—Harrison Berdan and John Bantly, Wayne, Mich.

97,270.—FASTENING FOR BEDSTEADS.—Charles Bradway, Maquoketa, Iowa.

97,271.—LAMP EXTINGUISHER.—Geo. V. Bunker, Yankton, Dakota Territory.

97,272.—DEVICE FOR CLEARING LAND OF STUMPS.—Chas. Canfield and H. Willard, Grand Rapids, Mich. Antedated November 18, 1869.

97,273.—COMBINED ROLLER AND CULTIVATOR.—J. B. Catey, Williamsburgh, Ind.

97,274.—PUMP.—E. S. Cavnah and David Yeagley, Bourbon, Ind.

97,275.—FRUIT PICKER.—L. D. Cogswell, Lowell, Mass.

97,276.—DUST PAN.—F. L. Daniels, Boston, Mass.

97,277.—COMBINED REVOLVING HOE AND COTTON CULTIVATOR.—Major E. Davis, Rome, Ga.

97,278.—WOOD PAVEMENT.—David L. De Golyer, Chicago, Ill.

97,279.—MACHINE FOR THE MANUFACTURE OF ARTIFICIAL FUEL, AND FOR COMPRESSING CONGLOMERATE SUBSTANCES INTO COMPACT MASSES.—A. Dietz, New York city, assignor to F. N. Hopkins, Baltimore, Md.

97,280.—BORING MACHINE.—E. C. Dodge, Edgecomb, Me. Antedated Nov. 13, 1869.

97,281.—PITCH BOARD.—John R. Drew, San Francisco, Cal.

97,282.—HAY ELEVATOR.—F. R. Dufour, Vevay, Ind.

97,283.—APPARATUS FOR CARBURETING AIR.—C. F. Dunderdale, New York city.

97,284.—APPARATUS FOR PRODUCING ILLUMINATING GAS.—C. F. Dunderdale, New York city.

97,285.—GAS MACHINE FOR CARBURETING AIR.—H. F. Eberts and John Fanning, Detroit, Mich.; said Eberts assigns his right to said Fanning.

97,286.—BOOT CRIMPER SCREW.—Jacob Edson, Boston, Mass.

97,287.—PLATE PRINTING FOR COLORS.—Joseph Enthoffer, Washington, D. C.

97,288.—GATE.—Samuel Freet, Upper Strasburg, Pa.

97,289.—BRACKET FOR CONDUCTORS.—Peter Gantz (assignor to himself and Martin Fryer), Albany, N. Y.

97,290.—FAUCET ATTACHMENT TO CANS.—John H. Garrigan, Sacramento, Cal., and F. L. Hall, Reno, Nevada.

97,291.—COOKING RANGE.—R. D. Granger, Providence, R. I.

97,292.—MACHINE FOR FORMING CIGARS AND PLUG TOBACCO.—Wm. Hall and E. J. Bennett, Boston, Mass.

97,293.—FRUIT JAR.—L. B. Harberger, Philadelphia, Pa.

97,294.—LAMP SHADE.—E. K. Haynes, Boston, Mass.

97,295.—PAD OR HOUSING FOR HARNESS SADDLES.—C. B. Hogg, Boston, Mass.

97,296.—BOILER OR OTHER FURNACE.—M. L. Horton, Windsor, Vt.

97,297.—BRICK MOLD—Stephen Inman, Rockford, Ill.

97,298.—LAMP BURNER.—Melvin Jincks, Wallace, N. Y.

97,299.—STEAM PLOW.—J. G. Knapp, Madison, Wis.

97,300.—APPLYING STEAM POWER TO STREET RAILWAY CARS.—L. W. Langdon, Northampton, Mass.

97,301.—REST FOR CARRIAGE TOPS.—C. C. Lawrence and Jas. Lewis, Marengo, Mich.

97,302.—HEAD BLOCK FOR SAW MILLS.—C. Leffingwell (assignor to himself, H. Blandy, and F. Blandy), Zanesville, Ohio.

97,303.—RAILWAY CAR COUPLING.—H. L. Lockwood, Denmark, Iowa.

97,304.—CURTAIN FIXTURE.—Moses Loeb, Chicago, Ill.

97,305.—STEAM GENERATOR.—W. B. Mack, Detroit, Mich. Antedated Nov. 11, 1869.

97,306.—FOUNDATION FOR SPRING BED BOTTOMS.—David Mannel, Dedham, Mass.

97,307.—FIRE PLACE.—Stephen Martin, Detroit, Mich.

97,308.—TOOL FOR MOLDING DOVETAILS.—Bernard McEnally and Edward Farrell, Detroit, Mich. Antedated Nov. 13, 1869.

97,309.—PRESS FOR COMPACTING THE WASTE PARTICLES OF COAL INTO BLOCKS FOR FUEL.—T. M. Mitchell, Philadelphia, Pa.

97,310.—STAVE MACHINE.—Samuel Newman, Cleveland, Ohio, assignor to himself and John Newman.

97,311.—VAPOR BURNER.—J. H. Pattee, Monmouth, Ill. Antedated Nov. 20, 1869.

97,312.—METAL BELTING.—W. P. Powers, North La Crosse, Wis. Antedated Nov. 24, 1869.

97,313.—GRAPE CRUSHER AND STEM SEPARATOR.—T. C. Purington Lincoln, Cal.

97,314.—CHAIR SPRING.—T. C. Purington, Lincoln, assignor to himself and A. Mayoux, Marysville, Cal.

97,315.—BABY WALKER.—P. H. Randolph, Leavenworth City, Kansas. Antedated Nov. 13, 1869.

97,316.—SNOW GUARD FOR ROOFS.—A. Rogers, Worcester, Mass.

97,317.—SEEDER.—J. S. Rowell, Beaver Dam, Wis.

97,318.—TELEGRAPH INSULATOR.—A. G. Safford, St. Albans Vt. Antedated Nov. 17, 1869.

97,319.—CULTIVATOR.—Alexander Shaw, Monmouth, Ill. Antedated Nov. 24, 1869.

97,320.—MACHINE FOR DRESSING MILLSTONES.—Franklin Simmons (assignor to H. D. Coleman), New Orleans, La.

97,321.—STOVE STAND.—D. N. Smith, Boston, Mass. Antedated Nov. 27, 1869.

97,322.—HAY RACK FOR WAGONS.—S. J. Smith, Farmington N. Y.

97,323.—WATER-CLOSET PAN.—W. Smith, San Francisco, Cal

97,324.—GOVERNOR.—Robert Spear, New Haven, Conn.

97,325.—MACHINE FOR PUTTYING SEAMS OF VESSELS.—Alfred Stevens, Georgetown, assignor to Josiah Starling, Manheigan, Me.

97,326.—CAN HANDLE.—L. A. Sunderland, Madison, Ohio.

97,327.—HORSESHOE BLANK.—E. B. Turner, Providence, R. I. Antedated Nov. 13, 1869.

97,328.—CARPENTERS' PLOW.—Harmon Vanbuskirk, Vienna Mich. Antedated Nov. 24, 1869.

97,329.—RAILWAY CAR WHEEL.—Zadock Washburn, Hopedale, assignor to Hopedale Furnace Company, Milford, Mass.

97,330.—CHANNEL OPENER FOR BOOT AND SHOE SEWING MACHINES.—Orin Weeman, Lynn, Mass.

97,331.—FASTENING FOR NECKTIES.—P. S. White, Providence, R. I. Antedated Nov. 24, 1869.

97,332.—LATCH.—M. J. Woodruff (assignor to Russell and Erwin Manufacturing Company), New Britain, Conn.

97,333.—TILE OR SLAB FOR FLOORING AND WAINSCOTING, AND FOR THE MANUFACTURE OF FURNITURE.—E. H. Woodward, New York city.

97,334.—RAILWAY SWITCH.—W. L. Yantis, Brownsville, Mo.

97,335.—LUBRICATING COMPOUND.—W. N. Abbott, Boston, Mass., assignor to himself, G. W. Boyle, and F. N. Terrent, Baltimore, Md.

97,336.—PRINTING PHOTOGRAPHS.—Joseph Albert, Munich, Bavaria.

97,337.—PLOW.—C. C. Ansley, Americus, Ga.

97,338.—SCHOOL DESK AND SEAT.—B. W. Arnold, Des Moines, Iowa.

97,339.—MACHINE FOR PLANTING POTATOES.—L. A. Aspinwall, Albany, N. Y.

97,340.—VELOCIPEDE.—S. M. Bailey, Cottage Grove, Minn.

97,341.—MIDDLINGS SEPARATOR.—Joseph Barker (assignor to himself, A. L. Brown, and T. H. Brown), Chicago, Ill. Antedated Nov 17, 1869.

97,342.—ANCHOR.—E. T. Barlow, San Francisco, Cal.

97,343.—MACHINERY FOR PROPELLING CARS.—G. T. Beauregard, New Orleans, La.

97,344.—CANCELING PUNCH.—M. E. Berolzheimer, New York city.

97,345.—LINIMENT FOR THE TREATMENT OF NEURALGIA, RHEUMATISM, ETC.—Benjamin Bissell, New London, N. Y.

97,346.—STEM WINDING WATCH.—Edouard Bourquin, New York city.

97,347.—HOT AIR FURNACE.—Robert Boyd and J. C. Hart, Rochester, N. Y.

97,348.—WINDOW BUTTON.—E. K. Breckenridge, West Meriden, Conn.

97,349.—PRESERVING EGGS AND OTHER ARTICLES.—Catherine Bruner, Marshall, Mo.

97,350.—MACHINE FOR TURNING WOODEN WARE.—J. C. Bryant and A. W. Turner, Gardner, Mass.

97,351.—BOLT HEADING MACHINE.—O. C. Burdict, Providence, R. I.

97,352.—PLOW.—P. Burns, Indiana, Pa.

97,353.—SECTIONAL STEAM GENERATOR.—A. S. Cameron, New York city.

97,354.—LUBRICATOR.—A. S. Cameron, New York city.

97,355.—WATER WHEEL.—J. T. Case, Barkhamsted, Conn.

97,356.—CUT-OFF FOR BRICK MACHINES.—Cyrus Chambers Jr., Philadelphia, Pa. Antedated Nov. 20, 1869.

97,357.—SAW-MILL.—T. E. Chandler, Indianapolis, Ind.

97,358.—LAMP CHIMNEY.—E. S. Chase, Eau Claire, Wis.

97,359.—NECK YOKE.—G. P. Cole, Hudson, Mich.

97,360.—MUSIC STAND.—Edward Conley, Cincinnati, Ohio.

97,361.—AUTOMATIC BOILER FEEDER.—Silas Cook, Magnolia, assignor to himself and Henry Ford, Sioux City, Iowa.

97,362.—WEATHER STRIP.—G. W. Cretors and Enos Hoover, Clinton county, Ind.

97,363.—BUTTON.—A. P. Critchlow, Northampton, Mass.

97,364.—PEANUT PICKER.—W. A. Crocker, Norfolk, Va.

97,365.—MODE OF PRODUCING WHITE LEAD.—J. G. Dale and Edward Milner, Warrington, England.

97,366.—TWO-WAY COCKS.—D. F. Dodge, Lowville, N. Y.

97,367.—ARBOR OR FENCE POST.—J. P. Dorman, Galesburg, Ill. Antedated Nov. 25, 1869.

97,368.—COMBINED RAKE, WEEDER, AND SMOOTHER.—A. F. Duckwitz, New York city.

97,369.—CLOTHES SPRINKLER.—S. G. Dugdale, Richmond, Ind.

97,370.—SUPPORT FOR ELLIPTIC SPRINGS.—Ellis Eves, Millville, Pa.

97,371.—FEED WATER HEATER.—John Fairclough, St. Joseph, Mo.

97,372.—BOILER FLUE CLEANER.—John Fairclough, St. Joseph, Mo.

97,373.—MILLSTONE DRESS.—John Fairclough, St. Joseph, Mo.

97,374.—SUBMARINE TELEGRAPH CABLE.—M. G. Farmer, Salem, Mass, assignor to the American Compound Telegraph-Wire Company, New York city.

97,375.—BEDSTEAD FRAME.—J. N. Farnham (assignor to Woven-Wire Mattress Company), Hartford, Conn.

97,376.—BENCH CLAMP.—O. L. Fenner, Rochester, N. Y.

97,377.—CULTIVATOR.—James Ferguson, Huntley Grove, Ill.

97,378.—ROAD GRADER.—E. L. Foreman (assignor to Edward Foreman), Rantoul, Ill.

97,379.—EGG BEATER.—H. G. Fougen and A. C. Fougen, Cape Girardeau, Mo.

97,380.—COMBINED SEEDER, ROLLER, AND DRAG.—John V. B. France, Boscobel, Wis.

97,381.—HINGE.—Louis Fruhinsfeld, Newark, N. J.

97,382.—PUMP.—Aaron Fuller, Marietta, Ohio.

97,383.—ROTARY BELL HEAD.—Samuel M. Fulton and Wm. M. Fulton, Pittsburgh, Pa.

97,384.—FEED CUTTER.—Warren Gale, Peekskill, N. Y.

97,385.—PACKER FOR RAILWAY CAR SPRINGS.—Perry G. Gardiner, New York city.

97,386.—BED SPRING.—F. J. Gardner, Washington, N. C.

97,387.—FIREBOX.—Redman Gay, Richmond, Va.

97,388.—PLOW.—James R. Gilbert, Wootens, Ga.

97,389.—STEAM PUMP.—Walter W. Gilbert, New York city. Antedated November 24, 1869.

97,390.—MODE OF CONSTRUCTING WATER PITCHERS AND OTHER VESSELS.—Kingston Goddard, Richmond, N. Y.

97,391.—COMBINED WATCH KEY AND TOOTHPICK.—Henry E. Graham and Richard D. Child, Boston, Mass. Antedated November 24, 1869.

97,392.—INSULATOR FOR TELEGRAPH WIRES.—W. D. Guseman and E. C. Bright, Morgantown, West Va.

97,393.—SAWING MACHINE.—E. R. Hall and Wm. H. Town Syracuse, N. Y.

97,394.—GRAIN DRILL.—W. N. Hamilton, Odessa, Del.

97,395.—COMBINED HAY RAKE, THRASHER, LOADER, AND STACKER.—James R. Hammond, Sedalia, Mo.

97,396.—LANTERN.—H. W. Harkness (assignor to himself and Andrew Turnbull), New Britain, Conn.

97,397.—PAPER FILE.—B. F. Herr, Livingston, Ala.

97,398.—AUGER HANDLE.—George W. Herring, Bangor, Me. Antedated November 27, 1869.

97,399.—INSTRUMENT FOR PULLING WEEDS.—Daniel M Holmes, Watkins, N. Y.

97,400.—SASH BALANCE.—John Douglas Hopkins, London England. Patented in England, November 20, 1868.

97,401.—BELLY-BAND FASTENER.—Charles H. Horne, Astoria, Oregon.

97,402.—COMBINED STOVE AND WATER HEATER.—Henry Howard, Springfield, Mass. Antedated November 20, 1869.

97,403.—EXTENSION CRIB AND BEDSTEAD.—Charles H. Hudson, New York city.

97,404.—Paddle Wheel.—Wm. Huffman, Oshkosh, Wis.
97,405.—Steam Condenser.—Charles Hughes, Yng Flor De Cuba, Colen, Cuba.
97,406.—Condenser Valve.—Charles Hughes, Yng Flor De Cuba, Colen, Cuba.
97,407.—Railroad Car Wheel.—Lewis B. Hunt, Leverett, Mass.
97,408.—Wagon Skein.—John C. Johnson, Golconda, Ill.
97,409.—Clothes Line.—P. C. Johnson (assignor to Mary Johnson), Central City, Colorado Ter.
97,410.—Railway Car Coupling.—Wm. C. Johnson (assignor to himself and Aaron Johnson), Fort Madison, Iowa.
97,411.—Velocipede.—Willis H. Johnson, Springfield, Ill. Antedated November 27, 1869.
97,412.—Weather Strip.—Joseph Johnson, Chicago, Ill.
97,413.—Churn.—Jacob Klingensmith, Warren, Ohio.
97,414.—Stove Damper.—L. W. Langdon, Northampton, Mass., assignor to himself and Edwin R. Locke, Keene, N. H.
97,415.—Device for Grinding Saw Gummer Burrs.—Chas. E. Lewis, Northfield, Vt.
97,416.—Harrow.—Samuel H. Lintan, Burrows, Ind.
97,417.—Metallic Solution for Coating Iron and Steel.—Alson A. Lothrop, Neponset, Mass.
47,418.—Corset.—Henry Alexander Lyman, Cheapside, London, England, assignor to Thompson, Langdon & Co., New York city.
97,419.—Photographic Printing Apparatus.—L. J. Marcy, Newport, R. I.
97,420.—Oyster Dredge.—Thomas F. Mayhew, Port Norris, N. J.
97,421.—Velocipede.—Charles A. Maynard, St. Louis, Mo.
97,422.—Street Sprinkler.—R. Y. McConnell and George Pringle, Rochester, N. Y.
97,423.—Safe.—Wm. McFarland, Williamsburg, N. Y.
97,424.—Cotton Seed Planter.—Matthew McMillian Caney, Arkansas.
97,425.—Dropping Device for Seeding Machines.—Daniel E. McSherry, Dayton, Ohio.
97,426.—Printing Type.—Rufus S. Merrill, Cambridge, Mass.
97,427.—Sad Iron.—M. W. Montgomery and E. H. Votaw, Springfield, Mass.
97,428.—Mode of Covering Elastic Rolls.—Joel Moulton, Boston, Mass.
97,429.—Corn Harvester.—Nelson Newman, Springfield, Ill.
97,430.—Wrench.—Robert Nicholson, Pleasantville, Pa.
97,431.—Stove Leg.—Wm. R. Oatley, Rochester, N. Y.
97,432.—Map-drawing Apparatus.—George S. Ormsby, Xenia, Ohio.
97,433.—Railway Car Wheel.—Joshua T. Owen, Philadelphia, Pa.
97,434.—Method of Weaving Fabrics.—John Owens, Salford, England.
97,435.—Tuck-creasing Mechanism for Sewing Machines.—Charles Page, Boston, Mass.
97,436.—Gage for Weather Boarding.—Jos. B. Pedrick, Columbus, Ind.
97,437.—Hay Tedder.—J. G. Perry, Kingston, R. I.
97,438.—Hay Tedder.—J. G. Perry, Kingston, R. I.
97,439.—Composition for Cleaning Millstones.—G. M. Pettee, Detroit, Mich.
97,440.—Turntable.—J. L. Piper, Pittsburgh, Pa.
97,441.—Operating Grindstones.—Hamilton Pray, Sharon, Conn.
97,442.—Sailing Vessel for Storing and Transporting Petroleum and Other Oils.—P. A. Quinan, Baltimore, Md.
97,443.—Holder for Checkreins.—David Reynolds, Rockford, Ill.
97,444.—Lifting Jack.—R. M. Reynolds, Oakville, Mich.
97,445.—Machine for Pulverizing Ores and Rock.—V. B. Ryerson, New York city.
97,446.—Seed Planter.—J. M. Shaw, Water Valley, Miss.
97,447.—Sewer.—John Silsby, New York city.
97,448.—Exterior Casing for Sewer, Gas, and Water Pipes.—John Silsby, New York city.
97,449.—Horse Hay Fork.—Samuel G. Simpson, Mill Creek, Pa.
97,450.—Machine for Rolling Metals.—W. H. Singer, Pittsburgh, Pa.
97,451.—Plate for Blanks of Cultivator Teeth.—W. H. Singer, Pittsburgh, Pa.
97,452.—Clapboard Gage.—George Smith, Omaha, Nebraska.
97,453.—Lamp Trimmer and Extinguisher.—C. P. Snow, Freeport, Ill.
97,454.—Dissolving Xylodine for Use in the Arts.—Daniel Spill, Paradise Terrace, Hackney, England.
97,455.—Bitstock.—Augustus Stanley, New Britain, Conn. Antedated Nov. 20, 1869.
97,456.—Steam Slide Valve.—Monroe Stannard, Hartford, Conn.
97,457.—Apparatus for Generating and Carbureting Illuminating Gas.—Amos Stevens, Fitchburg, Mass., assignor to himself and H. C. Mahurin.
97,458.—Elliptic Spring.—W. A. Sweet, Syracuse, N. Y.
97,459.—Medical Compound.—A. Agnew Thomson, Newburg, Pa.
97,460.—Truss.—O. O. Thwing, Martinsville, Ind.
97,461.—Stump Extractor.—George W. Townsend, Galesburg, Mich.
97,462.—Fruit Slicer.—F. C. Vibert, Hockanum, Conn.
97,463.—Lamp Shade.—Gustavus Wedekind, Philadelphia, Pa.
97,464.—Ditching Machine.—J. W. Weston and M. H. Weston, Windsor, Ill.
97,465.—Expanding Plow.—A. W. Wilkins and S. T. Eskridge, Rome, Ga.
97,466.—Watch-winding Attachment.—G. H. Wilson (assignor to H. W. Dee and Louis Dee), London, England.
97,467.—Combined Planter and Cultivator.—Thos. Wilson, Garton, England.
97,468.—Bedstead Fastening.—Nickolas Zins, Evansville, Ind.
97,469.—Compound for Disinfecting and Deodorizing.—H. G. Dayton, Dayton, Ohio.

REISSUES.

90,644.—Apparatus for Generating and Carbureting Gas.—Dated June 1, 1869; reissue 3,748.—Cleaveland F. Dunderdale, New York city.
90,653.—Guano Attachment for Seed Drills.—Dated June 1, 1869; reissue 3,749.—J. F. Fisher, Greencastle, Pa., and Daniel Breed, Washington, D. C., assignees of J. F. Fisher.
89,144.—Gang Plow.—Dated April 20, 1869; reissue 3,750.—T. J. Hall, Bryan, Texas.
58,268.—Gate Latch.—Dated Sept. 25, 1866; reissue 3,751.—R. A. Leeds, Stamford, Conn.
94,805.—Composition of Liquids for Tanning.—Dated Sept. 14, 1869; reissue 3,752.—Ira Wood, Woodstock, Vt.
90,246.—Plow.—Dated May 18, 1869; reissue 3,753.—H. B. Durfee, Decatur, Ill.
61,070.—Manufacture of Whipstocks.—Dated January 8, 1867; reissue 3,754.—Liverus Hull, Charlestown, Mass.
34,178.—Clothes Wringer.—Dated January 14, 1862; reissue 3,755.—Metropolitan Washing Machine Company, Middlefield, Conn, assignee of A. M. Bailey and J. O. Couch.

