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Improved Scroll-Sawing Machinery.

It is claimed by the inventor of this saw that its construction renders the machine more durable, effective, and convenient in use than has hitherto been the case in machines of this kind. Our engraving gives a good view of the general appearance of the machine, and the nature of the improvements may be understood from the description which follows.

The first improvement we notice is the provision of a brake, which acts upon the crank wheel on the main driving shaft. This brake is actuated by the belt shifter in such a manner that, when the belt is run on to the loose pulley, the motion of the saw is checked, and by moving the shifter a little further than necessary to stop the saw, the brake is taken off, so that any adjustment of the saw may be made while the belt is running on the loose pulley. This arrangement saves time in stopping the saw.

Each of the guides for the upper and lower cross-heads is made in two parts, adjustable by set screws, so that wear can be taken up on all sides of the bearing surface.

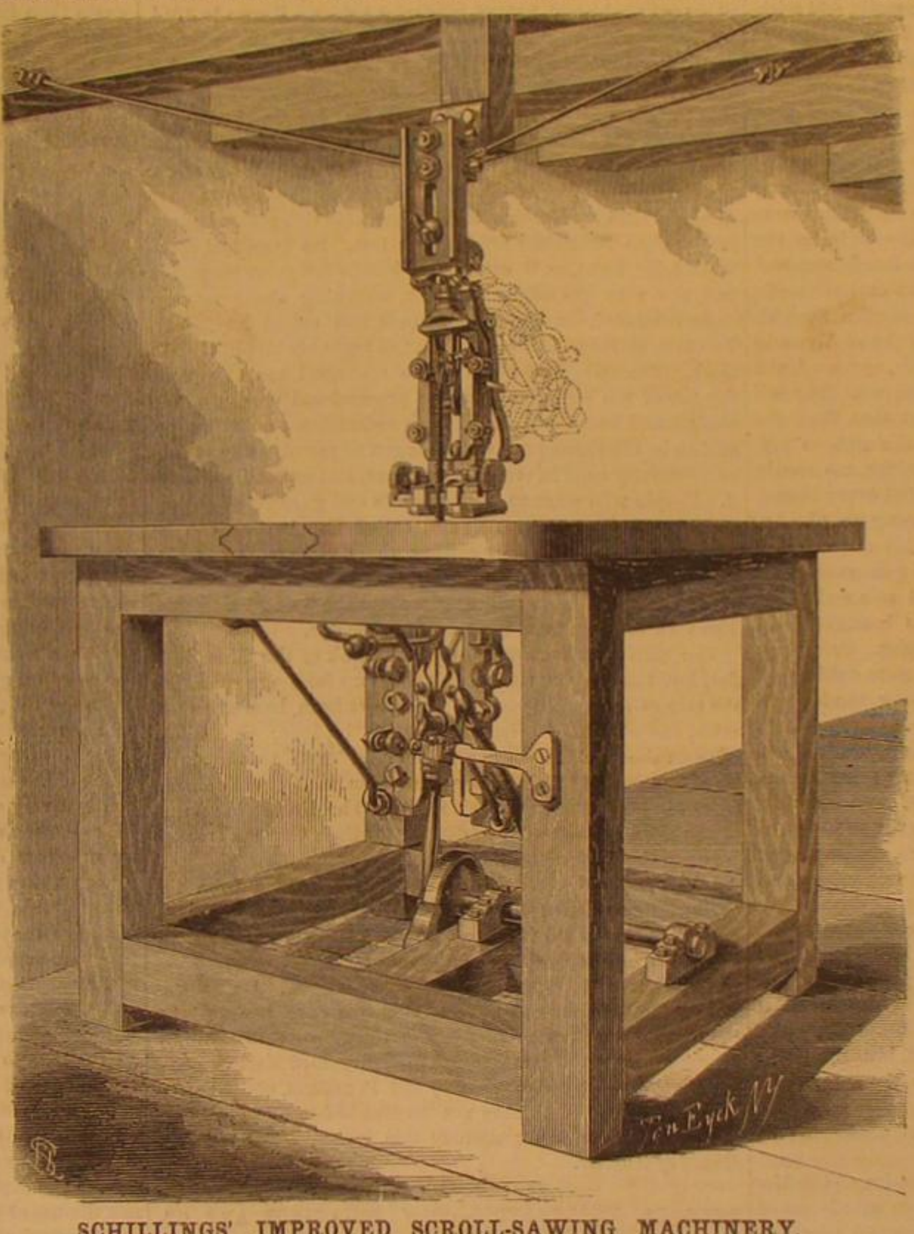
The saw is held in the lower cross-head by means of two clamping jaws operated by levers, and a conical wedging screw, which, when turned in between the levers, separates their lower ends, and forces the jaws together. When released the jaws are separated by a spring.

When the saw is very light and thin, its upper end is attached to a light cross-head, as shown in the engraving; but when it is desired to saw out a hole, or scroll work, in the center of a piece, the release of a latch bolt allows a spring to act, which throws the entire gear above the table back out of the way into the position shown by the dotted outlines. After the saw has been inserted this gear is thrown again into position to guide and steady the saw.

A system of set screws and clamping screws enables both the upper and the lower gear to be adjusted in all directions for different widths and rake of the saw, etc., and the center of the table is also made adjustable for the same purpose, and to support the work close to the saw.

The upper and the lower gears are strengthened by iron braces with nuts and screws, by which the proper degree of tension is secured and the parts are aligned.

When running without the upper cross-head the saw is sustained by guides attached to the upper gear, which, bearing against its back and sides, prevent vibration. Guides to sustain the sides and back of the saw are also provided on the bottom of the table. The position and form of the latter are shown in dotted outline in Fig. 2. Both upper and lower guides are made adjustable to suit various widths and thicknesses of the saw.



SCHILLINGS' IMPROVED SCROLL-SAWING MACHINERY.

The wrist pin and ways, as are all the working parts, are provided with oil cups which keep the running parts well lubricated.

The number of parts, screw bolts, etc., give an appearance of complication to the machine, which it does not in reality possess.

Patent pending through the Scientific American Patent Agency. For further information address August M. Schillings, 348 West Twelfth street, Chicago, Ill.

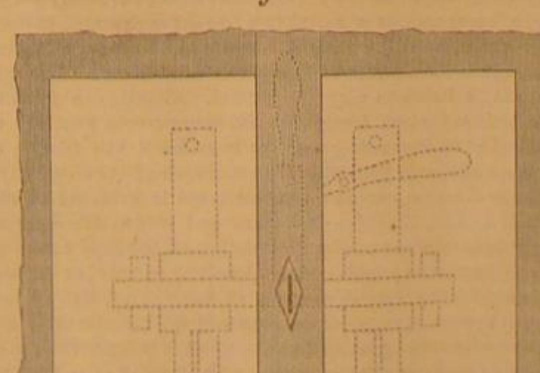
Gutta-Percha.

Gutta-percha is similar in chemical properties to caoutchouc The substance itself is the concrete juice of the *Isonandra percha*, a tree belonging to the family of *Sapotaceae*, which is indigenous to all the islands of the Indian Archipelago, and especially to the Malaya peninsula, Borneo, Ceylon, and their neighborhoods, where immense forests of this tree are found, yielding juice in abundance. The name *percha* is given to the tree by the Malays. As timber it is perfectly useless, but its fruit contains a concrete edible oil, which is used by the natives with their food. The more striking qualities of the juice were not unknown to the natives.

Dr. Montgomerie, an assistant surgeon at Singapore, once observed the handle of a wood-chopper in the possession of a Malay, which struck him as peculiar. On questioning, he ascertained that this handle was made of the juice of the percha, which had the peculiar quality of becoming plastic when dipped in hot water, and regaining its original stiffness and rigidity when cold. Scarcely fifteen years have elapsed since hen, and now, who has not, in some form or other, become practically acquainted with its great services to human interest?

The purified commercial gutta-percha consists of distinct portions: The pure gutta constitutes from 75 to 82 per cent of the mass; it is milk white, fusible at 150°C., insoluble in alcohol, but soluble in ether. The two other constituents are a white and a yellow resin, which are soluble in boiling alcohol. The crude gutta-percha is of a light brown color, much like the inner coating of white oak bark, and is without elasticity. When divested of its woody and earthy substance, it becomes hard like horn, and is, according to Mr. Burstall, of Birmingham, England, wonderfully tenacious. That gentleman, referring to some experiments testing the strength of tubes composed of this material, says: "The tubes were

Fig. 2



three fourths inch bore, the material one eighth thick. They were tested by the Water Company's proving pump, with its regular load of 250 pounds to the square inch; afterward we added weight up to 337 pounds, and I wished to have gone to 500, but the lever of the valve would bear no more weight; we were unable to burst the pipe." Mr. Andrew Robertson, of Stirling, Scotland, says: "For, although our pressure is perhaps the greatest in the kingdom, being upwards of 450 feet, not the slightest effect could be discovered on the tube or joints, while the same pressure on our leather hose sends the rivets in all directions."

Gutta-percha is a tough, inelastic substance, which, at ordinary temperatures, retains any shape which may have been impressed upon it; below 212° it becomes so soft that it can be molded like wax, and may be employed for taking casts, etc., since it will copy the finest lines with fidelity.

One of its most valuable properties, especially as regards manufacturing of telegraph cables, is that it will weld together while soft, provided that the surfaces are quite free from any film of moisture. Below 113° Fah., it becomes hard again. When rubbed it becomes negatively electric, and, in its dry state, it is an insulator of electricity.

Its uses are not confined to covering wires for telegraphic purposes. Almost daily new and useful applications are thought of. Gutta-percha water-proofing material, tubes for conveying gas and liquids, bands for driving machinery are hardly novelties, and, on the whole, as a substitute for leather its use seems to become more and more expanded. The peculiar volatile oil contained in gutta-percha is essential to its good services. This oil is expelled by exposure to the air and more readily by overheating. The effect of such escape is, that the material becomes brittle and cracks. This, then, is one of the points which claims the particular attention of the manufacturer. The plasticity of the gutta-percha must be preserved by retaining this volatile oil. When once submerged, the danger of losing it is almost *nil*. Under such circumstances the oil and the gum last unimpaired for an indefinite time. We hear little or nothing about spontaneous deterioration of a gutta-percha coating in the case of deep-sea cables, and this, in addition to its comparative cheapness, gives it an advantage over india-rubber which it would be difficult to overcome.

Its behavior in the presence of chemicals is somewhat similar to that of india-rubber, with some essential exceptions. Gutta-percha is quite insoluble in water; it is not attacked either by Stockholm tar or by linseed oil. Benzole, chloroform, carbon disulphide, oil of turpentine, and the essential oils generally, dissolve it rapidly. It melts at a moderate heat. According to Mr. G. Williams, it is decomposed beyond this point, yielding hydrocarbons identical with those eliminated from the caoutchouc. Solutions of the alkalies are without effect upon gutta-percha; the same is the case with hydrochloric and dilute hydrofluoric acids, as well as the dilute acids in general. Concentrated nitric acid, however, and oil of vitriol attack it readily and disintegrate it; the former rapidly, the latter more gradually. There is one peculiarity in gutta-percha which, for many purposes prevents its adaptation. It always retains a certain degree of porosity, which allows the slow transudation of liquids through its pores.—*Electric Telegraph and Railway Review.*

THE HISTORY AND FORTIFICATIONS OF METZ.

This old-fashioned town, twenty-four miles from Nancy, the capital of the old Duchy of Lorraine, and two hundred and twenty-eight from Paris, is the capital of the Department of the Moselle, and, what is more, a first-class fortress, the seat of a bishopric, and the head-quarters of a military division.

The Romans, who always trod heavily, left deep footprints here. Six of their great military roads met at this spot They called the place, surrounded by vine-clad hills, Divodurum, but from the half German tribe known as the Mediomatrici, the name of the strong fort on the Moselle became corrupted, about the fifth century, to Mettis, from whence it slid easily down to Metz, or Mess, as it is now pronounced. Gray old Roman walls remain here and there, and there are fragments, near the southern outworks, of an amphitheater and naumachia for sham sea fights, and a great aqueduct once stalked away southward, of which seventeen gigantic arches still remain out of one hundred and sixty-eight, to frame the pleasant landscape at Jouey, on the Moselle, eight kilometers off.

Metz was a good deal troubled about A.D. 70, by some riotous troops of that wild boar, Vitellius, and in 452, when it had quite forgotten those troubles, by Attila, whose Huns sacked, burned, and destroyed everything portable, consumable, and destructible. At the death of Clovis, the city became the capital of the kingdom of Austrasia, and later, the capital of Lorraine. In 988 it was made a free imperial town, and became a self-supporting neutral fortress on the border of Charlemagne's old domains.

Metz played an important part in the wars between the daring Maurice, of Saxony, and his crafty enemy, Charles the Fifth. The French, as allies of Maurice, marched into Lorraine in 1552, and took Toul and Verdun. The Constable Montmorency, having artfully obtained permission to pass through Metz with a small guard, so quibbled about the word "small," that he introduced troops enough to capture the strong city. Charles almost immediately advanced to besiege Metz, to which Francisco of Lorraine (that young Duke of Guise, who afterwards took Calais from the English), had already been sent by Henry the Second to direct the operations of its sixty-six thousand inhabitants. This brave, sagacious, and ambitious prince had brought with him Condé, several princes of the blood, and many noblemen of rank, as volunteers to aid in the chivalrous defense against one hundred thousand Germans.

The duke found the town in a confused and helpless state. The suburbs were large, the walls, in places, weak, and without ramparts. The ditch was narrow, the old towers stood at too great a distance apart. He at once ordered the suburbs to be pulled down, without sparing the monasteries or churches, not even St. Arnulph, where several French kings had been interred, the holy robes and sacred bones being, however, all removed in solemn processions. The duke and his officers labored with their own hands in pulling down the old houses that impeded the fire from the walls. The magazines were filled with provisions and military stores, the mills in the nearest villages burnt, and all the corn and forage removed or destroyed. The young duke got up such an enthusiasm in the town that the people began to long to see the Spanish banners approaching, and the moment the Duke of Alva and the Marquis of Marignano, Charles' generals, appeared, the Metzers attacked the vanguard with great success. The sallies of the French were so hot and incessant that the duke had, indeed, to frequently hide the keys of the gate to prevent the young French gallants, his companions, too rashly and too frequently exposing their lives. Behind every breach made by the German cannon new works sprang up like hydras' heads. Charles, against the advice of his generals, for it was now October, determined to press the tedious siege on through the winter, in spite of the incessant rain and snow. He himself, though ill with the gout, was brought from Thionville, to Metz to urge forward the batteries. Provisions now became scarce, for the French cavalry were cutting off the convoys, and disease was spreading among the Italians and Spaniards, who suffered from the climate. Charles, maddened at the delay, ordered a general assault, but the discouraged army, seeing the troops of the enemy eager for the combat, refused to advance, and the emperor, swearing they did not deserve the name of men, retired angrily to his quarters. Charles then tried the slower but more secure way of sapping; but the Duke of Guise sunk counter mines, and everywhere stopped his advance. After fifty-six days before the town, the emperor at last reluctantly consented to retire. Thirty thousand men had fallen by the enemy's steel and lead, or by the invisible sword of the pestilence. The French, when they broke out of Metz, found the imperial camp full of the dead and dying.

"I now perceive," exclaimed the emperor, bitterly, "that Fortune resembles other women; she leaves the old for the young."

The old Porte des Allemands, on the east of the town, still bears traces of the emperor's cannon shot.

Metz is built on a flattish spot, at the junction of the Moselle and Seille, and was fortified by the most subtile art of Cormontaigne and Vauban, Louis the Fourteenth's great engineers, and strengthened by all the ingenuity of Marshal Belleisle. It is calculated that its nine gates and drawbridges, its citadel commanding the river, its threatening double Couronne and Belle Croix forts, built in 1728–31, and its seventeen bridges, would require one hundred and twenty thousand men to encircle it in anything like a grip that would crush its life out.

This city, which was finally secured to France by the peace of Westphalia, in 1648, is worth the plundering. Blucher, who smacked his lips at the goldsmiths' shops of London and exclaimed: "Here's for plunder!" would have reveled in Metz, which is quite a commercial center for the departments of Moselle, Meurthe, and the Ardennes. Its blouses make brandy and vinegar, gunpowder, cannon, saltpeter, leather, cotton yarn, military hats, muslins, beet-root sugar, chicory, nails, hardware, cutlery, buttons, glue, lace, brushes, flannels, pins, and combs. Nothing comes amiss to them from an 18-pounder to a 10-penny nail. As a commercial town, Metz never recovered the revocation of the Edict of Nantes, and it has now twenty thousand inhabitants less than it had in the time of Charles the Fifth.

In every way Metz is military. Its royal gunpowder factory, on an island in the Moselle, produces nearly the best powder in France, and plenty of it is now being experimented with on the banks of the Seille. Its military hospital, large and airy, was built by Louis the Fourteenth, for fifteen hundred men, but it will hold eighteen hundred. It is a noble building, in two ranges, and will soon, we fear, echo with the groans and shrieks of mutilated men. Metz is also naturally proud of its school of military engineering for young officers from the Polytechnique. It is attached to the arsenal, once part of St. Arnauld's Abbey, and boasts a choice library of ten thousand volumes, besides charts, maps, and original manuscripts of Vauban. There is also a sister establishment, a regimental school of artillery, a handsome building, completed in 1852. If the Prussians should happen to enter Metz at the rear of the French, they will not forget to visit the arsenal with its round Templars' chapel of the Tenth Century, for there are eighty thousand stand of arms there, and, what is more in the Prussian way, a bronze culverin, called the Vogel Greif, a trophy from Ehrenbreitstein, in 1799. It is fifteen feet long, and is seventeen inches wide at the muzzle; it weighs twenty-eight thousand seven hundred and seventeen pounds, and carries shot one hundred and seventy six and a half pounds weight. That gun would certainly roll back to Germany. It was cast for Richard of Griffenclau, an elector of Treves. Metz has also several large barracks and magazines—one of the latter in the ex-abbey of Clement, built by some Italian architect in the Sixteenth Century—and being very military, the town adores the memory of its distinguished native Marshal Fabert, a high-souled man, whose statue you are taken to see in the Place Napoleon. Metz is the strongest fortress in France except Strasbourg.

There have been enthusiasts who, forgetting Amiens and Chartres, have pronounced Metz cathedral as the most perfect Gothic work on the Continent. It is certainly beautifully light, and its spire shoots up like a fountain above the forest of carved peaks and fretted pinnacles below. Begun in 1014, by Bishop Thierri, the ghost of that worthy prelate remained restless and repining till 1546, when it was finished. So, after all, even Catholic zeal had its cold fits. The vergers tell you it is three hundred and seventy-three feet long, and that the spire is of the same hight. The nave is fifty-one feet wide and one hundred and nine feet high. The great stone ark is pierced with innumerable port-holes, and these windows were filled, in 1526, by Busch, of Strasbourg with rich stained glass, just in time before the art became lost. Its beautiful open-work spire, light, as if carved of wood, carries an enormous bell, the very palladium of Metz, weighing about twenty-eight thousand, six hundred pounds, and called La Mutte. The font, called the Cuve de Cæsar, is probably an old Roman tomb. The chief curiosities of the cathedral are the stone thrones of the early bishops, two processional crosses of the twelfth and fourteenth centuries, an embroidered red silk cope, said to be Charlemagne's, and a dragon of pasteboard and canvas, formerly used in street processions, and called Le Gracelli. People who want to see the walks and gardens of the esplanade, or the strong redoubt, called Pate, which can be turned into an island by closing the sluices on the Seille, should mount the cathedral spire, first ascending the clerestory gallery to see the stained glass and the flying buttresses. The view of Metz from the spire is a fine one.

The part of the town on the left bank of the Moselle is flat, but that on the right bank rises up from the river like the side of an amphitheater; the quays form handsome terraces, and are linked by innumerable bridges; the acacia trees on the esplanade wave green and fresh to the sight. The Metz people think, with some reason, that few European cities can boast such a riverside view. The French are proud of the town as the center of defense for their German frontier between the Meuse and the Rhine.

Like most old cities, cramped by fortifications from the earliest times, Metz has narrow streets and lofty houses. Buildings that could not grow in width shoot up into the air like overcrowded saplings in a plantation.

All about Metz there are relics of past wars. Duroc was born at Pont à Mousson; Thionville was once besieged by the great Condé; near Sierck was the camp thrown up by Vauban, in which Villars arrested the progress of Marlborough. Longwy has been twice taken by the Prussians, and who can tell what scenes Metz may not witness before these lines are in the hands of the readers of this journal?—*All the Year Round of Aug.* 27.

DEEP-SEA EXPLORATION—HOW SOUNDINGS ARE OBTAINED.

[From the Student].

The first point to be determined in the exploration of what are often called the "fathomless abysses" of the ocean, is their actual depth. This, it might be supposed, would be very easily ascertained by letting down (as in ordinary sounding) a heavy weight attached to a line strong enough to draw it up again, until the weight touches the bottom; and then to measure the amount of line it has carried out. But this method is liable to very great error. Although a mass of lead or iron thrown freely into the water would continue to descend at an increasing rate (at least until the friction of its passage should neutralize the accelerating force of gravity), the case is quite altered when this mass is attached to the end of a rope, of which the immersed length increases as the weight descends. For the friction of the rope comes to be so great when a mile or more has been run out, as seriously to reduce the rate of descent of the weight, and at last almost to stop it; and as the rope will still continue to descend by its own gravity (which, when it is immersed, considerably exceeds that of water), any quantity of it may be drawn down, without the bottom being reached by the weight at its extremity. Further, if there should be any motion, however slow, in the water through which it passes, this current acting continuously against the extended surface presented by the rope, will carry it out into an almost horizontal loop, the length of which will depend upon the rate of the flow and the time during which the rope is exposed to it. Under such circumstances it is impossible that the impact of the weight upon the bottom, even if it should really reach it, can become perceptible above; and thus the quantity of rope which may have run out affords no indication of the actual depth of the sea-bed beneath the surface. Hence all those older soundings which were supposed to justify the statement that the bottom of the ocean is not less in some places than six or eight miles from the surface, or may be even absolutely fathomless, are utterly unreliable; and no value can be attached to any of those that exceed a few hundred fathoms.

Various methods have been devised for obtaining more correct measurements; but it is not worth while to describe any, save such as have stood the test of experience; and there is now a general agreement as to the principle on which an efficient sounding apparatus should be constructed, although there are several different arrangements for giving to it practical effect. The principle is that regard should be had in the first instance, not to recovering the plummet, or "sinker," which is a matter of quite subordinate consideration; but to securing the vertical direction of the line to which it is attacked, so that the measurement of the amount run out may give as nearly as possible the actual depth of the water through which the sinker has fallen.

The earliest mode of sounding on this principle was a very simple one. A cannon-ball is attached to a reel of twine, of known length, made to turn very easily; the shot being let go, and allowed to descend as fast as it reels off, reaches the bottom with the least possible impediment; and a breaking strain then being put on the line, the depth is estimated by subtracting from its entire length the portion still remaining on the reel. This method, however, has not been found to answer in practice. For if the line be not strong enough to allow of being put strongly on the stretch, it cannot communicate the shock of the impact of the cannon-ball upon the sea-bottom; and its wants of tension renders it liable to be acted on both by gravity and by ocean currents, to such a degree that it continues to run out indefinitely, long after the sinker may be supposed to have reached the bottom. It is an additional objection to this method, that even if it could be worked in such a manner as to give true results, these data would be far from satisfactory; since we desire to know not merely the depth of the ocean-bed at various points, but the nature of the bottom; in addition to which it has now become a matter of essential importance to ascertain the temperature of the bottom-water; while it is also desirable to obtain a sample of that water, for determing the composition of the gases as well as of the solid matters which it holds in solution.

For the attainment of these objects, it is now found expedient to adopt the following plan: The sinker is connected, not with the line itself, but with an apparatus which is so constructed as to detach it when it touches the bottom; and the line is made sufficiently strong, not only to bear a considerable tension as the weight descends, but also to pull up the carrying apparatus, with any instruments attached to it, when the weight has been left below. The shock of its impact against the bottom, even at a depth of three miles, can then be distinctly recognized by a practiced hand; and as a line of the required strength can be made small enough to run out very easily, its vertical direction can be pretty well secured, even at great depths, if the operation be carried on by an officer of ability and experience. For work of this kind, a steam vessel has a great advantage over a sailing vessel; since the former can be much more readily kept directly over the line of vertical descent, so as to obtain that true "up-and-down" sounding which is required for the correct estimation of the depth.

The nature of the bottom is ascertained in ordinary shallow-water sounding by the examination of the small sample that may adhere to a lump of tallow introduced into a hollow at the bottom of the plummet. But for deep-sea soundings it is desirable to employ some arrangement, whereby a larger sample may be brought up without any admixture of tallow; and for doing this, various contrivances have been devised. When the depth does not exceed 1,000 fathoms, so as to permit the use of an ordinary cylindrical deep-sea lead, weighing one hundred pounds, which can be pulled up again by the line, nothing is more simple and effective than a conical cup attached beneath this, having a circular lid so fitted as to fall down and close it when an upward movement is given to the lead. For if the cup should penetrate into sand or mud, it fills itself with this before the lid falls down; while the subsequent closure of its mouth prevents its contents from being washed out, while the lead is rising to the surface.

During the sounding voyage of the *Bull-dog* an apparatus was devised by Dr. Wallich, which, as having been subsequently much employed by Swedish explorers of the deep sea, merits special notice. This is constructed somewhat on the plan of a bullet-mold; two hemispherical cups, which are kept apart while the apparatus is descending, being brought together by a spring which comes into action when the sinker detaches itself on reaching the bottom, so that a sample of the mud or sand into which they may have penetrated is inclosed between them. This "Bulldogsmaskinen," as it was termed by Prof. Sars, has been very effectively used for obtaining not merely samples of any deposit covering the sea-bed, but also specimens of the animal life which it may support. It is obvious, however, that the information it can afford in regard to the latter must be very limited in comparison with that obtained by the use of the dredge; since the forceps can only inclose what happens to lie between them at the spot which they strike.

The sounding instrument now preferred in the British service is known as the "Hydra" apparatus; having been devised by Capt. Shortland, of Her Majesty's surveying ship *Hydra*. It consists of a strong tubular rod, furnished with valves that open upwards, so as to allow the water to stream through it freely in its descent, while the mud or sand into which the tube is forced on reaching the bottom, is prevented by their closure from escaping. This is loaded with sinkers; which are masses of iron, each weighing one hundred pounds, having the shape of a cheese, with a perforation in the middle for the passage of the rod. One, two, or three of these sinkers may be hung upon it, in such a manner as to rest securely on their support while the apparatus is descending, but to fall off as soon as the rod strikes.

In the recent *Porcupine* expedition, the one hundred-pound deep-sea lead with a conical cup was employed for sounding, when the depth was not supposed to exceed 1,000 fathoms. For soundings between 1,000 and 1,500 fathoms, the "hydra" apparatus with two sinkers was employed; and for depths greater than 1,500 fathoms, three sinkers were used. The line to which these were attached was specially made for the purpose, of the best Italian hemp; and although not thicker than an ordinary lead pencil, it bears a strain of twelve hundred pounds. It was allowed to run out as fast as the weight would carry it down, a moderate strain being kept upon it; and was reeled in by the donkey-engine provided for working the dredge.

The following particulars of the deepest sounding taken in the expedition will be interesting; since, though not the deepest on record, it is one of the deepest yet made which is thoroughly reliable, having been taken with the most perfect appliances, and managed by an officer of the greatest skill and experience, to whose practiced hand the shock of the arrest of the weight at the bottom was distinctly perceptible, though this took place at a depth of nearly three miles:

Fathoms.	Time.		Fathoms.	Time.		Fathoms.	Time.	
	Min.	Sec.		Min.	Sec.		Min.	Sec.
100	0	45	900	1	22	1,700	1	37
200	0	40	1,000	1	15	1,800	1	47
300	0	45	1,100	1	21	1,900	1	47
400	0	55	1,200	1	21	2,000	1	47
500	0	50	1,300	1	23	2,100	1	49
600	1	00	1,400	1	32	2,200	1	53
700	1	09	1,500	1	32	2,300	1	59
800	0	59	1,600	1	33	2,435	1	92

The whole time occupied in the descent was thirty-three minutes, thirty-five seconds; and the rate at the end was about one third of the rate at the commencement, the retardation being on the whole very regular. The reeling-in, which required great caution in order to avoid putting an undue strain on the line, its friction resistance being much greater than the weight it carried, occupied two hours two minutes. The pressure exerted by the water of the ocean upon whatever is submerged in its abysses, may be readily calculated when the depth is known. The weight of a column of sea-water, one inch square, is almost exactly a tun for every 800 fathoms of its hight; and consequently the pressure upon the bottom at 2,435 fathoms depth is rather over three tuns upon every square inch. This, however, has but very little effect upon the density of the water; for the compressibility of water is so slight that even the pressure just mentioned would certainly not reduce it by one fortieth of its volume, or produce an increase in its density equaling the difference between salt and fresh water. The popular notion, therefore, that a mass of iron or lead thrown into the sea would encounter so rapid an increase in density of the water through which it sinks, that the deeper strata of the liquid would equal, or even exceed, the metal in density, and would thus hold it in suspension or even buoy it up, is altogether unfounded.

Not less unfounded are the statements that have been put forward upon professedly scientific authority, as to the effects which such pressure must exert upon any substances, whether mineral or organic, that may be exposed to it. Thus it has been asserted in an "Advanced Text-Book of Geology," that "at great depths, sand, mud, and all loose *débris* will be compressed and consolidated;" as if these substances were being squeezed in a Brahmah press, which should force out all their liquid, and bring their solid particles into the closest possible contact. The fact, now ascertained beyond all doubt, that sand or mud retains its ordinary condition at a depth of nearly three miles, under a pressure of more than three tuns on the square inch, is perfectly accordant with the law of fluid pressure; for as such pressure acts equally in all directions, it will be exerted just as much in forcing in water between the solid particles as it is in pressing these particles together; and thus an equilibrium being uniformly maintained, the loose sand or mud of shallow water would remain absolutely unchanged in its condition, to whatever depth the bottom might subside. The same principle will be hereafter shown to apply to the case of animals whose bodies are composed of solids and liquids alone; such animals being able to "live, and move, and have their being" under the enormous pressure just mentioned, in virtue of its uniformity of distribution. The case is quite different, however, in regard to substances containing air; for this, under great pressure will either be forced out, or be reduced to extremely small proportional dimensions, its place being taken by liquid. Thus it has happened that a boat having been dragged down by a whale to great depths, the wood of which it was made sank in water like a stone, and this not only when it was first recovered from the sea, but for a long time afterwards. And in like manner not only the bodies of air-breathing animals, but those of fish provided with swimming bladders would undergo great changes in size and form when submerged to great depths, owing to the extreme reduction in the bulk of their cavities.

Albrecht Von Graefe.

The *American Journal of Pharmacy*, for September, pays the following tribute to the late Dr. Von Graefe, who was known by many in this country who visited Europe to receive treatment at his skillful hands.

"This celebrated physician and oculist, whose recent death is announced in the journals, was born in Berlin in 1825, and was the son of an eminent surgeon. After finishing his academic studies, he spent some time in England in company with Prof. Donders, of Holland, and returning to Berlin established the Ophthalmic Hospital now so celebrated. In 1853, in connection with Arlt and Donders, he founded the *Archiv. für Ophthalmalgie*, to which he continued to his death an active contributor. His great discovery was that glaucoma, or disorganization of the eye ball, could be arrested by iridectomy. *The Lancet* says of him: 'There can hardly be, either in Europe or America, a community of 10,000 persons which does not contain at least one individual who is in the enjoyment of vision that has been preserved by iridectomy, and who, if Von Graefe had not lived, would now be unable to see the sun.' As a physician he owed much of his success to a combination of suavity and firmness of manner, and, like Simpson, was followed to the grave with profound regret by a wide circle of friends and patients."

THE ARTISAN IN DENMARK SPAIN, PORTUGAL AND GREECE.

Shakespeare's line,

"Something is rotten in the state of Denmark,"

might be fittingly prefixed to Mr. Strachey's report, which paints the Danish operative's position in anything but bright colors—a thing not to wonder at if it be true that nine out of ten old workmen have to go to the parish for relief. The Dane is better paid than the Swede, but he has fewer opportunities of bettering himself, most masters being their own foremen. The numerical proportion of men to masters in Denmark is a curious one, in Copenhagen there being only thirteen men to every ten masters, while in the country at large there are actually ten masters to every two journeymen! The hours of labor are long, extending from twelve or thirteen up to fifteen hours, with half time on Sundays. Thanks to some philanthropic capitalists some half dozen building societies have been started with tolerable success, although those for whose benefit they are intended have not displayed any over eagerness to take advantage of them.

In the capital the workman is contented to live in the back part of a several storied house, generally in a cellar or half underground room, opening upon a dingy court nine or ten feet square. Light and ventilation are limited, and the windows are generally kept closed to exclude the effluvia from the *latrines* and gutters, which render Copenhagen almost unmatchable for general and special smells. Single men share a room between them. Family men live in unfurnishd lodgings, consisting of two rooms and a kitchen, often getting their rough furniture upon hire.

Victuals are cheaper than in England, but the quality is not so good, first-rate meat being unobtainable at any price in the capital itself, where the workingman's daily expenditure is estimated at thirty-six cents a day. His clothing, that is, what is indispensable, costs him from $15 to $20 a year; but as he is anxious to pass for a gentleman on Sundays and holidays that amount hardly suffices.

With one thing and another it is calculated that the Dane cannot well subsist upon less than five dollars a week, which the majority of working men cannot earn; and even this calculation is founded on the assumption, that his wife, if he has one, supports herself and children, although she cannot, in ordinary cases, make more than a shilling a day and her food. Some do contrive to save, it is true. Of 16,786 depositors in the savings banks, in 1866, 1,265 were operatives; but a sum of $250 is looked upon as enormous for any artisan to accumulate by the time he reaches his fiftieth or sixtieth year.

A competent authority in Denmark wishing to illustrate the disinclination of the Dane to provide for "a rainy day," observed: "Where one Danish workman saves a dollar the Englishman saves fifty dollars." Trades' unions are unknown in Denmark, and strikes almost so, only three having taken place since 1848. The Dane is more sober and more moral than the German, but neither so frugal nor so industrious; he has yet to learn the meaning of the word *work*. Like the German he enjoys the benefit of an admirable system of obligatory popular education, and has an excellent cheap press; but he only supplies an illustration of a truth that cannot escape any one who peruses the reports from which we have drawn our information; namely, that in manual as in more intellectual occupations something besides education is required for the achievement of superiority. With all his advantages in the way of instruction, neither Dane, Swede, nor German can turn out such work as the Frenchman and Englishman.

It is customary in some parts of Russia to place a board at the entrance of a village to inform travelers how many men and oxen it can boast, but the fair sex are not thought worthy of enumeration. In the countries of Southern Europe, the industrial population would seem to count for as little as the women in Russia, if we may judge from the difficulty in obtaining any information respecting them and their belongings.

After waiting four months for information promised by the Spanish officials on the subject, Mr. Ffrench was coolly told no data could be procured, so he was compelled to prosecute his inquiries in private quarters as best he could; consequently his report is confined to three provinces—those of Catalunna, Valencia, and Andalusia. The principal industry of the first-named province is the cotton manufacture, employing some 110,000 men, women, and children; while from 15,000 to 18,000 hands are engaged in flax, silk, and wool factories, in which weavers and spinners earn upon an average from $3 to $4 a week.

Barcelona is the chief seat of these trades, but there is a growing tendency to carry them away into the interior of the province for the sake of convenient water power, a tendency which the striking propensities of the Barcelonese makes stronger every day. The operatives of that city live in single rooms in "barracks" built by speculators for the purpose; but in the villages the artisans often occupy small houses; but in all cases their domiciles are poorly and scantily furnished.

In Valencia it is the rule to work from sunrise to sunset, with a half hour's breakfast and a two hours' dinner-time. The following is the scale of weekly earnings in the different handicrafts—we quote those only of the first-class workmen—masons, carpenters, smiths, saddlers, tailors, and cigar makers, about $4; shoemakers, a little less (women, $1·25); hatters, $5·25; fanmakers, $6·25 (women a little less than $2). Silk weavers can barely earn $2 50 a week; and seamstresses working at their own homes make from $1 25 to double that amount. Luckily they are not expensive feeders, their two meals of breakfast and dinner being composed—the first of dried cod or tunny fish, bread, capsicums, fruit, and red wine; and the last of a thick soup of rice, beans, parsnips, and olives. This fare is meager enough, but sumptuous compared with the *gaspacho*—a cold soup of slices of cucumber and bread in vinegar and water—that forms the principal support of the Andalusian laboring classes.

The lower order of working men are described as lazy, excitable, proud, and independent. It is perhaps creditable to them that they can be independent upon less than $2·25 a week; but the better paid artisans, who earn from $2·75 to $6·25, according to their ability, are more immoral and more irregular in their habits. Their dwellings are small, poor, and uncomfortable; three or four families usually inhabit the same house; contracts between tenant and landlord are made for a period of two or three years, but the agreement is not worth much, as workmen leave their service at a moment's notice, and of course have often to leave their lodging at the same time.

In Portugal there is a pretense of registering statistics respecting the industries of the country, but these records are made by the parish *regedors*, who does the business gratuitously, and generally contents himself with making a sufficient number of random notes to satisfy official formality. According to the Portuguese authorities wages vary from month to month in every town and in every trade, ranging from twenty cents to $1·30 a day; unofficial information places the maximum at 87½ cents a day. Artisans are, as a rule, badly lodged.

Trades' unions are unknown, and strikes of rare occurrence. If the workmen are not very highly paid, they earn enough for their wants, which are few, the Portuguese being a quiet, tractable, sober fellow, who works his six days a week, and knows no such saint as St. Monday; nevertheless, it must be owned that, quiet and peaceable as he usually is, when there is no work to be got he is sometimes roused into something very like rebellion.

It would be strange indeed to find industry of any sort in favor in a land whose political leaders pander to brigandage, if they do not share its spoils. The poet, with the license allowed his craft, may extol

"The isles of Greece, the isles of Greece!
Where burning Sappho loved and sung;
Where grew the arts of war and peace,
Where Delos rose, and Phœbus sprung;

but the mountains that still look upon Marathon, if mountains have feelings, must look down with contempt on the degenerate race that make the once proud name of Greek a byword and reproach. In Greece the natural resources of the country are left undeveloped, manufactories are few and far between, and commercial activity scarcely exists.

Those Greeks who possess energy and intelligence betake themselves to other countries, and seldom return to their own, even when success has given them all the wealth they desire. Capital, consequently, is scarce in Greece, labor languishes accordingly, and the artisan class is very limited in numbers, and is never taken into account by native statisticians.

What artisans there are live in one or two roomed earthen-floored houses, with doors opening upon dirty little courts, and windows for the most part destitute of glass, cleanliness and comfort being unconsidered trifles. The rents of these places range between $1·75 a month and double that sum, whole families accupying a single room. The highest wages earned are earned by house decorators, who make about $6 a week; carpenters and masons get $5·25; barbers, $4·25; weavers and watchmakers, a little over $3; blacksmiths, a little over $2·50; tailors, $2·15; bakers, $1·63. These are the maximum rates; but in all trades payment is reckoned by the day, and as, thanks to the numerous holidays kept by the Greek Church, there are only two hundred and sixty-five working days in the year, considerable reduction must be made in the earnings of the Greek artisan. Fortunately food its cheap, such meat as is to be had, costing less than ten cents a pound, bread, three cents, and the resined wine in which he delights, but four cents per quart; a very small quantity of food suffices to sustain life in such a climate, and the want of warm clothing and fuel is rarely felt. As a rule, engagements between masters and men are not binding, both parties holding themselves free to break them without any warning. Apprentices are, however, bound to serve out their indentures, in some cases paying for their training, in others working without pay, and sometimes receiving a small wage; but in almost every case they are boarded and lodged by their masters, for whom they not unfrequently have to perform the duties of servants.—*Chambers' Journal.*

Improved Clothes Dryer.

Probably in no department of invention have more devices been made and patented than in that pertaining to the washing and drying of clothes. Of clothes-dryers there have been many, but the one illustrated herewith has conveniences and advantages which the inventor claims places it in the front rank of this class of devices.

The objects sought to be obtained are the placing of the goods entirely out of the way, while they are at the same time kept in the warmest stratum of air in the room—that at the top. This is accomplished in the simplest possible manner. Bars of wood, turned round and handsomely finished, are so suspended by cords and pulleys that they are drawn up or let down, as desired, always keeping parallel with the ceiling, only a single cord for each bar being seized by the hand in performing this movement. When the bars are drawn up to the ceiling they are held until wanted by rings attached to the ends of their respective cords, the rings being placed over suitable knobs, as shown.

The rods are from eight to twelve feet in length and one and one-half inches in diameter, the cords being three-eighths of an inch in diameter. The apparatus can not only be made cheap but ornamental in appearance, and will take the place of the ordinary clothes-horse.

Patented, through the Scientific American Patent Agency, June 28, 1870, by Asahel H. Patch, of Hamilton, Mass., who will sell the entire right, and who may be addressed for further information.

PATCH'S CLOTHES DRYER.

Preparation of Birds and Small Animals for the Cabinet.

H. W. Parker communicates to the *American Journal of Science and Arts* the following, upon the use of carbolic acid in the preparation of cabinet specimens:

"The following methods, carefully studied for two years, with results noted, are recommended for the saving of birds in warm weather until the operator finds time to skin them; for the permanent preparation of drawer specimens, where the student needs a large series of individuals to determine the variations and limits of species; and for mounting small birds, at least as temporary representatives, when neither the time nor the expense involved in the old methods can be afforded.

The viscera are removed, to effect which neatly the legs are pinned widely apart, and a paper several times folded is pinned over the tail in the direction whither the viscera are drawn out. With proper care, the sex is readily observed. A wad of cotton absorbs the fluids remaining in the cavity. The leg is then grasped close to the body, and a knife or wire is introduced into the cavity and run down into the flesh of the leg, working the instrument around, but not so at to break the skin. For a small bird, five to ten drops of the commercial fluid preparation of carbolic acid is made to anoint the whole interior, and to penetrate the leg by stretching and relaxing the same in proper position. The application is repeated after the first drops are absorbed; and a wad of cotton, wet with the acid, may be left close under the breastbone next to the neck. The cavity is then filled with cotton and the skin drawn back into place. The inside of the mouth is well anointed, and a saturated wad of cotton pushed down the whole length of the neck. The eyes are removed by a hooked wire inserted into the ball, the head being so held that the humors of the eye will drop without soiling the lids. The moist lids are left as open as possible, and the specimen placed in a cool cellar till the next day, when the lids are dry enough to take their open shape. Then a nail is inserted through the lids and pushed through the bone at the back part of the orbit into the brain, and so worked as to make a good opening. A tightly rolled bit of cotton, saturated with the acid, is pushed into the brain and worked around in it, care being taken not to wet the eyelids. If by chance the feathers are wet, the acid can be removed by powdered chalk, repeatedly applied.

Specimens so prepared in warm weather, can be skinned a week or two after, if kept boxed in a cellar. No smell of decomposition is observed; the acid gradually and completely penetrates the pectoral muscles; the skin is strong and the feathers not loosened.

For permanent preparation, the skin should be laid open from the abdomen to the neck, the pectoral muscles removed and replaced by cotton, and the incision sewed up. The throat, neck, and orbits are also filled with cotton. The specimen should then be suitably arranged, encircled by a slip of paper, and placed on a bed of cotton. Before this, the flesh of the wings should be laid open and arsenic applied in the usual manner.

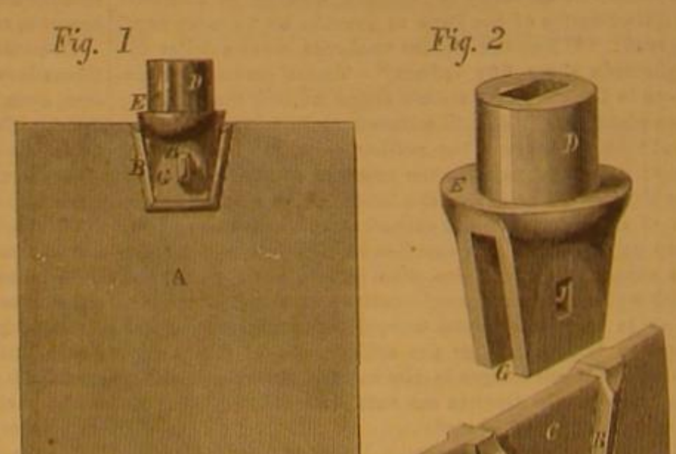
For mounting it only needs to run one wire through the foot, tarsus, and so on through the neck to the forehead, and another wire through the other foot to any point in the back or breast where the end of the wire catches firmly. Papers or strings for keeping the feathers in place should remain long. Some shrinking about the head and neck will eventually follow in the case of many birds, particularly those of the smallest size or of scanty, or close, plumage; but in other instances no shrinking whatever can be noticed after more than a year of drying. The cabinet in which they have been set up is made insect-proof by means of pasted cloth and paper, putty and paint, fifteen inches passage way being left in front of the shelves and the only access being through a tight door at one end, fastened by a screw.