DESIGNS.

3,767.—Brush.—C. L. W. Baker, Hartford, Conn.
3,768.—Frame of a Carding Machine.—E. C. Cleveland, Worcester, Mass.
3,769.—Trade Mark.—H. Fenn, Plymouth, Conn.
3,770.—Printers' Type.—Julius Herriet (assignor to D. W. Bruce), New York city.
3,771.—Label.—T. F. Leslie, Brooklyn, N. Y.
3,772.—Safe.—W. K. Marvin, New York city.
3,773.—Miter Mold.—Wm. Sage, Indianapolis, Ind.
2,774 to 3,778.—Caster.—G. Wilkinson (assignor to Gorham Manufacturing Co.), Providence, R. I. Five Patents.

EXTENSIONS.

Envelope.—E. Harmon, Gettysburg, Pa.—Letters Patent No. 13,838, dated Nov. 20, 1855.
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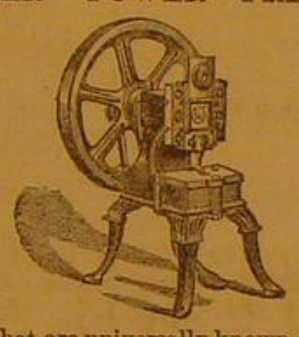

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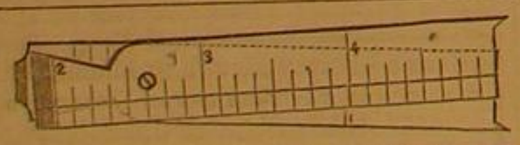

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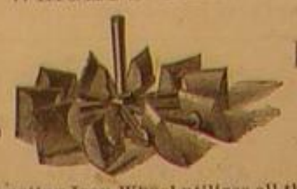
CHEAP,  POWERFUL.

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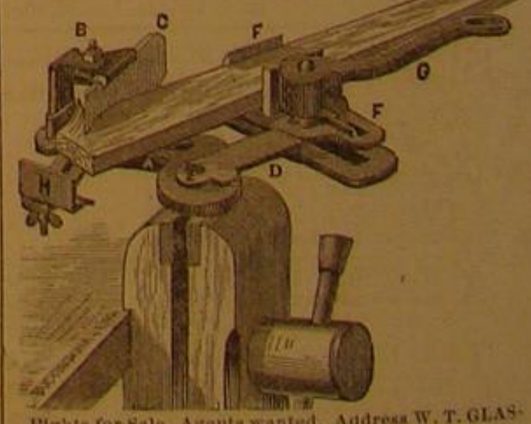

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SCIENTIFIC AMERICAN

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Vol. XXI.—No. 26. [NEW SERIES.] NEW YORK, DECEMBER 25, 1869. $3 per Annum [IN ADVANCE.]

Improved Horse-power Fire Engine.

The several parts of this invention, in themselves, contain but slight elements of novelty, yet the combination of these parts, which is covered by the patent, constitutes, in our opinion, an important and useful improvement, and one which has before it a large field in which it may be advantageously and economically applied.

Our artist has so well delineated the machine that it will be at once understood by all familiar with fire engines. It is a combination of the well-known and extensively used endless apron horse-power machine with a force pump, and reel for a hose; the force pump and reel being placed at the front, as shown. The pump is driven by a crank motion actuated by a pair of bevel gears, the suction and delivery hose being coupled underneath the barrel of the pump, or in any other convenient position, the relative position of the parts not being material to the claims of the inventor. The whole is placed and fixed on a suitable truck, and the weight of the entire apparatus including truck may, it is thought, be brought within 2,500 pounds.

McCARTHY'S HORSE-POWER ENGINE FOR EXTINGUISHING FIRES.

A folding back, when let down as shown in the engraving, forms a bridge whereby the horses mount to the endless apron. The engine is drawn by horses to the place of conflagration, and is ready to operate as soon as the horses can be unhitched from the carriage and led upon the endless apron described.

For rural towns and the suburbs of large cities, this engine possesses many advantages, coming, as it does, between the hand engine and the expensive steam fire-engine. Its lightness enables it to be rapidly drawn to a fire, and the cost of fuel is saved. Its cost is much less than a steam engine, and its working efficiency may be made much greater than that of a hand engine as the number of horses is not limited to two, but three or four may be used in machines of large capacity. It thus has, in proportion to the working power of the horses, the advantages of steam fire-engines, without the defects of hand engines, not the least of which is the generally admitted demoralizing tendency of volunteer fire-company organizations upon the youth who for the most part compose them. Extra hose-carts are not needed. The machine may be placed in charge of some responsible person in small towns, and when required two or three men may effectually operate it. Where the water has to be raised only a short distance through the suction pipe it is claimed that two horses will, through two hundred feet of hose, throw a three-quarter-inch stream to a hight of from sixty to seventy feet.

We think this machine peculiarly adapted to the wants of far-western towns. In such cases it might be placed in the care of the postmaster, merchant, or other responsible party centrally located, and would be an important safeguard against those disastrous conflagrations which have so frequently ravaged our border settlements.

Patented, through the Scientific American Patent Agency, Nov. 2, 1869. For further information concerning rights, etc., address John C. McCarthy, patentee, 131 Barrow street, New York.

Novel Trout Fishing.

The *Virginia City* (Nevada) *Enterprise* states that trout are taken at Carson in the following unique manner:

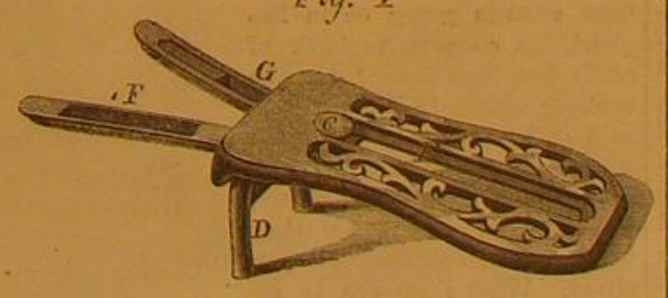
"They take a cartridge of 'Giant' powder, weighing about a quarter of a pound, insert into it a piece of fuse, properly capped, about six inches in length, then, lighting the fuse, the cartridge is thrown into any deep hole supposed to contain trout or other fish. After the cartridge has been thrown into the water, smoke and bubbles of gas are seen to rise to the surface, then in a few moments comes the explosion—a dull, heavy report. The surface of the water is seen to bulge up, and the ground can be felt to shake for fifteen or twenty feet back from the water.

"Immediately after the explosion, all the fish that happen to be within a circle of twenty-five or thirty feet of the spot where the cartridge fell, come to the surface, either killed outright or so badly stunned that it is some minutes before they recover. Our informant says that with two cartridges he saw over fifty pounds of fish killed, counting trout, white fish, and chubs. In places, after a blast, the whole surface of the water would be covered with minnows from an inch to three or four inches in length. At Elko they are practicing the same style of fishing, only that out there they tie the cartridge to the end of a long pole and thrust it into the water, holding it until the explosion occurs. This is the most destructive mode of fishing we have ever heard of; it is a regular wholesale slaughter of great and small, good and bad. Should the practice gain ground it will be necessary for the Legislature to put a stop to it by making it a criminal offense to fish with Giant powder. Parties have already been talking of trying this process in Lake Tahoe, where, by using large cartridges, they expect to bring up hundreds of trout at a single shot."

SEYMOUR'S PATENT POCKET BOOT-JACK.

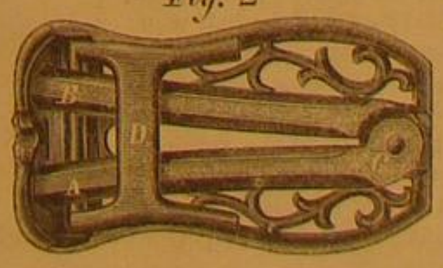
This convenient little implement is made of cast iron, and is so contrived that it may be folded into a very small space, as shown in Fig. 2, or extended for use as shown in Fig. 1.

Fig. 1



The jaws, F G, are pivoted together at C, the head of the pivot sliding in a rib of a slot, E, in the foot plate. The jaws have grooves in their upper surfaces, as shown in Fig. 1, the groove of one being placed further back than the groove of the other. The support, D, of the foot plate, is pivoted to the foot plate, and folds down, as shown in Fig. 2, when the jaws are thrust back; thus making a very compact arrangement for carrying in the pocket or carpet bag. The folding and unfolding of the support, D, is effected by lugs cast upon the portion of the support, D, which passes between the jaws and the foot plate. These lugs lie directly under the points of the jaws indicated by the letters A and B, Fig. 2. The outer end of the groove which lies nearest to the foot plate, Fig. 1, striking against the lug which plays in that groove folds down the support when the jaws are thrust in; while the inner end of the groove in the other jaw, striking the lug which slides in that groove, unfolds it when the jaws are thrust out. The jaws slide in ways which force them together when they are thrust in, and open them when they are thrust out.

Fig. 2



This implement will draw any sized boot from a lady's gaiter to the largest men's wear. Its convenience to travellers, as well as others, is obvious.

Patented through the Scientific American Patent Agency, Oct. 29, 1867, by Albert P. Seymour, of Hecla Works, Oneida county, N. Y., who may be addressed for the entire right for the United States or for State rights.

The East River Bridge.

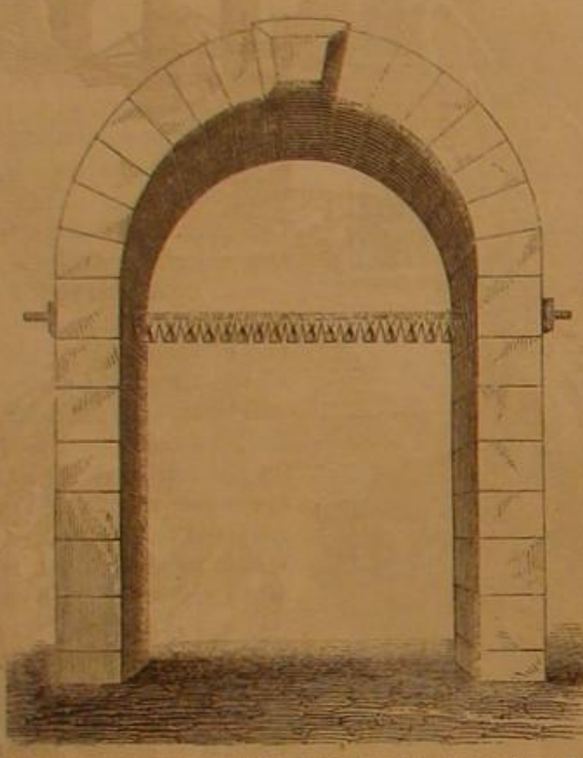
We learn from the Brooklyn *Times* that the construction of the caisson which is to be sunk at the base of the Brooklyn tower of the East River Bridge, is begun, and is now well under way. Colonel Wm. H. Paine is present at Messrs. Webb's yard every day, superintending the work on behalf of the Bridge Company. It is expected that the caisson will be ready to launch some time in March. It will then be floated to the location of the Brooklyn foundation of the tower. The river shore will be dredged out to low water line, and the caisson floated into its position on a high tide; on the water receding, it will be anchored or "seated," and excavating to sink it the required depth will be carried on in its interior. Through the roof will be six shafts, or funnels, made of half-inch boiler iron. The two supply shafts through which the workmen descend and ascend, and by which the excavated soil is removed, will be twenty-one inches in diameter each. Each of the two air shafts, by which air is supplied to the workmen, is forty-two inches in diameter. Each of the two water shafts, in which the water oozing through the soil will be conducted, so as to keep clear of the workmen, is seven feet square. On top of this caisson will be piled timber to the hight of fifteen feet, and the whole mass filled in with concrete; and on this bed of wood and stone will be placed the masonry for the towers.

The caisson is in shape a parallelogram, 168 feet long and 102 feet wide on the outside, and is about 15 feet high. The sides are V-shaped, the bottom being eight inches thick, and the top eight feet three inches, and ten feet high, and the roof, which rests on these sides, is five feet thick. The whole is constructed with yellow pine a foot square, with the seams caulked. Between the outside layers of timber is a sheathing or layer of tin, between two of felt, intended to prevent the atmosphere from working into the interior of the caisson. The sharp edges of the structure, are to facilitate the sinking of the box thirty feet beneath low tide level, and accordingly this portion is strongly made. The first layer of timber is of oak; on this is bolted a cast-iron shoe, eight inches wide, oval on its face, being three inches thick in the center. Around the shoe is placed an armor of boiler iron, extending three feet above the shoe, on both sides of the wall, the whole strengthened by heavy angle irons on the interior, sixteen feet long. As the pressure of air on the caisson will increase as it sinks, it is estimated that the atmosphere resting on the surface will vary from 18,000 tuns to 40,000 tuns. Consequently, careful and accurate calculation is made to give strength to the box. The timbers are all bolted together, perpendicularly, horizontally, and diagonally, with the heaviest and longest bolts ever used. These bolts are, on an average, eighteen inches apart throughout the structure, and the ends are made air-tight by rubber washers. The immense number of bolts may be imagined, when it is expected that one hundred tuns of them will be used. The interior of the caisson will be a room one hundred and sixty-six feet long, one hundred feet wide, and nine feet high. There will be about one million five hundred thousand lineal feet of timber used in constructing the caisson, and when ready for launching it will weigh three thousand tuns. In order to launch it, there will be seven ways or keels underneath, and a water-tight compartment, or air-chamber, in the interior, thirty-eight feet wide, extending lengthwise. In addition to this there are ten heavy supporting frames to sustain the roof.

As regards the negotiations for obtaining the site for the tower on the Brooklyn side, it appears that they have so far made but little progress. This tower will, it is understood, be built in the third or upper slip of the Fulton ferry. The Ferry Company lease their ferry property from the City of New York, and the Commissioners of the Sinking Fund of that city are vested with the power of leasing and selling public property. The Brooklyn *Eagle* states that when negotiations were opened by the Bridge Company to obtain possession of the upper slip and section of the adjacent land, the Sinking Fund Commissioners referred the matter to a Commission of Estimate and Assessment, consisting of Wilson G. Hunt, and Thomas R. Agnew, who have not yet made their report. It is understood, however, that this will be forthcoming without much further delay, after which the preparations for the reception of the caisson will be at once proceeded with.

The Force of Contraction Applied to Repairs of Buildings.

The force of contraction is equal to that of expansion, and quite as irresistible. Its immense power was strikingly illustrated some years since in Paris. The two sides of a large building, the "*Conservatoire des Arts et Métiers*," having been pressed out by the spreading of the arched ceilings and the immense weights supported by the floors, M. Molard undertook to remedy the evil by boring holes in the wall at the base of the vaulted ceilings, and opposite to each other, through which strong iron rods were introduced, so as to cross the interior of the building from one side to the other. On the projecting ends of the bars on the outside of the building were placed strong iron plates, which were screwed, by means of nuts, tightly against the walls. The rods were then heated by means of rows of lamps placed under every alternate bar, and being lengthened by the expansion, the



nuts and plates were pushed out to the distance of an inch or more beyond the walls. While in this condition, the nuts were screwed a second time tightly against the wall. The lamps were then extinguished, and the rods, contracting as they cooled, drew the walls together with a force almost irresistible, and to a distance as great as that to which they had been lengthened by expansion. These bars being then left in their new position, the *alternate* bars, which had remained unheated, and by the contraction of the others had been also made to project beyond the walls, were again tightly screwed against the building. These were in turn expanded and lengthened by the application of the lighted lamps, and once more screwed up tightly against the walls. The lamps were then extinguished, and by the contraction of the second set of bars the walls were drawn still further toward each other. These were then left, in turn, to hold the building in its new position, and the first set of bars a second time brought into requisition. And thus the process was continued until the walls were drawn into their proper vertical position; and the bars being left in their places, they have remained firm and upright ever since. In this manner a force was exerted which the power of man could scarcely have applied by any other means. The same process has since been applied to the restoration of other buildings which were threatening to fall.—*Pynchon's Chemical Forces.*

Air in Illuminating Gas.

Professors Silliman and Wurtz have been investigating the effects of atmospheric air upon the illuminating power of gas, with, according to the *Chemical News*, the following results:

"For any quantity of air less than 5 per cent, mixed with gas, the loss in candle power due to the addition of each 1 per cent, is a little over six tenths of a candle (0·611 exactly); above that quantity the ratio of loss falls to half candle power for each additional 1 per cent up to about 12 per cent of air; above which, up to 5 per cent, the loss in illuminating power is nearly four tenths of a candle for each 1 per cent of air added to the gas. With less than one fourth of atmospheric air, not quite 15 per cent of the total illuminating power remains, and with between 30 and 40 per cent, it totally disappears.

A Belgian report on the preservation of telegraph posts decides that chloride of zinc is the best and cheapest agency to employ, though it does not work equally well in all soils

Railway Bridge Across the Seine.

Our illustration annexed represents a railway bridge which crosses the Seine, below Paris, at the Point du Jour, on the Chemin de Fer du Ceinture. The bridge, which is rather a remarkable structure, is built in two stories, the lower one consisting of five elliptical, and the upper one of thirty semicircular arches. The span of the lower arches is, in each instance, 99·2 feet; and that of each of the upper arches 15·5 feet. The intermediate piers of the lower arches are each 15·5 feet thick in the direction of the length of the bridge, and those of the upper series of arches measure at the springing of the latter 3·36 feet in the same direction. The upper arches carry the Chemin de Fer du Ceinture, the roadway being 29·5 feet wide, the width of the lower being 131·7 feet, thus affording ample room on each side of the upper viaduct for a carriage and foot-way, the carriage roads being each 24·6 feet wide. The materials used in the erection of the bridge are cut stone and rubble, the parapets and balustrades being of Jura marble. In the large spans the stones are set in cement. The river bed beneath is of clay, chalk being reached under the left abutment, at a depth of about 26 feet, while on the sides of piers and right abutment, sand was met with. In making foundations for the piers, large bottomless wooden caissons were sunk nearly to the chalk, and were then partially filled in with beton, on which the masonry was built by the aid of coffer dams. The ends of the centers of the large arches were supported by dried sand contained in suitable boxes, and they were struck by allowing the sand to escape; the centers were only lowered about one fifth of an inch at one time. The lower story was entirely completed before the upper one was commenced. The bridge was erected about four years and a half since, at a cost of $650,000, from the designs of M. Bassompiere, engineer to the Chemin de Fer du Ceinture.

RAILWAY BRIDGE ACROSS THE SEINE, BELOW PARIS.

Co-operation in Italy.

A Naples correspondent of the London *Times* says:

"One of the most striking features in modern constitutional Italy, is the disposition to form associations. This, of course, is one of the natural results of political liberty, but in the last week or so, we have had a development of it on the co-operative principle, which has probably received an impulse from what is going on in England. A co-operative bank of credit has been formed for the working classes in Naples. One half of its shares have already been taken. The remaining shares are offered to the working classes, and as soon as two fifths are taken the bank will commence its operations. What these are is explained as follows: Limited loans on word of honor, prudently restricted to seventy-five lire; discounting work; discounting bills; receipt of savings, even so low as ten centesimi; deposits in running accounts; advances on public property. Many even of the half who have already taken shares, it is said, are working men, not heads of establishments; and, as this is the first instance of the application of the co-operative principle to credit in Southern Italy among the working classes, the experiment is regarded with much interest.

"A bank of the same kind exists in Padua, and has met with considerable success, having with a capital of 30,000 lire conducted affairs in the first year to the amount of 300,000 lire; but without meaning to throw cold water on any effort in a right direction, still it remains to be seen whether the social atmosphere of Southern Italy is as favorable to the growth of such institutions as that of Northern Italy. At all events, the working classes are daily becoming a more important element here; partly, no doubt, from the increased demand for labor, which has been created by private and public enterprise, and as much from the instruction they have received during the last nine years.

"The labor market, I may add, is not sufficiently supplied in this country, and the rate of wages has risen within a few years, in some trades, one half higher than it was before. Another and a novel instance of the application of the co-operative principle, is announced as having been made, not by workmen, but by masters—that is, by the architects of Caserta, with whom those of the neighboring town of Maddaloni have united themselves. Under the title of the 'Association of Architects of the city of Caserta,' they undertake, in their common interest, any commission connected with their profession, and to resolve all questions of art in the meetings of the society. While, therefore, not paying more than would be demanded by a single engineer, it is pointed out as one of the great advantages offered by the association that any person entering on a building or engineering enterprise would here have the benefit of the united study, intelligence, and activity of many. I do not say a word as to the merits or prospects of success of these associations, but report them merely as an indication of that awakening of the public

Italian mind which in many directions and forms is so evident."

Correspondence.

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

Proposed Industrial Fair at Washington.

MESSRS. EDITORS:—There is now in the Treasury of the United States more than $500,000 of money received through the Patent Office in excess of expenses. The average amount of such surplus that may be calculated upon hereafter will not be less than $200,000 per annum. All the other bureaus are maintained entirely at the expense of the Treasury. But Congress intended that the Patent Office should be in the main self-sustaining, and to the special tax necessary for that purpose the inventors of the world—for whose benefit the Office was created—consent. It seems reasonable, however, that the taxes thus paid by them should be appropriated for their benefit, and that they should not be diverted to other uses, so long at least as there were wants of their own to the relief of which the money might properly be applied.

Now the models which are required by law are of great and daily importance, and should not be dispensed with unless from necessity. But the space provided for them is already mainly occupied, and about 5,000 square feet of additional shelf surface is required every year. It would also be of great advantage to the supporters of the Patent Office if opportunity were afforded to exhibit working machinery as well as manufactures and other products.

Two years ago it occurred to me that this surplus, which was then said to be of about half its present amount, might with propriety and advantage be applied to the commencement of a structure that would meet present wants and be capable of indefinite expansion. An eminent architect expressed the opinion that such an undertaking would be perfectly feasible. It was believed that from moderate beginnings the present wants of the Office and its patrons might thus be supplied by an institution that would grow into proportions commensurate with the growing requirements and capabilities of the American people, that international rivalries might also be invited—that it might thus at length become developed into a permanent world's fair, at the same time that it subserved the legitimate purposes of the Patent Office.

Circumstances prevented an effort to carry out that project then, but other circumstances have revived the intention now. At least it has seemed proper that the idea should be presented and discussed, and, if deemed expedient, adopted and urged to its consummation.