Travelers, who desire to collect a large number of birds for comparison, will find this method one of great advantage; and the specimens will be better for study than skins, inasmuch as the proportions will be better preserved. Small mammals can be kept some days for skinning by a similar process, and an opening into the brain may be made through the roof of the mouth, if preferred. A fox squirrel, so treated, was in good condition for skinning after four day's preservation, in very warm weather. This, with similar methods of preparing specimens without skinning, has been found of little use in the damp air of the Eastern States.

IMPROVED WICKET FOR CANAL LOCKS.

In wickets of locks on canals the journals only are sub-

Fig. 1 Fig. 2



jected to wear. In the old style of wicket when the journals become so worn that they are useless, the entire wicket has to be put aside as old metal. The invention illustrated herewith is intended to obviate this waste by supplying to the wickets detachable journals, so that when they become worn they may be removed and new ones put in their places at a comparatively trifling expense.

It is claimed that the wickets made after this method are as effective as though cast entire, and that a saving of seventy per cent in the cost of wickets would be made through its adoption.

Fig. 1 is a view of the wicket with its detachable journals. Fig. 2 is a perspective view of one of the journals detached, and of a portion of the wicket, showing the way in which the detachable journals are attached to the plate.

A is the plate made of cast iron having formed thereon ledges, B, forming a recess, C, in which the parts, G, of the detachable journal fit, being held when in place by a key, H, which passes through rectangular holes, J, made in the parts G, and in center of the recess, C, of the plate A.

The journals, D, are formed with shoulders, E, as shown. The wicket is fitted into the canal gate precisely as is done with the old form of gate.

The construction is extremely simple, and the wicket is, we are informed, in use on several of the principal canals in Pennsylvania, upon which it is superseding not only the old style of gate, but is, according to testimonials shown us from the chief engineer of the Pennsylvania Canal Company and the superintendent of the Susquehanna Canal Company, found superior to any wickets hitherto made with detachable journals.

Patented Feb. 2, 1864, by John D. Marshbank, of Lawrence, Pa. For rights to use or for State rights, address J. D. Marshbank, Harrisburg, Pa.

Thomson's Road Locomotive.

A Parliamentary paper just issued (says the London *Artizan*) will be read with interest as showing that the time approaches when the advantages of steam on common roads is likely to be appreciated.

Mr. Anderson, the superintendent of machinery, says he has "come to the conclusion that the question of steam traction on common roads is now completely solved;" that the application of the india-rubber tire is a perfect success; that it opens up an entirely new field, and that he looks upon this application as a discovery rather than an invention. The wheel and its tire may be described as consisting of a broad iron tire with narrow flanges, upon which is placed a ring of soft vulcanized india-rubber; this ring is about twelve inches in width and five inches in thickness, which thus surrounds the iron tire, and is kept in its place by the flanges; then over the india-rubber there is placed an endless chain of steel plates, which is the portion of the wheel that comes into actual contact with the rough road, the reticulated chain being connected by a sort of vertebra at each side of the wheel. The india-rubber tire and this ring of steel plates have no rigid connection, but are at perfect liberty to move round as they please without consulting each other or even without the concurrence of the inner ring of the wheel which they both inclose. Mr. Anderson states that the reason why the wheel is so efficient is because the soft india-rubber allows it to flatten upon the road, whether rough or smooth. The wheel, being a circle, if it is a rigid structure, presents but a small surface, but this wheel conforms to every irregularity for a space of nearly two feet, by the weight of the engine causing the india-rubber to collapse, and so producing a change of form. In the construction of the road steamer the greater portion of the weight, including the boiler, rests upon the driving wheels; the third wheel in front is for guiding the direction of movement, and is perfectly under control.

On the first day Mr. Anderson saw it in Leith the streets were very wet and greasy. A train of wagons containing ten tuns of flour, besides their own weight, were standing at the bottom of a slippery street with a gradient of about one in seventeen; to this train the little engine was attached, and away it marched as if it had no load, went up to the top of the hill, and then down on the other side, no brakes being required. After depositing its load somewhere in Leith it ran down to the Portobello seashore at the rate of ten miles an hour. On surveying the sands, Mr. Anderson says it seemed an impossibility that it could walk on such soft sinking ground, but it rushed through all in the most wonderful manner. It then, after returning from the seaside, removed an old boiler from the docks to a yard at some distance. The boiler and wagon, with the fastening chains, weighed upwards of twenty-two tuns, and the boiler on the wagon stood some twenty-five feet high. Up to this the engine backed, then marched off with its load along the quay, over the swing bridge and along the quays, until it reached its destination. The charm of the performance, Mr. Anderson says, was in the way in which it was done. No shouting, no refractory or desultory pulling of horses, but by the expenditure of a few pounds of coals and water the whole was accomplished with ease and celerity, and so accustomed are the people in Leith to its performance that no notice was taken of it except by the country horses, for the town horses seem to know that it is their friend rather than their enemy.

EARLY BREAKFAST.—The earlier the breakfast the more work will be accomplished during the day, and the better will be the health of the household. It is a bad custom to work before breakfast, attending to chores in the damp miasmatic air.

[For the Scientific American.]

THE SPIDER.

[By Edward C.H. Day, of the School of Mines, Columbia College].

The spider is a proscribed individual among the refinements of our human civilization; its webs are a perpetual eyesore to the housekeeper—its habits are quoted as the very ideal of cruelty—its appearance, according with its habits, often grotesque in color, and always ghoul-like in form, is the signal for screams and flights in the fearful, and for determined efforts at its destruction in the more bold part of the household. And yet we think that all this antipathy to the spider is hardly fair; we have much to thank him for; we reap the benefit of his capture of the tormenting fly; and, let us face the truth, is not our sentimentalism about his so-called cruelty altogether out of character. With the scenes recently enacted in a corner of France before our eyes—thousands of our fellow-beings hurried out of existence—thousands maimed for the rest of their lives—thousands of families rendered fatherless and homeless—whole nations for future generations ground down by oppressive taxes, making harder the hard fate of the poor, and driving millions into the abject miseries of crime; is it for us—justifying war, applauding the victor, and sympathizing with the desperate brute valor of the vanquished—to speak of the cruelties of the spider or the tiger? With human diplomacy and its effects before our eyes shall we hypocritically bewail the deceits of a spider's web?

It may seem out of place for us to intrude such thoughts here, but we trust that in the future, science may render war impossible—not by inventing destructive engines, but by carrying out her glorious mission of peace by raising the intelligence of man above his brutish passions—and by educating him to a recognition of the beauty of that nature of which he forms a part, and which he alone mars by the *intelligent* and *wanton* destruction of life.

But the spiders deserve well of us for the amusement and instruction they afford us by their habits and instincts. The spider's thread of silk is a wonderful product in itself, spun as it is from such a multitude of infinitely fine streams of the gummy secretion of which it is composed; but the variety of ways in which this silk is applied to diverse purposes is still more admirable. The strength of these silken threads is remarkable. Madame Merian described spiders existing in South America which captured small birds in their snares. This was disbelieved, as a gross exaggeration, but recent observers have established the truth of the statement, and we ourselves see no reason to doubt it on other evidence. The Mygale of which this fact is stated is a perfect giant among spiders, many times larger than our largest native species, yet we have more than once, in pushing through the woods, had our straw hat fairly taken off by a spider's thread which remained unbroken, and frequently we have seen Cicadas (the common locust) captured in the webs of spiders of by no means extraordinary dimensions.

The habits of spiders and their natural characters are so closely associated that systematic classifications of the group have been based upon the habits of species and the kind of webs they spin, or the use they make of their silk, and the variety of their instincts is well shown in such an arrangement.

Almost all spiders are terrestrial in their habits (the Crustacea perhaps taking their place in the water), all have the power of spinning silk, and all are carnivorous. Many of the best known species are of sedentary habits; some spin nets of various forms, and lie in wait until their prey touches or becomes ensnared in the sticky meshes. Some of these nets have the greatest accuracy of outline, others consist of threads cropping irregularly in various directions, while others again are thick snares, tapering away into a tube in which the hunter lies hid, reminding us of the decoy structure used for wild fowl. Numberless species of spiders are wanderers prowling about in search of prey, throwing out glutinous threads to entangle it, and often lining their habitations in sheltered spots with their silk. Some chase their prey with great speed, others lie in wait for it and leap upon it in a cat-like manner, while others hide themselves in natural recesses or make hiding places for themselves. There are species of mygale that form tubes in the earth, line the tube with their silk, and close it with a trap-door formed upon a basis of silk, and this trap-door, when closed, they hold with such force that admission can only be obtained by stratagem; there are others that follow their prey over the surface of the water; while Kirby and Spence mention one species that actually makes rafts and floats off upon them in search of drowning insects—"not as you may conceive, for the sake of applying to them the process of the Humane Society, but of hastening their exit by a more speedy engine of destruction. The booty thus seized is devoured at leisure upon its raft under which it retires when alarmed by any danger."

To such inventions are these creatures driven in the great struggle for existence! But perhaps the most extraordinary adaptation of the silk of the spider is that represented in the accompanying cut from Blanchard. Long before man had ever dreamt of a diving-bell these spiders had them in use, not coarse, heavy, human-like inventions, but such as man might well copy from, and thus improve upon his own cumbrous machinery.

The *Argyroneta aquatica* is a plain, dark-brown spider, densely hairy. It dives from a leaf on the surface, and, as it plunges in, a bubble of air surrounds it attached to its hairy body. Arrived at a desirable location in the midst of a matted mass of water plants it sets the bubble free by means of its feet in such manner that it shall lodge amidst the vegetation. It repeats the journey, until finally the bubble thus produced is large enough; it then spins around its upper part a net to retain it, and anchors this net to the neighboring water plants. If this thimble-shaped diving-bell does not contain enough air, more is now brought down, until finally the satisfied creature establishes itself within its aquatic domicile to look out for passing prey.

Such is the summary of Prof. Blanchard's description, derived from his own observation. The silvery garb of the spiders as they descend, and the beauty of their delicate abode, must be seen to be realized, and they consequently form most delightful additions to the society of a fresh-water aquarium.

THE WATER SPIDER.

Prof. Blanchard adds that the Abbe de Lignac "saw the male construct its bell close to that of the female and make a gallery to communicate with the latter after having made an opening in the wall."

Such a proximity must be dangerous if the female of the water spider is as treacherous as most of her sex among the Arachnids. The female among spiders generally being the larger and the more powerful, invites a husband to her embraces, or following his natural instincts, he seeks them. She accepts him—the nuptials are consummated—but unless his movements are very agile, she finishes the ceremony by killing and eating him. This may be done out of excess of affection, a literal rendering of the theory that man and wife should be one flesh; or it may be an expeditious, effective, and certainly an economical way of procuring a divorce. Who knows? If the latter, we are anxious to learn does the lady marry again? because if not—this must be accepted as some mitigation of such an illegal procedure. It has one point of fairness, however, that some human divorces that we have heard of, have not—*the husband knows all about it.*

Paris Defended without Gunpowder.

A novelty in the way of engines of destruction is that suggested by M. Delaurier, at the meeting of the Paris Academy of Sciences. It is really nothing more than the Lenoir gas engine, adapted to the discharge of projectiles. A mixture of gas and air is exploded in a sort of cannon and away goes the ball—to what distance and with what velocity is at present rather a matter of guess than calculation or experiment. Seven volumes of gas to 100 of air ought, we are told, to produce the greatest effect; but the machine to use the mixture is not yet in existence.

It ought, says M. Delaurier, to be of iron, and to be shaped like a *retort* (the ordinary glass retort), the belly of which is to hold the mixed gas and air, and the tube, which must be long, is to form the barrel. As the ball must hermetically seal the barrel, it should, we are told, have a wadding of lead.

As the new engine will not foul, and will give no smoke, it may be used continuously, and there will be no difficulty in pointing it. How far it might, if it existed, be useful in the defense of Paris, is made clear by the following statement: Paris consumes 400,000 cubic meters of gas per day. This quantity of gas may be made to throw more than a million of 60 lb. shot—how far is not stated; nor is it said how Paris is to be lighted during the time. Another suggestion by M. Delaurier is to store a mixture of gas and air in cellars, and in houses carefully sealed, to be exploded at the proper time (which everybody can guess) with terrible effect. Thus the defense of Paris may, it is thought, be conducted without the use of gunpowder.

Another French patent is for entirely removing the smell from turpentine, and so forming a superior kind of camphene, has been recently obtained. It is effected by rectifying turpentine over tannin, which is said, with how much truth we do not know, to remove all the resinous materials which give an offensive odor. So rectified, the turpentine can replace, it is claimed, the best benzole used for cleansing, and gives a much better result.

How to Skeletonize Leaves.

We find in an English exchange the following explicit directions for skeletonizing leaves, which will answer some queries we have received in regard to this subject:

Skeleton leaves are among the most beautiful objects in nature, and as they can be arranged either in groups under glass shades, made into pictures, as it were, and hung against the wall, or placed in either blank books or albums, they come within the means of all, and can be used to decorate the palace or the cottage. The most suitable leaves for the purpose are those from what botanists call *exogenous* plants, and may be known by the veins of the leaf branching from a central vein or midrib; those from *endogenous* plants rising from the base and curving towards the apex of the leaf. The object in view is to destroy what may be called the fleshy part of the leaf, as well as the skin, leaving only the ribs or veins.

The most successful, and probably the simplest, way to do this is to macerate the leaves in rain-water till they are decomposed. For this purpose, when the leaves are collected they should be placed in an earthenware pan or a wooden tub, kept covered with rain-water, and allowed to stand in the sun. In about a fortnight's time they should be examined, and if found pulpy and decaying, will be ready for skeletonizing, for which process some cards, a camel's-hair brush, as well as one rather stiff (a tooth-brush for instance) will be required. When all is prepared, gently float a leaf on to a card, and with the soft brush carefully remove the skin. Have ready a basin of clean water, and when the skin of one side is completely removed, reverse the card in the water, and slip it under the leaf, so that the other side is uppermost. Brush this to remove the skin, when the fleshy part will most likely come with it; but if not, it will readily wash out in the basin of water.

If particles of the green-colored matter still adhere to the skeleton, endeavor to remove them with the soft brush; but if that is of no avail, the hard one must be used. Great care will be necessary to avoid breaking the skeleton, and the hard brush should only be used in a perpendicular direction (a sort of gentle tapping), as any horizontal motion or "brushing" action will infallibly break the skeleton. Never attempt to touch the leaves or the skeleton in this state with the fingers, as when they are soft their own weight will often break them.

A very good way of bleaching the skeletons is to prepare a solution of chloride of lime, which must be allowed to settle, and the clear liquid poured into a basin in which the skeleton may be put by floating them off the card. It is as well to have half-a-dozen ready to bleach at once, as they require watching, and if allowed to remain in too long will fall to pieces. From two to four hours will generally suffice to bleach the skeleton of all ordinary leaves, after which they should be washed in several changes of water, and finally left in clean water for half an hour.

After the leaf has been sufficiently washed it should be floated on to a card and dried as quickly as possible, care being taken to arrange the skeleton perfectly flat, and as near as possible to the natural shape. This can be done with the assistance of the soft brush. When dry the skeleton should be perfectly white, and should be mounted on dark backgrounds, as black velvet or paper.

Well grown leaves should always be chosen, and be thoroughly examined for flaws before maceration. Leaves containing much tannin cannot be skeletonized by this process but are generally placed in a box with a number of caddis worms, which eat away the fleshy parts, when the skeletons can be bleached in the usual way. Holly-leaves must be placed in a separate vessel on account of their spines, which would be apt to damage other leaves; they make beautiful skeletons, and are sufficiently strong to be moved with the fingers.

It is not necessary to give a list of leaves suitable; but the leaf of the poplar, the apple, the pear, and the ivy may be mentioned as easy ones to commence with. Various seed-vessels may be treated in a similar manner, and by precisely similar means, and thus greater variety given to the groups. Wishing our readers success in their experiments, we would remind them that what is worth doing at all is worth doing well, and that "a thing of beauty is a joy forever."

A RICH silver mine has been discovered near Huamanianga, in Peru, and measures are taken for working it.

Correspondence.

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

Concrete Paving.

MESSRS. EDITORS:—Your eminently sensible and practical remarks on "Concrete Paving," in a late issue of your valuable paper, meet the subject fully. My attention has been for a long time directed to this matter, and the views expressed coincide with mine. I arrived, however, at my conclusions by actual experiments, and will give them to you as a matter of general interest to the public.

It is *true*, as you state, that "no attempt has been made to modify the character of pitchy substances by chemical action," yet herein lies, I am fully satisfied, the secret of success, and the attainment of the requirements you speak of.

The key to the whole subject is an analysis of the *Seyssel val de travers*, or French asphalte. To speak in general terms this French asphaltic rock is simply bitumen or pitch in chemical combination with calcareous earth. The bitumen or pitch in combination has, of course, a vegetable origin, the same as the coal formations; in short, the coal formations would have become asphaltic had the conditions of heat been existent together with proximity of calcareous earth. In Trinidad the necessary condition of heat was present to convert organic matter into a thick, viscid, slimy, tenacious matter, but no calcareous earth was present to make the further conversion into an asphaltic rock. It is plainly a misnomer to call the Trinidad deposit an asphalte, since it has no calcareous substances in combination to make it such. It is simply bitumen or pitch holding mud and other extraneous matter by mechanical union only.

The analysis of asphalte, then, would seem to indicate that the asphalte would not have been formed in nature unless three conditions were present at its formation, viz., the requisite degree of heat to convert organic matter into a liquid pitch or bitumen; secondly, the presence of a calcareous substance (for which it had affinity) to form the chemical union; and, thirdly, pressure, to render the union more perfect.

If these conclusions be correct, and I know of no valid objections against them, then we have made for ourselves a platform upon which to work in our attempts to make an artificial asphalte; and if actual experiments coincide with our analysis and conclusions therefrom, the subject becomes one of interest to us all. I am happy to be able to state that all my expectations have been realized as relates to the latter.

Extracting the bitumen or pitch from coal tar carefully, and uninjured by direct contact of excessive heat, and uniting this with a calcareous earth, and using sufficient pressure, make an artificial asphalte.

What calcareous earths must we make use of? Let us imitate nature in the selection. In France the formation adjacent to the asphaltic is gypsum—a sulphate of lime—plaster of Paris. We therefore make use of gypsum to bring about the marriage with bitumen. Are there any specific calcareous formations that will answer instead of seeking for gypsum? Yes, there is marl, indigenous to many sections of the United States; purely a calcareous earth, having, moreover, in combination several elements—silex, copperas, gypsum, etc., all alike indestructible and unchangeable. The union of bitumen with marl forms a homogeneous compound; the chemical union seems perfect, and the viscous nature of pitch is very much modified.

The advantages from the use of marl, are, that the latter substance furnishes the requisite silica, which, by the way, is not present in the French asphalte, but is supplied when laying the streets of Paris with the celebrated asphalte.

Marl contains, at the average, about forty per cent silicious matter. The presence of sulphate of iron or copperas in marl gives to the artificial asphalte compound a pleasant greenish tint, similar to Tennessee marble, and thus changes the dull, somber black that characterizes the pitch from coal tar. Your statement that even a better material than the French asphalte can be made, is exemplified most certainly in this union.

To conclude, I coincide with your statement, to the letter, viz., that in order to use tarry or pitchy substances, we must get a chemical combination—something that will modify the character of pitchy substances by chemical action. If calcareous matter is in the combination forming the asphaltic ore, may not calcareous matter with bitumen make for us an artificial asphalte, excluding any and everything that is pulverulent in nature, or destructible through the operation of ordinary causes?

Such I find to be the case from the union of bitumen (carefully prepared from coal tar), with marl or any other calcareous earth united in definite proportions. This combination meets the requirements you state, viz.: "Imperviousness to water, unchangeability under the action of air and moisture (having stood a solar temperature of 130° Fah.), toughness, strength, elasticity, and the power of hardening quickly."

The penetrating odor is absent because in extracting the pitch from coal tar all the volatile and offensive odors are removed. May we not, even in a short time, through researches in chemistry, realize the truth of your avowal, that a better material than the French asphalte, for paving purposes, is within the possibilities? I firmly believe so.

J. R. HAYES, M. D.

Philadelphia, Pa.

Tempering Saws.

MESSRS. EDITORS:—M. P. M., under this heading, in the SCIENTIFIC AMERICAN of August 20, complains of the tempering of saws. The fault of which he makes mention is not so much with the saw maker as with the material that he uses. And similar fault may be found with nearly every kind of cutting tool in the market. The natural tendency of purchasers to get the cheapest, and a similar disposition of dealers to supply their customers with the cheapest, and the consequent determination of manufacturers to supply the trade as low, or a little lower than their competitors, tell the whole tale. Each one trying to outrival his fellow in cheapness throws on the market a most miserable excuse for a saw, or other cutting tools, down to sheet iron hand saws and cast iron chopping axes.

There are five qualities of English saw steel in the market. When in Sheffield, England, I took particular pains to ascertain how it was that saws were made at such extremely low rates. About 400 000 cross-cut saws are made in Sheffield annually for Russia, all of one size, being about four feet eight inches long, eighteen gage in thickness, and a little wider than our American tenon saws of that length, and about 150,000 frame and pit saws, also of similar uniformity. Such a vast number of saws without any deviation, even in the size or shape of the teeth, is proof of the entire lack of improvement in that vast country of upwards of 60,000,000 population. The frame and pit saws are to saw lumber by hand, and the fact that 150,000 are sold yearly shows the vast amount of hand sawing done in that country. It is almost a wonder that Russia, with her cheap labor, and the skill she manifests in many articles of manufacture, does not make her own saws.

The cheapness with which these saws are produced in Sheffield is a wonder. I will mention the Russia cross cuts (the frame and pit saws are equally cheap). The usual price is one and sixpence each (or about thirty-six cents) at which a large order is filled for Russia.

A proprietor of a rolling mill in Sheffield told me how he made cheap saw steel. He purchased the dregs (I called it) of Bessemer steel, or that part which adheres to the fire clay used in covering the inside of the converter; this he broke or cut up into small bits, mixing with it a little spiegeleisen, in order to raise the temper, melted it in the crucible, poured it into ingots, and rolled it into saw steel. This is only one of the cheap ways of producing steel in Sheffield.

In America a large portion of the cross-cut saw steel that is used is made from old scrap, such as old carriage and car springs, old files, rasps, etc. Saws made from such material will never take a uniform temper. If the saw maker will purchase extra saw steel and temper his saw in the usual way, there will be no trouble in having a good temper. But so few purchase extra saw steel that it is seldom in market, but must be ordered from Sheffield. A plate of this steel before it is touched costs more than a common cross cut sells for all finished. The proper temper of saws, however, is so much a matter of opinion that what one calls too soft another calls too hard. Some timber requires a saw to have a very high temper; in other timber it may be milder, and even in the same locality users differ widely on the temper of saws. Different methods of treating the saw makes a great difference, and the instrument used in setting a saw mill makes a great difference in breaking the teeth. Some use a wrench set that bends the tooth over a sharp corner and brings the bend all at one point in the tooth; if a tooth has only a good cutting temper it is almost sure to be broken in this manner. The tooth should be bent on a gradual curve.

Pittsburgh, Pa. J. E. EMERSON.

THE ELECTRIC TELEGRAPH.

[From Chambers' Journal.]

Beacon fires were the ancient mode of telegraphy adopted in Great Britain. An act of the Scottish Parliament of 1455 directs that "one bale or fagot shall be the warning of the approach of the English in any manner; two bales, that they are coming indeed; and four bales blazing beside each other, that the enemy are in great force." The earliest well defined plan of telegraphic communication is that of Dr. Robert Hooke, described by him in a paper to the Royal Society in 1684, and published in 1726 in Derham's collection of his *Philosophical Experiments and Observations.* A number of symbols or devices were to be displayed on an elevated framework. M. Chappe much improved on this in 1793. A kind of shutter telegraph was in 1796 adopted in England in the first Government line of telegraph from London to Dover. It is stated that information had been conveyed by this from Dover to London in seven minutes. This, of course, was only available in clear weather.

We now come to the electric telegraph, by which Puck's fairy boast of putting a girdle round the earth in forty minutes can be realized, though, instead of forty minutes, it can be done in *one second.* Strada, the Italian Jesuit, speaks in his *Prolusiones Academicæ*, in 1617, of "the instaneous transmission of thoughts and words between two individuals over an indefinite space," caused by a species of loadstone, which possesses such virtue, that if two needles be touched with it, and then balanced on separate pivots, and the one turned in a particular direction, the other will sympathetically move parallel to it. These needles were to be poised, and mounted parallel on a dial with the letters of the alphabet around. It is wonderful how nearly this description would apply to the electric telegraph. Addison playfully quotes this as a substitute for love letters in the *Spectator* of 1712. Glanvil, in a work addressed to the Royal Society two hundred years ago, treating of things, then rumors, which might be practical realities, says: "To confer at a distance of the Indies by sympathetic conveyances, may be as usual to future times as to us in literary correspondence." Experiments of making electric shocks through wires had been made many times before Franklin's theory of positive and negative electricity was started. Mr. Timbs states that in the *Scotts Magazine* for 1753 there appeared a distinct proposition for a system of telegraphic communication by as many conducting wires as there are letters in the alphabet. Arthur Young in his *Diary*, October 16, 1787, states that a French mechanic named Lomond had made a remarkable discovery in electricity. "You write two or three words on paper: he takes it with him into a room, and turns a machine inclosed in a cylindrical case, at the top of which is an electrometer, a small, fine, pith ball; a wire connects with a similar cylinder and electrometer in a distant apartment; and his wife, by remarking the corresponding motions of the ball, writes down the words they indicate: from which it appears that he has formed an alphabet of motions. As the length of the wire makes no difference in the effect, a correspondence might be carried on at any distance—within and without a besieged town, for instance." This is, to all intents and purposes, the electric telegraph. In 1812, Mr. Crosse the electrician uttered this prediction; "I prophesy that by means of the electric agency, we shall be enabled to communicate our thoughts instantaneously with the uttermost parts of the earth." In the same year, Francis Ronalds employed frictional electricity. His telegraph was a single insulated wire, the indication being by pith balls in front of a dial. In the next year, Mr. Hill, of Alferton, invented a voltaic electric telegraph.

Oersted discovered, in 1819, that a magnetic needle is deflected by the passage of a circuit of electricity through a wire parallel and in close proximity to it. This made the wonderful discovery of the telegraph possible. But the deflecting power of the current must be multiplied, and Schweigger did this by passing a wire insulated by silk a number of times round the needle. M. Arago, in 1819, invented the first electro-magnet, by coiling round a piece of soft iron a length of insulated copper wire, the ends of which communicated with a battery. By alternately making and breaking the circuit of the current, an up and down movement can be produced, which is the principle of action in Wheatstone's electric magnetic dial instrument. These discoveries do not seem to have been followed up in a practical manner till, in 1837, Wheatstone took out a patent in conjunction with Mr. Cooke. Their telegraph had five wires and five needles, two of which indicated the letters of the alphabet placed around. In July, 1837, wires were laid down from Euston Square to Camden Town Stations, by the sanction of the Northwestern Railway, and Professor Wheatstone sent the first message to Mr. Cooke between the two stations. The professor says: "Never did I feel such tumultuous sensation before, as when, all alone in the still room, I heard the needles click; and as I spelled the words, I felt all the magnitude of the invention, now proved to be practical beyond cavil or dispute." The form of telegraph now in use was substituted because of the economy of its construction, not more than two wires (sometimes only one) being required. Of course several persons claimed to have invented the telegraph before Professor Wheatstone. In the same month that the professor was working upon the Northwestern Railway, there was one in operation invented by Steinheil of Munich, but Wheatstone's patent had been taken out in the month before. An American named Morse claims to have invented it in 1832, but did not put it in operation till 1837. After this, his system was generally adopted in the United States. It is a *recording* one.

Mr. Brunel adopted Wheatstone's telegraph on the Great Western, and the wires at this time were not carried on posts, but placed in a tube under ground. But soon after a gentleman, at a meeting of the shareholders, said the whole was a "new fangled scheme," and actually got a resolution passed repudiating the agreement with the patentees. They were, however, graciously permitted to work the wires at their own expense The tariff was one shilling per message; curiously enough, the very sum now charged since the wires in Great Britain have been transferred to the Government.

Sir M. I. Brunel and Professor Daniell thus speak of the relative positions of Messrs. Cooke and Wheatstone in the invention of the electric telegraph: "Whilst Mr. Cooke is entitled to stand alone, as the gentleman to whom this country is indebted for having practically introduced and carried out the electric telegraph, as a useful undertaking, promising to be a work of national importance—and Professor Wheatstone is acknowledged as the scientific man whose profound and successful researches had already prepared the public to receive it as a project capable of practical application—it is to the united labors of two gentlemen so well qualified for mutual assistance, that we must attribute the rapid progress which this important invention has made during the five years since they have been associated."

In 1840, Professor Wheatstone invented the revolving dial telegraph, working without any clock-work power: a magneto-electric machine supplies the place of a voltaic battery. In 1841, he invented the type printing telegraph. The American printing telegraph of House has much complicated mechanism, but does its work well; and messages are printed by it at the rate of fifty letters per minute in common Roman characters on long slips of paper. Bakewell's telegraph is of this kind, though, if possible, more ingeneous. Formerly, an alarm used to be sounded by an electro magnet, to arouse the operator, but the cliking of the needle is found quite sufficient. When a message is sent between London and Edinburgh, all the needles of all the telegraph stations on the line are deflected at the same time: but a special signal is made to show for which station the message is intended. Dr. Winter mentions a somnolent station clerk, who, in order to enjoy a nap, trained his terrier to awake him at the clicking of the needles.

The new magnetic alphabet dial telegraph, invented by Wheatstone in 1858, and improved in 1860, was used by the Universal Private Telegraph Company, and by private individuals in great numbers. On a dial-like face, the letters of the alphabet are placed, with accordeon-like keys round. By touching these, a communication is obtained with a like instrument at the end of the wire. The professor found the best way of working the private telegraphs in the metropolis was by a number of wires, not thicker than pack-thread, bound together in a cable, but isolated from each other by an india-rubber process, patented by Messrs. Silver. This, of course, greatly reduces the cost. Suspending posts were placed at intervals of one hundred yards, and connecting boxes to combine and arrange the various lines—the boxes a mile apart. Faults can be easily discovered by a very ingenious arrangement at each suspending post. The charge for the use of a wire to an individual and working instruments is about $80 a mile per annum. It is impossible to estimate the importance of this to the British merchant, who may at his country residence know all that is going on at the docks without leaving his library. Dr. Wynter says that Lord Kinnaird has laid one down from Rossie Castle to the neighboring county town, eight miles distant, and orders to the tradesmen are sent by it.

The fast speed automatic telegraph, invented by Wheatstone in 1858, and improved in 1867, is perhaps the most wonderful of the professor's inventions. He thus describes it; "My invention consists of a new combination of mechanism, for the purpose of transmitting through a telegraphic circuit messages previously prepared, and causing them to be recorded or printed at a distant station. Long strips or ribbons of paper are perforated, by a machine constructed for the purpose, with apertures grouped to represent the letters of the alphabet and other signs. A strip thus prepared is placed in an instrument, associated with a rheomotor (or source of electric power), which, on being set in motion, moves it along, and causes it to act on two pins, in such a manner that, when one of them is elevated, the current is transmitted to the telegraphic circuit in one direction; an l when the other is elevated, it is transmitted in the opposite direction; the elevations and depressions of the pins are governed by the apertures and intervening intervals. These currents, following each other indifferently in the two opposite directions, act upon a printing or writing instrument at a distant station in such a manner as to produce corresponding marks on a ribbon of paper, moved by appropriate mechanism." He soon found, after devoting his attention to fast speed telegraphs and dot-printing, that a rapid printer was required. This he invented by the name of the "line-printer," printing the dot and dash alphabet at the rate of six hundred letters per minute. It would be impossible, in our limited space, to give descriptions of the working of the various varieties of the telegraph; but we refer our readers to Professor Pepper's recent volume, *Cyclopædic Science Simplified* (Warne & Co., 1869), for capital descriptions and woodcuts of these instruments.

In 1843, Mr. Cooke had the wires of the telegraph suspended on posts, instead of conveying them underground. Iron wire galvanized is used for these lines; but in the neighborhood of large manufacturing towns, the sulphur in the air converts the oxide into sulphate of zinc, which the rain washes off, to the great detriment of the wire. Lightning has been known to run for miles along the wire, melting the delicate coils in the instruments in the various stations along the line. The aurora borealis also affects the wire. In September, 1851, it prevented any messages being sent in New England in the United States. Professor Wheatstone, by elaborate experiments, discovered that electricity travels through a copper wire at the rate of two hundred thousand miles per second, or the velocity of light; and Professor Bache, that through iron wire the velocity was fifteen thousand four hundred miles a second. About one tun of wire is required for every five miles. The wires were attached to the posts by brown salt-glazed stone ware of the hour-glass shape; but Mr. E. Clark invented a method of placing them on a stoneware hook, open at the side, so that the hook could be replaced if required. In India, the delicate wires used here would not be suitable; so iron rods three eighths of an inch thick are employed. Rain may pour on them and monkeys sit on them without doing any damage. In Whitworth's *Report*, it is stated that in America, in certain states of the atmosphere (rain carrying much of the electricity from the wires), Bain's telegraphs will work when Morse's will not.

The needle instruments transmit the messages much more quickly than the recording ones; but in the latter, an indelible record of every message transmitted is made, which is of great importance.

There is one man who has done an immense deal to utilize telegraphic information; we mean Mr. Reuter. In 1849, he opened an office at Aix la Chapelle, and had carrier pigeons to convey messages from that place to Brussels, as the telegraph was not formed there at that time. In 1851, he transferred his office to London, and devoted his attention to inducing the British press, which obtained information at an enormous cost, to depend on him for it. In 1858, to show what he could do, he sent his telegrams to the various papers, free of cost; and they were so impressed with their value, that several subscribed to his system. In February, 1859, the Emperor of France made the famous speech threatening Austria through her ambassador. This was delivered at 1 P.M., and at 2 P.M. the speech was published in the third edition of the *Times*, having been transmitted by Mr. Reuter. The press soon adopted his system, and the daily papers in the north have the same telegrams as those of the metropolis. The wires are connected in London from Mr. Reuter's office into the editor's room of each journal. It is stated that Mr. Reuter sold his business to Government recently at a premium of $1,500,000.

The first newspaper report by electric telegraph appeared in the *Morning Chronicle*, May 8, 1845, detailing a railway meeting held at Portsmouth on the preceding evening. A chess match was played in April, 1845, between amateurs in London and Mr. Staunton and Captain Kennedy in Gosport. The contest began at 11·30 A.M., terminating about 7 P.M., the time being taken by the consideration of the players over the moves. The squares of the board and the men were numbered, and the electric fluid must have traveled at least ten thousand miles during the contest.

Many a thief has been caught by the aid of the telegraph, as information can be sent to stop him if he has started in a train at some distant station. Tawell the murderer is another instance of this. Sarah Hart had been murdered in 1845, at a cottage in Salt Hill, and a man in Quaker attire had been seen to leave the house. A clergyman hearing he had been supposed to have gone to Slough, went there, and saw the Quaker-like man enter a first class carriage. A telegraphic message was despatched to London, and a detective followed Tawell, and he was subsequently apprehended. He nearly escaped in this manner; the letter Q was then represented by K, and the clerk in London could make nothing out of *Kuaker*, but fortunately guessed it in time to be Quaker.

Here is an example of laconic telegraphy. A person who had committed an offense against the laws and run away, desired to know if it would be prudent to return. He asked: "Is everything O. K?" The answer was: "Proverbs xxvii. 12." Upon referring to this, he found: "A prudent man foreseeth the evil, and hideth himself; but the simple pass on, and are punished.

Elihu Burritt tells us how a train of passenger cars was saved from destruction by a message by telegraph. A long railway bridge was blown down between Hartfield and Springfield, in the United States, and the train was stopped by telegraphing to a distant station. Mr. Walker, Superintendent of the telegraphs of the Southeastern Railway Company, states that in 1850, a collision occured to an empty train at Gravesend, and the driver leaping from the engine, it started full speed for London. The line was kept clear by the telegraph, and an engine started in pursuit, fortunately overtaking it. But it had passed twelve stations safely before this.

We now turn to submarine telegraphy. Professor Morse is said to have made the first practical experiments in this part of the subject in 1842. Wheatstone laid wires across the bed of the Thames eight months after Morse's experiment. It is probable that if gutta-percha had not been discovered in the Eastern Archipelago, electric communication could not have been made to any extent through water. This substance was first applied for insulating in 1847, by Lieutenant Siémens, of the Prussian artillery; and Faraday used it in electrical experiments in 1848; and in 1850 the first submarine cable was laid between Dover and Cape Gris-nez. This soon broke from friction on a sharp ridge of rocks. Another was soon laid down of better construction, and this was a great success, and has remained so. Then one followed to Ostend, connecting us with Europe through Belgium. In May, 1853, another cable was laid down from Orfordness, near Ipswich, to Schevening, in Holland; this goes for one hundred and twenty miles under the North Sea. In 1849, Mr. J. J. Lake submitted a plan to the *Athenæum* for connecting the electric telegraph with America by a wire covered with gutta-percha. The first Atlantic cable was finished in 1857, by Glass & Co., of Greenwich, and Newell, of Birkenhead. It was paid out successfully to the extent of three hundred and fifty-five miles. At this point it parted from the strain, and it was lost forever. In 1858, another cable was ready, being made under the direction of Mr. Cyrus Field. But it broke several times before it was finally laid in August, 1858. It worked well for a time, and then became useless. Till 1865, no fresh attempt to lay another, was made. Sir Charles Bright recommended a combination of iron wire and hemp for the outer protecting strands. Two thousand six hundred miles were placed on the *Great Eastern*. The central conductor was composed of seven fine copper wires, with four layers of gutta-percha, and then eleven iron wires. In strength it was equal to a strain of seven and three quarter tuns. It was constructed by Messrs. Glass & Elliott at East Greenwich. The *Great Eastern* sailed from Valentia, July 23, 1865. As it was being paid out, two faults were discovered which would have been fatal to the working of the line. Stout iron wire had been driven through the cable, some said purposely. On August 2, the cable broke, to the consternation of all on board. The great ship then determined to grapple it, and from August 3 to August 11, the cable was grappled three times; and on the latter day, the grapnel being found defective, and the stock of wire rope exhausted, the *Great Eastern* moored a buoy, and returned home. Thus, $7,250,000 was sunk at the bottom of the ocean. Another cable was constructed and began to be paid out July 13, 1866, and on July 27, Newfoundland was sighted. In August, a telegram was sent from New York to Bombay, going across a wide stretch of America, spanning the Atlantic, crossing Ireland and England, Europe, Asia Minor, Persian Gulf, and Indian Ocean to Kurrachee. In September 2, the 1865 cable was raised from the bed of the Atlantic by the *Great Eastern*. Experiment proved that the communication was perfect. On September 8, the *Great Eastern* finished paying out, the 1865 cable being then landed at Newfoundland. A banquet was given at the Royal Polytechnic, December 21, 1867, to Sir C. Wheatstone; the Duke of Wellington and others were present. The wires of the Atlantic cable were brought into the room, and the following message was sent to the President of the United States: "The Duke of Wellington, the directors, and scientific guests now at the Royal Polytechnic, London, send their most respectful greeting to the President of the United States, their apology being, that to the discoveries of science the intercourse between two great nations is indebted." This message was nine minutes, thirty seconds, in transit from London to Washington, by Heart's Content and New York. The following reply, occupying twenty-nine minutes in transmission, was received; "I reciprocate the friendly salutation of the banqueting party at the Royal Polytechnic, and cordially agree with them in the sentiment, that free and quick communication between governments and nations is an important agent in preserving peace and good understanding throughout the world, and advancing all the interests of civilization.—Andrew Johnson."

On the same evening, a message of twenty-two words was started from the same institution for Heart's Content at 9 P.M., and *at 9·10 the reply of twenty-four words was delivered.*

Electrical tests applied to these two cables show them to be at least twenty times better in conductivity and insulation than on the first day they were submerged. Their earnings average about $3,500 a day. We cannot wonder, therefore, that the French wished to have an independent line for themselves, making the third line to America. The new French cable is about 3,564 nautical miles in length—nearly double that of either of the English ones. The principle of construction is the same, only the French conductor weighs 100 pounds more per mile than ours. The Manilla hemp used is saturated with tar—another advantage. The Anglo-American companies have the sole right of landing cables on Newfoundland, so this cable has to go from Brest to St. Pierre, and from St. Pierre to Massachusetts. The standard of the manufactured value of a cable is judged by what are called units of resistance. The amount of resistance to the passage of the electric current through the conductor is measured by the galvanometer, and is counted by millions of units; a cable giving a low rate of resistance would show that some hidden leakage allowed the current to escape, and so to enter the wire faster than it ought. The Persian Gulf cable had a resistance of 50,000,000 units; the Atlantic cable of 1865, 100,000,000 units; that of 1866 150,000,000 units; and the new French cable, no less than 250,000,000 units, showing a great increase of perfection in the manufacture.

Asphalte Tubes for Underground Lines.

Of what material the tubes used to protect and form a subway for underground wires shall be made, has long been an open question. M. Collette, of the Netherlands Telegraph Administration, has submitted the following interesting facts with regard to the employment of asphalte.

In 1865, a trial line, nearly 3,000 yards in length, was laid in asphalte tubes in the streets of Amsterdam. These tubes have each an interior diameter of 3 inches (about 75 millimetres), and are 7 feet (2 meters 134 millimeters) in length. They are jointed to each other by the aid of muffles of short pieces of tubing 4 inches in interior diameter, the interstices being run with bitumen., The laying was executed without the least difficulty. Only six copper wires, covered with a double coat of gutta-percha, were, in 1865, introduced into the asphalte tubes; but two years after, this number was augmented to 25 wires. It is from this occasion that we have been able to ascertain that the wires withdrawn from the tubes, after having been worked during two years, were in such perfect condition that they were replaced with the 19 new wires. The asphalte tubes, since they were laid, have three times been uninjured by accidents which cast iron tubes would have been unable to resist, and, doubtless, in breaking, would have injured the wires.

Five years have elapsed since the laying in Holland of the first line in asphalte tubes, and, hitherto, scientific men have not been deceived in their expectations. Also the Netherlands Telegraph Administration has not hesitated to follow the path dictated by experience. In January of the present year, a length of 10½ miles of underground lines was laid in asphalte tubes. The maximum number of wires introduced into the tubes, having 3 inches internal diameter, amounted to 40.

The tubes are chiefly manufactured at Hamburg, and the prices are as follows:—For tubes 7 feet in length and 3 inches in diameter. $1·00 per length; for those having the same length and 2 inches in diameter, the cost per length, including muffles for jointing, is about 75 cents. Tubes having other dimensions have not yet been constructed in Holland.

Death of Thomas Ewbank.

Thomas Ewbank, mechanic, author of "Ewbank's Hydraulics and Mechanics," and ex-Commissioner of Patents, died in this city on September 16, at the advanced age of 79 years. He had been for some years in feeble health, and his death was not unexpected.

The spinners' strike at Fall River, Mass., ended on the 15th inst.; many operatives went back to work. Some were accepted, others were rejected, and will not be employed again. Some of the mills compelled an agreement on the part of the workmen that they should belong to no more "unions." The mills are now running, nearly all full. The strike has lasted two months. The loss in wages has been about $500,000.

Detection of Fusel Oil in Alcohol.—The *Revue Hebdomaire* gives a simple test for the detection of amylic alcohol in spirits, which, if effective, is calculated to be of considerable value. The spirit to be examined is mixed up with an equal bulk of rectified ether, and a like quantity of water; the mixture is shaken in a burette, or glass tube, when after a short rest, the ether rises to the surface, and is removed by a pipette. This must be left to spontaneous evaporation; if the alcohol contained fusel oil, it will be left behind, and may be easily recognized by its pungent smell.