An effort is now being made by the people of this district to hold a World's Fair in this city at no distant day. Nearly half a million of dollars have already been subscribed for that purpose, and it is confidently believed that this amount may be increased to $1,000,000. Especially if, instead of being a temporary undertaking, it is made one which contemplates permanency.

Now if these two projects were united, could they not be worked up into what might prove a great mutual as well as general advantage? There is competent authority for saying that with $1,500,000 a permanent structure of iron and glass might be made of a capacity at least equal to that of the entire Patent Office building. Sufficient space for the arrangement and preservation of models would thus be provided as well as for manufactures and machinery of all descriptions. A permanent temple would thus be erected to human ingenuity to which men of genius from all quarters would resort to give and receive new inspiration.

I hope the thought will not be deemed extravagant that under the united influence of the Smithsonian Institution, the Patent Office, and the Agricultural Department, this establishment might at length become the chief center of the arts and sciences of the civilized world.

As far as has been yet ascertained the matter as thus presented meets with favor among those under whose auspices the project of a World's Fair here has been inaugurated. Before making any serious effort on the subject, however, it is thought expedient to know the views of inventors and their friends on this subject. Your position and character render your opinions of great moment, and on that account I now address you.

It is not proposed to ask the appropriation of a single dollar by Congress. All that would be expected from that quarter would be a permission to appropriate funds which rightfully belong to the Patent Office to aid in carrying out the common enterprise which is mainly for its benefit.

I am fully conscious of the fact that, in a mere financial point of view, the "Exposition" would prove a much greater success, if held in some large commercial city. But that is not the question now. The enterprise is already undertaken. It will be carried through, as I am assured. Whether it prove a financial success, or otherwise, to the stockholders is not an element in our present calculation. It is only here that the Patent Office could, with any propriety, connect itself with such an undertaking, for it is only here that this undertaking could yield those advantages that would justify the connection and expenditure. Besides, Washington is not the commercial rival of any other city, and the jealousy that might be excited against most other plans of like magnitude would interpose no obstacle here.

Washington, D. C. CHAS. MASON.

Magnetic Action of Wind Currents.

MESSRS. EDITORS:—I have been making some experiments for the past three months, which, I think, will interest some of your readers. The instrument used consists of a wind vane made of a thin board some four inches long by one twentieth wide, and as thick as a sheet of commercial note paper. In one end are placed four magnets, so arranged that the south poles point down and perpendicular to the vane, which turns freely on a pivot. The instrument is placed in a box so that the air cannot disturb it.

It sounds singular to hear of a wind vane protected from the wind, but, so it is, and I have never, during the entire course of my experiments, found it at fault in indicating the quarter the wind comes from, and that some little time before it comes. The final experiment was made to-day. I placed the instrument at right angles to a meridian traced on the floor, and left it to itself for one hour. When, on returning, I found it had changed its position, and pointed to the southwest. I timed it, and found that in fifteen minutes the wind came from the southwest (number 1 of the Smithsonian table). There had been nothing of note, in a meteorological point of view, for over one week, so that the magnetic currents could not have influenced the vane. ERNEST TURNER, C. E.

Philadelphia, Pa.

Suggestions about Steam Navigation and Steam Boilers.

MESSRS. EDITORS:—One of the greatest benefits your valuable journal confers is, that its columns afford a means of ready communication between all classes of inventors—those of the hand as well as those of the brain; and thus the floating, useless visions of the theorist meet, fructify, and utilize the barren though vigorous growth of the man of practice alone. The mechanic sets his wheels and gear, and calls for assistance; a spirit is breathed upon them which animates the mass. Encouraged by such reflections, I venture to send you some of my random ideas for publication. They *might* be flint to some ones steel. Concisely and briefly, then, in regard to steam navigation:

Robert Stevenson said, the problem here was how to diminish the friction of the vessel and the water; not how to increase the power of engines. Among others, two systems might accomplish this: The discovery of a new instrument, or new application of the old; or a change of naval construction.

First—taking it for granted, I am not quite sure, that the resistance is as the square of the depth, then a lessening of depth in the water, with same power, would increase speed. We need, therefore, as it were, to raise the vessel. If gas raises a balloon, it should raise a ship, and naturally suggests itself as the means. A ship, contrived by the aid of gas, to draw only one, or a few feet of water, with a powerful engine, would seem, in theory, to solve Stevenson's problem. My objection is, the vast bulk of gas; but my calculations may be wrong. I suggest the use of gas, in this manner, as a subject for reflection.

I believe ships are now modeled after the fish because nature is supposed to have suggested it. They are made sharp and deep. I suggest, ships do not go through the water like a fish, but over the water like a duck. The water fowl is nature's model for those things which go over the water, flat, broad, and rounded. The objection of the effect of waves is futile. The center of gravity is at our disposal.

Another problem is to lessen the consumption of fuel. Now, a steam boiler consists of water in a metal vessel. When fire is applied, the metal absorbs a vast amount of heat, radiates, deflects, and otherwise destroys the effect of the fuel on the water. This is entirely due to the material of the boiler. What we want, then, is some agent which will hold the steam and water, while it will allow the direct action of the fire on the water—a substance which shall pass rays of heat as fully as glass does the rays of light—a heat-glass. Rock salt does so perfectly, so far as the heat is concerned, but is soluble and combustible. Can not some chemist give us a silicate of sodium which will answer? GEO. R. PHELAN.

Memphis, Tenn.

The Tidal Wave.

MESSRS. EDITORS:—The SCIENTIFIC AMERICAN, of November 13th, contains an article on this subject, copied from the London *Spectator*, and your readers are admonished editorially against overwhelming you with remarks on the same. It is, therefore, with hesitancy that I venture the following.

The drift of the paper quoted, is to show that by the tidal action, the rotation of the earth on its axis is retarded in consequence of the friction of the water, following the wave in its westerly and opposing direction to the earth's rotation. This is substantially the sum of the proposition.

Since the friction of the water is the retarding cause, how would the case stand if there were no water, or if solidified, and itself became friction, leaving a dry earth.

Trivial as this assigned cause, friction, appears, to disturb the precision of the earth's rotation, remaining undetected for ages, does it even exist, in an appreciable degree, or if so, is not its tendency to accelerate the rotation?

If we start with a swell or wave under the moon, the western course of her attraction would keep up the swell from the advancing or western side, and the eastern side would be constantly receding, *i. e.*, the source of renewal to the swell would be drawn from the advance and its decline eastward, by the retiring attraction of the moon. Hence, the friction of the water, both to and from the swell, would be in favor of acceleration. THOS. W. BAKEWELL.

Pittsburgh, Pa.

RAT POISON.—Recent experiments have shown that squills is an excellent poison for rats. The powder should be mixed with some fatty substance, and spread upon slices of bread. The pulp of onions is also good. Rats are very fond of either.—*Journal de Chimie.*

[For the Scientific American.]

THE SPECTROSCOPE AND AURORA BOREALIS.

BY DANIEL KNODE WINDER.

In a report of the proceedings of the Royal Astronomical Society, published in May last, there is a record of several interesting observations, concerning the spectrum lines of Aurora, which it is interesting to compare with several observations made on this side of the Atlantic Ocean. These observations promise to be useful in aiding us to determine the nature of the Northern Light.

In the report alluded to, Mr. Plumber tells us, that in the spectrum of Aurora, he saw one bright line in the green, near E.

Mr. Angström saw it as one bright line in the yellow, near D, and several faint bands, near F.

Mr. Struve observed one bright line, near D, and traces of two others in the green.

Professor Winlock has seen six lines, the brightest of which was near E.

The writer has frequently seen one bright line in the yellow, near D (coincident with one of a group of lines which appear in the solar spectrum, when the sun is near the horizon), and one faint line in the green. On one occasion there was visible one additional line in the red.

It has always proved a difficult task to determine, with certainty, the position of the spectrum lines of Aurora, and as the value of observations with the spectroscope rests principally upon our ability to do so, I am glad to find that the locations of eight lines have been announced.

The wave length of M. Angström's bright line is 556·7.

The lines seen by Mr. Winlock, he determines, micrometrically to be as follows: the bright line 1474, the other five lines, 1280, 1400, 1550, 1680, 2640, Kirchoff's scale.

The bright line seen by myself I found to be very nearly 557.

Now we learn from these observations: First, that the light of Aurora gives a spectrum consisting of bright lines; secondly, that the same number of lines are not always seen; thirdly, that the lines are fixed in their positions; fourthly, that the same line is not always the brightest; lastly, that one line in the spectrum of Aurora is coincident with a dark line, which appears in the solar spectrum, when the sun is near the horizon.

I was much pleased to find in No. 15, current volume, SCIENTIFIC AMERICAN, an interesting letter from Professor Vander Weyde, criticising the conclusions reached by M. Angström, and, also, those resulting from my own observations. To the objections which he urges against my hypothesis I will reply briefly, and, I trust, in the same kind spirit which he has shown in his criticism.

First, he objects because the spectrum seen by me is different from the spectrum of oxygen.

I reply, that this is a weighty objection to the opinion I have expressed, that Polar light is principally incandescent oxygen. But I have been led to this conclusion from the coincidence of the bright line in Aurora, with a line in Solar light, which, I think it probable, is produced by oxygen, because of the density of that gas. The difference between the spectrum of oxygen and that of Aurora, does not seem necessarily to prove my opinion incorrect, for it is a well-known fact, that the spectra of elements vary according to the circumstances under which they are produced. For illustration, potassium usually gives a spectrum of only three of the seventeen lines of which it is known to consist. Again, the position of the hydrogen line, F, in the spectrum of Sirius is changed by the movement of the star, as it recedes from the earth. Again, carbon gives six differing spectra, according to the circumstances under which they are produced, and in these the same line is not always the brightest.

Secondly, Professor Vander Weyde objects, because of the presence of a line, in the spectrum, that has not been identified. I confess that I am at a loss to comprehend this argument, as I have only expressed the opinion that Auroral light is, principally, not exclusively, incandescent oxygen.

Lastly, he objects to my explanation of the change of the bright line to a black one. I reply, that I accept the common theory, explaining the change of solar lines from bright to dark ones; I never, for a moment, doubted it; but the line under consideration is not an ordinary solar line, but one that is seen only when the sun is near the horizon, and, therefore, seems to require a different explanation, and as it is not seen at midday, I conclude that it is darkened by absorption in its passage (morning and evening) through the earth's atmosphere.

I am happy to find so many distinguished scientific gentlemen interested in the subject of the nature of Aurora Borealis, and I entertain a hope that the observations made before the present season of Auroral displays shall have passed away, will enable us to explain more fully the nature of its phenomena.

Toronto, Ont., Nov. 15, 1869.

A NEW WHITEWASH FOR WALLS, recommended by the Boston *Journal of Chemistry*, is as follows: Soak one fourth of a pound of glue over night in tepid water. The next day put it into a tin vessel with a quart of water, set the vessel in a kettle of water over the fire, keep it there till it boils, and then stir until the glue is dissolved. Next put from six to eight pounds of Paris white into another vessel, add hot water and stir until it has the appearance of milk of lime. Add the sizing, stir well, and apply in the ordinary way while still warm.

"Paris white" is *sulphate of baryta*, and may be found at any drug or paint store.

AMERICAN INVENTIONS IN EUROPE.

It is a fact exceedingly gratifying to the pride of every true American, that American inventors and manufacturers are to-day supplying the Old World with many of its best implements. In the matter of improved firearms, we are so far ahead of the nations of Europe, that many of them are sending large orders to our manufacturers, and where they have attempted to get them up themselves they have almost invariably adopted American inventions.

A writer in the *N. Y. Tribune*, mentions the fact that the Snider alteration of the Enfield, in England, was an American invention; the Henry Martin is but a very slight modification of the Peabody gun, and the Swiss gun is the Winchester (formerly known as the Henry) magazine rifle, altered very much for the worse. At the various trials abroad, the American guns have invariably come out ahead, and the English Commission reported as to magazine guns in favor of, first, the Winchester, and, second, the Ball guns. The Messrs. Remingtons, of Ilion, N. Y., have furnished to the Danish Government 25,000 of their celebrated breech-loading rifles, and to the Swedish Government, 25,000; while this year they will send to Europe generally fully 100,000. These rifles have been sold to Austria, France, Italy, Spain, Egypt, and Cuba, in smaller quantities, with a prospect of much larger sales in the future. Colt's Company is completing 30,000 Berdan rifles for Russia, and it is rumored that the order has been increased to 100,000. At the same time Col. Berdan has gone to Russia to superintend a factory there, probably for altering their present arms. Turkey has bought 200,000 of our rifles, and sent them home, and has just completed the purchase of over $60,000 worth of machinery, with which to convert them into breech-loaders, on the plan, probably, of those altered at Springfield. Sharp's Company have been converting 30,000 of their rifles and carbines into metallic cartridge guns for our Government. At the same time the Winchester Company is turning out over 100 per day of its repeating rifles, and is increasing its works. It has also bought out the Spencer Company, of Boston, including the Spencer and Fogarty patents, thus combining and controlling all the prominent magazine guns, except the Ball, which is owned by the Windsor Company, of Vermont, and of which quite a number have been recently sold in Persia. The Winchester and Remington rifles are being sent to China and Japan, and the former are also sent to Australia, as well as all over the West, the Plains, and the Pacific coast. Nearly one-half of the entire product of Smith & Wesson's pistol factory, employing some 300 hands, is sold in Europe, mainly in France, notwithstanding their cheaper labor. This result is of course due to the fact that they are mainly the product of *machine* labor, which machines are themselves of American invention and manufacture, and which produce an accuracy of work and finish that their hand labor cannot equal. But not only are we furnishing Europe and the Old World generallywith arms,but we are also supplying them with ammunition. The Union Metallic Cartridge Company of Bridgeport, under the control of Hobbs, of lock fame, is furnishing metallic cartridges—far superior to any ever before seen—to nearly all the world. They had one order of 25,000,000 from the Russian Government, and it is reported that the order has been increased to 100,000,000. They make them of every variety and size, their sale of one small size for pistols averaging 45,000 per day, a large portion going to Australia. And these, too, are all made on machines invented by Americans, the like of which do not exist elsewhere in the world. In addition to all this, the Windsor Company, of Windsor, Vermont, are just completing an order for $80,000 worth of milling and screw machines, to be shipped to Edinburgh, Scotland, to establish there a large factory for the manufacture of the Singer sewing-machine. Not content with shipping the sewing-machines themselves—of which large numbers of the leading kinds are constantly sent—they intend making them there, and that, too, with American machinery. Already, the Windsor Company has sent one or two lots of similar machinery to Canadjo for the same purpose; but sending machinery from here to Great Britain is bearding the lion in his den to some purpose. It is also specially worthy of note that the milling machine—one of the most important and useful of all metal-working machines—and the screw-making machine are purely of American origin.

Steam Boiler Incrustations.

According to *Cosmos* a series of experiments, made on purpose, and continued for a sufficient length of time to yield a reliable result, has fully proved that the addition to the feed water of steam boilers of fatty clays, especially the kind known as fuller's earth, entirely prevents boiler incrustations, even where, of necessity, very hard water has to be used as feed water. A loose, soft mud is deposited as soon as the motion of the water, due to the boiling, ceases on cooling. This mud readily runs off on opening the sludge valve of the boiler.

The *Annales de Génie Civil* informs us that these incrustations may be prevented by the use of raw potatoes, which cause all solid matters to be precipitated at the bottom of the boiler in a fine powder, leaving the sides perfectly free. The experiment was tried with an engine of 8-horse power, into the boiler of which ten kilogrammes of potatoes per week were introduced through the safety valve. Every week, when the fires were extinguished, the deposit was removed previous to the introduction of a fresh supply of potatoes. On examining the boiler after fourteen consecutive months of work, no traces of incrustation were perceptible; the appearance of the plates was blackish and slightly greasy, and the corners of the joints were in the same state as when first made. Refuse leather-cuttings from the tanneries will answer the purpose equally well.

These prescriptions for a bad complaint are not new, unless it be the use of fuller's earth. They have, in common with others of the same nature, the important drawback that they are not applicable to all cases. There is no doubt, however, of their utility in some cases.

The Maddening Mechanism of Thought.

Our brains are seventy-year clocks. The Angel of Life winds them up once for all, then closes the case, and gives the key into the hand of the Angel of the Resurrection. Tic-tac! tic-tac! go the wheels of thought; our will cannot stop them; they cannot stop themselves; sleep cannot still them; madness only makes them go faster; death alone can break into the case, and seizing the ever-swinging pendulum, which we call the heart, silence at last the clicking of the terrible escapement we have carried so long beneath our wrinkled foreheads. If we could only get at them, as we lie on our pillows and count the dead beats of thought after thought and image after image jarring through the over-tired organ! Will nobody block those wheels, uncouple that pinion, cut the string that holds these weights, blow up the infernal machine with gunpowder? What a passion comes over us sometimes for silence and rest—that this dreadful mechanism, unwinding the endless tapestry of time, embroidered with spectral figures of life and death, could have but one brief holiday? Who can wonder that men swing themselves off from beams in hempen lassos?—that they jump off from parapets into the swift and gurgling waters beneath?—that they take counsel of the grim fiend who has but to utter his one peremptory monosyllable, and the restless machine is shivered as a case that is dashed upon a marble floor? Under that building which we pass every day there are strong dungeons, where neither hook, nor bar, nor bed cord, nor drinking vessel from which a sharp fragment may be shattered, shall by any chance be seen. There is nothing for it, when the brain is on fire with the whirling of its wheels, but to spring against the stone wall and silence them with one crash. Ah, they remembered that—the kind city fathers—and the walls are nicely padded, so that one can take such exercise as he likes without damaging himself. If anybody would really contrive some kind of a lever that one could thrust in among the works of this horrid automaton and check them, or alter their rate of going, what would the world give for the discovery? Men are very apt to try to get at the machine by some indirect system or other. They clap on the brakes by means of opium, they change the maddening monotony of the rhythm by means of fermented liquors. It is because the brain is locked up and we cannot touch its movements directly, that we thrust these coarse tools in through any crevice by which they may reach the interior, alter its rate of going for a while, and at last spoil the machine.—*Oliver Wendell Holmes.*

Spontaneous Combustion of the Human Body.

In a former number, we spoke of the belief in the spontaneous combustion of the human body as "a vulgar superstition." A correspondent calls our attention to articles in cyclopedias, which refer to "well authenticated instances" of such combustion. Let us examine this matter in the light of what is actually known.

We must, in the first place, carefully distinguish between the notion of "a *preternatural combustibility*" of the body under certain abnormal conditions, and that of its *spontaneous combustion*. The former is not impossible; indeed, there are tolerably "well authenticated instances" of the kind. The latter, if not absolutely inconceivable, is in the highest degree improbable, and eminent physiologists who have carefully investigated all the cases in which it is alleged to have occurred, do not find a single one established beyond a doubt.

The earliest case of the kind which has a semblance of authority to sustain it, is said to have happened in 1725, and from that time down to the year 1847, when the last alleged case occurred, some fifty instances are recorded. Liebig made an analysis of all these cases in 1851, and found that they nearly all agree in the following points:

1. They took place in winter. 2. The victims were hard drinkers, and were drunk at the time. 3. They happened where the rooms were heated with fires in open fire-places or pans of glowing charcoal. Cases where rooms are heated by means of closed stoves are exceedingly rare. 4. It is admitted that no one has ever been present during the combustion. 5. No one of the physicians who collected the cases, or attempted to explain them, has ever observed the process, or ascertained what preceded the combustion. 6. No one has known how much time had elapsed from the beginning of the combustion to the moment when the consumed body was found.

Out of forty-five cases collected by Frank, of Berlin, in 1843, there are only three in which it is assumed that the combustion occurred when there was no fire in the neighborhood; and Liebig clearly shows that these three cases are totally unworthy of belief. The conclusion to which he comes is that "spontaneous combustion in a living body is *absolutely impossible*." Flesh which has been saturated with alcohol for a great length of time, as anatomatical preparations, is not combustible; if ignited, the alcohol burns off, scarcely charring the flesh. The corpses of drunkards have never been found to be combustible.

M. Duvergie has opposed Liebig's views, and has expressed the opinion that molecular changes may take place in the living body by which it becomes more combustible from the absorption of alcohol, or from its conversion into more inflammable compounds; but he admits that the combustion is probably never spontaneous. Dr. Marc has suggested that inflammable gases, and possibly even phosphoreted hydrogen, which, under certain circumstances, inflames on contact with the air, may be generated in the living body, and may thus give rise to its spontaneous combustion; but this is merely a theory to account for such cases of combustion, *if* they *have* occurred.

On the whole, this idea of spontaneous combustion appears to be one of those old medical delusions which, having once gained a sort of credence, are not readily given up. It is easy to see, as Liebig observes, that it arose at a time when men entertained entirely false views on the subject of combustion, its essence, and its cause. It is only since the time of Davy, or for about half a century, that combustion has come to be thoroughly understood. After people had once got it into their heads that the body might take fire of itself, it is not singular that when a man happened to be burned up, the case was explained in that way if it could not readily be accounted for in any other way; just as hundreds of fires caused by carelessness, not easily detected, are charged to the mysterious "incendiary." Then again, other things being equal, the more marvelous explanation of strange phenomena is usually the more popular one. The Latin proverb *omni ignotum pro magnifico est* might be read *omni ignotum pro mirifico est*, with everybody, whatever is unknown passes for a marvel. We need not be surprised, therefore, that this idea of human combustibility, which was not inconsistent with the scientific knowledge of the age in which it had its origin and which consequently came to be accepted by the scientific men of the time, should still live as a popular superstition and even find an occasional defender among the *savans* of this more enlightened day.—*Boston Journal of Chemistry.*

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING DEC. 7, 1869.