Smith & Lafferty's Wood Pump.—In our description of this pump, on page 150, an error occurred in giving one of the addresses. It states Toledo Pump Co., "Cleveland," Ohio, It should have been "Toledo," Ohio.

Improvement in Pitmans.

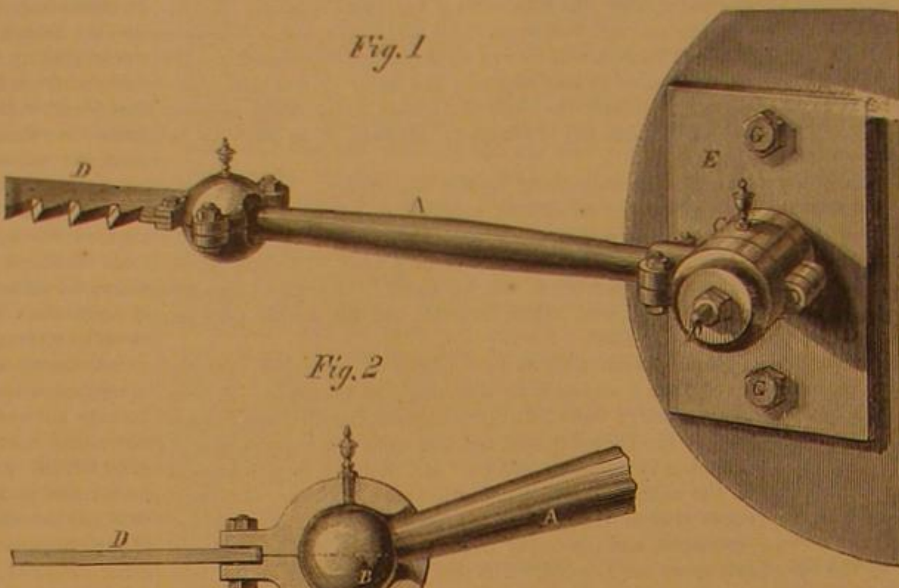
This invention has for its object to furnish an improved crank and pitman for use upon mowing machines, reapers, pumps, and in all other places where a pitman is employed to convert rotary motion into reciprocating motion or the reverse.

Fig 1 is a perspective view; Fig. 2 is a view showing the pitman attached to the cutter bar of a mowing machine. Fig. 3 is a sectional view showing the internal construction of the improvement.

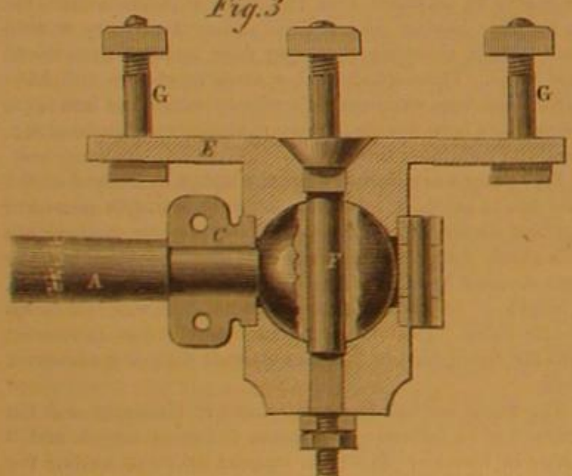
A, Figs. 1, 2, and 3, is the pitman; B, Fig. 2, represents the end of the pitman which is spherical; C, Figs. 1 and 3, is a hinged collar made concave on its interior to fit the ball on the crank end of the pitman, which it clasps as shown, being held together by screw bolts. D, Figs. 1 and 2, is the cutter bar, to which the pitman is attached by a universal or ball and socket joint, as shown. E, Figs. 1 and 3, is a plate which carries the journal of the crank end of the pitman, shown in the sectional view, Fig. 3, at F. The plate is fastened to the crank wheel by bolts, G, and the journal, F, passes through the ball of the pitman, as shown in Fig. 3. From the plate, E, projects a shoulder, in which is also a concavity to fit the ball, and through which also passes the journal, F. This journal is cylindrical where it passes through the ball, and a little way on each side of the ball, so that when wear takes place and the parts are screwed up to close the bearing surfaces together, the square parts of the journal shall not engage with the hole in the ball and cut the bearing surface. On the opposite side of the shoulder which projects from the plate, E, is a cap also made concave to fit the ball of the pitman. These parts are all drawn together as closely as may be desired by a double nut on the journal, F, the latter being made with a tapered head which fits into the plate, E. The hinged collar, C, together with the other parts described, completely cover the bearing surfaces, excluding grit and dirt, and oil cups are provided, so that one oiling on a harvester or mowing machine will keep the surfaces lubricated for five hours, obviating the necessity of the frequent oilings now practiced, and preventing cutting of the bearings.

There can be no binding in the joint which connects the pitman with the cutter bar, as this joint is a ball and socket, as shown.

For heavy labor, such as would be exacted on a locomotive, a gib and key would be used instead of the double nut on the wrist or journal, G.



KEALY'S IMPROVED CRANK AND PITMAN.



The inclined surfaces of all the bearings increase the aggregate of bearing surface, and permit the taking up of wear so as to keep up the fit, and to prevent the effect of increasing length in the pitman.

The pitman, when used on harvesters, allows the cutter bar to run at any angle with the pitman not exceeding 45°.

When this improvement is applied to locomotives or steam engines, the joint at the stroke end is also modified in some particulars which *do not* affect the general principle, but which, it is claimed, add to its efficiency and durability.

It is claimed by the inventor that the general application of this pitman to harvesters and mowers will prevent loss of time in oiling and repairs, as well as expenses, and that it will greatly reduce friction, thereby also lightening the draft of such machines.

Patented, through the Scientific American Patent Agency, May 17, 1870, by Thomas Kealy, of Lewisville, Texas, whom address for information concerning rights, etc., care of C. C. Wilcox, 84 Murray street, New York.

The Mitrailleuse.

A London journal adds to the thousand and one proofs that there is nothing new under the sun, the pseudo novelty in this case being the much-talked-of *mitrailleuse*. The authority for declaring it an old invention is nothing less than *Grose's Military Antiquities*. It appears that a patent was granted by Charles I., who seems to have indifferently profited by it himself, to William Drummond, of Hawthornden, in 1625, of, among other machines, "a sort of conjugated musket, by the assistance of which one soldier or two are enabled to oppose a hundred guns; which machine, from its effect, is called the thundering chariot, and vulgarly the fiery wagon." We may expect, after this, to hear the modern invention of sewing machines or ocean telegraphs questioned next; yet, after all, there is satisfaction in the thought that some difference exists between the dim recognition of a principle and its useful application in practice.

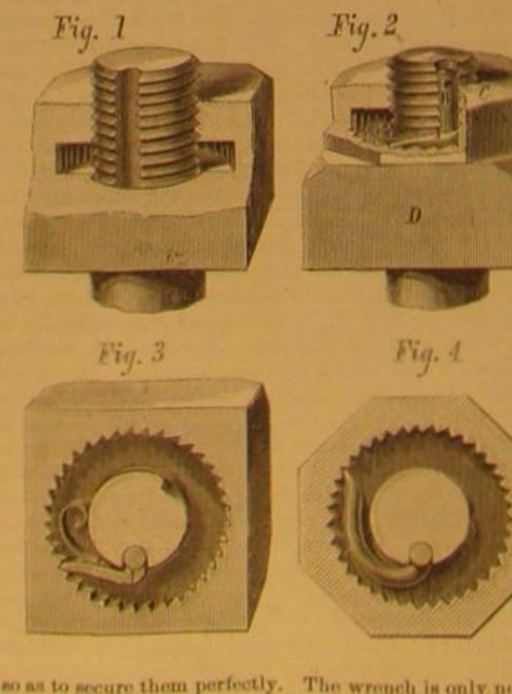
Iron Scaffolding.

We have before alluded to the improved methods of handling materials in building employed in France. A farther improvement in this field has been made by a French inventor, B. Cenci, of Paris. It is an iron scaffolding constructed with an iron platform mounted on four wheels running on axles which are adjustable, so that the platform may rest on these wheels, or may be lowered upon the ground. When mounted on the wheels it may be transported with great facility from place to place, and when arrived at its destination it is lowered and secured upon the ground, and forms a firm bed or foundation plate for the scaffolding. The two axles revolve in four bearings upon the platform, and have motion imparted to them by toothed wheels, one of which is fixed upon each axle and geared in connection with an endless screw. Two supports upon the framing of the apparatus are furnished with a bearing for the shaft of the endless screw and the wheel for imparting the circular motion of the axle for raising and lowering the carrying wheels.

FREELAND'S LOCK NUTS.

Some very good lock nuts have been devised, in fact it is almost a matter of surprise that so many different ways of accomplishing so simple a result should have been discovered. The importance of a good lock nut has stimulated inventive talent in this direction, and seems likely to call forth new devices for some time to come.

Our engraving adds another to the list of these devices which have found a place in our columns, and it is claimed it possesses advantages not found in others which have preceded it. It can be applied to locking nuts on common bolts already in use, without any alteration in either the bolt or the nut, except a small slot cut in the bolt, and it allows oiling or greasing of the bolt, so that the nut cannot rust fast, without in the least lessening the security of the locking. By its use nuts can be made so loose as to run on their threads by the aid of the fingers, and without a wrench, and still be locked



so as to secure them perfectly. The wrench is only needed in setting the nut home and starting it loose.

Three adaptations are made: First, a single nut with a ratchet, shown in Fig. 1. This nut has a ratchet cavity cast in it, as shown, in which a spring pawl—formed as shown at A, Figs. 2 and 3—works, allowing the nut to be turned down, but holding it from turning back. When it is desired to take off the nut, a wire is put into a hole in the top of the shank, B, of the pawl, which rises up through the nut, as shown in Fig. 2, a recess being cut in the bolt for that purpose. By means of the inserted wire the pawl is turned against the spring out of its engagement with the ratchet teeth, when the nut may be screwed off from the bolt.

Second. When it is desired to use the old nut after slotting the bolt, a thin supplementary nut, C, Fig. 2, with the ratchet and pawl, may be used as shown, which turned down upon the old nut, D, effectually locks it. The supplementary nut may be made so thick as to obviate the necessity of using the old nut, if desired not to use it.

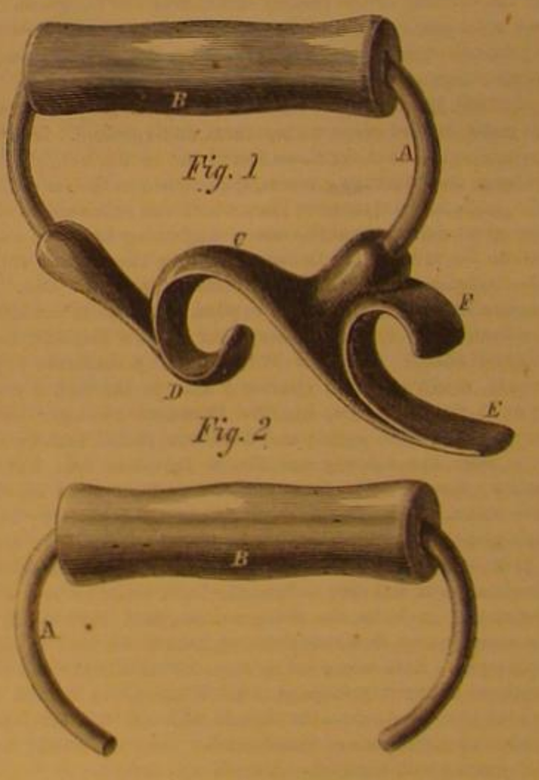
Third. The pawl may be made without the riveted spring, as shown in Fig. 4; the bent wire of which it is made being so formed as itself to act as a spring to engage with the ratchet. In this case the pawl is sacrificed when the nut is turned off, a wrench being employed to start back the nut and to break off the pawl, when the nut can be turned off by the fingers alone.

The supplementary nut might be advantageously used for locking the nuts of fish joints on railways already in use, by simply slotting the bolt—a very simple and cheap operation—and the various adaptations will be found of service in all situations where nuts are liable to jar loose, or where in certain machines it is necessary to frequently take off and replace nuts, and also necessary to secure them against running back while the machine is in motion.

Patented, through the Scientific American Patent Agency, Feb. 22, 1870, by O. S. Freeland, of Newport, R. I., who may be addressed for railroad rights, limited territorial rights, or other information.

IMPROVED STOVE COVER, DISH, AND KETTLE LIFTER.

Our engraving shows an improved form of stove-cover, dish, and kettle lifter, which is made of wood, wrought iron, and cast iron, in an ingenious manner, and is a very convenient and handy implement.



The part, A, which passes through the wood handle, B, is made of strong wire, bent as shown in Fig. 2, before the casting is made. It is then placed in the mold in such a way that when the melted iron is poured in, it partially fuses and joins the ends of the wire, A, to the part, C, as shown in Fig. 1.

As will be seen, the implement is small and compact. Its hook, D, is used for lifting light or heavy kettles, and being situated directly under the handle, it is in the most convenient position for that purpose.

The projections, E and F, are employed in lifting stove covers, pans, or dishes.

This device has already been put in market, and, we are informed, meets with much favor. It is very cheap to manufacture, and perfectly adapted to the end designed. The inventor will sell all the territory except the State of New York.

Patented, June 14, 1870, by Cyrus Cole, of Havana, N. Y. For rights address Zerbe Perrine & Co., 26½ West Third st., Cincinnati, Ohio, or the inventor as above.

Method for Bleaching Jute.—The material is first heated for six hours in milk of lime; for every pound of jute take one quarter of a pound of quicklime. Rinse well in water, afterwards in weak hydrochloric acid (2° B.) and heat a second time for five hours in a solution of caustic soda, so composed that there is one half of a pound of calcined soda to one pound of jute. In this way all resinous and fatty matter will be removed, and the bleaching can be completed by *chloride of* lime or permanganate of potash.

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NEW YORK, SATURDAY, SEPTEMBER 24, 1870.

Contents:

(Illustrated articles are marked with an asterisk.)

MODERN CHEMISTRY.

While revolutions are occurring in the political world, and the names of old streets are changed from the "10th of December" to the "4th September," and the "Avenue de l'Empereur" becomes "Avenue Victor Noir," a similar excitement prevails in the physical sciences, especially chemistry, and the names of things are so radically changed that chemists of the old school cannot recognize the most familiar object and soon become lost in a labyrinth of inexplicable terms. We have recently examined some of the new text-books on chemistry, and have been more edified than instructed by them. It is edifying to read the new definitions, and we are as much puzzled by them as we sometimes are with some of Johnson's definitions; for instance, Johnson says that "net-work is something reticulated or decussated with interstices between the intersections;" it is evident that the simplest weaver could at once understand this. So with chemistry, we find it defined in a recent book to be "that branch of physical science which treats of the atomic composition of bodies, and of those changes in matter which result from an alteration in the kind, the number, or the relative position of the atoms which compose the molecule." And in another place the same author says that "a molecule is the smallest particle of matter into which a body can be divided without losing its identity," And in the next sentence he defines an atom as "the still smaller particle produced by the division of a molecule."

We cannot say that we derive that degree of information from these definitions that we have a right to expect from an elementary text-book, and are sorry that modern chemistry has fogged the mind of the author just as the sunlight often fogs the plates in the hands of an unskillful photographer.

The doctrine of atoms and molecules must be taught to the present generation, and the writer of the book in question evidently knows what are the modern notions on the subject; but he fails to make it intelligible to his pupils. We should say, without pretending that our definitions were beyond criticism, that an atom is the smallest thing into which a body can be divided; a molecule the smallest group of atoms that can exist in a free state; and chemistry is the science that treats of atoms and molecules, and what can be made of them. People may quarrel about atoms, molecules, and matter generally, as much as they please, so long as we continue to put things together and produce such wonderful results as we have recently done. We want practical results at the present time, and are obtaining them at a rapid rate, notwithstanding the doubts that are expressed about the different forms of matter and the skepticism in reference to the existence of mind as distinct from matter.

The new school of chemistry will soon get out of the mists in which it has been lost for some time, and we may expect to have the skies cleared up when the warmth of true science has had an opportunity to disperse the clouds; but those of us who occupy neutral territory will have to suffer from both sides, and one generation must be sacrificed by the onward march of events. We are living in the transition period, when the language of science is undergoing such changes that very few can comprehend it, but it will be all clear to the next generation.

There has just been published in France a methodical report on the progress of organic and physiological chemistry in 1868, comprised in a royal octavo volume of 446 pages, the perusal of which, on account of numerous modern formulas, is about as easy as would be a treatise on the calculus or the computation of the orbit of Uranus. Everything in the book is new—the names of compounds are new; the symbols are new; the re-actions are new; and it shows such vast industry on the part of chemists, that it must be evident to any one studying it that it is impossible, in modern times, for any one person to keep up with chemistry in all of its departments. It will be a long time before the compounds mentioned in this book can have any practical application, but that they must eventually become objects of interest there can be no doubt. The author, L. Micé, treats of the doctrine of homologues, and this takes up, in separate chapters, the hydrocarbons, alcohols, aldehydes, acids, essences, conjugate sulphur acids, tannins, nitrogenous compounds, and a host of derivative and substituted bodies too numerous to mention.

It is evident that an accurate and minute report on the progress of modern chemistry in all its departments, for one year, would require several thousand octavo pages to print the story and after it was printed few people would be able to understand it. We cannot help thinking that it would be better to retain the old names of compounds familiar to every chemist, and to apply the new nomenclature only to new and hitherto unnamed substances. There are numerous erroneous expressions in science which are sanctioned by usage, and which have a well-known meaning attached to them, and there can only harm arise from suppressing them.

Modern chemistry is a very comprehensive science, and, if the believers in protoplasm are to carry the day, appears destined to swallow up the vital as well as the physical forces, and every change in nature of whatever character, unless we except the results of mechanical forces, may some day be ascribed to this all-absorbing science. This is doing pretty well for a science that had no existence one hundred years ago, and is not unlike the change in the relative position in rank and importance that has occurred in the history of modern nations.

WHAT ARE OUR COLLEGES DOING?

It has been charged, with some reason, that our colleges are failing to do the work expected of them, that they turn out more physical than mental athletes, and that, instead of cultivating good morals, they initiate youths directly into the mysteries of immorality, debauching them, and turning them out as finished sports, instead of expert scholars.

We say there has been some reason for this charge, but some reason is not a sufficient reason to justify the belief that all, or any one of these institutions, have ceased to do far more good than evil. It is true, that among the young men who annually leave our colleges, with degrees or without them, many carry into life bad habits, acquired during their collegiate course, and fail to carry with them any scholarship to speak of; but it is not true that the colleges are wholly to blame for this, or that this class of men constitutes the majority of students and graduates.

It is to be admitted, however, that the number of those who learn dissipation and gambling within the walls of our colleges is altogether too large, and the causes of the evil appear to us not by any means obscure.

American colleges are, for the most part, so poorly endowed that the receipts from tuition are absolutely necessary to their support. As a consequence, students are often admitted who ought positively to have been excluded, and retained long after a due regard for the moral health of the institution demands their expulsion.

Classical scholarship is also something which cannot be demanded of all young men who have leisure to study and money to pay for tuition. To those whose minds are not specially adapted to these pursuits, classical studies are the most unprofitable of bores. If such men seem to read, it will be only a pretense and a sham; their tastes and capacities lie in other directions, and their minds revolt against the compulsory attempt at acquiring what they know will never amount to anything for them. They fall behind in the standard of scholarship, feel a loss of self-respect, and finally drop into the society of those who have trodden over the same path, to that reckless state of mind which, of all others, is most dangerous to a young man. It will be seen that we regard the enforced pursuit of any one class of studies in college a mistake. The things which must, perforce, be learned to fit a man for the commercial business of life, and the clear interchange of thought on ordinary topics, should be learned before entering college, and a youth who commences a collegiate career should feel, that in whatever field of study he finds his tastes naturally lead him, he will be permitted to roam without stint, and to throw his intellectual weight where he can do it to the best advantage.

It may be said, that to permit this would defeat all uniformity in the character of studies pursued, and destroy any standard by which degrees can be conferred. Just so! Don't let us shrink from demolishing one of the most absurd shams of modern times. The abbreviations A.B. or A.M., might just as well stand for A. Butcher, or A. Miller, as for what they now represent, so far as their possession gives any good evidence of high attainments. At present they imply, in a large majority of cases, that those who affix them to their names, have by dint of coaching and ponying, and the regular payment of fees, managed to pass their three or four years in college, and to get out without open disgrace. They give no warrant that the one upon whom they have been conferred can calculate the interest on a bank note or write a page of good English.

How much more sensible it would be to drop this humbug altogether, unless college examinations are made so strict that no one can get a degree who has not earned it.

There is the beginning of a change already manifesting itself in these institutions, and is certainly a change for the better. Science and the modern languages are struggling for supremacy over the old system of classical instruction, and they will surely win. A disregard of the degrees conferred is also manifesting itself among students, who prefer to secure that which they find more adapted to their future needs, than to strive for college honors by enforced application to that which they feel will be of little comparative use to them. The time will come, and we think the next generation will surely see it, when the ancient classics will only rank as "optional" studies in all our colleges.

THE DRAFT OF VEHICLES.

Evidently the draft of vehicles depends upon two distinct things, the vehicle itself and the road. If an absolutely perfect roadway could be made, the draft of all vehicles would be equal to the power absorbed by the friction of its axles, and rolling friction of its wheels over a smooth surface, and that necessary for the ascent of grades. The power absorbed by friction, when axles and boxes are both iron and kept constantly well oiled, would for the axles be a pressure of about four per cent of the load, multiplied into the ratio of the mean diameter of the axles to the mean diameter of the wheels, overcome through the distance the vehicle travels in a given time. Thus the mean diameter of the wheels being forty inches, the load, including weight of the vehicle, exclusive of wheels being 4,000 lbs., and the mean diameter of the axles being 2·5 inches, the power absorbed by the friction of the axles at three miles per hour would be $\cdot 04 \times 4{,}000$ lbs. $\times \frac{2\cdot 5}{40} \times 3 \times 5{,}280 - 158{,}400$ foot-pounds per hour, or ·08 of one horse power. The rolling friction would be much less than this.