Reported Officially for the Scientific American

SCHEDULE OF PATENT OFFICE FEES:

On each caveat	$10
On filing each application for a Patent (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
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On granting the Extension	$50
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A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from upward, but usually at the price above-named $1
The full Specification of any patent issued since Nov. 20, 1836, at which time the Patent Office commenced printing them ..... $1·25
Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.
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97,470.—LUBRICATOR.—David Adamson, New York city.
97,471.—BALING PRESS.—J. L. Albertson, New London, Conn. Antedated Nov. 25, 1869.
97,472.—SAFETY VALVE.—Henry Ashfield, Chicago, Ill.
97,473.—STEAM GENERATOR SMOKE STACK.—W. F. Beecher, Morristown, N. Y. Antedated Nov. 24, 1869.
97,474.—SNOW PLOW.—Gottlieb Beer, Grafton, Wis.
97,475.—CONSTRUCTION OF PRESERVING-HOUSES.—Harrison Blackburn, Bedford county, Pa. Antedated, Nov. 20, 1869.
97,476.—PLANING MACHINE.—J. B. Brown (assignor to himself and N. F. Libby), Lowell, Mass.
97,477.—STOVE GRATE.—Edward Card, Pawtucket, R. I.
97,478.—BOOT JACK.—Wheeler Case, Russia, assignor to himself and J. H. Read, Jr., Utica, N. Y. Antedated Nov. 27, 1869.
97,479.—BUGGY TOP.—A. M. Cory, New Providence, N. J. Antedated Nov. 20, 1869.
97,480.—PUSHING JACK FOR RAILROAD CARS.—R. A. Cowell (assignor to himself and E. N. Keys), Cleveland, Ohio.
97,481.—SEWING MACHINE TABLE.—Henry Cowgill, Fredonia, Del., administrator of the estate of J. H. C. Cowgill, deceased.
97,482.—BASIN TRAP.—H. H. Crigie, New York city. Antedated Nov. 25, 1869.
97,483.—POST OFFICE LETTER BOX.—B. C. Davis, Binghamton, N. Y. Antedated Nov. 22, 1869.
97,484.—CLAPBOARD MACHINE.—C. S. Davis, Orono, assignor to himself and T. N. Egery, Bangor, Me.
97,485.—SAFETY VALVE.—Walter Dawson, Scranton, Pa.
97,486.—COMPOUND FOR LINING TEXTILE HOSE.—Julius Dollmann and F. W. Claessens, Boston, Mass.
97,487.—HOISTING APPARATUS.—William Dyatt, New York city.
97,488.—ORE CONCENTRATOR AND SEPARATOR.—James Edgar, New York city.
97,489.—ELEVATOR.—William Edson (assignor to E. H. Ashcroft), Boston, Mass.
97,490.—SULKY PLOW.—C. A. Edwards, Chatfield, Minn.
97,491.—SAW-SET.—A. R. Fenner, Cold Brook, N. Y.
97,492.—WIND WHEEL.—Leonard Fischer, Sonora, Cal.
97,493.—FRUIT BOX.—J. H. Fisher, Chicago, Ill.
97,494.—MACHINE FOR POLISHING STONE.—Calvin H. Fitch, Syracuse, N. Y.
97,495.—DEODORIZING APPARATUS FOR WATER CLOSETS.—B. A. G. Fuller, West Roxbury, Mass.
97,496.—LIGHTNING ROD AND CONDUCTOR.—Theodotus Garlick, Cleveland, Ohio.
97,497.—PROCESS OF DYEING BLACK.—James Gee, West New Brighton, N. Y.
97,498.—LATCH.—Rudolph Geselbracht and Frederick Frey, Galena, Ill.
97,499.—BORING MACHINE.—F. M. Gibson, Chelsea, Mass.
97,500.—GANG PLOW.—D. H. Gleeson (assignor to himself and Dennis Gannon), San Leandro, Cal.
97,501.—WELL AUGER.—J. Y. Goode, Water Valley, Miss.
97,502.—SASH HOLDER.—A. F. Gregory and C. H. Ensign, Bridgeport, Conn.
97,503.—COAL ASH SIFTER.—Abram Hagadorn, Canajoharie, N. Y.
97,504.—DITCHING MACHINE.—H. L. Hall, Buffalo, N. Y.
97,505.—ELECTRO-MAGNETIC RAILROAD SIGNAL.—T. S. Hall, Stamford, assignor to Hall's Patent Electric Railway Switch and Drawbridge Company, New Haven, Conn.
97,506.—BORING MACHINE.—Joseph Hampson, Newburg, N. Y.
97,507.—TWEER.—J. F. Harly, Kipton Station, Ohio.
97,508.—GARDEN PLOW AND MARKER.—Henry Haynsworth, Sumter, S. C.
97,509.—STEAM GENERATOR SMOKE STACKS.—William Holdcraft and David McLaughlin, Philadelphia, Pa. Antedated Nov. 20, 1869
97,510.—MACHINE FOR TESTING SPRINGS.—George Hopson, Bridgeport, Conn.
97,511.—CLOTHES DRYER AND STOVE-PIPE SHELF.—G. E. Hoyt, Hebron, N. H.
97,512.—SHOT AND BULLET MACHINE.—E. A. Hyde, Ann Arbor, Mich.

97,513.—ALARM LOCK.—B. F. Irvine and T. A. Hitchcock, North La Crosse, Wis. Antedated Nov. 27, 1869.
97,514.—WINDOW BLIND.—A. A. Jaqua (assignor to himself and David Parker), New York city.
97,515.—SADIRON HEATER.—James Jenkinson, Williamsburgh, N. Y. Antedated Dec. 4, 1869.
97,516.—CHAMBER PAIL.—J. S. Jennings, Brooklyn, N. Y.
97,517.—GAS BURNER.—W. L. Jukes (assignor to himself, F. McLewee, P. H. Putnam, and Bronson Murray), New York city
97,518.—SEWING MACHINE FOR SEWING SHOES.—Jeremiah Keith, Brooklyn, N. Y.
97,519.—DETACHABLE TIPPING BAIL.—J. Keith, Brooklyn, N. Y.
97,520.—SHAKER FOR THRASHING MACHINES.—M. A. Keller, Littlestown, Pa.
97,521.—SPRING BED.—S. P. Kittle, Newark, N. J.
97,522.—FOLDING BOX SPRING MATTRESS.—Sam. P. Kittle, Brooklyn, N. Y.
97,523.—COMBINED SHOVEL AND TONGS.—Henry Kliperd and Benjamin Newbury, Clarksville, Ohio. Antedated Nov. 30, 1869.
97,524.—MODE OF ATTACHING SEATS TO CARRIAGES.—Chas. Krebs, West Springfield, Mass.
97,525.—ATTACHING CALKS TO HORSESHOES.—Perley Laflin, Warren, assignor to himself and Z. E. Cary, West Brookfield, Mass.
97,526.—KNITTING MACHINE NEEDLE.—J. H. Lane and C. D. House, Lake Village, N. H.
97,527.—MACHINE FOR DRILLING AND PREPARING WATCH CASES FOR SPRINGING.—Jacques Laurent, New York city.
97,528.—MODE OF PREPARING PAPER FOR PRINTING POSTAGE AND REVENUE STAMPS.—Samuel Lenher and H. H. Spencer, Philadelphia, Pa.
97,529.—BASE BURNING STOVE.—G. W. Lewin, Worcester, Mass.
97,530.—BRODCAST SEEDER.—J. S. Lewis, Elkport, Iowa.
97,531.—GRAIN BINDER.—S. D. Locke, Janesville, Wis.
97,532.—GRAIN BINDER.—S. D. Locke, Janesville, Wis.
97,533.—GRAIN BINDER.—S. D. Locke, Janesville, Wis.
97,534.—GRAIN BINDER.—S. D. Locke, Janesville, Wis.
97,535.—GRAIN BINDER.—S. D. Locke, Janesville, Wis.
97,536.—GRAIN BINDER.—S. D. Locke, Janesville, Wis.
97,537.—METALLIC CARTRIDGE.—John Logan and D. W. Eldredge, Boston, Mass.
97,538.—PORTABLE FENCE.—Arthur Love, Saxonburg, Pa. Antedated Nov. 22, 1869.
97,539.—SAWING MACHINE.—Patrick Magee (assignor to Felix Thibodaux), Assumption parish, La.
97,540.—COOLER FOR BEER AND OTHER LIQUIDS.—John J. Märki, Richmond, Ind.
97,541.—MACHINE FOR WIRING BLIND RODS AND SLATS.—Godlip Meyer (assignor to himself and Jacob Wagner), Cleveland Ohio.
97,542.—GARDEN IMPLEMENT.—Henry Miller, Roadside, Va.
97,543.—COMBINED HAY RAKE AND TEDDER.—John C. Mills, Palmyra, N. Y.
97,544.—TUCK-CREASER FOR SEWING MACHINE.—John H. Mooney, San Francisco Cal.
97,545.—FOLDING BEDSTEAD.—John Muller, Philadelphia, Pa.
97,546.—ROTARY STEAM ENGINE.—H. Olney (assignor to himself, Robert A. Delong, and Lucius R. Townsend), Malone, N. Y.
97,547.—SHEET-METAL KEY.—Emery Parker, New Britain, Conn.
97,548.—WINDOW AND DOOR CAP MOLDING.—Joseph Parkin and James H. Smith, Cleveland, Ohio.
97,549.—DEVICE FOR FORMING BOILERS.—George S. Pierce, Wilkesbarre, Pa.
97,550.—PERMUTATION LOCK.—Oliver E. Pillard (assignor to Frederick H. North), New Britain, Conn.
97,551.—MACHINERY FOR MAKING PIANO-FORTE CASES.—Sawyer Porter (assignor to himself and Levi W. Porter), Leominster Mass.
97,552.—RAILWAY CAR WHEEL AND AXLE.—Perley Putnam, Laconia, N. H.
97,553.—MACHINE FOR PREPARING PAVING BLOCKS.—Wm. O. Robbins and Charles W. Stafford, New York city. Antedated November 30, 1869.
97,554.—MACHINERY FOR PREPARING WOODEN BLOCKS FOR PAVEMENT.—William O. Robbins and Charles W. Stafford, New York city.
97,555.—COMPOUND FOR DESTROYING INSECTS.—N. T. P. Robertson and Thomas Niles, Fairbury, Ill.
97,556.—HARVESTER.—A. Sheline and E. Burke, Edon, Ohio.
97,557.—SUSPENDERS.—Abraham Shenfield, New York city.
97,558.—BOOT CONFORMATOR.—Samuel W. Shorey, Galesburg, Ill.
97,559.—COMBINED UMBRELLA AND CANE.—Addison Smith, Perrysburg, Ohio.
97,560.—SAFETY LAMP.—Cyrus Smith, Hermon, Me.
97,561.—MANUFACTURE OF CARTRIDGE SHELLS.—Dexter Smith, Springfield, Mass.
97,562.—GARMENT SUSPENDER.—E. N. Snow, Chicopee, Mass.
97,563.—TRACK-CLEANER FOR MOWING MACHINE.—Pratt A. Spicer, Marshall, Mich.
97,564.—PISTON PACKING.—Edward Sullivan, Pittsburgh, Pa.
97,565.—CHURNING MACHINE.—D. G. Taylor, Campbellsville, Ky.
97,566.—EXPLOSIVE COMPOUND FOR USE IN FIREARMS, BLASTING, ETC.—Thomas Taylor, Washington, D. C.
97,567.—GUNPOWDER.—Thomas Taylor, Washington, D. C.
97,568.—COMBINATION PADLOCK.—M. P. Thatcher, Pontiac, assignor to Julius A. Foster, Adrian, Mich.
97,569.—CHECK HOOK.—George Theobalt, Springfield, Mass.
97,570.—VENTILATOR.—Wm. F. Thoms, New York city.
97,571.—INSTRUMENT FOR DESCRIBING SPIRAL LINES.—Lewis W. Truesdell, Owego, N. Y. Antedated November 30, 1869.
97,572.—TRUNK HASP.—Cornelius Walsh, Newark, N. J.
97,573.—CULTIVATOR.—Hiram J. Wattles, Rockford, Ill.
97,574.—SURCINGLE.—Martin Wesson, Springfield, Mass.
97,575.—SHAFT COUPLING.—Seth Wheeler, Albany, N. Y.
97,576.—VENTILATOR.—Charles F. Whorf, St. Louis, Mo.
97,577.—RAILWAY TRACK CLEANER.—M. F. Wickersham, Springfield, Ill.
97,578.—TRACE-LOCK FOR WHIFFLETREE.—Samuel P. Williams, Rutland, Vt.
97,579.—SEAT FOR CHAIRS, SOFAS, ETC.—Frederick Wittram, San Francisco, Cal.
97,580.—GENERATING HYDROGEN AND HYDROCARBON GAS.—Joseph S. Wood (assignor to himself and John J. Carberry), Philadelphia, Pa.
97,581.—LOCK.—Thomas B. Worrell and Thomas Walker, Philadelphia, Pa., assignors to Thomas B. Worrell.
97,582.—MANUFACTURE OF STEEL.—John Amsterdam, New York city.
97,583.—DRINKING CUP.—Bernhard Adler (assignor to himself and W. N. Drescher), New York city.
97,584.—GRAIN SEPARATOR.—J. R. Allen, Edinburg, Ind. Antedated November 27, 1869.
97,585.—PACKING FOR STUFFING BOXES.—Wm. W. Allmand, East Boston, Mass.
97,586.—DRIVING MECHANISM FOR SEWING MACHINES.—James B. Ayer, Elizabeth, N. J.
97,587.—HORSE COLLAR.—W. M. Baker, Greenwich Station, Ohio.
97,588.—FRUIT JAR.—Thomas J. Bargis and John C. Underwood, Richmond, Ind.
97,589.—SPRING FOR HORSE COLLARS.—Benjamin J. Barton and Roswell J. Stanley, Washington, Iowa.
97,590.—HOLLOW AUGER.—H. T. Beam, Joseph C. Freeman, and D. B. Mills, Palestine, Ill.
97,591.—WATER WHEEL.—E. R. Beardsley, Aroma, Ill.
97,592.—HORSE COLLAR.—A. Beckwith, New Orleans, La.
97,593.—RAILWAY RAIL.—Henry Belfield, Philadelphia, Pa.
97,594.—ALARM FAUCET.—Thomas M. Biddle, Fort Wayne, Ind.
97,595.—STEAM GAGE COCK.—Samuel Blackman, Reading, Pa.
97,596.—MACHINE FOR PREPARING TOBACCO STEMS.—Nicholas H. Borgfelt, New York city.
97,597.—PROCESS OF TREATING ASPHALTUM TO OBTAIN COLORS AND DYES.—Julius Bronner and Hermann Gutzkow, Frankfort-on-the-Main, Prussia.
97,598.—DUMPING WAGON.—J. G. Burwell and J. J. Walls, Crystal Springs, Miss.
97,599.—CORN HARVESTER.—John F. Byland, Walton, Ky.
97,600.—APPARATUS FOR DRESSING FLOUR.—Henri Cabanes, Bordeaux, France.
97,601.—RAILROAD TICKET.—C. A. Chamberlin, Pittsburgh, Pa.
97,602.—DEVICE FOR TURNING LOGS IN SAW MILL.—Bela L. Churchill and George Z. Vandersilice, Philipsburg, Pa.
97,603.—WOODEN TRUNK.—D. J. Clark, W. F. Doggett, and S. M. Burr, Columbus, Ohio.
97,604.—DISH-WASHER.—Frances E. Clarke (assignor to Thos. D. Clarke), Flint, Mich.
97,605.—FOLDING CHICKEN COOP.—George Edward Cleeton, New Haven, Conn.
97,606.—DITCHING MACHINE.—William Cline, Jr., Clayton, Ind.
97,607.—PROCESS FOR DECORATIVE OIL PAINTING.—Paul Cousin and Pierre Oury, Paris, France, assignors, for one third, to N. Washauer, New York city.
97,608.—RAILWAY CAR.—Walworth D. Crane, New York city.
97,609.—PLOW.—Charles Crow (assignor to himself and Williamson D. Kerr), Covington, Ind.
97,610.—WATER WHEEL SCROLL CHUTE.—Homer H. Cummings, Enfield, N. H.
97,611.—MACHINE FOR SEWING THE SOLE AND UPPER OF BOOTS AND SHOES.—John Cutlan, Moorestown, N. J.
97,612.—MUSICAL GAME.—George W. Dawson (assignor to Willis M. Smith), New Haven, Conn.
97,613.—APPARATUS FOR TREATING CROUP AND OTHER DISEASES.—Gilbert Déclat, Paris, France.
97,614.—MACHINE FOR IRONING AND STIFFENING LINEN AND OTHER FABRICS.—Jules Decoudun, Paris, France. Patented in France, May 16, 1868.
97,615.—METALLIC CARTRIDGE.—A. C. Depew and J. Slatcher, Bridgeport, Conn.
97,616.—TOBACCO MACHINE.—J. H. Dickason, Hannibal, Mo
97,617.—COMBINED CALL BELL AND TABLE CASTER.—H. A. Dierkes, New York City.
97,918.—CARRIAGE JACK.—W. S. Douglass (assignor to W. O. Douglass and A. S. Douglass), Richmond, Vt.
97,619.—BEDSTEAD.—D. E. Dugan, Springville, Pa.
97,620.—CAR COUPLING.—Joseph Dunott (assignor to himself and Geo. Gibson), Philadelphia, Pa.
97,621.—SAWING MACHINE.—Samuel Fletcher, Hollis, N. H.
97,622.—AXLE FOR CARRIAGES.—Samuel Forrester, Allegheny, Pa.
97,623.—CARRIAGE AXLE.—Samuel Forrester, Allegheny, Pa.
97,624.—KNIFE HANDLE.—James D. Frary, New Britain, Conn.
97,625.—MACHINE FOR JOINTING STAVES.—L. R. Fulda and Martin Fulda, San Francisco, Cal.
97,626.—SAWING MACHINE.—Samuel A. Gardner, Round Hill, Pa.
97,627.—GAS-BURNER REGULATOR.—Robert Gill, New York city.
97,628.—CORRUGATED REFLECTOR.—Bernard Goetz, Philadelphia, Pa.
97,629.—ATTACHMENT FOR FASTENING OVERLAPPING PARTS OF GARMENTS.—B. J. Greeley, Boston, Mass.
97,630.—POTATO DIGGER.—Wm. Green, Holly, Mich. Antedated Nov. 27, 1869.
97,631.—COTTON AND HAY PRESS.—Robert Greene, Greenville, N. C.
97,632.—MODE OF GENERATING ILLUMINATING GAS.—Alexander Hamar, Philadelphia, Pa.
97,633.—PUMP.—Michael Hanstine, Waynesborough, Pa.
97,634.—PORTABLE FURNACE.—John H. Harper, Pittsburgh, Pa.
97,635.—GRAPPLING HOOK.—Henry H. Hatheway, Clockville, N. Y.
97,636.—SPARK ARRESTER.—W. E. Hayes, Durand, Wis.
97,637.—FASTENING FOR NECKTIE.—Harry M. Heineman, San Francisco, Cal.
97,638.—MACHINE FOR TRIMMING THE HEELS OF BOOTS AND SHOES.—C. H. Helms, Poughkeepsie, N. Y.
97,639.—WATER CLOSET.—J. B. Hobson and J. Middleton, Jr., San Francisco, Cal.
97,640.—SAW MILL.—J. R. Hoffman, Fort Wayne, Ind.
97,641.—SADIRON HOLDER.—Egmont Inger, New York city.
97,642.—BRICK MOLDS.—Stephen Inman, Rockford, Ill.
97,643.—FASTENING FOR CORSETS.—Ludwig Jarchow, New York City.
97,644.—COFFEE ROASTER.—John Jay, Jonesborough, Ind.
97,645.—CAR SPRING.—C. T. Jeffries, Philadelphia, Pa.
97,646.—GANG PLOW.—Byron Jennings (assignor to himself and Henry W. Briggs), Gilroy, Cal. Antedated Dec. 1, 1869.
97,647.—ARTIFICIAL LEG.—S. B. Jewett, Laconia, N. H.
97,648.—SASH BALANCE.—Chas. Kanzler and Albert Nega, St. Louis, Mo.
97,649.—STAY FOR TRUNKS.—Chas. Kellermann and P. W. Stauff, Chicago, Ill.
97,650.—GRAIN DRYER.—S. C. Kenaga, Kankakee, Ill. Antedated Nov. 27, 1869.
97,651.—OILING CARRIAGE AND CAR AXLES.—Wm. Kenworthy and J. H. Pollitt, Buchanan, Pa.
97,652.—GAS BURNER.—A. M. Laevison, Quincy, Ill.
97,653.—SHOT CARTRIDGE.—Chas. Wm. Lancaster, London, England.
97,654.—ATTACHING KNOBS TO DOORS.—Chas. F. Langford, Brooklyn, N. Y.
97,655.—CENTRIFUGAL PUMP.—N. H. Lebby, Charleston, S. C.
97,656.—TOOL HOLDER FOR GRINDSTONES.—Philip Leonard, Sharon, Pa.
97,657.—MODE OF PREVENTING CORROSION IN PIPES, BOLTS, AND SIMILAR ARTICLES OF IRON IN SEA WATER.—Reuben Lighthall, Brooklyn, N. Y.
97,658.—WATER WHEEL.—A. W. Lloyd, North Adams, Mass.
97,659.—ARTIFICIAL NIPPLE.—H. D. Lockwood, Charlestown, Mass.
97,660.—COOKING STOVE.—Zephaniah Lockwood, Saratoga Springs, N. Y.
97,661.—SLED BRAKE.—C. M. Lufkin, Alstead, N. H.
97,662.—COCKEYE FOR HARNESS.—Thomas J. Magruder, Marion, Ohio.
97,663.—BUSH HAMMER.—J. W. Maloy, Boston, Mass.
97,664.—MACHINE FOR GRINDING NEEDLES.—Clark Marsh (assignor to Wheeler & Wilson Manufacturing Company), Bridgeport, Conn.
97,665.—WATER WHEEL.—H. P. McCleave, Tomales, Cal.
97,666.—WAGON STANDARD.—Jas. McCullough, Quincy, Ind. Antedated Dec. 4, 1869.
97,667.—CUTTER FOR CARD-SETTING MACHINE.—D. McFarland, Worcester, Mass.
97,668.—DRAIN-PIPE MACHINE.—Peter McIntyre, Norwich, Conn.
97,669.—FRUIT CAN.—A. J. McMillen, Ravenswood, West Va.
97,670.—PUMP.—C. L. Merrill, Watertown, N. Y.
97,671.—ABRADING AND POLISHING WHEEL.—E. C. Merrill, Charleston, Vt.
97,672.—PATTERN FOR LAYING OUT GARMENTS.—Wm. M. Michael, Indiana, Pa.
97,673.—MACHINE FOR OPERATING PUMPS.—R. E. Moore, Navasota, Texas.
97,674.—CHURN.—Ezra Morgan, French Creek, N. Y.
97,675.—CLAMP FOR EMBOSSING HARNESS LOOPS.—O. H. Morris, New Haven, Conn.
97,676.—PEN.—W. A. Morse, Philadelphia, Pa.
97,677.—HAY TEDDER.—M. D. Myers (assignor, of one fourth, to G. W. Gates), Frankfort, N. Y.
97,678.—HEATING ATTACHMENT FOR COOKING STOVES.—R. W. Meyers (assignor to himself, Geo. Gardiner, Wm. Gardiner, and O. L. Gardiner), Glen Gardner Station, N. J.
97,679.—MECHANISM FOR OPERATING THE SHUTTLE BOXES IN LOOMS.—Archibald Nimmo (assignor to himself and Thomas Moran), Philadelphia, Pa.
97,680.—HARROW CULTIVATOR.—Frederick Nishwitz, Brooklyn, N. Y
97,681.—INTERCHANGEABLE BOOT AND SHOE HEEL.—John Norburn, Pittsburgh, Pa., assignor to J. C. Woodhead and J. Holmes, trustees for Universal Manufacturing Co.
97,682.—MACHINE FOR WASHING WOOL.—Emile Nougaret, Newark, N. J. Antedated Dec. 1, 1869.
97,683.—VELOCIPEDE.—Rene Olivier, Paris, France.
97,684.—CENTRIFUGAL MACHINE FOR EXTRACTING HONEY FROM THE COMB.—H. O. Peabody, Boston, Mass.
97,685.—SPRING.—Wm. Pearson, Windsor Locks, Conn.
97,686.—PIANOFORTE ACTION.—A. W. Perry, St. Joseph, Mo
97,687.—FEED CUTTER.—Hans Peterson, Red Wing, Minn.
97,688.—APPARATUS FOR CLEANING BARRELS.—Immanuel Pfeiffer (assignor, for one half, to H. M. Brsem), New York city.
97,689.—VENTILATOR.—W. L. Phillips, Normal, Ill.
97,690.—DRAFT REGULATOR FOR PLOWS.—Martin Prillaman (assignor to himself and Elizabeth Ressler), Tipton, Ind.
97,691.—MACHINE FOR SWAGING THREADS ON SCREWS.—T. T. Prosser, Chicago, Ill.
97,692.—MANUFACTURE OF SOAP.—Wm. P. Pugh, High Point, N. C.
97,693.—GUN HARPOON.—J. P. Rechten, New York city.
97,694.—PRIVY SEAT.—Frank Reed, Fitchburg, Mass. Antedated Nov. 30, 1869.
97,695.—PISTON VALVE.—A. F. Reeder, Normal, Ind.
97,696.—TUBULAR REFRIGERATOR.—Adam Reid, Buffalo N. Y.
97,697.—LAND ROLLER.—Hermann Retzlaff, St. Louis, Mo.
97,698.—ATMOSPHERIC AND CONDENSING HYDRAULIC ENGINE.—A. J. Reynolds, Chicago, Ill.
97,699.—FLEXIBLE PIPE COUPLING.—Quartus Rice, Nevada, Cal.
97,700.—MACHINE FOR MAKING BUCKLES.—Julius Robbins, Auburn, N. Y.
97,701.—KNIFE SHARPENER.—Z. C. Robbins and H. A. Robbins, Washington, D. C.
97,702.—TOBACCO ELEVATOR.—G. Robinson, Louisville, Ky.
97,703.—MACHINE FOR ROLLING, PRESSING, AND CUTTING TOBACCO.—G. Robinson, Louisville, Ky.
97,704.—TRACE BUCKLE.—Wm. A. Robinson, Grand Rapids, Mich., assignor to O. B. North & Co.
97,705.—COIL SPRING AND ITS ATTACHMENTS.—Timothy Rose, Cortland, and P. S. Buell, Windsor, N. Y.
97,706.—SPRING BED BOTTOM.—Ira M. Russell, Lewiston, Me.
97,707.—APPARATUS FOR LAYING OUT STAIR RAILS.—A. Schollars, Leavenworth, Kansas.
97,908.—HORSE HAY RAKE.—Wm. Sharkey, Chico, Cal.
97,709.—PROCESS FOR MANUFACTURING CHEESE.—Mary A. Sheaffer, Elizabethtown, Pa.
97,710.—BOOK HOLDER.—Hamilton Sherman, Waverly, Pa.
97,711.—PLATE FOR HOLDING THE LIDS OF TRUNKS IN PLACE.—J. W. Shubert and Norval Douglas, New Haven, Conn.
97,712.—VISES FOR WOOD WORKING.—J. Simpson, Cleveland, Ohio.
97,713.—KEY GUARD.—P. G. Smith (assignor to himself and Robert Donahue), Brooklyn, N. Y.
97,714.—BRIDGE.—R. W. Smith, Toledo, Ohio.
97,715.—HAMMER.—S. B. Smith, New Haven, Conn.
97,716.—BOOT AND SHOE CLEANER.—W. H. Smith, Newport, R. I.
97,717.—SIGHT FOR FIREARMS.—C. E. Sneider, Baltimore, Md.
97,718.—MANUFACTURE OF IRON AND STEEL.—H. Spencer and L. K. Saylor, Philadelphia, Pa.
97,719.—TOY HARPOON GUN.—Ebenezer Sperry, St. Louis, Mo.
97,720.—SPRING BED BOTTOM.—Jost Stengel, Croton, Mich.
97,721.—PLEATING MACHINE.—Simon Sterns, New York city.
97,722.—BEDSTEAD FASTENING.—William Stevens, Tarentum, Pa.
97,723.—TOOL REST FOR LATHES.—J. G. Stowe, Providence, R. I.
97,724.—HAY LOADER.—W. H. Straub, Danville, Pa.
97,725.—WASHING MACHINE.—T. H. Tatlow, Jr., Newark, Mo.
97,726.—HANGING WINDOW SHADES.—J. I. Tay, Oakland, Cal.
97,727.—MEANS FOR HANGING WINDOW SHADES.—J. I. Tay and L. L. Sawyer, Oakland, Cal.
97,728.—BREAD SLICER.—Joseph Taylor, Hudson, N. J.
97,729.—GRAIN DRILL.—J. H. Thomas and P. P. Mast, Springfield, Ohio.
97,730.—RAILWAY CAR BRAKE.—J. B. Van Dyne, Nashville, Tenn. Antedated Nov. 30, 1869.
97,731.—COOKING STOVE.—Nicholas S. Vedder, Troy, N. Y. Antedated Nov. 30, 1869.
97,732.—COAL STOVE.—S. D. Vose, Milwaukee, Wis.
97,733.—FASTENING FOR TRAVELING BAG.—C. Walsh and Josiah Walsh, Newark, N. J., assignors to C. Walsh.
97,734.—BREECH-LOADING FIREARM.—Wm. G. Ward, New York city.
97,735.—PEN.—Addison G. Waterhouse, San Francisco, Cal. Antedated Nov. 25, 1869.
97,736.—CLOTHES DRYER FOR STOVE PIPES.—L. B. Waterman (assignor to L. B. Kelly), Chicago, Ill.
97,737.—BOILER FEED AND WATER HEATER.—H. Wigley, New Albany, Ind.
97,738.—ICE CREEPER.—A. Wilke, Brunswick, Germany.
97,739.—CORN PLANTER.—F. L. Wilkens, St. Mary's, Ohio. Antedated Dec. 4, 1869.
97,740.—TIRE HEATER.—Isaiah M. Williams, Clinton county, Ohio.
97,741.—MECHANISM FOR DRIVING SEWING MACHINES.—J. H. Wilson, Philadelphia, Pa., and J. C. Outwater, Newark, N. J.
97,742.—MOLE KILLER.—Joseph Wilson, Little Falls, N. J.
97,743.—CIDER MILL.—Levi Wilson, Springfield, Ohio.
97,744.—APPARATUS FOR TREATING DISEASES BY MECHANICAL MOVEMENT.—A. L. Wood, New York city.
97,745.—GATE.—J. A. Wood and E. V. Marbaker, Crosswicks, N. J.
97,746.—PLOW.—Alex. Wright, Allegheny City, Pa.
97,747.—GAME TRAP.—E. M. Day, Elkhart, Ill.
97,748.—GAS MACHINE.—T. G. Springer, Clinton, Iowa.
97,749.—MACHINE FOR MAKING CANDLE MOLDS.—Moses Burlingame, Garrattsville, N. Y., assignor to himself and J. E. Pilkington, Washington, D. C.
97,750.—HOOP SKIRT.—Gottfried Biering, New York city.

REISSUES.

89,669.—FEED-CUTTING ATTACHMENT TO THRASHING MACHINES.—Dated May 4, 1869; reissue 3,756.—G. W. Lee, Sandy, Ohio.
24,772.—POWDER KEG.—Dated July 12, 1859; reissue 1,383, dated January 6, 1863; reissue 3,757.—Charles Green, Wm. Wilson, Jr., Henry Du Pont, E. I. Du Pont, L. Du Pont, and Eugene Du Pont, Wilmington, Del., and Charles Pratt, New York city, assignees of James Wilson, Charles Green, and Wm. Wilson, Jr.
96,278.—BRIDGE.—Dated Oct. 26, 1869; reissue 3,758.—Smith, Latrobe & Co., Baltimore, Md., assignees of F. H. Smith.

DESIGNS.

3,779.—CLOCK CASE FRONT.—F. Kroeber, New York city.
3,780.—PENDULUM-CLOCK CASE FRONT.—F. Kroeber, New York city.
3,781.—COLLAR.—E. E. Mack, Albany, N. Y.
3,782.—FLOOR OIL CLOTH PATTERN.—James Patterson, Elizabeth, assignor to Richard H. Reeve and Benjamin C. Reeve, Camden, N. J.
3,783.—HARNESS BUCKLE.—D. Schoonmaker, Springfield, Mass.

NEW PUBLICATIONS.

FOR CHRISTMAS.—The children must always have something to make them merry on Christmas. Messrs. Turner & Brother, 808 Chestnut street Philadelphia, have issued a neat and and very pretty book called "Christmas Day," with three poems; viz.: "'Twas Night Before Christmas," "Christmas Day," and "The Night After Christmas," from Punch. It has a beautiful cover, and is sent by mail for fifty cents.

Improved Telegraph Instrument.

The apparatus which we herewith illustrate is a combination of three distinct inventions, upon each of which a separate patent has been granted; viz., the magnet, the sounder, and the key. They, together, constitute one of the most beautiful and efficient instruments of its class we have had brought to our notice. We will notice the parts of the device in the order above specified.

The wire has, previous to this invention, been wound entirely around one spool, after which it was carried to the other, which was wound in like manner; the current consequently passed through the entire coil on one spool before reaching the other.

In this new system of applying the wire, both spools receive the current simultaneously; the current passing alternately from one to the other. Greater power and quicker action are, therefore, secured by a battery of a power which, under the old system, would almost be insufficient to work the instrument.

These advantages are secured by winding both spools at once. The spools are placed with their heads together, and the wire being started at the outer end of one spool is wound in a single layer over that spool, crossed over the heads of both spools, which are placed together, then wound over the second spool, and back, crossed over the heads again and wound over the first spool and back, again crossed over the heads, and so on until both spools are filled. In this way many connections are made between the two coils, and the wire, instead of being wound continuously on each spool separately, is equally distributed between both.

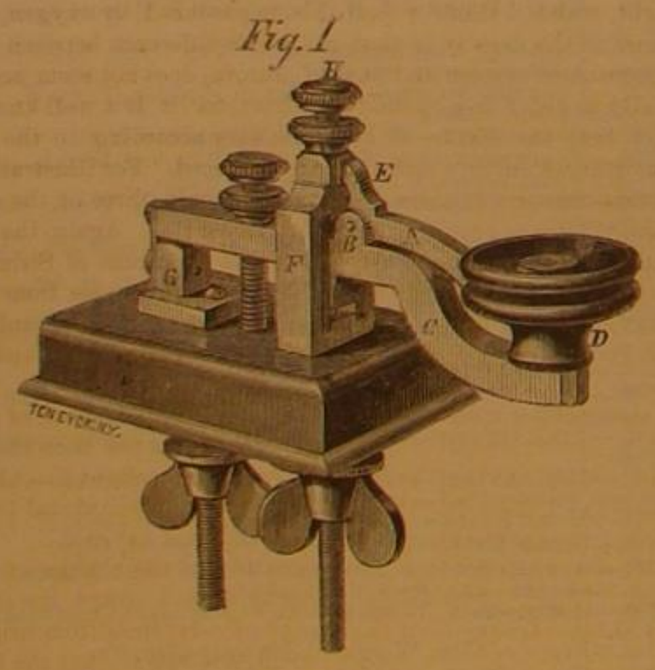
The spools thus wound are set up in the ordinary manner.

When the electric current is passed through the coils, it passes simultaneously around both spools, and both, therefore, act at once to attract the armature, instead of, as heretofore, one after the other. The action is thus rendered more sudden and powerful than in the method of winding, as heretofore practiced.

It is scarcely necessary to add that this method is equally applicable to all kinds of electro-magnets for whatever purpose they may be employed, and whether spools, cores, or legs are used.

The principal differences between the key, Fig. 1, and those in ordinary use are, first, the addition of a supplementary lever, A, pivoted to the principal lever, C, at B, the use of which is to make an indirect circuit while the instrument is not in use; and, second, the insulation of the point of the adjusting screw, H, which limits the motion of the principal lever, C. A hard-rubber knob, D, on the principal lever, C, is

Fig. 1



separated by a coiled spring from a button of similar material on the supplementary lever, A. The latter has a foot, E, which rests against the standard, F, when the instrument is not in use, the points of contact being made of platinum. The current then passing through the standard, F, passes through E, and thence through C, and the spring attached to the standard, G, and so out through the wire. In use the knob, D, and the button on the supplementary lever, A, are pressed together, which breaks the indirect current, and the direct circuit, is then made and broken in the usual manner by bringing together a platinum point on the under side of the principal lever, and a similar point on the bottom of the slot in the standard, F, or *vice versa*, as the key is depressed or elevated.

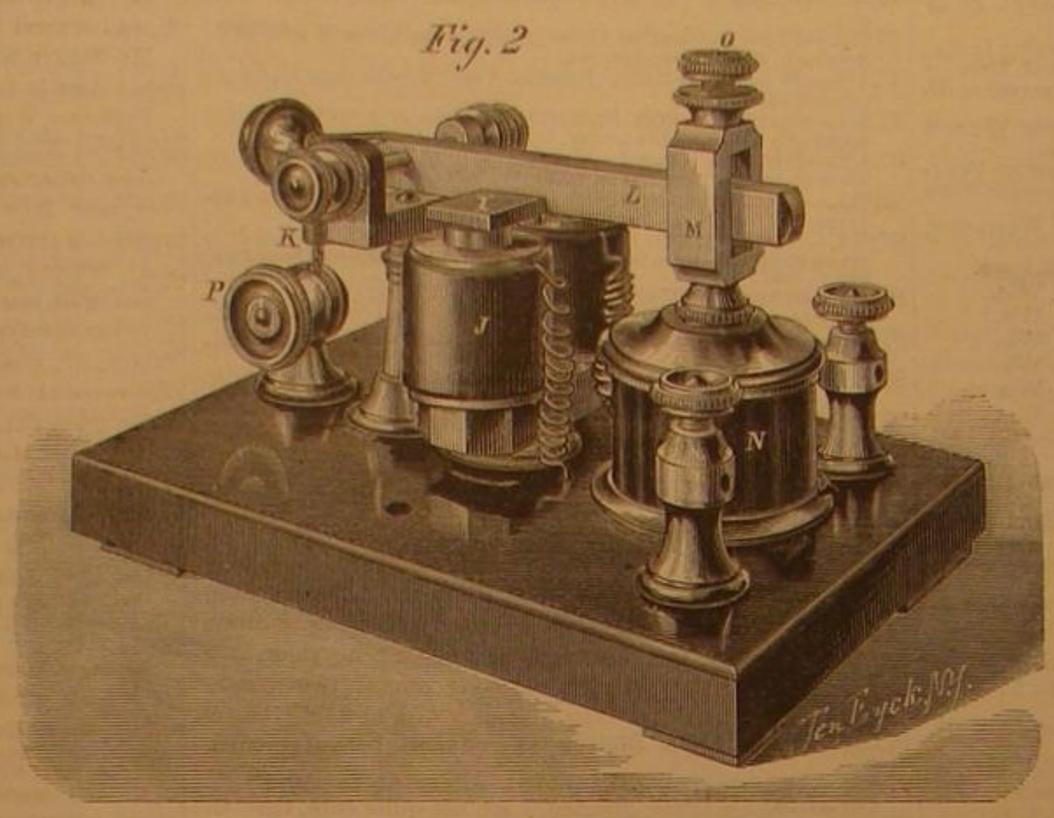
The insulation of the point of the adjusting screw, H, is necessary to prevent the current from passing through it from the standard, F, to the principal lever, C. The sides of the slot in the standard, F, are also insulated by plates of hard rubber, to prevent any danger of making the circuit by accidental contact of the lever, C, with them.

This device, therefore, it will be seen, closes the circuit automatically when not in use.

Fig. 2 represents a combination of an electro-magnet with coils formed as above described, with an improved sounding column.

The armature, I, being alternately attracted to the magnet, J, and withdrawn by the action of the spring, K, through the sounding bar, L, strikes L upon the end of a steel bolt, not shown in the engraving, which passes down through the bottom of the standard, M, and through the center of the hollow hard-rubber cylinder, N. This hollow rubber cylinder is surmounted by a brass cap, and rests on a brass ring, which, in its turn rests on the rosewood stand of the instrument, the whole being firmly held by a nut screwed on the lower end of the central steel bolt. Around this nut are bored sound-holes which communicate from the bottom of the rosewood stand with the interior of the hollow hard-rubber cylinder, N. This cylinder reinforces the sound made by the impact of the sounding bar, L, upon the central steel bolt above described, in a remarkable manner, making it very distinct and

Fig. 2



DAVIS' SOUNDING INSTRUMENT.

clear; the sound waves formed in the interior of the hard-rubber cylinder, N, communicating freely with the external air, through the holes at the bottom of the stand above described. A screw, O, limits the motion of the sounding bar, L, and a winding pin, P, in a double-slotted post, serves to regulate the tension of the coiled spring, K.

The construction of this instrument involves some nice scientific principles, which cannot fail to attract the attention of electricians and practical telegraph operators.

The patents for the three parts of this instrument we have thus described were taken out through the Scientific American Patent Agency; the one on the electro-magnet bearing date Nov. 9, 1869, and the patents on the key and sounding column July 6, 1869. The patentee is Mr. William Edward Davis, of 319 Newark avenue, Jersey City, N.J., where address him for further particulars.

REDUCE THE COST OF PATENTS.

We publish elsewhere an extract from the Report of the Secretary of the Interior, giving a brief *resumé* of the operations of the Patent Office for the past year.

The financial result appears to be gratifying. The applications have been very numerous, and the fees in excess of expenditures some $213,920. The Secretary proposes to use this surplus in printing copies of the drawings—a suggestion which is very good so far as it goes; but we should have experienced additional pleasure if the Secretary had urged upon Congress the importance of reducing the patent fee. The Patent Office is a self-sustaining institution, and can be kept so by a judicious administration of its affairs and upon a reduced scale of fees. We should say that $25 were amply sufficient—$10 payable in advance, and the balance, $15, upon the allowance of the claims. We hope Commissioner Fisher, in his Annual Report, will take hold of this matter and urge a reduction of the costs of granting patents.

Patent Office Affairs.

The report of the Secretary of the Interior furnishes the following interesting facts concerning the Patent Office:

Application for Patents	19,360
Caveats filed	3,686
Applications for extension	153
Patents issued	13,762
Patents extended	125
Patents allowed, not issued	899
Balance appropriation on hand Oct. 1, 1868	$117,249·18
Appropriation since made	722,018·00
Total	$839,267·18
Expenditures since Oct. 1, 1868	$472,462·62
Balance on hand	416,804·53
Fees in excess of expenditures	213,926·02
Expenditures in excess of fees, 1868	171·64
Appropriation asked for	564,420·00

The office now publishes a weekly list of claims, which is furnished to subscribers at $5 per annum. It is believed that by the ensuing year the receipts will cover the entire cost of the work. This list, published simultaneously with the issue of the patents, serves all the purposes of the annual report, which is not issued until two years later.

In order that the public and the examining corps may have access to the drawings of the Office, I recommend an appropriation for printing copies. The expense so occasioned can be reimbursed, if the Commissioner be authorized to make sale of them, and apply so much of the proceeds thereof as may be necessary. If he could sell copies of the patents and of the drawings at cheap rates to those who desire them, and place copies in the State capitals and great commercial centers, more complete information of the action of the bureau than is now furnished by the report would be promptly disseminated, and an annual expenditure of $200,000 of the public money avoided.

My immediate predecessor, in each of his annual reports, urged the repeal of all laws which authorized an appeal from the decision of the Commissioner of Patents on applications for letters patent and in interference cases. The reasons he presented are, in my opinion, clear and unanswerable. It is, indeed, believed that it was the intention of Congress to abolish such an appeal by the act of 1861. No mention is made of it in the provision for appeals, or in the new schedule of fees thereby established. It has, however, been held that prior acts which authorized such an appeal are still in force, and that the right thereto still exists. If their purpose was to secure uniformity in the administration of the patent laws, it has signally failed. The appellants may select either of the four members of the Supreme Court of the District to hear and determine the case, and from his decision no appeal lies to the court in banc.

The Commissioner, in a paper addressed to me, represents that, as a natural consequence of the appeal and of the fee claimed for acting upon it, the judges have, without authority from Congress, assumed to extend their jurisdiction to his purely ministerial duties, and to interfere with the discharge of them. Decisions have been made on the proper date of letters patent, the allowance of amendments, the issue of double patents to an inventor and his assignee, and on other questions of a like character. The practical working of this asserted supervisory control over the doings of the Commissioner has been, upon the whole, injurious. Consistency of decisions and of administration has not been attained. Controversies and litigation as to the extent of relative jurisdiction have arisen, and the usefulness of the Office, in its attempts to protect the public against imposition has been essentially impaired.

Sheepskin Mats.

A correspondent of *The Country Gentleman* gives the following directions for making beautiful sheepskin mats, the recipe being for two skins.

"Make strong soapsuds, using hot water, and let it stand till cold, then wash the skins in it, carefully squeezing out all the dirt from among the wool, then wash them in cold water till all the soap is out. Next dissolve half a pound each of salt and alum in a little hot water, and put into a tub of cold water sufficient to cover the skins and let them soak twelve hours, then hang over a pole to drain. When well drained, stretch carefully on a board to dry. Stretch several times while drying. Before they get entirely dry, sprinkle on the flesh side one ounce each of finely pulverized alum and saltpeter rubbing it in well; then lay the flesh sides together and hang in the shade for two or three days, turning them over every day till perfectly dry.