Comparing this with what is found by experiment to be the actual power consumed on the average, and on what are thought good, metaled roads, the difference is surprising. The power required in the latter case is, on the average, nearly one third of one-horse power per tun of load transported three and one half miles per hour.

This wide difference is attributable in large measure to the construction of the vehicles used for transportation of loads, partly to defective lubrication, and partly to the imperfect road surface.

The principles upon which the draft of vehicles depends are quite imperfectly understood by most mechanics, although they have been made the subject of elaborate experiment and investigation by Morin, who in his valuable treatise on mechanics treats this subject exhaustively.

Wheels acting upon road surfaces may be considered as simple rollers. Coulomb has demonstrated that the resistance of hard rollers rolling over even, hard surfaces is proportional to the pressure; that it is in the inverse ratio of the diameter of the rollers, and that it is so much the greater as the width of contact is smaller. But as roadways are not even surfaces, and wagon wheels have loose fitting axles through their hubs, it is evident that the laws demonstrated by Coulomb cannot be expected to apply rigidly to them.

In the years 1837, 1838, 1839, and 1841, Morin, under the direction of the French Government, performed an extensive series of experiments to ascertain the laws which control the draft of vehicles, employing for the purpose all sorts of vehicles, and propelling them over all sorts of roads, muddy, rutty, and stony, as well as those of the smoothest surface.

He found that the draft of wagons over a given roadway is proportional to the load, and that it varies in the inverse ratio of the diameter of the wheels, thus showing that the laws of Coulomb, as applied to hard rollers upon even, hard surfaces, also applies to them upon rough or yielding surfaces in so far as they involve the diameter of the rollers and the load. But on the point of width it was found that the coincidence failed. Upon soft foundations the draft increases as the width of tire decreases, and on solid roads the draft is practically uninfluenced by width. For use on farms or soft earth Morin maintains that the width of rims should be four inches.

It was further found that resistance increases with inequalities of surface, the stiffness of the wagon, and the speed upon hard roads, while upon soft bottom it does not so increase with speed.

It was further shown that the inclination of the traces has but little influence on the draft, but that it it is better for all roads, and for common wagons, to make the inclination approach the horizontal so far as the construction will admit.

Wheels of large diameters and narrow tires injure roads less than those with small diameters and wide tires, and the concentration of load upon two wheels having wide rims is more injurious to roads, than the distribution of the same load upon four narrow rimmed wheels.

THE FINISHING AND DECORATION OF MACHINERY.

Everybody prefers to look at beautiful things rather than at those unattractive in their appearance; but in things made not with a special design to be looked at and admired but to be used, it has been questionable in the minds of many whether it is not better to avoid much attempt at decoration or ornamental design, both for the sake of cheapness, in initial cost and the saving of subsequent labor to preserve the beauty of such articles when in actual use.

As usual there are extremists on both sides of this question, and the truth lies in a mean between the elaborate decoration which some would advocate, and the total neglect of adornment which would suit the views of others.

For ourselves we are always gratified to see an elegant design and finish in a machine, even when it is employed to do rude work; but elegance of design does not always mean elaboration.

The question of fitness is one which should greatly influence all consideration of ornament. Nothing looks well out of place. A cluster of roses looks very pretty in the center of a panel of an enameled bedstead. On the blade of a barn shovel such an ornament would be simply ridiculous. The cloth plate of a sewing machine may be highly decorated, and such decoration is in perfect good taste. Sewing machines are much used amid surroundings of beautiful objects. Beautiful textures are wrought upon them, and no incongruity results from ornamentation of such machines designed to be used in the household.

We confess that the hose carts now used by the fire departments of our principal cities, in connection with steam fire-engines, appear to us much more appropriate with their almost entire absence of ornamentation than the elaborately adorned ones formerly in vogue under the volunteer fire-company system. Those now employed are made for service and not for show, and their fitness for the purpose to which they are applied is an element of comeliness, which more than compensates for the absence of gay colors and the glitter of polished metal.

It is because we deem elaborate ornament entirely out of place on locomotives that we regard the reform in this particular, now in progress on American roads, as a step in the right direction. Our sense of the fitness of things has always received a shock when we have seen a highly decorated locomotive dash besmirched and dingy into a railway depot. A "sweep" could as appropriately put on a shirt of "snaw-white seventeen-hunder linen," in a preparation for the cleansing of a kitchen chimney, as a manufacturer of a locomotive could lavish thereon the ornate display we deprecate, which, besides being out of place, is an element of expense, and an entailment of increased labor in caring for the costly machine.

But while we find fault with extravagant and incongruous ornament, it will not do to ignore the fact that a machine appropriately decorated stands a much better chance of being well cared for than one totally destitute of attractiveness in appearance. The reflex effect of a beautiful design in a machine will unconsciously influence its attendants and beget in them increased neatness and care. So there is possibly a danger that in stripping locomotives of their inappropriate and elaborate finish, the other extreme may be adopted, and what would not only be appropriate but useful in its effects may be neglected.

PROGRESS OF FOREIGN INVENTION.

In connection with the numerous inventions of American origin, which constantly come under our notice, we find it one of the most interesting items of our manifold labors, to follow the progress of invention abroad, and to note the influence of customs and national peculiarities upon the requirements which give birth to the numerous devices of European inventors. Often some of these are almost exactly like those which simultaneously make their appearance here. For instance we find in the last number of *The Engineer* a description of an improvement in mill picks, attributed to a Chester, England, inventor, similar in all essential respects to the one we illustrated and described in our last issue. These coincidences show that a universal want exists for some device of the kind which gives rise to them, and that this want has become so well defined as to have attracted the general notice of inventors in the department which feels the necessity for it. As there are many ways of accomplishing a given end, such devices are open to competition on the part of other inventors, who, if they keep their eyes open, will gain many important hints from the study, not only of our illustrated descriptions, but from the notices of European inventions we give from time to time.

An English inventor has made an improvement in railway time-tables, calculated to render their indications and directions more intelligible and unmistakable. He inserts under the name of each station on the table or bill a line, ruled horizontally, and continued under the various times across the sheet, each line having a distinctive color or form. He also uses waved, curved, dotted, and other irregular lines, with or in lieu of straight or colored lines, or both combined. In some cases he prints the time tables in colors, the colors of the various stations being the same, and in unison with the figures indicating the times.

Another English invention is an improvement in the method of grinding cards on carding machines. He adapts the screw shaft and the parts in connection therewith to the employment of a flat grinding disk, in lieu of a box or roller, whereby he claims to obtain a better effect. In an arrangement of the improved apparatus, adapted to the grinding of the rollers or cylinders in their places, the screw shaft is fitted to revolve in bearings formed in end plates or frames, which are suitably formed to fit into the ordinary brackets or bearings, or into brackets provided for the purpose, and on the shaft is mounted a traveling frame, which carries the grinding disk.

The war seems to be stimulating invention in small arms. Improvements in breech-loaders follow each other rapidly. The following are some of the most noticeable of recent English improvements in this field. In one the breech bolt is hollow, and contains a discharging piston, the latter being operated by means of a spiral spring, and furnished with a tooth or projection by which it is capable of being retained in position for firing by a tooth. At the rear end of the upper part of the breech is placed a spring having a tooth at the hinder end, which tooth, when in its normal position, drops into a recess in the upper part of the rear end of the breech bolt, and prevents the latter from being drawn backwards until it is released by the spring being lifted upwards.

In a second improvement instead of fastening down the barrels by means of the ordinary lump and grip or bolt, the inventor makes on the face of the breech ends of the barrels, and between the barrels, a projecting piece or lump, and also makes in the face of the break-off a vertical slot, into which the said projecting piece or lump fits, when the barrels are shut down against the face of the break-off. He fastens down the barrels by means of mechanism constructed as follows: In the break-off of the gun he makes a vertical tubular chamber, into which the vertical slot in the face of the break-off opens. In this chamber a vertical grip is fitted and turns. The vertical grip consists of a cylindrical block of metal, the middle part of which is of greater diameter than the parts above and below it.

A third device of this kind consists in the construction and employment of a plug or rod with two heads within a tube; secondly, in the construction and employment of a tube for containing a coiled spring, and to serve as a guide for the closing bolt to slide upon; thirdly, in the employment of the double lever provided with a pin, and acted upon by a trigger; fourthly, in the employment of a forked lever, caused to act automatically to eject the empty cartridge case on opening the breech; fifthly, in the employment of a disk with a projecting thumb piece and with a portion of the edge cut away, for retaining the arm at full cock, or for freeing it, ready for the discharge.

The details of these inventions are perhaps too meager to give a very clear idea of them, but they indicate activity in this field of invention, based upon the now demonstrated fact that, for future warfare, muzzle-loading small-arms are to be universally superseded by breech-loaders.

Another inventor has patented and proposes to introduce as an improvement in vehicles for paints a composition made by combining alcohol, shellac, and vegetable oil (by preference castor oil) together, and then mixing this vehicle or composition with white lead or other pigments to form paint. The proportions are about eight parts of alcohol, two parts of shellac, and one part of any vegetable oil; these are to be subjected to gentle heat, and stirred until the shellac is dissolved. He claims that paint made with this vehicle is inodorous, dries very quickly, and is not liable to crack or blister by exposure to heat.

CHEMICAL EXPERIMENTS.

Professor Hofmann, the accomplished investigator, author, and lecturer, has recently published some lecture-room experiments that are worthy of being generally made known.

1. Explosion of hydrogen compounds by contact with fuming nitric acid.

It is generally known that phosphureted hydrogen is spontaneously combustible when prepared in a particular way; but that it loses this property when brought into contact with sulphur and other bodies. By holding a glass rod dipped in fuming nitric acid over the aperture out of which the gas is steaming, it is instantly ignited; and if a few drops of slightly heated fuming nitric acid be poured into a jar filled with phosphureted hydrogen, a violent explosion at once takes place. Sulphureted and seleneted hydrogen gases exhibit similar phenomena. The former gas must be pure and free from hydrogen, and is best prepared for the experiment from sulphide of antimony.

The neatest experiment is with hydriodic acid. If we pour from a test tube a few cubic centimeters of gently-warmed, fuming nitric acid into a tolerably roomy cylinder filled with hydriodic acid gas, a voluminous red flame will burst out, veiled in a violet cloud of iodine vapors, and the interior walls of the cylinder will be covered with a net work of steel gray iodine crystals.

2. Observation of complementary colors by reflected and transmitted light.

Many bodies exhibit by reflected light a color that is complementary to what is seen by transmitted light. This phenomenon can be especially well shown by aniline colors, aniline or iodine green being the best adapted for the purpose. If a concentrated solution of iodine green in alcohol be evaporated over a water bath in a glass capsule, the bottom of the vessel will be covered with a homogeneous crust of a perfectly transparent film, which exhibits by transmitted light a magnificent green color, and by reflected light an undoubted copper-red color. If a portion of the capsule be now heated, the green is changed to violet in reflected light, and the transmitted light gives a brass-yellow color.

3. Coloring power of aniline dyes.

The divisibility of matter has long been illustrated by the great extent to which gold coin can be drawn out, or by the penetrating powers of certain odors; but aniline dyes afford an equally apt exhibition of this physical phenomenon.

A solution of rosaniline in water containing a few drops of acetic acid, so diluted that there is one part of the dye in one million of water (1 milligramme in 1 liter of water), still possesses a deep carmine-red color. A skein of silk, moistened in acetic acid and plunged into the solution, becomes immediately a fine red. If the liquid be further diluted until there are 25 millions water—$\frac{1}{25}$ milligr. in a liter—to 1 of rosaniline, the red shade of color is still visible, and the silk in a quarter of an hour will exhibit a rose tint.

If the dilution be continued further until one part of coloring matter occurs in one hundred million parts of water ($\frac{1}{100}$ milligr. in 1 liter), the extreme limit at which the shade of color can be detected is reached, and it is necessary to look through tolerably large volumes of the liquid to detect the tint. A white floss silk thread, suspended in the solution for twenty-four hours, exhibits the color more distinctly than the liquid. Another phenomenon exhibited by the silk thread is of the utmost importance in modern physics, as it seems to confirm the theory of the motion of molecules now held by many physicists.

The colored-water molecules would appear to be attracted by, and to move toward the silken thread, and thus to produce currents in the apparently perfectly quiet liquid. Other aniline colors are adapted to this experiment, but for extreme dilutions the best is the rosaniline.

4. A ball room experiment with aniline colors.

At a ball given by Madam Hofmann in Berlin, an amusing and ingenious application was made of her husband's discoveries by the introduction of the aniline colors during the dancing of the German. It is customary at a certain figure of the dance for the gentlemen to take bouquets from a table and hand them to the ladies, and for the ladies to give ribbons to the gentlemen. On this occasion both the bouquets and the ribbons were made of pure white silk. At the end of the room was a fountain perfumed with *eau de cologne*, and as each couple waltzed past it, the bouquet and band were held for a moment in the spray, and were instantly turned an exquisite blue, green, red, or violet color, and if a like color fell to the same couple, it was looked upon as a good omen. The way this was accomplished was by sprinkling the smallest possible quantity of the powdered aniline pigments on the flowers and ribbons, and as soon as the powders came in contact with the alcohol of the perfumed fountain, they were instantly diffused through the material and dyed it like a charm.

5. Formation of nitric acid by the combustion of hydrogen in the air.

By the analysis of air in Ure's eudiometer, after the explosion of the hydrogen and oxygen, it is always found that some of the nitrogen becomes oxidized. The same phenomenon can be shown in the experiment of forming water by the combustion of hydrogen in contact with oxygen, if it be performed in a large balloon (10 liters capacity) from which the atmospheric air is not wholly excluded. Red fumes of nitrous acid will sometimes appear, and the water collected from the bottom of the vessel reddens litmus paper, and if it be neutralized with ammonia, evaporated crystals of nitrate of ammonia can be readily detected.

6. Liquid cyanogen.

Cyanogen gas can be readily liquefied at 68° Fah., and only four atmospheres of pressure are necessary to condense it; and at 32° Fah. no more than one and a half atmospheres. At about zero, Fahrenheit, cyanogen gas is liquid at the ordinary pressure of the atmosphere, and at the freezing point of mercury it also becomes solid. Professor Hofmann has found that the liquefaction can be accomplished as readily as sulphurous acid, and without the necessity of a Geissler tube. An ordinary combustion tube, bent like a bow, closed at one end, and provided with a well-fitting brass stop-cock luted on with sealing wax, can be used as a condenser. After this is filled with gas it is only necessary to place it in a freezing mixture of ice and salt, to which a little chloride of calcium has been added, to condense the gas to a liquid. On opening the stop-cock the gas rushes out with a hissing sound at first, but escapes more gradually after a few moments, on account of the intense cold produced by the sudden change from liquid to gas. The tube becomes covered with snow from the condensed moisture produced by this cold. When the flow of gas becomes gradual it can be ignited to exhibit the peach-blossom color produced by its combustion. Other experiments, such as are commonly shown with sulphurous acid, can be repeated with the liquid cyanogen. The liquid cyanogen can be preserved unchanged for weeks. By burning a jet of the gas before the slit of a spectroscope, the magnificent spectrum which it produces can be readily shown.

7. Alternate reduction and oxidation.

A neat way to show this experiment is to take a copper bell and place it on a triangle over a gas blast where it can be suddenly heated. The surface of the metal soon becomes oxidized and turns black. If now a funnel, connected by an india-rubber tube with a hydrogon apparatus and filled with that gas, be lowered over the bell, the thin film of oxide will rapidly disappear, and the bell assumes its original brilliant color. By repeating this operation we show all of the effects of oxidation and reduction.

THE "WORM" ON THE AILANTHUS.

The new caterpillar,

"His vile antipathy and scorn,"

concerning which H. E. C. asks, is the ailanthus silkworm, or, in other words, it is the larva of the Cynthia moth (*Samia Cynthia*). This species is a native of northern China and Japan, and was introduced into Europe in, we believe, 1858. It has been there largely experimented on as a silk producer, its special recommendations for that purpose being that it is hardy, and double brooded, and that it feeds on the ailanthus. From a note in the *American Entomologist* of last June, we are led to infer, however, that its cultivation has not proved so advantageous as was anticipated.

The Cynthia was introduced into this country in 1861, and has become naturalized in the neighborhood of several of our large cities. The perfect insect may be readily distinguished from the native species, which most resemble it in form and size, by its coloration. In our Cecropia, Polyphemus, and Promethea moths, brown, russet, and claret shades predominate; in the Cynthia, the light brown or fawn ground is tinged by green, giving it a faint olive cast, and, outside of a white line that crosses the wings, there is a band of a most delicate blush of flesh color.

Measuring, as it does, from four to five inches across the wings, this moth is altogether a beautiful and conspicuous insect, and offers full atonement for its "disgusting" appearance in earlier life.

FAIR OF THE AMERICAN INSTITUTE.

The American public is quite accustomed to pay for what it does not get, and endures such transactions with supreme placidity. Occasionally some high-strung victim of extortion gives a yelp through the newspapers, and having thus "freed his mind," generally subsides into silence and careful watching to avoid being again sold; but the vast majority swallow their chagrin and confine themselves to private profanity, or public prayer that the blessed time may be hastened, when sells shall cease and honesty shall control all pecuniary transactions.

The opening of the fairs of the American Institute, have in times past, been attended with tedious delays in the arrangement of the articles to be exhibited, and the setting up of machinery; very trying, no doubt, to the management and the exhibitors, but still more so to those, who, deluded by the announcement that "The Fair of the American Institute is Now Open," published in the newspapers, hung up on banners across the streets, and placarded on the walls, go thither, only to find things just beginning to emerge from chaos, and still in such confusion as to defeat all the purposes of a public exhibition.

We do not wish to underrate the arduous task devolving upon the management in perfecting all the manifold arrangements for a display of this kind; but it will not do to charge the delay wholly to the exhibitors. A little more backbone is needed in the management to make exhibitors come to time, or in lieu of firmness on their part, they should have the fairness to postpone their opening, and advertise the postponement as thoroughly as they now do the delusive announcement of the opening.

Even with our experience of the way these fairs are conducted, we thought a week's grace would suffice to bring the exhibition up to some approximation to completeness. Having delayed visiting the fair for a week, we found on our arrival at the building that it would be impossible to inspect the machinery, very little of which was in place, and none at all in motion, except one or two scroll-sawing machines.

Our general impression derived from this visit, was that the display of machinery would be unusually meager, and that the department of steam engineering would have very little worth mentioning, to boast of in the present show. It is, perhaps, premature to hazard such an opinion, but future visits will determine this point.

The display of

AGRICULTURAL MACHINERY

is extremely meager. Our summary contains all that was on exhibition, at the time of our visit, worthy of mention, if we except, perhaps, some few things whom nobody seemed to own, and about which we would gain no information. Of

MOWERS AND REAPERS

there are the principal standard machines, well known to the agricultural public.

The Warrior Mower is exhibited by the Warrior Mower Co., of Little Falls, N. Y. This machine runs upon two driving wheels, each furnished with ratchets which impart motion to the axletree or main shaft, thus making of each an independent driving wheel. The driving wheels are eight inches further apart than in most other machines, which allows them to run in the track made for them by the track clearer, and thus avoid running over the cut crop. The gearing is of the kind called planetary, and is entirely encased in an iron shell, which encircles the axletree and keeps out grass and dirt from the cogs and gearing. The frame is so balanced that it brings no weight on the horses' necks, and side draft is obviated, as the finger or guard bar is in front of the machine. The folding of the bar is so contrived as to relieve the horses' necks from weight when the bar is folded for transportation.

The Columbian Junior Mower, is a light machine embracing all the good points of the larger sized machines of the same make, but designed to supply at a moderate price, a mower of small size and of less weight and draft. It is exhibited by the American Agricultural Works, 24th street and 10th avenue, New York.

A fine specimen of the well known Buckeye Mower and Reaper combined, with self-raker, is exhibited by Adriance, Platt & Co., Poughkeepsie, N. Y., who also exhibit a Buckeye Mower.

The Clipper Mower is exhibited by the Clipper Mower and Reaper Co., 154 Chambers street, New York. It is a well made and evidently a good machine.

The Wood's Reaper, and Wood's mowing attachment to reaper, and the Wood's Mower are, as usual, on exhibition. Their merits are too well known to need any description. Exhibited by the Walter A. Wood Mowing and Reaping Machine Co., Hoosick Falls, N. Y.

A machine called the American Mower is exhibited by the Builder's Iron Foundery, Providence, R. I. It looks like a good machine.

The Eureka Mower is exhibited by Wilber's Eureka Mower and Reaper Company, Poughkeepsie, New York. The cutter bar of this machine is directly in front of the body of the machine. It has no side draft, but it necessitates the traveling of one horse in the grass.

The Ames Plow Company, 53 Beekman Street, New York, exhibited the Perry Mower, a strong and compact machine.

All these machines will doubtless find a formidable competitor in a novelty called the Sprague Mower, exhibited by the Sprague Mowing Machine Company, Providence, R. I. For lightness, simplicity of construction, and recognition of all the principles requisite to a good mowing machine this machine ranks in the first class. It is a cheap machine, and embraces many points of practical excellence. The frame is an iron case in which all the gears are placed and entirely covered. The shafting is all held by the frame, and as it is a single piece there can be no warping and springing. The shafting once in line must always be in line, thus securing easy draft throughout the whole life of the machine. Only four bolts are used to hold cover, caps, seat, shafting, gears, and frame. No dust, dirt, or grass can reach the gears, and the driver cannot possibly be injured by them. Almost the entire weight of the machine is carried upon the wheels, giving large driving power in proportion to the whole weight. The machine is one of the lightest in use, weighing only 600 pounds. The lifting apparatus is so made that with the lever only the bar is brought to a perpendicular position and fastened, and with the lever it is unfastened and lowered, and the driver can do this almost instantly without leaving his seat. The gear shifting apparatus is worked by the foot. This is the first season these machines have been put into market, and we are told 325 of them have been sold and put into actual work, giving excellent satisfaction. It will, if we mistake not, prove *the* attraction in this department of the fair. Among

HAY TEDDERS

we notice "Bullard's Improved," exhibited by Duane H. Nash, 29 Cortlandt Street, New York; the "American," exhibited by the Ames Plow Company, 53 Beekman street, New York, and the "National," shown by E. D. and O. B. Reynolds, North Bridgewater, Mass. Among

MISCELLANEOUS ARTICLES

we noticed Seymour's improved grain drill for sowing seeds and distributing fertilizers, intended to sow coarse or fine seeds. The distribution is even and continuous, and performed in full sight of the operator, who can thus assure himself that the work is proceeding properly. Two harvester knife grinders are exhibited, one by Thos. Loring, Blackwoodstown, N. J., and a second by W. H. Field, of Port Chester, N. Y. The latter is the simplest grinder we have seen. It will grind the knives to a sufficiently true bevel, and may be used on any flat-faced stone, whether it runs true or is out of round, and it may be clamped to any common grindstone frame.