"Finish by scraping the flesh side with a blunt knife, to remove any remaining scraps of flesh, and then rub the flesh side with pumice or rotten stone and the hands. Very beautiful mittens can be made of lamb skins tanned as above."

The Genesis.

Professor Agassiz denies that he, as has been publicly charged, recently opened a lecture with the statement that he wanted no one to listen to his lectures who believed in the first chapter of "Genesis." This charge bears on its face the evidence of its falsity, yet Professor Agassiz deems it worthy of notice. He says in a letter to a friend:

"I am little in the habit of noticing things of this kind, being convinced that often it is useless, and having become from long habit somewhat callous to misrepresentation. Something in the tone of your letter makes me answer, and unwilling to leave it unanswered, I write to say that the statement you sent me is false. In some opening remarks of a course on geology, which I am now delivering in the University, I said that the 'theological interpretation of the Book of Genesis, giving six thousand years as the age of the world, was a hindrance to the understanding of geological evidence, and no one who started with this idea, and allowed his researches to be influenced by it, could be a geologist.' I do not remember my exact words, the lecture being extemporaneous; but this is the substance, and I know that I did not say what your newspaper extract reports."

THE LEVEL OF THE MEDITERRANEAN AND RED SEAS.—During the celebrated Egyptian campaign of 1798, the difference of level between these two seas was calculated by the French engineers, and found to be 0·85 of a meter. The result obtained in making the survey for the construction of the Suez canal, in 1866, was ·86 of a meter. The accuracy of the earlier survey is very strikingly confirmed by the close coincidence of these results.

A VALUABLE PRESENT.—What more useful present can be made to young mechanics than a year's subscription to the SCIENTIFIC AMERICAN? Employers will be doing their employés a great service by acting on this hint, and we feel sure that at the end of the year they will consider the investment a good one.

Scientific American,

MUNN & COMPANY, Editors and Proprietors.

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NEW YORK, SATURDAY, DECEMBER 25, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

TO OUR READERS.

The day of publication falling one day earlier in the calendar each year, has gradually antedated the issue of our journal, causing thereby a serious inconvenience to ourselves, and one that has been noticed by many of our readers. We prefer in this matter not to be so far in advance of the actual time, and in order to correct the discrepancy between the date of the paper and the day of actual issue, we seize the opportunity now offered at the beginning of the new volume, to defer the issue of the first number one week. By this arrangement none of our subscribers will lose anything, as we have already published two complete volumes, of twenty-six numbers each, for 1869, and before the 1st of January the first number for the year 1870 will be published and mailed to all our subscribers. With the present number we send out a supplement of the SCIENTIFIC AMERICAN to all our readers, which contains a large and fine engraving of the Railway Bridge over the Susquehanna river at Havre de Grace, also a calendar for 1870. This supplement has been printed at considerable expense, and is sent free to all our subscribers. We would regard it as a special favor if they would post it up conspicuously where it may be seen, as it contains our annual prospectus.

Subscriptions are coming in very rapidly, and present indications encourage us to believe that our circulation will be very much increased on the new volume.

ANNOUNCEMENTS FOR THE NEW VOLUME.

The premiums in cash offered by us are as follows: Whoever sends in the largest list of subscribers, according to published terms, on or before the tenth of February, will receive $300; for the second list, $250; third list, $200; fourth list, $150; fifth list, $100; sixth list, $90; seventh list, $80; eighth list, $70; ninth list, $60; tenth list, $50; eleventh list, $40; twelfth list, $35; thirteenth list, $30; fourteenth list, $25; fifteenth list, $20.

Surely these prizes are worth striving for, as either of the sums specified will be handy to have in the pocket. To those who do not compete for the cash prizes we offer the splendid large steel engraving, "Men of Progress—American Inventors," as follows: Any one sending 10 names and $30 will receive one picture; 20 names and $50, one picture; 30 names and $75, two pictures; 40 names and $100, three pictures; 50 names and $125, four pictures. This picture is worthy of the subject, and will grace the drawing-room of any citizen of the land. We are aiming at a large subscription list and we frankly acknowledge that we can only accomplish it by the coöperation of our present patrons, who have always generously responded to our appeals. We urge them now to speak a good word for the SCIENTIFIC AMERICAN. By so doing they can induce some of their neighbors to join in making up a club. If ten or more names are sent, the subscription is $2·50 a year.

STEAM PLOWING IN AMERICA.

The time is coming when in many portions of the United States the steam plow will be permanently adopted. If, in a country of small farms like England, it can be made so useful as to render profitable lands, which, without it, can only be worked at a loss, how much wider is its scope on our broad plantations, wide prairies, and river bottoms which are devoted to grain production.

The period is ripe for the introduction of a Yankee steam plow. Some inventors in this field have had the misfortune to live some years too early. But the inventive genius of the country is now fairly turned to the solution of the problem, and the steam plow of the time to come is now imperatively demanded.

In aiming at the production of a good steam plow, we think inventors have confined their efforts too closely to the imitation of the work of the common plow. Is it not quite possible that some other method of loosening the earth may be found to answer all the purposes of the furrow, without rendering large tractive power necessary.

The early, and still favorite method with gardeners, is forking or spading up the ground, and there can be no doubt that in this way the soil is better prepared for the reception of seed than by the use of the plow.

No mowing machine inventor has ever succeeded in applying other than human strength to the working of swinging blades or scythes, though many have sought to do so. It was not till the shearing principle as used in the common cutter bar was adopted that mowing machines found an abiding place.

But it may be objected that in plowing green sward it is essential to not break the earth to pieces but to turn it over neatly, grass side down, so that the vitality of the grass roots may be destroyed and the turf may rot. We do not think the continuous furrow the only means whereby this may be accomplished, and we believe the plowing machine of the future will demonstrate the truth of our views.

A new locomotive plowing machine, capable of drawing a gang of plows through a stiff soil was recently tried at Rochester, it is said, with highly satisfactory results. The locomotive weighs scarcely more than two tuns, but its tractive power is gained by a series of out-thrusting flukes in the traction wheels, which penetrate the earth, and are withdrawn by machinery inside as the wheels revolve. By this means the flukes only project from the wheels as they approach the earth on the under side of the wheel. There are springs attached to the flukes to relieve them when they come into contact with stones or other impenetrable substances. The plows are attached to this traction engine by chains, and at the trial, three plows, each held in the usual manner by an attendant, were drawn in this way through a stubborn soil.

So much for the Rochester machine.

From New Albany, Ind., we learn of a new steam plow, the invention of a citizen of that place, and which is described at length in the *Daily Ledger*: "The framework, in fact the entire machine, is of pipes. The driving wheels are geared positively, and are driven by vertical cylinders, the pistons of which are attached by an irregular eccentric motion, direct from the engine. In addition to this motion eight toggle joints joining levers, which simulate the motion of a horse's leg, assist the driving wheels when they fail in their traction."

The description given in the *Daily Ledger* is not so clear as to give a very distinct idea of this plow; but we gather that the plows proper are attached to beams, which are raised or lowered at will, and move along with the traction engine.

A California inventor has also recently taken out a patent for a steam plow, the general principle of which, like those described, is the drawing of plows by a traction engine. We are not aware that the English method of drawing gangs of plows across fields by a wire rope and drum finds much favor with American mechanics; but if plows must be drawn through the earth after the old fashion, it seems a more economical plan than the use of traction engines for that purpose.

THE USES OF SNOW.

As we write, a few straggling snow-flakes flutter timidly past our window and quickly melt into oblivion on the flags below. They will soon cease to melt and will gradually fill our streets with the characteristic New York slush, to the utter weariness of overdone horses, and the almost total extinction of good temper on the part of drivers, who will swear that snow is a nuisance, and wish that it were in a place where it would not be long in melting.

Now it is to be admitted that so far as New York city is concerned, the benefits of a "good heavy fall of snow" are rather indirect than otherwise, yet we shall see that even the poorest, who shiver in cellars along dark and gloomy alleys, are interested to have the snow fall, although they, in their ignorance, think it "poverty's curse."

Coal is dear this winter, and for the poor, hard to get, but food costs more than coal, and food must be had at any cost. The supply of fuel may be eked out and supplemented by many a makeshift, imperfect though it be, but hunger cannot be appeased by a subterfuge.

The snow which falls upon the earth is a tender mantle to infant food-plants which would otherwise perish of frost. In what is called an "open winter," you may see whole fields of young rye and wheat and clover, all pulled up by the frost and laid on the top of the ground to wither and die in the spring sunshine. The frost heaves up the earth, and with it the plants; slight thaws permit the earth to settle and renew its hold, and so successive freezings and thawings gradually uproot entire crops. "Winter killed," is the sad verdict of the farmer, as he contemplates the loss of his labor and seed in the spring; and "winter killed," might be appropriately spoken of the suffering and dying victims of starvation prices which follow the destruction of crops.

True, Nature sometimes in her zeal to protect, covers too deep and smothers the young plants; tucks in the coverlid so tight that the unseasonable warmth of the earth stimulates their vitality into an attempt at growth, which fails for want of air and light. But such disasters are comparatively rare, and open winters are the most deadly to grain crops. It is also true that in the large territories devoted to grain growing in the United States, when a crop fails in one section it succeeds in another, and so the food-supply keeps pretty steady pace with the demand, but it is none the less true that in many sections of the country winter wheat or rye could not be successfully grown without snow to protect these crops from frost.

But snow has another important office to perform. It is a fertilizer. Ask the experienced farmer, and he will tell you that the late snows of spring falling upon the springing crops makes them look green and vigorous, and really nourishes them. It is the bearer of ammonia, an important element of the food of plants, which it collects from the air. We have known thrifty farmers to rise early to plow in a light snow before it melted, being aware of its value, though perhaps not realizing in what its virtue consisted. It is also without doubt true that open winters are more favorable to the spread of disease than the contrary. It is an old proverb that "green Christmases fill churchyards."

So we see that snow has other uses than to make sleighing, though we get so little of this in New York, and the snow so interferes with travel in our crowded thoroughfares that one may well be pardoned for wishing that in the annual distribution our metropolis might be over-looked.

WHAT REMAINS FOR INVENTORS.

A great deal has been done in mechanical invention and chemical discovery. In these respects the world has moved immensely since the beginning of the present century. It is the habit of some short-sighted people to predict that we have, as a race, arrived at the pinnacle of our greatness, so far as relates to the subjugation of the brute forces of nature We have, say they, now harnessed the forces of gravity, heat, electricity, light, and affinity, we have learned how far it is possible to make them work for man, and henceforth, whatever improvement is to be made, must be only in the form of the harness.

It is the habit of this class of men to not only regard the steam engine as capable of improvement only in trivial details, in variations in the form of cut-off, or other subordinate particulars, but to look upon electricity as a necessarily more expensive force to generate than heat, and as consequently, forever debarred from economic use as a generator of motive power for machinery. They consider the application of light as limited to the various kinds of photography now known, and which may hereafter be developed.

They discern no remote possibility in the enormous force of chemical affinity, although it is through one of the commonest manifestations of that force—combustion—that we get the heat for our engines, dwellings, dyehouses, furnaces, and forges.

Although the present era in science has given to the world the great doctrine of the mutual convertibility of these forces, and the cognate and equally important doctrine of the conservation of force, the possibilities which a consideration of these doctrines open to the mind, do not seem to force themselves upon their understandings.

To give a glimpse of some of these possibilities is the object of the present article.

When we, divesting our minds of all preconceptions, examine our relations to the things which surround us, we find all these relations resolving themselves into motion. It is primarily through motion that we get any knowledge of anything, and practically it is motion which feeds, clothes, and warms us. Growth is motion. The changes which take place in the substances which we take as food, is a movement of their molecules and their rearrangement in the tissues of our bodies, where they rest not day nor night until finally eliminated and thrown out as effete matter. Nor even then do they rest. There is no rest in nature. Motion is life: nay, more; it and matter together constitute the whole category of physical existence.

It follows that whatever force can contribute to the physical and mental welfare or the pleasures of mankind—and it is in this only that invention finds a profitable field—must be capable of being converted into mass motion; for the human control of molecular motion depends upon mass motion.

To illustrate this let us consider the growth and preparation of any article of food, as wheat. It is by the mass motion of the plow and the harrow the ground is prepared to receive the seed; in this way the molecular motions concerned in its growth are aided, and the full ear and plump berry obtained. It is by mass motion that it is harvested, thrashed, ground, and kneaded, preparatory to the molecular changes which take place in its conversion into bread. It is by mass motion that it is masticated and mixed with the saliva in the mouth, to facilitate the molecular change it must undergo in the process of digestion.

As in this, so in all chemical processes, mass motion is employed to control the molecular motion, and this mass motion is, to a very great extent, in the present age of the world, communicated through the agency of machinery. But we also find that the mass motion of machines is obtained by the aggregation of molecular motions, so that in a ceaseless cycle these forms of motion flow one into the other

The chief field for inventors must, then, continue to be in the future as it has been in the past, in the employment of machines as intermediate links between molecular motion and other molecular or mass motion, which it is desired to make minister to the wants of mankind.

If we now accept the modern view that light, electricity, and gravity are, as well as heat, but modes of molecular motion, who shall dare to say that machinery may not be made the connecting link between them and other modes of molecular motion, in the future, as successfully as it is now between heat and work.

It sounds odd to speak of a light engine, or a gravity engine, although we are familiar enough with caloric engines, steam engines, and electric engines; and a water wheel is but a gravity engine, although we know that previous to the action of gravity it was, so to speak, "wound up" by the action of heat upon the water of the sea.

There is yet an almost unlimited field for lesser lights in the invention of improvements on present forms and devices, but the geniuses of the future have more glorious work before them. When the vast coal-fields upon which the world at present relies shall have been consumed, there will be just as much carbon as before, only it will exist in another form. The mass motion which it will have produced in assuming that form, will in its turn have been converted into molecular motions of some kind, which will be capable of re-conversion without loss into mass motion again, and the world's great workshop will keep running—no fear about it.

Where, then, shall invention stop? When man ceases to want anything to minister to body or mind, then will invention cease. What is there left to do? So much, which is possible, that the ages to come will never see it all accomplished.

THE CONSTRUCTIVE FACULTY OF THE MIND.

Perhaps no one of the powers of the human mind is more widely and uniformly distributed among mankind than the power to control and guide the muscles in the shaping of crude materials into objects of utility and beauty.

Phrenologists have classed constructiveness as a distinct faculty, and have given its supposed external indication a location upon the skull. It is evident, however, that it is not the simple control of muscle by the will that phrenologists mean by the term constructiveness. As illustrations of the prominent development of this faculty their books contain principally heads of such men as have distinguished themselves by great feats of mechanical skill and genius in invention.

Now we maintain that if what is meant by constructiveness in phrenology be anything more than mere power to guide the muscles in making imitations of existing things (and of course more is meant), it can no more be justly considered a single faculty of the mind than the power to become scientific in the most general sense of the latter term. To be scientific a man must have not one but many "bumps" well developed. To become a skilled constructor in anything but the imitative sense of the term, he must have not merely the bump of constructiveness, deemed necessary by phrenologists, but the rest of his skull must contain some brains, as well. Take away his causality, his calculation, his ideality, his sense of color, form, and weight, and he will never make even a horseshoe, not to mention a steam engine. And though he may possess all the faculties which go to make a skilled constructor, he will never become such without knowledge.

To construct, one must have mental as well as physical materials. To become skilled in the working of any material and fashioning it into that which better fits it for the use of man, it is necessary to know in some measure the properties of that material, and the means by which it may be so fashioned.

Savages perform marvels of imitative skill, when the rude character of their implements are considered, but they invent little. Much invention and a savage state are incompatibles. When man begins to invent he has progressed, and it would not be hard to show that the progress of civilization has gone hand in hand with invention.

We see then that mechanical skill may be reduced to three subjective elements; namely, good natural powers of mind and body, cultivation of those powers, and knowledge.

Brutes have not the first of these elements, they can therefore not have the others, and hence it is absurd to speak of their being skillful in their works. The beaver's dam, the honey-comb of the bee, and the tailor-bird's nest, are often spoken of as works of skill, but they are only so by comparison with the feeble mental and physical faculties of the beaver, the bird, and the bee. To form wax into much more complex forms than a honey-comb, would not be a surprising feat if done by a boy six years old. To build a dam as substantial as it is done by the beaver, or to stitch leaves together like the tailor-bird, is far within the power of the lowest and most ignorant savages on the face of the earth. Savages do even more remarkable things than these, but they are not feats of constructive skill in a broad sense of the term; a watch or a steam engine is, because all the requisites above enumerated are necessary to its construction. True, an ignorant man may imitate, but he could not devise, or improve it. An educated man might invent improvements, but lack the power to construct his improvement, but neither of these could be called skillful.

How absurd, then to consider constructive skill as a peculiar faculty of the mind, like the phrenologist, for mere deftness of the hand like the workman, who will none of books because he esteems most the judgment of practical men, and likely thinks himself a practical man.

Of all absurd terms, this "practical" is most misunderstood. What does it mean? Clearly, it means pertaining to practice, and practice signifies the practice of something, the application of knowledge or theory. Hence, theory precedes practice. A theoretical man may not be practical, but a practical man must be theoretical in spite of himself, and just as he is deficient in theory, in just so much he must be deficient in practice. There is a lesson to be drawn from this, but it must form the subject of a future article.

MEN OF PROGRESS---GREAT INVENTORS.

We continue this week our biographical sketches of the lives of the great inventors whose portraits are offered (see another column) as one of our subscription prizes.

At the extreme left of the picture stands the dignified Dr.

WILLIAM THOMAS GREEN MORTON,

who was born in Charlton, Mass., August 19, 1819. His youth was passed on a farm. At the age of seventeen he spent some time in a publishing house in Boston. In 1840 he commenced the study of dentistry in Baltimore, and eighteen months after established himself as a dentist in Boston. Among other improvements introduced by him was a new kind of solder by which false teeth are fastened to gold plates, preventing galvanic action. In order to render his work complete, it was desirable that the roots of old teeth should be removed. This was a tedious and painful operation, and there seemed little prospect of the success of the invention, unless he could devise means to lessen the pain. He tried by stimulants, intoxication, and magnetism, but in vain; yet still he clung to the idea that there must be something to produce the desired effect. He entered his name as a medical student in Boston in 1844. About this time the idea was suggested to him, in a lecture at the college, that sulphuric ether might be used to alleviate pain in his operations. He studied chemistry, and experimented on animals. Learning from books and lectures that the ether could be inhaled in small quantities, but that in large amount it was dangerous, he experimented on himself, and, satisfied of its safety, he administered it to a man, on September 30, 1846, producing unconsciousness, during which a firmly-rooted bicuspid tooth was painlessly extracted. At the request of Dr. Warren he administered the ether to a man at the Massachusetts General Hospital, from whose jaw was removed a vascular tumor, October 16, 1846, with perfect success. Dr. Morton obtained a patent under the name of letheon, November, 1846, in the United States, and the following month in England. The Paris academicians awarded 5,000 francs to be equally divided between Drs. Jackson and Morton; the latter declined receiving this joint award, but in 1852 received the large gold medal, the Monthyon prize.

From this time Dr. Morton labored incessantly for years to induce surgeons to adopt the ether, and, when its anæsthetic qualities were demonstrated, chloroform in their practice. His efforts secured him small profits, but brought upon him bitter persecution. His claim to the discovery of anæsthesia was disputed, and even the value of his efforts in behalf of its introduction was denied. In 1867, after witnessing a very successful, though severe surgical operation, in which Dr. Morton administered with his own hands the anæsthetic, we listened to an able and eloquent statement of his claims to the discovery of anæsthesia, as applied to surgery, which had the effect to establish in our mind the entire justice of that claim, and which, whether allowed by posterity or not, in our opinion entitles him to head the list of the world's benefactors. The full value of this discovery can only be appreciated by those who know how much suffering is saved by its now general application, and this value cannot be expressed in language, or estimated in dollars and cents. After many fruitless applications to Congress for some pecuniary recognition of his services to the world, some of them made at a time when the agony of thousands of wounded and maimed soldiers on the battle field, was being mitigated by his discovery, to the eternal shame of an ungrateful country be it said, he died July 15th, 1868, a poor man.

Immediately in front of Dr. Morton, stands

COL. SAMUEL COLT,

who was born at Hartford, Conn., July 19, 1814, and educated in his own native city. When a child, he preferred the workroom to the school-room. He remained in his father's factory from the age of ten to fourteen, when he was sent to school at Amherst, Mass., but ran away from the school, and, in July, 1829, shipped as a boy before the mast on as East India voyage. On his return, he served a short apprenticeship in a factory at Ware, Mass., in the dyeing and bleaching department, where he learned something; after which, under the assumed name of Dr. Coult, he traversed every State and most of the towns in the Union and British North America, lecturing on chemistry. In this way he earned considerable money, which he devoted to the prosecution of the invention of his revolver, the germ of which he had already devised while on his voyage to Calcutta. The first model of his pistol, made in wood, in 1829, while a sailor boy, is still in existence. At the age of twenty-one, he took out his first patent for revolving firearms. Before obtaining his patent here, he visited France and England and secured patents there. He returned to the United States and succeeded in inducing some New York capitalists to take an interest in the invention, and a company was formed in Paterson, N. J., in 1835, with a capital of $300,000, under the name of the Patent Arms Company. The revolvers were first introduced into use in the Florida War of 1837. In 1842 the Patent Arms Company were forced to suspend. The Mexican War commencing in 1847, General Taylor sent Captain Walker of the Texan Rangers to procure a supply; there were no arms to be had, not even could he obtain one to serve as a model, so that he was compelled to make a new model, which he did with several improvements. The first thousand were made at Whitneyville, Conn. Other orders immediately following, Mr. Colt procured more commodious workshops at Hartford, and commenced business on his own account. The demand for revolvers greatly increasing, and more room and greater facilities being required, he purchased a tract of meadow land south of Mill River, within the limits of the city of Hartford, surrounded it with a dyke or embankment about two miles in length, one hundred and fifty feet at the base, from thirty to sixty at the top, and from ten to twenty five feet in hight. He erected within this his armory, consisting of two main buildings, with others for offices, warerooms, etc., in which armory he could manufacture one thousand firearms per day. He also manufactured the machinery for making these firearms elsewhere, and supplied a large portion of the machinery for the armory of the British Government at Enfield, England, and the whole of that for the Russian Government at Tula. The entire expenditure upon his grounds and buildings amounted to more than $1,000,000. He did not forget the comfort of his workmen, having good dwellings provided for them, besides a public hall, a library, courses of lectures, concerts, etc. Mr. Colt subsequently invented a submarine battery of great power, and was one of the first to lay a submarine cable. He amassed an immense fortune in his manufacture of arms; and died in 1861.

By his side stands

CYRUS HALL M'CORMICK,

of Scotch descent, though born in this country, in the State of Virginia. The constant employment of his active mind in pursuit of mechanical improvements, has resulted in one of the most important inventions of agricultural machinery. His automatic mowing and reaping machine, was exhibited in the World's Fair, held in Hyde Park, London, in 1851, and like many other pioneers in the van-guard of progress, was greeted with ridicule. The *Times* called it "a cross between an Astley chariot and a flying machine." Its first trial, however, at Tiptree farm, changed the current of public opinion, and even the *Times* recanted. A still more satisfactory acknowledgment of its merits was the award to it of the Grand Prize medal of the year by the jury of the Exhibition. In the New York Exhibition of 1853, it also won a gold medal. Mr. M'Cormick, not content with this great success, continued his investigations and experiments, until he achieved another important improvement in this same machine, the automatic "raker." This machine, called by its inventor the "M'Cormick," attracted a great deal of attention at the last Great Exhibition in London, in 1861; even crowned heads and the highest nobility considered it worthy of their examination. At every trial in all parts of Great Britain and the Continent, it elicited applause by its admirable performance of the operations for which it was constructed. At the Lancashire Agricultural Meeting, at Preston, it triumphed over nine competitors. Mr. M'Cormick has a large factory in Chicago, Illinois, where, as an inseparable result of such indomitable perseverance and inventive genius, his success is firmly established.

In front of Mr. M'Cormick sits, with vulcanite cane in hand, and large vulcanite pin on his shirt-front,

CHARLES GOODYEAR,

who was born in New Haven, Conn., December 29, 1800. He there attended public school. When not studying he assisted his father Amasa Goodyear, who was the pioneer in the manufacture of hardware. He subsequently joined his father in the hardware business in Philadelphia, and made many improvements in agricultural tools. The firm being overwhelmed by the commercial disaster of 1830, Goodyear selected a new business, the improvement in india-rubber. His early experiments were made in New Haven, Conn., Roxbury, Lynn, Boston, and Woburn, Mass., and the city of New York. The first important improvement made by him was at New York, 1836, being a method of treating the surface of native india-rubber by dipping it into a preparation of nitric acid. This discovery enabled the manufacturer to expose an india-rubber surface in his goods, which, on account of adhesiveness, was before impracticable. The nitric acid gas process, as it was called, was introduced into public use and met with great favor, especially in the manufacture of shoes. Sulphur had been noticed as producing remarkable drying effects on rubber, and in 1838 and '39 Goodyear made at Woburn, Mass., many experiments with compounds of india-rubber and sulphur. In the course of these experiments, about January, 1839, he observed that a piece of rubber mixed with ingredients, among which was sulphur, upon being accidentally brought in contact with a red-hot stove, was not melted, but that in certain portions it was charred, and in other portions it remained elastic though deprived of adhesiveness. From 1839 to the day of his death vulcanization occupied Mr. Goodyear's whole attention. More than sixty patents were taken out by him. The first publication to the world of the process of vulcanization was Goodyear's patent for France, dated April 16th, 1844. He was unfortunate both in France and in England, in being robbed of both patents at the Paris Exhibition of 1855. He obtained the grand gold medal and the ribbon of the Legion of Honor, presented by Napoleon III. His whole time night and day appeared to be taken up with improvements in india-rubber. For years he suffered from poor health. He died in the city of Washington 1861.

ELIPHALET NOTT, D.D., LL.D.,

is represented as seated by the right of Professor Morse in the middle foreground. Although for more than half a century President of Union College, he was to a great extent self-educated, having never received a collegiate training. He was born in Ashford, Connecticut, June 25, 1773. He studied divinity in his native county, and at the age of twenty-one was sent out as a domestic missionary to the central

part of the State of New York. On passing through the old settlement of Cherry Valley, he was requested to take charge of the Presbyterian Church at that place; he accepted the call, and in addition to his pastoral duties became the teacher in the Academy. Two or three years afterward he was called to the Presbyterian Church, at Albany, where he took a prominent position as a preacher. In 1804 he was chosen President of Union College, Schenectady, N. Y., which place he continued to fill for 58 years. More than 3,500 students were graduated during his presidency, and in their number may be found some of the most eminent men in the country. Union College was emphatically of his own formation. He came to it in its poverty and infancy, and raised it to wealth and reputation In 1854 the semi-centennial anniversary of his presidency was celebrated, when between 600 and 700 of the men who had been graduated under him came together to do him honor. Dr. Nott was an earnest advocate of the temperance cause, and published "Lectures on Temperance" in 1847. Though he has written much, his other publications are confined principally to occasional addresses and "Counsels to Young men." He gave a great deal of attention to the laws of heat, and besides obtaining thirty patents for applications of heat to steam engines, the economical use of fuel, etc., was the inventor of a stove bearing his name, which has been very extensively used. He died in Schenectady, January 29, 1866.

Immediately behind Dr. Nott stands

CAPT. JOHN ERICSSON,

whose great genius as an inventor and engineer are universally acknowledged. He was born in the province of Wermeland, Sweden, in 1803. The son of a mining proprietor, his earliest impressions were derived from the engines and machinery of the mines. In 1814 he attracted the attention of the celebrated Count Platen, and in 1820 he entered the Swedish army as an ensign, and was soon promoted to a lieutenancy. His regiment being stationed in the highlands, where government surveying was in progress, Ericsson surveyed upwards of fifty miles of territory, detailed maps of which, executed by his own hands, are yet in the archives of Sweden. He visited England in 1826, with a view of introducing his invention of a flame engine; not succeeding, he abandoned the idea, and numerous other inventions followed. He joined the house of Braithwaite, London, where he introduced several improvements in steam boilers. In the fall of 1829 his invention was applied to railway locomotion on the Liverpool and Manchester Railway. The directors had offered a prize for the best locomotive engine, and within seven weeks of the time of trial Ericsson heard of the offer, planned an engine, executed the working drawings, and completed the machine. The lightest and fastest engine started on this occasion was the "Novelty," which, guided by its inventor, Ericsson, started off at the rate of fifty miles an hour. A similar engine, of great power, he subsequently constructed, for the King of Prussia. For this invention he received the prize medal of the Mechanics' Institute, in New York. In 1833 he reduced to practice his long cherished project of a caloric engine, and submitted the result to the scientific world in London. Ericsson's attention was next directed to navigation; the result revolutionized the navies of the world. He was employed through Capt. R. F. Stockton, of the U. S. Navy, in the construction of the U. S. ship of war, *Princeton*, the first steamship ever built with the propelling machinery below the water line. In the United States division of the great exhibition in London, 1851, Ericsson gained the prize medal for a large number of important inventions there exhibited. In 1852, he was made Knight of the order of Vasa, by King Oscar, of Sweden. The same year brought out his caloric engine in the ship *Ericsson*. It propelled a ship of 2,000 tuns from New York to Alexandria, in the winter of 1853. It was visited there by the President and heads of the departments. His caloric engine has been perfected, and a large number are in successful operation. His greatest triumph was the invention and construction of the *Monitor*. He is still designing and improving naval batteries, and at the same time conducting extensive researches on the subject of solar heat, with a view to its application as a motive power, and also in other scientific fields. Probably no man in America has a better appreciation of the value of time than Capt. Ericsson. He economizes every moment. We are informed, that he has for thirty successive days, worked eighteen hours each day. He rarely leaves his house unless obliged to do so, and allows himself no leisure for social recreation. The speed with which he masters details and throws off designs, is said to be probably unparalleled. His manners are simple and dignified, but, without any assumption, he impresses every one with whom he comes in contact, by his broad views and rich stores of learning. His inventions are numerous and various, but they all bear the true stamp of genius.

FREDERICK E. SICKLES,

seated a little to the left of Dr. Nott, was born in the State of New Jersey in the year 1819. While an apprentice at the "Allaire Works," New York, he invented a "Cut Off," which improvement has become extensively known, not only from its great value in the saving of expense for fuel in the working of steam engines, but also from the litigation that existed during the lifetime of the patent. Although in controversy during the entire fourteen years, for which term the patent was granted, Mr. Sickels could obtain from the courts but partial protection to his rights, and it was not until after the patent had expired, and its extension had been refused by the Patent Office, that he obtained a decision from the highest court that he *was* the inventor of the improvement known as the "Sickels' Cut Off." Mr. Sickels has taken out twelve patents for as many distinct improvements in steam engines, all which have gone into extensive use. His latest invention for steering vessels by steam power has been successfully applied to government and merchant steamers, and was favorably received in England at the great exhibition in London, 1862, where it received the Great Medal.

The most prominent figure in the group occupying the middle foreground of the picture is that of

SAMUEL FINLEY MORSE,

who was born in Charlestown, Mass., April 27, 1791. He graduated at Yale College in 1810, and went to England with Washington Allston in 1811, to study painting under his tuition and that of Benjamin West. In 1813 he received the gold medal of the Adelphi Society of Arts, at the hands of the Duke of Norfolk, for an original model of a "Dying Hercules," his first attempt at sculpture. He returned to the United States in 1815, and in 1824-25 with some other artists of New York, organized a drawing association, which, after two years' struggle against various obstacles, resulted in the establishment, in 1826, of the present "National Academy of Design." Mr. Morse was chosen its first President, and was continued in that office for sixteen years. In 1829 he visited Europe the second time to complete his studies in art, residing for more than three years in the principal cities of the continent. During his absence abroad he had been elected to the professorship of the literature of the arts of design in the University of New York, and in 1835 he delivered a course of lectures before that Institution on the affinity of those arts. While at Yale College, Mr. Morse had paid special attention to chemistry and natural history to such a degree, that, from being subordinate as recreations, they had become a dominant pursuit with him. The electro-magnet on Sturgeon's principle (the first ever shown in the United States) was exhibited and explained in Dana's lectures, and at a later date by gift of Professor Toney, came into Morse's possession, and this same magnet is used in every Morse telegraph throughout both hemispheres. It was on board ship bound for Havre in 1832, and in a casual conversation with some of the passengers concerning recent discoveries in France, regarding the means of obtaining the electric spark from the magnet, that Morse's mind conceived not merely the idea of an electric telegraph, but of an electro-magnetic recording telegraph, as it now exists. The testimony to the paternity of the idea in Morse's mind, and to his acts and drawings on board the ship is ample; so that the court and judges before whom he appeared were satisfied with his claim; the date of 1832 is therefore fixed by this evidence as the date of Morse's conception of the telegraph system which now bears his name. In the latter part of this same year he reached home, prosecuted his studies, and prepared portions of his apparatus. The first instrument was shown in successful operation to many persons in 1835 and 1836, for the purpose of communicating from and to a distant point. In 1837 he completed and exhibited his whole plan at the University of New York. Application was made to Congress in 1842 without success. But in March of 1843 he was startled with the news that Congress, near the midnight hour of the last session, approved his plans and had placed at his disposal the sum of $30,000, to make the experiment between Washington and Baltimore; all know the result. Submarine telegraphy originated also with Professor Morse. He laid the first submarine telegraph lines in New York harbor in 1842, and received a gold medal for that achievement. One of the most prominent figures on the right of the picture is that of

HENRY BURDEN,

an inventor and mechanic, who was born at Dunblane, Scotland, April 20, 1791. His father was a farmer, and it was while a youth engaged on the farm that the son gave evidence of inventive genius, by making with his own hands labor-saving machinery from the roughest materials, and with but few tools and no models. The first marked success was in constructing a thrashing machine. He afterwards engaged in erecting grist-mills and making various farm implements. During this period he attended the school of William Hawley, an accomplished arithmetician; and afterwards, having resolved to try his fortunes in America as a machinist and inventor, he went to Edinburgh and entered upon a course of studies, embracing mathematics, engineering and drawing. Arriving in this country in 1819, he devoted himself to the improvement of agricultural implements. His first effort was in making an improved plough, which took the first premium at three county fairs. In 1820 he invented the first cultivator in the country. In 1825 he received a patent for his machine for making the wrought spike, and in 1835 for a machine for making horseshoes. 1840 he patented a machine for making the hook-headed spike, an article which is used on every railroad in the United States. In the same year he patented a self-acting machine for reducing iron into blooms after puddling. In 1843 he patented an improvement in his horseshoe machinery. In 1849, he patented a self-acting machine for rolling iron into bars. In June, 1857, he patented a new machine for making horseshoes. This may be considered his greatest triumph in mechanics; it is self-acting and produces from the iron bars sixty shoes per minute. He has obtained patents for this machine from every prominent government in Europe. Mr. Burden's suspension waterwheel is another of his inventions. In 1833, he built a steamboat 300 feet long, with paddle-wheels 30 feet in diameter; from its shape it was called the "segar boat." It was lost through the mismanagement of the pilot. In 1836, Mr. Burden warmly advocated the construction of a line of ocean steamers, of 18,000 tuns burden. In 1845, when the steamer *Great Britain* was crippled by breaking one of her screw blades, Mr. Burden went to England for the especial purpose of inducing her owners to adopt the sidewheel, but was unsuccessful. He is now a resident of Troy, N. Y., and is highly esteemed as a citizen.

The remaining portraits are those of Richard March Hoe, Erastus B. Bigelow, and Elias Howe, biographical sketches of whom will be given in a future number.

MICROGRAPHS.

The microscopist often desires to secure in permanent form, the beautiful and curious objects which are revealed to his eye. Recourse is frequently had to the pencil and the prism, success being in direct proportion to the skill. Photography affords the best means, and by its employment we obtain exact copies of the magnified objects. Such pictures are called micrographs, and are produced by combining a microscope with a photographic camera. These combinations are generally expensive; but their operation is simple, and they are easily managed.

Mr. Louis Edward Levy, of Milwaukee, Wis., sends us some micrographs of his own production, which are creditable to him as an amateur, especially when we consider the simplicity and cheapness of the apparatus by which they were produced. Over the eye-glass tube of an ordinary achromatic microscope, he places a sleeve or ferule, to which is attached a small box, having its rear part open so as to receive the plate-holder which fits nicely into the box. The interiors of box and plate-holder are painted black. In focusing, a frame with ground glass takes the place of the plate-holder. With a microscope and camera, thus made, all objects visible by means of the microscope may be readily photographed. Mr. Levy states that his box was made of tin, and the whole expense was only $3.

Report on Steam Boilers Exhibited at the Recent Fair of the American Institute.

THE HARRISON SAFETY BOILER—FIRST MEDAL AND DIPLOMA.—1st. Safety. 2d. Economy of space. 3d. Economy of fuel.—This boiler was the only one which was found reliable and capable of driving the engines at the Exhibition, and which did furnish all the steam for the competition tests of the engines.

Root's Wrought-Iron Sectional Boiler—Second premium and diploma for facility of repairs and economy of space.

If any of our readers have been kept awake by the problem we gave them last week in regard to this report, they may now rest easy—the report is made.

How about the evaporation power of these boilers? How about the quality of steam produced? How about the boilers exhibited, not mentioned in the report? We recommend any who wishes to see how much can be said without saying anything, to put the report on engines and this on boilers side by side, and study them together.

The Gold Hill Fire Still Burning.

The terrible and fatal fire which broke out in the Gold Hill (California) mines on the 7th of April last, and which resulted in the destruction of a large number of lives, is still smouldering. After it had been reduced to close quarters, it was carefully walled in, and work was again started in different directions around it. It was thought to have been extinguished long ago; but such, it appears, is not the case, for a few days since some miners working between the 600 and 700-foot levels of the Kentuck mine suddenly picked through into a space where there was plenty of fire, finding large brands of it. The place was at once closed up again. Being as far as possible shut in and kept from the encouragement of atmospheric air, the fire merely smoulders, but it is there, nevertheless, and may keep on burning for many months to come. It can do no particular harm, however, as it is merely burning out the old timbering where the mine has been worked out.

Obituary---Death of Mr. John Degnon.

We regret to announce the death of Mr. John Degnon, whom our readers will recollect as the engineer who took the locomotive *Best Friend* to Charleston in 1836, and set it running, and therefore claimed to be the first man who ever ran a locomotive in the United States. When we saw him last he appeared in good health, but he died of paralysis, at Boston, on the third of December, aged 59 years. He was a skillful mechanic. He learned his trade at West Point Foundery, and has been successively engineer on the steamships *Arctic* and *Re d'Italia*.

REMITTANCES should be made in money orders, bank checks, or drafts, if possible. When neither of these can be procured, send the money in a registered letter. The present registration system is virtually an absolute protection against losses by mail, and all postmasters are obliged to register letters whenever requested to do so.

AGENTS who receive their weekly supply of the SCIENTIFIC AMERICAN through news companies, are urged to canvass their localities. By a little effort among intelligent mechanics and manufacturers, they can add largely to their lists. We will send specimen numbers, when desired, for that purpose.

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

CITY SUBSCRIBERS will continue to be served, either at their residences or places of business, at $3·50 a year. Send in your names and the carrier will serve you faithfully.

OUR rule of prepayment of all subscriptions is so rigidly enforced that whoever receives the paper regularly may consider it paid for. No names are entered on the subscription books without advance payment.

Powerful Turbines.

A correspondent of the *American Odd-Fellow*, which, by the way, is a very well conducted and popular magazine, thus describes the turbines used in the Mastodon Mill, in the village of Cohoes, New York.

"The entire number of looms in this mill is fourteen hundred and eighty-six; five hundred of which are located on the first floor." These looms and the other machinery of the mill are driven by three "immense turbine water wheels, made by the Ames Manufacturing Company, which operate the main shaft, and possess an aggregate driving capacity of over eleven hundred horse power. This pit having an extreme depth of forty feet, with a floor twenty-five feet from the surface, which hides the water wheels from a top-view, is in reality an underground two-story building. Three mammoth cast-iron cylinders, eight feet each in diameter, convey the water from the canal on the west side of the building to the wheels; the volume of water being regulated by a sort of tiller located in the pit, and connected with the flood-gates. The perpendicular shaft of each turbine is connected with the main shaft by beveled gear, and the united power exerted, if so applied, would reverse the motion of the great Burden water wheel at Troy, and drive the machinery of a good-sized manufactory besides. The shaft to which this wondrous power is applied is supported by three granite abutments, and forms the axis of six ponderous driving pulleys, twelve feet each in diameter. The immense belts which radiate to all parts of the building are in keeping with the massive pulleys and gearing. These are each two feet wide, and the longest one, reaching to the fifth story, measures nearly two hundred feet. At the north end of the pit, two rotary force pumps are located, which, in case of fire, can be instantly geared to the main shaft by means of a sliding cog wheel, and are jointly capable of throwing six thousand gallons of water per hour."

A Balloon View of a London Fog.

A London paper says:—"On Wednesday afternoon, when London and the suburbs were enveloped in a dense fog, Mr. Coxwell made a balloon ascent from the Hornsey Gas Works. The ascent took place at 2:40, when the atmosphere was clear. Soon after three o'clock the fog extended exactly in the direction the balloon was traveling, and presented a strongly defined line of vapor stretching for miles in an easterly direction. The formation of this fog, as witnessed by Mr. Coxwell from his balloon car, was, we hear, one of the most interesting occurrences in the adventurous life of the experienced aeronaut, and will no doubt be fully described. Over the Forest, near Woodford, Mr. Coxwell and his companion were unable to see the earth at a hight of only fifty feet, and it was only by the aid of a rope trailing on the ground, that a level course could be regulated so as to select an open spot on which to alight. While holding conversation with some men who were following the balloon, and could only hear the rustling of a rope among the bushes and trees, the aeronauts were supposed to be poachers. Keepers, who were in close pursuit, rushed upon the strangers when Mr. Coxwell cast his grapnel in a hedge, and great was their surprise when they discovered what kind of a net and cordage it was trailing over the park. So dense was the fog, that the balloon could not be seen, and the voyagers were supposed to be running along the ground, although Mr. Coxwell proclaimed his balloon, but this was thought to be a ruse to draw off the keeper's attention. Notwithstanding the difficult position, Mr. Coxwell was placed in as to landing, still a safe descent was made."

A PEANUT picker was among the new labor-saving machines exhibited at the Virginia State Fair. Hitherto the nuts have been picked off the vines by hand; four bushels a day being the fair average for a hand. A farmer who raised 1,000 bushels required ten hands for nearly two months to save his crop, at a cost of fifteen cents per bushel. The crop raised on the south side of James river, between Petersburg and Norfolk, is estimated at 1,000,000 bushels a year. To save this crop would require the labor of 6,000 hands for two months, at a cost of $200,000. The new machine is said to save much time and labor.

A RAZOR INDEED!—Mr. J. W. Churchill, of Willkesbarre, Pa., thinks people hone and strop razors too much. He has used one for two years without either honing or stropping it, and it still cuts his beard well, though latterly it begins to pull—a little. He means to use the razor until compelled to sharpen it, but he can still cut a hair held in his fingers with it. Mr. Churchill thinks his razor hard to beat, and we think his beard must be still harder to beat if it has with constant use not dulled a razor in two years. The very thought of it makes our face smart.

CLOTHES WRINGERS.—These indispensable household articles are becoming more generally introduced than almost any other labor-saving machinery. It is but a few years since the first patent was taken out on a clothes wringer and now there are but few families that do not use them. A good article in the clothes-wringer line is advertised on another page.

WATER WHEEL EXPERIMENTS.—We have the promise of a report of the recent trial of water wheels at Lowell, Mass., for publication in our next number.

Answers to Correspondents.

L. B. F., of N. Y.—The power to direct safeguards in the use steam boilers, and to provide for the inspection of stationary steam boilers is vested in the local boards of health by the Statutes of New York. These boards are, we believe, appointed by supervisors, unless the Boards are organized under a special commission like the Metropolitan Board of Health, and have power to enforce their requirements. There is no general law requiring the use of lock-up safety valves on such boilers.

A. F. W., of Mass.—To set the tail-stock of a lathe so as to turn a taper, you must set it off the center half the amount of the taper. A good practical way to do this is to turn down the work at each end to the size you want it before altering the lathe. Then set your tool accurately to the larger end of the work, and run it along opposite the smaller end and use it as a gage in moving the tail stock off the center.