Black's hay conveyor is an ingenious device for placing hay, when taken from the load by a horse fork, at any desired place in the mow. It is a self-locking and unlocking pulley traveler, which, when the forkful of hay is raised up to it, unlocks, and carries the hay to the place desired, and when the forkful is dropped it immediately runs back and locks itself fast to raise another forkful. It is exhibited by G. and B. Holmes, of Buffalo, N. Y. The same firm exhibits a dumping wagon of novel construction, which will well repay inspection. It is admirably adapted for farm use, and for trucking in cities, and has many novel peculiarities of construction, which cannot well be described without an engraving.

We shall give more information in regard to the machinery display in subsequent issues, and as soon as the various machines are set up and put in motion.

On Edible Earth.

To the list of the earth-eating people the Javanese must be reckoned; a fact brought to our knowledge by Alexander von Humboldt. From the specimens of which I have had the opportunity of seeing, it is to be inferred that earths of very different external appearance, and of different character, are eaten. One deposit of such edible earth, possessing an intensely red color, exists in the neighborhood of Sura Baja, between strata referable to the time of the latest tertiary.

This earth is formed into thin cakes, having a diameter of from 1 to 1½ inches; it is then dried over an open fire, and in this condition is brought into the market. It is perfectly smooth to the touch, and is composed of materials in the finest state of subdivision. By a chemical analysis, to which I subjected it, after removing the thin stratum of soot, which settled upon it during the process of drying over the fire, I convinced myself that it does not contain the slightest trace of an organic substance. The analysis gives the following result:

Silica	50·63
Alumina	21·32
Iron oxide	10·47
Water	12·97
Lime	2·40
Magnesia	0·33
Potash	1·02
Soda	0·23
	99·37

Of the water, 6·36 per cent was driven off below red heat. The remaining 6·61 per cent disappeared only when the test portion was heated to bright redness. From the analysis it is apparent that the earth consists of a clay rich in iron; in which is still retained small quantities, yet undecomposed, of the minerals from which it derived its origin. In this way the trifling percentage of potassa and soda may be accounted for. Taking away the accessory alkalies, and so much of the silica as they demand, there remains behind a clay containing silica and iron.

Humboldt suggested, that the probable explanation of the earth-eating habit might be found in the desire to fill the stomach, and thus, in a measure, to allay the pangs of hunger. This view of the subject may be satisfactory when applied to those rude people who devour it in great quantity; but it will not apply to the case of the Javanese, who make this use of but trifling quantities. With these, it is much more probable that the physical properties of the earth alone are sufficient to furnish the cause we are seeking.

Upon rubbing it, not the slightest grittiness is perceptible, and on being moistened with water it forms a smooth and unctious mass. The enjoyment derived from eating it seems to reside in the similarity of the sensations it produces, with those derived from the eating of fatty substances. In many parts of Würtemberg the quarrymen have the habit of eating the smooth, unctious clay which collects in the fissures of the rocks. The term "Mondschmalz," which they apply to it, would seem to refer to the enjoyment they experience in the process of eating.—*Prof. C. W. C. Fuchs.*

MILEAGE SYSTEM OF RAILROAD COMMUTATION TICKETS.

Railroad managers have devised many plans for providing commutation tickets to their patrons, the most common of which is to sell tickets for certain stations, good for one, three, or twelve months. For instance, a ticket is bought which entitles the purchaser to ride on any train over the Erie Railroad from New York to Paterson and back for the month of September. The ticket is shown on each trip to the conductor, and at the end of the month the ticket is taken up. If the purchaser has occasion to go back and forth from Paterson every day he gets the full value of his investment. But should he fail to use his ticket (for it is not transferable) the railroad company gets his money, and he realizes no consideration for his investment. Therefore a more equitable system for the traveler is desirable, and this, on many Eastern and Western roads, has been adopted.

The following very good plan is recommended by the Boston *Railway Times*, which says that the recent practice of selling railway mileage tickets necessitates the use of some kind of ticket, so that conductors can ascertain readily how many miles are traveled by the passengers. The best arrangement that we have seen of the kind is one designed by Wm. Mahl, Esq., Auditor of the Louisville, Cincinnati, and Lexington Railway. It is a sheet containing ten columns, or coupons, of figures representing one thousand miles, the first three of which we copy below shows the general arrangement:

200					100									
80	60	40	20	0	80	60	40	20	0	80	60	40	20	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
90	70	50	30	10	90	70	50	30	10	90	70	50	30	10
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9	9	9	9	9	9

The full sheet, folded in convenient sections, with the name of the person holding the ticket and the distances between the different stations, is attached to a neat cover, which can be conveniently carried in the vest pocket. It requires nothing but simple addition to enable the conductor to mark the miles traveled. The right-hand coupon markes the first hundred miles or any intermediate distance, and when over a hundred are traveled the coupon is torn off and the proper figures punched in the next coupon. The figures over the coupons mark the hundreds of miles, and those in the body of the coupons still marking the intermediate distances. Thus, a traveler going 65 miles the conductor punches 5 under 60; then if he goes 20 miles further, 5 under 80 is punched; if 40 miles further, the first coupon is torn off and 5 under 20 is punched on the next coupon; and so on up to any number of miles represented by the coupons.

This is a very neat, ingenious, and convenient device, and just meets the want. The price charged on the Louisville and Lexington road for their tickets is two cents per mile and a passenger who buys one of these mileage tickets pays twenty dollars for his thousand miles of travel, and gets rid of the necessity for frequent making of change, and has the evidence of his right to travel constantly in his pocket, with his name indorsed thereon, and countersigned by the ticket agent; and should he lose his ticket no one else could use it. We think Mr. Mahl's design a very good one, combining simplicity with great convenience.

The Remarkable Gas Wells at Erie, Pa.

The Erie *Republican* says that drilling has been suspended in the gas well of Stearns, Clark & Co., and the work of tubing and seed-bagging were accomplished. Everything being in readiness fires were kindled beneath the boiler, and soon the flames roared and leaped from one end of the furnace to the other. It was found by actual measurement that a ter sufficient gas had been used to generate the requisite amount of steam there still existed a pressure from the well equal to about 100 lbs. to the square inch. Before the match was applied to the pipes the whole pressure was tested by means of a steam gage, and was found to be about 200 lbs. to the square inch. Of course the stars and stripes were run up on the flagstaff which overtops the derrick as soon as the result was known to be a certainty. It is now believed by the proprietors of Presque Isle Iron Works that

that institution has as good a well as any yet struck in the city. The hole is six inches in diameter and descends into the earth 542 feet.

Two hundred pounds pressure to the square inch is equivalent to thirteen atmospheres.

A correspondent writing from Erie, Pa., adds the following:

Our gas wells are still going down with success. We have about a dozen completed, and half as many more being bored.

Every one so far has struck heavy veins of gas.

Private parties are now boring to get fuel and light for their dwellings.

Sulphur in Coal Gas.

Dr. W. Odling, Fullerian Professor of Chemistry at the Royal Institution, in a lecture delivered on the 2d of June, shows most conclusively the sulphur bugbear to be all moonshine. He says:—

"I am altogether at issue with the public when they maintain that the sulphur of gas produces, by its combustion, oil of vitriol, or that the amount of sulphur ordinarily contained in gas is of any consequence whatever, and a little consideration will, I think, satisfy you of the soundness of this position. We will assume that coal gas contains not 20, but 40 grains of sulphur in 100 feet, a quantity at any rate greatly exceeding the reality. Now, making another extravagant assumption, that the whole of these 40 grains of sulphur would be completely burned—and in reality they would be burned very incompletely—they would furnish by their combustion 80 grains of sulphurous acid gas. This quantity of the produced sulphurous acid would occupy, at ordinary temperatures, about $\frac{1}{15}$th part of a cubic foot; and since 100 cubic feet of our coal gas gives $\frac{1}{15}$th of a cubic foot of sulphurous acid, 1,500 feet of coal gas would be required to furnish one cubic foot of the acid, even upon the extravagant assumption we have purposely made. But the combustion of 1,500 feet of coal gas would produce something besides sulphurous acids It would produce at least 1,000 cubic feet of carbonic acid, and, in addition to its dilution with other gases and vapors, we should have our sulphurous acid diluted by 1,000 times its volume of carbonic acid. Now, if we can get at the proportion of carbonic acid in the atmosphere of a room highly illuminated with gas, and take the thousandth part of that proportion, we shall be able to form some notion of the amount of sulphurous acid present. You will remember that the amount of carbonic acid furnished by the breath of one individual is equal to that furnished by two 3-feet gas-burners, and that the maximum amount of carbonic found in the atmosphere of a crowded theater was 0·32 per cent. Now, if in addition to our previous unreasonable suppositions, we further suppose that an atmosphere contains 0·2 per cent of carbonic acid furnished by gas combustion, you will see that the whole matter becomes a *reductio ad absurdum*—that we might actually have one half-millionth part of sulphurous acid present in the air of a gas-lighted room.

The Hottest Summer for a Century.

The Hartford *Courant* says that, according to the weather records of Yale College, the past has been the hottest summer for ninety-two years. That is as far back as the Yale record enlightens us, and no centenarian who was running around barefooted during the summer of the eight previous years remembers anything hotter; we may, therefore, safely call this the hottest summer for a century. From July 10 to August 15, 1870, the mean daily temperature was, at New Haven, 85 degrees; and no season, at least since 1778, has shown so many consecutive hot days. Our highest temperature this summer was (July 17) noted at 98 degrees, and this has been exceeded only four times during the period above indicated; at New Haven the thermometer rising to 100 degrees one day each year in 1784, 1800, and 1845. In 1798 it reached 101.

Portable Cider Mills and Presses.

We are informed by dealers that never before this fall was there such a wide demand for machines of this class as now. This not only indicates that there is an unusually large apple crop this year, but it may suggest to inventors that there is still room for competition in this extensive field. There is no good reason why hand cider mills should not be as common among farmers as churns.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

"Edge Keys" for Making and Polishing the Edges of Boot and Shoe Soles.—George C. Todd, Lynn, Mass., has petitioned for the extension of the above patent. Day of hearing Nov. 9, 1870.

Railroad Car Seats and Couches.—Theodore T. Woodruff, Philadelphia, Pa., has applied for an extension of the above patent. Day of hearing Nov. 16, 1870.

Railroad Car Seats and Couches.—Theodore T. Woodruff, Philadelphia, Pa., has applied for an extension of the above patent. Day of hearing Nov. 16, 1870.

Method of Clamping Cutters in Cutter Heads for Planing Machines.—Jonathan P. Grosvenor, Lowell, Mass., has petitioned for an extension of the above patent. Day of hearing Nov. 16, 1870.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,211.—Steam Generator.—N. H. Barbour, New York city. August 9, 1870.

2,248.—Generating Gas from Petroleum.—A. I. Ambler, Washington, D. C. Aug. 12, 1870.

2,258.—Machinery for Compressing Air.—C. Burleigh, Fitchburg, Mass. August 12, 1870.

2,274.—Nut-locking Washer.—W. H. Van Cleve, Ypsilanti, Mich. Aug. 1870.

2,286.—Cartridge.—F. D. Draper, Boston, Mass. August 18, 1870.

2,294.—Device for Lubricating and Excluding Dust from Journals.—E. Von Jeinsen and J. M. McDonald, San Francisco, Cal. August 19, 1870.

Business and Personal.

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

J. R., of Leipzig, Germany.—If you have sent me the Scientific American, I pray you urgently to send me a more distinct sign of your existence, by writing personally to your—Betty.

NEW BOOKS AND PUBLICATIONS.

Railway Manual of the Railroads of North America for 1870-71.

This work, compiled by James H. Lyles, has just been issued by Messrs. Lindsay, Walton & Co., No. 56 John street, this city. It contains a list of all the railroads of the country, showing their financial condition, mileage cost, earnings, expenses, and organization. The statistics are obtained from returns furnished by the Companies, and are valuable to those who are immediately interested in the development and progress of our railway system.

Answers to Correspondents.

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

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

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

D. R. V., of Vt.—To extract honey from the comb, cut the combs in a horizontal direction into small pieces and place them in a sieve over an earthen jar. Draining may take two or three days, but the greatest portion and the best quality will be drained off in a few hours When all that can be got by draining is obtained, the combs may be pressed by the hand, but the honey so obtained will be inferior both in quality and color, as a portion of bee bread would be pressed through the sieve. To get honey of the finest quality strain the combs from the outside of the hives by themselves, keeping the first drainings separate, as the combs from the center of the hives are usually darker colored, and the honey not so good. They should be put to drain in a warm place near a fire. The remainining combs can be made into wax.

L. P. D., of Tenn.—The most common impurities in nitric acid are sulphuric acid and chlorine. You can purify the acid by distilling it with nitrate of potassa. Let the vapors pass into a cool receiver, and test the condensed acid for chlorine till no trace of chlorine or sulphuric acid appears; then collect for use till only a small quantity remains in the retort. Test for chlorine with nitrate of silver, and for sulphuric acid with nitrate of baryta, first diluting with water. When these substances cause no turbidity the acid is pure enough for chemical purposes.

C. M. G., of Iowa.—To spread gums or cereous substances over leather and cloth for plasters it is usual to employ what is called a plaster spatula. This instrument is a hollow metal box having one side flat and smooth like a sad iron, and in its interior is placed a heated piece of iron; or it may be heated with gas, a flexible tube being employed to convey the gas to a small burner in the box. The instrument has a metallic rod extending from one end provided with a wooden handle by which the manipulation is performed. In large manufactories there are machines which do this kind of work.

R. T. V., of Ky.—The solvents of amber are, besides various hydrocarbons, alcohol, ether, and linseed oil. The latter is the solvent used in making amber varnish. Amber is but difficultly soluble in alcohol and ether. In dissolving it with linseed oil it is usual to accelerate the process by heat. Amber burns like other gum resins.

L. S., of N. H.—Bay rum is made by distilling alcohol with the leaves of the bayberry tree—*Myrcia acris*—not the leaves of the bay tree—*Laurus nobilis*—as you suppose. The bayberry tree is a native of Jamaica and other West India islands.

E. P. N., of Fla.—The following is a recipe for cleaning brass: Rub some bichromate of potassa fine, pour over it about twice the bulk of sulphuric acid, and mix this with an equal quantity of water. Don't apply it with your fingers. The dirtiest brass is cleaned in a trice. Wash immediately in plenty of water, wipe it, rub perfectly dry, and polish with powdered rotten stone.—The expense of binding Scientific American is $1·50 each volume.

W. H., of La.—Polishing horn is done in large establishments by buffing with sand and oil and finishing with rotten stone and oil. Trent sand—so called from the name of a small river where it is obtained—is used in the Sheffield, England, factories. It is a very fine and sharp sand, and is prepared for use by calcining and sifting. Similar sand is found in the beds of many American rivers.

J. W. H., of N. Y.—Your solution of Problem 1, page 71, current volume, employs a pitman, not allowed by the conditions. Your solution of Problem 2 will not work without a fly wheel on the driven shaft to carry it over the dead point, and fly wheels are prohibited.

Mrs. L. C., of ——.—Soluble glass will cement broken glass so that it will hold cold water. Hot water will be apt to open the joint. Use it of the consistence of varnish, and warm it, as well as the parts to be joined, as much as can be done without cracking. Let stand some days before using. Use as small a quantity as possible to cover the edges to be joined.

T. D. F., of Mich.—The ghost-like beams of electric light dancing among clouds is a manifestation of northern lights often observed. The apparent nearness was undoubtedly the result of reflection.

H. F., of Ind., wishes results of experience in the use of electric apparatus with platina points for the prevention of scale in steam boilers.

T. B., of Ohio., wants a recipe for a good marking ink, black or blue, especially adapted to marking show cards and paper packages. The common inks in use for this purpose do not satisfy his requirements.

L. G., of Mass.—The accepted horse power of the present day is a power that will raise 33,000 lbs. one foot in one minute.

D. J. B., of D. C., wants to know how he can fasten emery to cast iron for polishing or cutting purposes.

J. H., of N. Y., wishes to know the process employed by manufacturers of gold watch cases in giving them their final finish. Can any of our correspondents give this information?

J. R., of Va.—According to Knapp nicotine may be extracted from tobacco, without injuring the structure of the leaf, by passing slowly through it during the process of curing the vapor of ammonia.

J. W. H., of Iowa.—The mineral you send is a species of slate. Its presence is not a certain indication of coal.

R. G., of La.—Frequent melting improves rather than injures glue. The deterioration in the adhesive quality of the glue you describe could not have arisen from this cause.

Recent American and Foreign Patents.

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

Stone Adz.—William Covart, Claytonville, Kansas.—This invention relates to improvements in tools for cutting and dressing stone, and consists in a broad tool with a smooth or continuous cutting edge at one end, with lips at each side for cutting the "draft," and with a notched edge, at the other end, for "pointing off," the said edges being in a plane perpendicular to the handle, which is applied at the center.

Sawing Machine.—J. T. Baggs, Bridgeport, Ohio.—This invention relates to improvements in sawing machines, and it consists in so hanging the saw for cutting wide grooves, making rabbets, and the like, as that it will wabble, by means of collars, with the outer ends curved, on radii extending to the center of the saw, and with holes widening on two sides, from the inner ends outward, to admit of adjusting the said collars obliquely on the mandrel.

STEAM ENGINE.—William Inglis, Bolton, and John F. Spencer, London, England.—The first part of this invention relates to the adaptation of separate cylindrical valves for steam and exhaust, to the compound, or high and low pressure system of steam engines. The second part relates to mechanism for working and liberating the steam valves, or for working any steam valve where separate steam and exhaust ports are used, and the steam valves liberated, and the closing action or cut-off effected by springs or their equivalents.

ATTACHING TELEGRAPH INSULATORS.—J. B. Stearns, Boston, Mass.—This invention relates to improvements in attaching the glass insulators for telegraph wires to their supports, whereby it is designed to provide a means of accomplishing the same more readily than can be done by screwing them on as is now done. It consists in providing the inner walls of the holes in the insulators with right-angled grooves, and the sticks or supports with pieces to engage the same, in the manner of bayonet fastenings, or the grooves may be on the sticks and the pins in the insulators.

AUTOMATIC ELECTRO-MAGNETIC INDICATOR.—James P. Snyder, Brooklyn, N. Y.—This invention relates to improvements in magnetic apparatus for sounding alarms in buildings when windows or doors are opened by burglars, for unlawfully entering them, and consists in an improved arrangement of apparatus for setting a secondary current in action by means of the current first set in action by the movement of the door or window, which secondary current, cannot be broken again, except by the person in charge, so that the burglar, having once set the alarm in action, cannot stop it, to prevent exposure thereby.

MACHINE FOR DECORTICATING AND DRYING GRAIN.—Evan Skelly, Plaquemine, La.—This invention relates to improvements in machinery for decorticating and drying grain, and consists mainly in an arrangement within a hollow cylinder, of another hollow cylinder having a corrugated spiral flange for rubbing the grain, within which interior cylinder is another spiral rubbing screw or propeller, to which the grain is conveyed, and by which it is acted upon, while either steam or hot or cold air is admitted through the axle or shaft of the propeller, the operation being performed on batches of grain admitted through the outer cylinder, and retained as long as required, according to the nature of the grain.

MARKING ATTACHMENT FOR CORN PLANTERS.—Eli Sawyer, Madison, Iowa.—This invention relates to improvements in corn planters, and consists in the application to the frame of one or two arms, projecting laterally therefrom, the distance required for the width of the rows, capable of oscillation, and provided with levers for turning them, to the outer ends of which markers are so hinged that they will work up and down freely, as required by the uneven ground, and so that the arms, being turned by the hand levers, the markers will be raised above the ground, and be supported when not required to be in action.

MACHINE FOR MAKING SHOE STAYS.—Stephen N. Smith, Providence, R. I.—This invention relates to improvements in machines for making shoe stays, and consists in a combination with a cupping punch and die and a spring-holding presser, of a new mechanism arranged to make alternate long and short movements, the long one being to feed the sheet-metal strips the distance that the eyelets of the stays are designed to be apart, from center to center, and the short movement being to feed the strips only a sufficient distance from the eyelet of one stay to the eyelet of another to provide the necessary metal from which to form the eyelets and cut them out without undue waste, which occurs when the feed is arranged as heretofore for all the feed movements to be the same, and equal to the distance between the centers of the two eyelets of the stay.

HARROW.—James Dingman, Decatur, Ill.—The object of this invention is to provide for the use of agriculturists a cheap and convenient flexible harrow, either side or end, of which, can be raised independently of the rest of the instrument, for the purpose of cleaning the teeth, avoiding obstacles, etc.

TOBACCO PLUG WRAPPER.—Randall D. Hay, Crooked Creek, N. C.—This invention consists of a paper wrapper for tobacco plugs to take the place of the leaf which forms the exterior of all plugs now manufactured.

APPARATUS FOR MOLDING PLASTER CORNICES.—Smith Ferris, New York city.—This invention has for its object to furnish an improved apparatus for forming plaster cornices, which shall be so constructed as to enable the cornice to be finished with the mold around an internal or external angle or corner with the same accuracy as when the cornice is being formed along a straight wall.

COFFIN HANDLES.—Alonzo B. Bailey, Cobalt, Conn.—This invention has for its object to furnish an improved coffin handle, simpler in construction, cheaper in manufacture, and equally as strong as the handles manufactured in the ordinary manner.

SCREW FASTENER FOR PIANO PINS.—Charles M. Lindsay, Forreston, Ill.—This invention has for its object to prevent the pins to which the ends of the strings of pianos or other stringed musical instruments are fastened, and by turning which the springs are tightened, from turning backward under the strain to which they are subject when the strings are taut.

CLOTHES DRYER.—Andrew Scheff, Raymondville, N. Y.—This invention has for its object to furnish an improved clothes dryer, designed more especially for airing clothes after they have been ironed, but which may also be used with advantage for drying clothes after they have been washed.

CARPET-RAG CUTTER.—William Eberhard, Akron, Ohio.—This invention relates to a new machine for cutting rags, paper, leather, and other suitable fabric, into strips of suitable width. The invention is more particularly applicable to cut rags which are to be used for rag carpets.