J. A. M., of N. Y.—A wheel intended to roll around a circle eight feet in diameter, would need, in order that it should not grind but roll freely around the circle, to be beveled so as to incline the outer surface one foot from the perpendicular.

W. H. G., of Ohio.—We have no report upon the experiment of carrying fresh meats in the ship *Henry Taber*, constructed for that purpose. If it succeeds we shall certainly hear of it and will publish the fact.

C. P., of N. H.—The light minerals you send are common quartz crystals. The red colored specimens are garnets. They contain silicate of alumina, iron, etc.

J. L. T., of Me., and J. A. B., of Mass.—The Report of the Smithsonian Institute is prepared by Prof Henry, Washington, D. C. You had better write to him on the subject.

E. A. G., of Mass.—"Byrne's Practical Metal-workers' Assistant," contains the exact information you require. Published by Henry Carey Baird, Philadelphia.

D. W. R., of Mich.—Your question cannot be answered without diagrams, and it is not of enough general interest to warrant our doing this.

J. R., of Iowa.—The protoxide of chromium is a compound of 26 parts of the metal chromium and 8 of oxygen.

C. C., of O.—The best food for fishes, in a fresh water aquarium is dried beef cut up very finely.

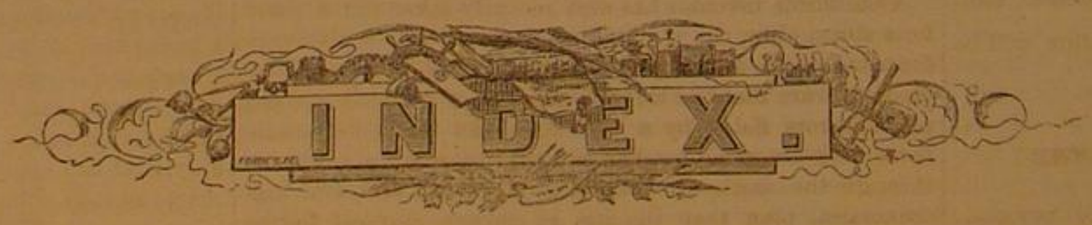
G. B., of Me.—We have had no personal experience in the lumber trade, and cannot answer the point of your inquiry.

F. H. G., of Mass.—The mineral you send appears to be a species of conglomerate. We discover no shells.

F. D., of La.—The red-colored mineral contains iron ore.

S. K. P., of Del.—We cannot explain the phenomenon to which you refer; but your only relief consists in thorough drainage.

C. S. J., of N. Y.—You can render mull or jaconet much stiffer than starch can make it by the use of isinglass size.



ILLUSTRATIONS.

MISCELLANY.

PATENT CLAIMS.

Recent American and Foreign Patents.

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

HORSE COLLAR.—A. Beckwith, New Orleans, La.—The object of this invention is to provide for public use a cheap, substantial, and durable collar for working horses, and which will be easier for the neck than those heretofore employed.

WELL AUGER.—J. Y. Goode, Water Valley, Miss.—The object of this invention is to provide certain improvements in well-boring augers, calculated to make them work more easily, and to facilitate the withdrawal of them from the holes, as required from time to time, without incurring the resistance of atmospheric pressure due to the vacuum commonly produced below.

PUMP.—Chas. L. Merrill, Watertown, N. Y.—The object of this invention is to provide for public use a simple and cheap attachment for pumps, for the purpose of forcing fresh atmospheric air to the bottom of the well during the process of pumping, and thereby to cleanse and purify the water.

HAY LOADER.—W. H. Straub, Danville, Pa.—This invention consists in pivoting the rake heads to the endless elevator chain in such manner that, as the former arrive, in succession, at the point where their loads should be deposited in the hay cart, they shall automatically drop on their points like a trap door, and, afterward, be restored again to their former position.

PIANO ACTION.—A. W. Perry, St. Joseph, Mo.—The object of this invention is to so construct and arrange the several parts, composing the action, that, in playing passages where the same note is repeated with great rapidity, the whole passage can be played, so as to bring out the individual notes with the utmost distinctness, delicacy, and perfection of tone, by an exceedingly slight and rapid depression of the key.

POTATO DIGGER.—Wm. Green, Holly, Mich.—This invention relates to a frame mounted upon two wheels, the central part of the frame being bent downward from the axle, and the rear part sustaining the digging and separating apparatus. The invention consists in a series of narrow spades projecting from the front side of the aforesaid apparatus, each spade rising above and being curved over upon one of the conveying bars, by which the vines are carried to the rear.

LIFTING JACK.—W. S. Douglass, Richmond, Vt.—This invention consists of a forked vertical standard, having a series of notches in its inclined top, and bands placed over such notches in such manner as to form inclined guideways under the bands, of which guideways the notches form part, and in which guideways the pin that forms the lever fulcrum slides, when the pin is not resting in a pair of the notches, such sliding being for the purpose of stationing the fulcrum at a higher or lower point as may be desired, and the lever being so pivoted as to be self-locking.

TIPPING DEVICE.—J. Keith, Brooklyn, N. Y.—This invention relates to as new and useful improvement in a device for tipping pots and kettles for facilitating the operation of pouring out the contents.

COMBINED HAY RAKE AND TEDDER.—John C. Mills, Palmyra, N. Y.—This invention relates to a new and useful improvement in combining in one (or combining a tedder with a hay rake), and it consists in the construction of the tedder and the arrangement of the same in combination with the rake.

SHAKERS FOR THRASHING MACHINES.—Moses A. Keller, Littlestown, Pa.—This invention has for its object to furnish an improved shaker for separating the grain and straw as they come from the thrasher, which shall be simple in construction and effective in operation.

SOLE-SEWING MACHINES.—Jeremiah Keith, Brooklyn, N. Y.—This invention relates to new and important improvements in that class of sewing machines used for sewing soles in the manufacture of boots and shoes, and consists, mainly, in connecting the horn of the machine with the needle bar so that they may be revolved, or partially revolved, simultaneously, in completing the stitch by mechanism detached from the needle and needle bar, and in forming the stitch or chain on the inside instead of on the outside, as is usually done in this kind of sewing, thereby rendering it unnecessary to cut away the outside of the sole any more than would be done in common hand-sewing.

MODE OF LAYING OUT GARMENTS.—Wm. M. Michael, Indiana, Pa.—This invention comprises a mode of laying out the different parts of a garment by lines and measures from a central point within the said parts, by means of patterns for each part of the garments, and a scale bearing the relations to the different measurements of the person.

REAPER AND MOWER.—A Sheline and E. Burke, Edon, Ohio.—The object of this invention is to provide certain improvements in the operating gear of reaping and mowing machines, calculated to furnish more useful and efficient machines than those now in use. The invention consists in an improved arrangement of the drawing gear, and clutching and unclutching devices; also, in an improved arrangement of attaching devices for the mower; and, also, in an improved arrangements of side dropping devices for the reaper, and operating devices for the reel.

WATER WHEEL.—A. W. Lloyd, North Adams, Mass.—This invention relates to improvements in water wheels, such as are used with a draft tube, and has for its object to provide certain improvements in the construction of the same. Also, a draft regulating apparatus for keeping the draft tube full of water whether running or not, to compensate for the loss of water in the said tube, by reason of leaking and accumulation of air therein, set free from the water, which lowers the level of the water therein, and consequently the efficiency of the wheel.

FRUIT CAN.—A. J. McMillen, Ravenswood, West Va.—This invention relates to improvements in cans of tin or other thin sheet metal for putting up fruit; it consists in the application of a strong band or hoop at the center between the ends to prevent the cans from collapsing, and adapted also as a register to designate the name of any fruit which may be put into the can.

TOBACCO MACHINERY.—J. H. Dickason, Hannibal, Mo.—This invention relates to new and useful improvements in machinery for manufacturing tobacco, whereby the labor and expense of preparing plug tobacco for market is greatly lessened.

IRONING MACHINE.—Jules Decoudun, Paris, France.—This invention consists in a fixed, smooth, heated metallic surface, and one or more revolving cylinders, upon which an endless apron of felt is applied with such a tension, that, by engaging the fabric to be operated upon between the fixed metallic surface and the felt, the same is carried around with the latter gliding over the heated surface, whereby it is thoroughly ironed.

SAFETY VALVE.—Walter Dawson, Scranton, Pa.—The object of this invention is to provide a better seat for the valve, and also to secure a more free escape of steam than can be obtained by the ordinary safety valve.

DESIGN FOR CHAMBER PAILS.—John S. Jennings, Brooklyn, N. Y.—This invention relates to an improved design for the form and construction of chamber pails.

MACHINE FOR WASHING AND RINSING WOOL.—Emile Nougaret, Newark, N. J.—This invention has for its object to provide a simple machine for washing and rinsing wool, with the aid of warm or cold water or other liquid. The invention consists chiefly in the arrangement of an annular vessel, in which the wool to be washed is kept in constant motion, by a stream of water falling in an inclined direction upon it, so that the force of the water will serve to move the wool.

SASH LOCK AND FASTENER.—A. F. Gregory and C. H. Ensign, Bridgeport, Conn.—This invention relates to an improved device for retaining window sashes at any suitable hight, and for locking the same, when they are lowered.

WASHING MACHINE.—T. H. Tatlow, Jr., Newark, Mo.—This invention relates to a new washing machine in which the rubber is attached to a lever that can be oscillated, both in a vertical and horizontal direction, to obtain the requisite action on the articles to be cleaned.

ALARM FAUCET.—T. M. Biddle, Fort Wayne, Ind.—This invention has for its object to provide means for automatically arresting the flow of liquid matter of a suitable kind, when the receptacle is filled to the requisite hight.

COAL AND ASH SIFTER.—Abram Hagadorn, Canajoharie, N. Y.—This invention has for its object to so construct a coal and ash sifter, of that class in which a rotary screen is employed, that such screen can be locked stationary, while the coal and ashes are being filled in.

ELECTRIC SIGNAL FOR RAILROAD CROSSINGS, ETC.—T. S. Hall, Stamford, Conn.—This invention has for its object to provide means by which an electric signal, visible or audible, to be operated by a passing train, can be held displayed for a certain length of time, until the train acts on a different magnet, than that at first set in motion.

SNOW PLOW.—Gottlieb Beer, Grafton, Wis.—This invention relates to a new snow plow, which is to be moved ahead by horses, or other draft animals, and which is provided with a steering point, swinging wings, and with a backward projecting pole.

LUBRICATOR.—David Adamson, New York city.—This invention has for its object to provide a lubricator cup, which can be used on all kinds of machinery, but more particularly on high pressure engines, with any suitable viscid lubricating material. The invention consists in the arrangement of a cylindrical cup which contains a piston, to the upper or outer surface of which steam pressure is, or can be applied.

PROCESS OF DYEING BLACK.—James Gee, West New Brighton, N. Y.—The object of this invention is to simplify and accelerate the dyeing and sizing of all kinds of fabrics in black, and refers more particularly to the dyeing of cotton, or the fabrics made of vegetable fiber.

PEANUT PICKER.—W. A. Crocker, Norfolk, Va.—The invention comprises an arrangement in a closed case, through which the vines are supplied at one end, of an endless chain carrier, composed of chains woven together diagonally, making large angular meshes, working between fixed screens, one above and the other below the upper portion of the chains; also, in combination with the above, a rotary spiked vine discharger, a fanning device, and a scouring apparatus.

PAPER FILE.—Benj. F. Herr, Livingston, Ala.—This invention consists in the arrangement of three parallel bars, one of which is provided with hooks and pins for the connection of the other two, and springs for forcing the middle bar against the second outer bar, for clamping the papers placed between them. For disengaging the papers the bars are forced together and the hooks disengaged from the second outer bar and engaged with the middle bar, holding the springs, while the second outer bar is free to be removed.

SPRING FOR HORSE COLLARS.—Benjamin J. Barton and Roswell J. Stanley, Washington, Iowa.—This invention has for its object to furnish an improved spring for horse collars, which shall be so constructed as to strengthen the collar and keep it in position and form, both when on and when off the horse.

CHURNING MACHINE.—D. G. Taylor, Campbellsville, Ky.—This invention has for its object to furnish a simple, convenient, and effective churning machine, which shall be so constructed and arranged as to do its work quickly and well.

HEATING SADIRONS.—James Jenkinson, Williamsburgh, N. Y.—This invention has for its object to furnish an improvement in heating sadirons with kerosene lamps, gas burners, etc., by means of which the sadirons may be readily and conveniently heated.

DITCHING MACHINE.—H. L. Hall, Buffalo, N. Y.—This invention has for its object to furnish a simple, convenient, and effective machine for opening ditches, and which shall be so constructed and arranged that it may be used for making crooked ditches.

COTTON SEED PLANTER.—Matthew McMillian, Caney, Ark.—This invention has for its object to furnish a simple, convenient, and effective cotton seed planter, which shall be so constructed and arranged, as to plant the seed in a narrow channel making it much more convenient for scraping, chopping, and, in fact, for the entire process of cultivation.

GATE AND DOOR LATCH.—Rudolph Geselbracht and Frederick Frey, Galena, Ill.—This invention has for its object to furnish a simple, strong, convenient, and effective latch for gates.

TRACE LOCK FOR WHIFFLETREES.—Samuel P. Williams, Rutland, Vt.—This invention has for its object to furnish an improved lock, by means of which the trace or tug may be effectually guarded against becoming accidentally detached, and which shall, at the same time, be simple in construction and easily applied and operated.

VENTILATOR.—William F. Thoms, M.D., New York city.—This invention has for its object to furnish a simple, convenient, and effective apparatus for ventilating dwellings, offices, churches, halls, and other buildings, and which shall be so constructed and arranged that it may be so adjusted as to introduce into the room warm air in winter and cool air in summer.

MOLE KILLER.—Joseph Wilson, Little Falls, N. J.—This invention has for its object to furnish a simple, convenient, and effective device for destroying moles, which shall be so constructed that it can be set without obstructing the track of the mole and thus alarming him.

BURGLAR-PROOF SAFE.—William McFarland, Williamsburgh, N. Y.—This invention has for its object to improve the construction of an improved safe, patented September 14, 1869, and numbered 94,761, so as to make it more convenient in construction and use, while being equally strong and safe against the attacks of burglars.

MACHINE FOR ROLLING, PRESSING, AND CUTTING TOBACCO, ETC.—G. Robinson, Louisville, Ky.—The object of this invention is to provide a simple and efficient machine for rolling and pressing tobacco leaves and cutting them into plugs or cakes. It consists of a system of tongued and grooved pressing rollers and cutting rollers, together with feeding and delivering apparatus.

TOBACCO ELEVATOR.—G. Robinson, Louisville, Ky.—This invention relates to elevating apparatus for elevating or lowering tobacco in warehouses, whereby it is designed to provide a simple and convenient apparatus, adapted to carrying the tobacco up or down while suspended in bunches or hands on the racking sticks.

BOOK HOLDER.—Hamilton Sherman, Waverly, Pa.—This invention consists of a table hinged to a stand for adjustment to the required angular position in front of the reaver, and provided with means for holding it as required; also, with a spring clamp of peculiar construction.

GARDEN PLOW AND MARKER.—Henry Haynsworth, Sumter, S. C.—This invention relates to improvements in hand garden plows for making and marking furrows or drills for planting, and for plowing between rows of plants for cultivating. It consists of a curved and fork beam, answering for beam and handles; a wheel at the front end of the frame supporting it; a plow or scraper behind the wheel, and a marker supporting arm hinged to the beam, so as to project laterally therefrom, and to be turned to either side for marking the next row by a marking rod supported at a suitable distance from the frame.

TOOL HOLDER FOR GRINDSTONES.—Pallip Leonard, Sharon, Pa.—This invention relates to improvements in tool-holding attachments for grindstones, and consists of a plate, arranged for oscillation in front of the face of the grindstone, and a carriage mounted thereon, to slide back and forth, and carrying an adjustable tool holder mounted on the said carriage, and capable of feeding towards or from the stone, the whole being arranged to hold the tool in contact with the stone, and to move it back and forth across the face in a way to grind the edges truly and at any required level.

SWIVEL COCK EYE FOR HARNESS.—Thomas J. Magruder, Marion, Ohio.—This invention relates to improvements in the construction of swivel cock eyes for harness, and consists in constructing the neck of the eye between the two ends, of a regular concave form, and uniting the cross bar of the frame, to which the tug is connected by casting it around the said neck, previously arranged so as not to project beyond the inside of the cross bar, so formed by casting around the said neck in the mold, whereby the abrupt shoulders commonly formed at each end of the straight necks, which are objectionable because of the weakness of the necks at the junction with the said enlargements, and because of the protruding ends inside of the frames, are avoided, the objection to the protruding ends is that they come into contact with the parts of the tugs looping around the bars to which they are attached and bear them.

APPLICATIONS FOR EXTENSION OF PATENTS.

MACHINE FOR FOLDING PAPERS, ETC.—John Thompson, New York city, executor of Thomas Thompson, late of Brooklyn, N. Y., deceased, has applied for an extension of the above patent. Day of hearing Feb. 9, 1870.

CULTIVATING PLOW.—William E. Wyche, Brookville, N.C., has petitioned for the extension of the above patent. Day of hearing, Feb. 9, 1870.

METHOD OF BOTTLING FLUID UNDER GASEOUS PRESSURE.—Jane Quantin and Henry A. Pintard, Philadelphia, Pa., executors of Alphonse Quantin, deceased, have applied for an exension of the above patent. Day of hearing, Feb. 16, 1870.

HARVESTER RAKE.—Owen Dorsey, of Newark, Ohio, has petitioned for an extension of the above patent. Day of hearing Feb. 16, 1870.

METHOD OF BENDING WOOD.—John C. Morris, Cincinnati, Ohio, has applied for an extension of the above patent. Day of hearing Feb. 23, 1870.

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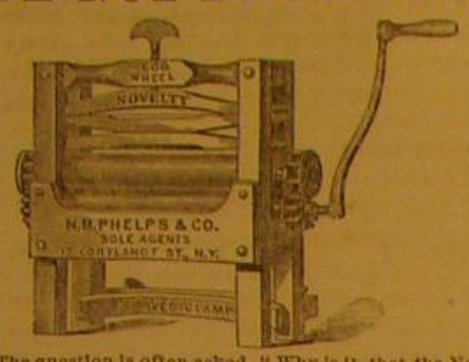

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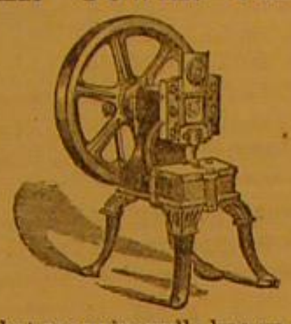

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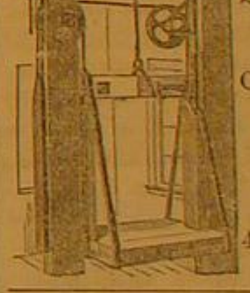

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RAILROAD BRIDGE OVER THE SUSQUEHANNA AT HAVRE DE GRACE.

THE Bridge represented above is one of the finest and most substantial structures of the age. It was built after the plans and under the superintendence of Mr. George A. Parker, C. E., and receives the highest commendations of eminent engineers. Its cost was about $1,500,000, an immense amount for a single transit structure on a road of only one hundred miles, but the public are great gainers in the shortening of the time of travel between Philadelphia and Baltimore, and in the absence of the danger to which all have felt exposed in making the passage on the immense train ferry-boat formerly used. It was the work of a thousand men for four years. It spans the Susquehanna River at Havre de Grace, and is owned and used by the Philadelphia, Wilmington, and Baltimore Railroad. The piers which support the superstructure are thirteen in number, and are of stone carefully laid in cement within caissons of boiler iron, which reach a point above the line of running ice. From this height the piers are finished with cut stone laid in courses. The draw-pier is circular, with a diameter of twenty-four feet eight inches at the top of the caisson, while each of the other piers has a width of eight feet, and a length of thirty-five feet four inches, at top of caisson, and a width of seven feet three inches at top of cut stone. Beside the piers which carry the superstructure, there are at the draw two guard piers, one above and one below, which serve to protect the draw from injury and to aid vessels in passing.

Considering all the difficulties encountered in the construction of this bridge, and the convenience it is to the traveling public, it is one of the best engineering works of the age. The superstructure, which is for a single track, is of wood, built mainly on the Howe plan, with arches, and consists of twelve spans of two hundred and fifty feet nine inches, very nearly in the clear, and a draw of one hundred and seventy-four feet nine inches. The whole distance between abutments is three thousand two hundred and seventy-three feet and nine inches.

The unstable nature of some parts of the bed of the river, together with the unusual depth of the water, and the occasional violence of the ice freshets at the site of this bridge, has given the work a character of unusual engineering difficulty. The mode of constructing the piers was especially designed to meet this difficulty, and it has answered its purpose very perfectly. The masonry was laid within wrought iron water-tight caissons, which were fastened to timber platforms, and lowered gradually with the building of the masonry to prepared foundations of piles. The lowering was in some cases assisted by screws, and in others guided to the bottom by temporary guide piles. One of the piers was lowered by means of six 3¼ inch screws, fifty-six feet long, to a pile foundation in water generally over forty feet deep.

Additional Announcement for 1870. A Splendid Work of Art for Subscribers.

To mark the period of a quarter of a century which the SCIENTIFIC AMERICAN has been published, 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 22×36 inches, and contains the following group of illustrious inventors, namely—Prof. Morse, Prof. Henry, Thomas Blanchard, Dr. Nott, Isaiah Jennings, Charles Goodyear, R. 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 $4000 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 " " "
For 30 Names, one Year,..... $75 two Pictures.
" 40 " " " ..... 100 three "
For 50 Names, one year,.....$125 four Pictures.

Send for Specimen of the Paper and Prospectus. Address,

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CALENDAR FOR 1870.

JANUARY.						
Su	M	Tu	W	Th	Fr	Sa
. .	. .	. .	. .	. .	. .	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	. .	. .	. .	. .	. .

FEBRUARY.						
Su	M	Tu	W	Th	Fr	Sa
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MARCH.						
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APRIL.						
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MAY.						
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JUNE.						
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JULY.						
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AUGUST.						
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SEPTEMBER.						
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OCTOBER.						
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NOVEMBER.						
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DECEMBER.						
Su	M	Tu	W	Th	Fr	Sa
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18	19	20	21	22	23	24
25	26	27	28	29	30	31

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