MARINE STEAM BOILER.—Thomas Rimmer, South Braintree, Mass.—This invention has for its object to so construct steam boilers that the same may be surrounded by cold water, which is constantly supplied fresh, for the purpose of preventing the heat from being radiated from the surfaces of the boiler. The invention consists therefore chiefly in surrounding the boiler with a continuous chamber through which water can be constantly passed. The invention consists also in the arrangement of devices for passing the water into and ejecting it from the said surrounding space.

WASHING MACHINE.—A. L. D. Moore, Lagrange, Texas.—The object of this invention is to furnish an efficient and durable machine for washing clothes and wringing them.

ADJUSTABLE FRUIT LADDER.—S. Wright, Hillsborough, Mo.—This invention relates to improvements in fruit, and step-ladders generally, and consists in so constructing and arranging the brace or swinging support that the ladder may more readily adapt itself to rough or uneven ground, and be more available in shops or stores where boxes or other articles are placed upon the floor near the wall than the ladders at present in use.

MARKING POT.—William H. Green, New York city.—This invention relates to a new and useful improvement in pots or vessels for containing paint or liquid for marking boxes, bales of goods, and for all of the purposes for which marking pots are used.

PLOWS.—A. A. Dailey, Wilson, N. Y.—This invention has for its object to improve the construction of plows so as to make them more convenient in use and more effective in operation.

ANIMAL TRAP.—J. H. Richardson, Westport, Mo.—This invention has for its object to furnish an improved trap for catching game and other animals, and which shall be reliable and effective in operation and at the same time self-setting.

TABLE.—G. H. Henkel, Hartford, Ind.—This invention relates to new and useful improvements in dining and breakfast tables, whereby they are made much more convenient and useful than they have hitherto been, and it consists in the mode of extending or enlarging the table, and also in the manner of supporting the falling leaves of the table.

IMPROVED PLANTER AND CULTIVATOR.—Nathan Earlywine, Centreville, Iowa.—This invention has for its object to furnish an improved machine simple in construction and effective in operation, and which may be readily adjusted for use as a corn planter or cultivator, as may be desired, doing its work well in either capacity.

PLOW PLANTER AND CULTIVATOR.—Elijah Bourne, New Iberia, La.—This invention has for its object to furnish an improved machine which shall be so constructed and arranged that it may be readily adjusted for use for preparing the ground, planting the seed, and cultivating the crop, and which shall be convenient in use and effective in operation in either capacity.

MACHINE FOR SPREADING AND TURNING HAY.—M. B. Harvey, Stafford, Conn.—This invention relates to a mechanism designed to follow a mowing machine or a man mower for the purpose of spreading the hay left by the latter lying in swaths on the ground, and also to turn hay that has been lying in masses and is partially dried, so as to expose fresh surfaces to the sun.

EARTH PULVERIZER.—J. W. Pence, Clayton, Ohio.—The object of this invention is to furnish to the farming community a machine for pulverizing the soil which shall be durable in its construction and perfect in its operation, and it consists in a series of adjustable rotary cutters supported from a properly constructed frame mounted on wheels.

SOFA.—Julius Cicsor, Davenport, Iowa.—This invention relates to a new and useful improvement in sofas or lounges whereby they are adapted to purposes other than those for which sofas and lounges are ordinarily used, and it consists in forming a writing cabinet or desk and drawers in one or both of the ends of the sofa so that the same may be secured and concealed from view when not in use.

COMBINED AWNING AND FAN.—H. L. Bird, Baltimore, Md.—This invention consists of an awning constructed in any suitable manner and in any desired shape, in combination with three or more rods, each of which is jointed at one extremity to the awning, one at each side, and the third at one end of the same, which rods are designed to pass through sockets attached to a horse's bridle, and thus support the awning above the horse's head, and in combination with a flap that is suspended from a cross-bar of the awning, and swings as the horse travels, serving as a fan and fly brush.

CARRIAGE IRONS.—S. P. Graham, Columbus, Ohio.—This invention consists of a double-reach for carriages made of U-shaped strips of iron or steel in two parts, one narrower than the other, which parts may be joined in either of two ways, that is to say, the narrower parts may be placed within the wider one with the edges of the outer strip, leaving an inclosed space between the tops of the inner and outer parts and a groove in the under side of the reach, or the narrower strips may be inverted and placed outside the wider one, the edges of the latter resting on the bottom of the former, so as to leave an inclosed space larger than in the former case between the top of one strip and the bottom of the other, which spaces may be filled with wood.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING Sept. 13, 1870.

Reported Officially for the Scientific American

SCHEDULE OF PATENT OFFICE FEES

On each caveat	$10
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In addition to which there are some small revenue-stamp taxes. Residents of Canada and Nova Scotia pay $500 on application.

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107,209.—TAPER HOLDER.—H. B. Adams, New York city. Antedated September 3, 1870.
107,210.—BLIND FASTENER.—Franklin Babcock and Frederick Babcock, Middletown, Conn.
107,211.—SAWING MACHINE.—J. T. Baggs, Bridgeport, Ohio.
107,212.—COFFIN HANDLE.—A. B. Bailey, Cobalt, Conn.
107,213.—SPRING BED BOTTOM.—H. D. W. Bailey, Sterling, Ill.
107,214.—HARVESTER.—Moses Bales and W. P. Bales, London, Ohio.
107,215.—EXTENSION TABLE.—Melvin Bancroft (assignor to G. F. Richardson & Co.), Montague, Mass.
107,216.—MACHINE FOR MAKING FLANGED AND BEADED HOOPS.—Joel Blood, Watertown, N. Y.
107,217.—REFRIGERATING CAR.—Alfred Booth, Chicago, Ill.
107,218.—PLOW, PLANTER, AND CULTIVATOR.—Elijah Bourne, New Iberia, La.
107,219.—MUSIC STAND.—L. V. Brown, Salisbury, N. C.
107,220.—SHUTTLE FOR LOOM.—Hugo Carstaedt, New York city.
107,221.—MOTIVE POWER.—J. M. Cayce, Franklin, Tenn.
107,222.—MACHINE FOR TENONING WINDOW SASH.—F. G. Chapman (assignor to Dennis Beach), Chicago, Ill.
107,223.—HANDLE FOR TABLE AND OTHER CUTLERY.—Matthew Chapman, Greenfield, Mass.
107,224.—SOFA.—Julius Cicsor, Davenport, Iowa.
107,225.—ADJUSTABLE LIFTING LADDER.—George Claflin, Miller's Corners, N. Y.
107,226.—ICE VELOCIPEDE.—Mark Coffin, Milton, Ky.
107,227.—STONE ADZ.—William Covart, Claytonville, Kansas.
107,228.—PLOW.—A. A. Dailey, Wilson, N. Y.
107,229.—POTATO DIGGER.—Cook Darling, Utica, N. Y.
107,230.—KNITTING MACHINE.—Owen Davis, New Lebanon, Ind.
107,231.—LADIES' BOOT.—E. F. Doty, Ravenna, Ohio.
107,232.—ROOFING COMPOUND.—J. V. Douglas (assignor to himself and J. A. Craig), Philadelphia, Pa.
107,233.—TRACTION ENGINE.—W. C. Douthett, Chicago, Ill. Antedated September 1, 1870.
107,234.—GAS BURNER.—A. E. Dupas, New Orleans, La.
107,235.—PLANTER AND CULTIVATOR.—Nathan Earlywine, Centerville, Iowa.
107,236.—CARPET BAG CUTTER.—William Eberhard (assignor to himself and J. P. Alexander), Akron, Ohio.
107,237.—MOUNTED HORSE POWER.—M. B. Erskine, Racine, Wis.
107,238.—ELASTIC NASAL PLUG.—J. J. Essex, Newport, R. I.
107,239.—SELF-REGISTERING WEIGHING SCALES.—Henry Fairbanks, St. Johnsbury, Vt.
107,240.—RECORDING WEIGHING SCALES.—Henry Fairbanks, St. Johnsbury, Vt.
107,241.—DEVICE FOR MOLDING PLASTER CORNICES.—Smith Ferris, New York city.
107,242.—HAND PUNCH.—O. C. Ford, Burlington, assignor to himself and N. C. Stiles, Middletown, Conn.
107,243.—PISTON PACKING.—W. J. Ford, Chicago, Ill.
107,244.—MANNER OF TREATING COD-LIVER AND CASTOR OILS.—G. W. Fox, Manchester, Great Britain.
107,245.—BRACKET SHELF.—I. H. Frost, Bristol, Conn.
107,246.—GALLEY REST.—H. H. Gale, Eugene City, Oregon.
107,247.—CLAMP.—Francis Glasser, Mystic Bridge, Conn.
107,248.—BIAS CUTTER.—J. H. Goodfellow, Troy, N. Y.
107,249.—APPARATUS FOR MOVING BUILDINGS.—M. N. Gordon, Foster's Crossing, assignor to himself and J. S. Gordon, Cincinnati, Ohio.
107,250.—MARKING POT.—W. H. Green (assignor to himself and F. McH. Kitching), New York city.
107,251.—PERMUTATION LOCK.—Martial Hainque (assignor to himself and Alexander Stieger), San Francisco, Cal.
107,252.—CARRIAGE.—G. W. Ham, Parsonfield, Me.
107,253.—LID FASTENING FOR BURIAL CASKET.—William Hamilton, Allegheny City, Pa
107,254.—GATE.—J. H. Harnly (assignor to himself and E. L. Spickler), Penn Township, Pa.
107,255.—MULTIPLE TOOL.—H. J. Harris, Shreveport, La.
107,256.—HORSE HAY RAKE.—George Hauck, Mechanicsburg, Pa.
107,257.—REVOLVING TABLE.—W. H. Henderson and W. S. Jones, Thaxton's Switch, Va.
107,258.—TABLE.—G. H. Henkel, Hartford City, Ind.
107,259.—MACHINE FOR HUSKING CORN.—Joel Hood, Milwaukee, Wis.
107,260.—STOVE PIPE BAND AND SHELF.—Reuben Hoover Vernon Center, Minn.
107,261.—BED BOTTOM.—Darlington Hoskins, Philadelphia, Pa.
107,262.—APPARATUS FOR CARBURETING AIR AND GAS.—J. B. Hyde, New York city.
107,263.—BLOW PIPE.—J. B. Hyde, New York city.
107,264.—TRAP ATTACHMENT FOR GAS FIXTURES.—J. B. Hyde, New York city.
107,265.—STEAM ENGINE.—William Inglis, Bolton, and J. F. Spencer, London, England.
107,266.—MOLD FOR DRYING CIGAR FILLINGS.—S. B. Jerome (assignor to Samuel Peck & Co.), New Haven, Conn.
107,267.—WASHING MACHINE.—Powell Johnson, Des Moines, Iowa.
107,268.—CARBURETING APPARATUS.—M. W. Kidder, Lowell, Mass.
107,269.—HARROW.—Andrew Lewis, Hastings, Minn.
107,270.—SAW DRESSING MACHINE.—John Mallory, Penn Yan, N. Y.
107,271.—IRONING TABLE.—J. F. Martin and W. A. Schaffner, Harrisburg, Pa.
107,272.—SPRING WEIGHING SCALES.—J. V. Mathevit, Cleveland, Ohio.
107,273.—REVERSIBLE CENTER PINION FOR WATCHES.—J. V. Mathevit, Cleveland, Ohio.
107,274.—PISTON PACKING.—Franklin McConnell, Dowagiac Mich.
107,275.—TIGHT AND LOOSE PULLEY.—J. G. McCormick Louisville, Ky.
107,276.—LAMP.—Francis McDaniels, Philadelphia, Pa., assignor to Charles D. Macqueen.
107,277.—LAMP.—R. S. Merrill (assignor to himself, Joshua Merrill, and W. C. Merrill), Boston, Mass.
107,278.—LAMP.—R. S. Merrill (assignor to himself, Joshua Merrill, and W. B. Merrill), Boston, Mass.
107,279.—LAMP BRACKET.—R. S. Merrill (assignor to himself, Joshua Merrill, and W. B. Merrill), Boston, Mass.
107,280.—CORN PLANTER.—Solomon Mickley, York, assignor to himself and Samuel Leathery, Rossville, Pa.
107,281.—SASH HOLDER.—A. D. Millard, Canton, Ohio.
107,282.—CHIMNEY CAP.—B. F. Miller and J. G. Miller, New York city.
107,283.—WASHING MACHINE.—A. L. D. Moore, La Grange Texas.
107,284.—CHURN.—John Moyers, Hillsborough, Ohio.
107,285.—CUTTING OR LAP BOARD.—Norman O'Donnell, Cincinnati, Ohio.
107,286.—REGISTERING WEIGHING SCALES.—H. Paddock (assignor to himself and F. Fairbanks), St. Johnsbury, Vt.
107,387.—EARTH PULVERIZER.—John W. Pence, Clayton Ohio.
107,288.—THREAD SPOOL.—C. V. Pettibone, Fond du Lac Wis.
107,289.—SHOE.—Joel Putnam, Danvers, Mass.
107,290.—SEAMING THE ENDS OF METALLIC ROOFING PLATES—G. A. Reynolds, Rochester, N. Y.
107,291.—LATHE CHUCK.—John Rich, Painesville, Ohio.
107,292.—ANIMAL TRAP.—James H. Richardson, Westport, Mo.
107,293.—MARINE STEAM BOILER.—Thos. Rimmer, South Braintree, Mass.
107,294.—MARKING ATTACHMENT TO CORN PLANTER.—Eli Sawyer, Madison, Iowa.
107,295.—CLOTHES DRYER.—Andrew Scheff, Raymondville, N. Y.
107,296.—MOWING MACHINE.—H. F. Shaw, West Roxbury Mass.
107,297.—FENCE.—Phineas L. Sherman, Geneseo township, Iowa.
107,298.—COLTER.—H. M. Skinner, Rockford, Ill.
107,299.—LAMP WICK.—P. J. Skinner, Oswego, N. Y.
107,300.—SHOE-STAY STOCK AND MACHINES FOR MAKING THE SAME.—S. N. Smith (assignor to the Union Eyelet Company), Providence R. I.
107,301.—AUTOMATIC CIRCUIT CLOSER FOR ELECTRO-MAGNETIC BURGLAR ALARM.—J. P. Snyder, Brooklyn, N. Y.
107,302.—CORN PLANTER.—Peter Soule, Windsor, N. Y.
107,303.—ATTACHING INSULATOR TO TELEGRAPH POLE.—J. B. Stearnes, Boston, Mass.
107,304.—WRENCH.—D. C. Stillson, Charlestown, Mass.
107,305.—MACHINE FOR BENDING RAKE TEETH.—Jas. Sugden, Pittsburgh, Pa.
107,306.—CHURN.—J. G. Talbot, Sloansville, N. Y.
107,307.—CIGAR MACHINE.—Isaac Ten Eyck and John O. Reilley, New York city; said Reilley assigns his right to said Ten Eyck.
107,308.—SAFETY VALVE.—Nicholas Thomas, Chicago, Ill.
107,309.—HORSE-POWER APPARATUS.—E. O. Thompson, and C. B. Thompson, Thomasville, Ga.
107,310.—BOOK HOLDER.—W. J. Thorn, Westbrook, Me.
107,311.—FLOUR AND GRIST MILL.—A. J. Vandegrift, Covington, Ky.
107,312.—DEVICE FOR CATCHING AND HOLDING HOGS.—Frederick Voss, John P. Hax, and Henry Krug, St. Joseph, Mo.
107,313.—MECHANISM FOR OPERATING THE PICKERS OF LOOMS—E. A. Wareham and W. H. Waggoner, Kirkville, Iowa.
107,314.—SNOW SHOVEL.—Wm. P. Wentworth, Seneca Falls, N. Y.
107,315.—CHEESE HOOP.—Samuel Wilson, Watertown, N. Y
107,316.—REED ORGAN.—George Woods, Cambridgeport Mass.
107,317.—PLATFORM SCALES.—Henry Wood, Manchester England.
107,318.—CONSTRUCTION OF CYLINDERS OF KNITTING MACHINES.—C. H. Young, Lake Village, N. H.
107,319.—KINDLING WOOD.—Merritt T. Arnold, Summit, R.I.
107,320.—PAPER-FEEDING APPARATUS.—J. T. Ashley, Brooklyn, E. D., N. Y.
107,321.—POTATO AND FRUIT PEELER—M. B. Atkinson (assignor to himself and J. H. Welch), Georgetown, D. C.
107,322.—REFINING IRON AND STEEL.—J. E. Atwood, Pittsburgh, Pa.
107,323.—SIDING FOR BUILDINGS.—Clarke Avery, San Francisco, Cal.
107,324.—PROCESS OF OBTAINING GLYCERIN FROM SOAP MAKERS' SPENT LYES.—B. T. Babbitt, New York city.
107,325.—BRACELET.—W.H. Ball and Thos. Barnard, Newark N. J.
107,326.—STEERING APPARATUS FOR TORPEDO BOATS, ETC.—J. A. Ballard, Bombay, India.
107,327.—POTATO DIGGER.—Leander Berry, Clyde, N. Y.
107,328.—VINE PULLER FOR POTATO DIGGERS, ETC.—Leander Berry, Clyde, N. Y.
107,329.—MACHINE FOR EMBOSSING CAPSULES.—Wm. Betts No. 1. Wharf Road, City Road, England.
107,330.—CAR STARTER.—John Bevan, Hudson, N. Y.
107,331.—POWER METER.—J. A. Bradshaw, W. H. Brown and Darius Whithead, Lowell, Mass.
107,332.—BUTTONHOLE CUTTER.—T. C. Bush, New Haven Conn.
107,333.—AWNING AND FAN FOR HORSES' HEADS.—H.L.Byrd Baltimore, Md.
107,334.—WIRE CUTTER.—Frank Carew, South Hadley Falls Mass.
107,335.—DRAFT HARNESS.—George Chamberlin, Olean N. Y.
107,336.—BROOM OR MOP CLAMP.—Eugene Chapman, Lacon Ill.
107,337.—ROTARY HARROW.—George Collins, Fremont, Nebraska.
107,338.—GRAIN SEPARATOR.—Hezekiah Cook, Dillsburgh, Pa.
107,339.—CHARRING BARREL HEADS.—J. D. Copenhaver, Martinsburg, W. Va.

107,340.—PADDLE WHEEL.—Matthew A. Crooker, New York city.
107,341.—WATER REGULATOR.—G. W. Darby and A. S. Moon, Blanchester, Ohio.
107,342.—TRANSPOSING MECHANISM FOR ORGAN.—W. G. Day, Baltimore, Md.
107,343.—SPOOL SHOW CASE.—Ira Dimock, Florence, Mass.
107,344.—HARROW.—James Dingman, Decatur, Ill.
107,345.—SLED.—C. H. Douglas, Hartford, Conn.
107,346.—SAW TABLE.—C. H. Douglas, Hartford, Conn.
107,347.—COMBINED FURNACE AND RANGE.—Eben Edward, South Boston, assignor to himself and Ebenezer Sanborn, Boston, Mass.
107,348.—SPRING BED BOTTOM.—A. H. Fatzinger, New York city.
107,349.—MACHINE FOR HULLING COTTON SEED.—W. R. Fee, Cincinnati, Ohio.
107,350.—LOCKING BOLT.—Henry Feyh, New York city.
107,351.—SHEET-METAL CUTTING MACHINE.—S. B. Fitch, Walton, N. Y.
107,352.—WOOD PAVEMENT. — Maurice Fitzgibbons, New York city.
107,353.—GRINDING MILL.—Joseph A. Forsman, Chicago, Ill.
107,354.—SHUTTLE FASTENER.—Albert L. France, Wilmington, Del.
107,355.—THRASHING MACHINE.—Matthias Fuos, Castroville, Texas.
107,356.—TUBULAR GRATE.—Benjamin Garvin and R. J. Pettibone, Oshkosh, Wis.
107,357.—CORN CULTIVATOR.—Wm. Gilman, Ottawa, Ill.
107,358.—EARTH CLOSET.—Henry John Girdlestone and John Ward Girdlestone, London, England, assignors to the Earth Closet Co., Hartford, Conn.
107,359.—COMBINED CULTIVATOR AND GRAIN DRILL.—John Gire, Simpton, Ill.
107,360.—CARRIAGE.—Simon P. Graham, Columbus, Ohio.
107,361.—HARNESS PAD.—G. W. Graves, Chicago, Ill.
107,362.—SPITTOON HOLDER.—Chauncey O. Haley, Westfield, Mass.
107,363.—TRIP MOTION FOR PRESSES, ETC.—Albert Hamlin (assignor to Mays & Bliss), Brooklyn, N. Y. Antedated September 5, 1870.
107,364.—MEAT CUTTER. — Thomas Hartley, Bridgeport, Conn.
107,365.—HAY TEDDER.—Moses B. Harvey (assignor to himself and H. F. Cook), Stafford, Conn.
107,366.—LAMP AND LANTERN.—William Harvie, Glasgow, North Britain.
107,367.—PRESERVING MEAT.—F. H. Hatch, New Orleans, La., and B. R. Hawley, Normal, Ill.
107,368.—PROCESS FOR MANUFACTURING TOBACCO PLUGS.—R. D. Hay, Crooked Creek, N. C.
107,369.—MACHINE FOR FASTENING SOLES.—C. H. Helms, Poughkeepsie, N. Y.
107,370.—SEAL FOR METAL STRAPS ON BOXES.—J. P. Herron, Atlanta, Ga.
107,371.—COTTON AND HAY PRESS.—J. P. Herron, Atlanta, Ga.
107,372.—WINDMILL.—James O. Heyworth, Chicago, Ill.
107,373.—
107,374.—UMBRELLA FRAME.—A. S. Hubbell, Providence, R. I.
107,375.—IRRIGATING MACHINE.—William W. Hull, Ashland, N. Y.
107,376.—PROPELLER.—Robert Hunter, New York city.
107,377.—Suspended.
107,378.—COMBINED CORN HUSKER AND SHELLER AND GRAIN THRASHER AND CLEANER.—James W. Huntoon, Washington, D. C.
107,379.—HORSE-POWER.—James W. Huntoon, Montgomery, Ala.
107,380.—GAS METER.—H. J. Hyams, Pittsburgh, Pa.
107,381.—KNITTING MACHINE.—George Johnstone, Philadelphia, Pa.
107,382.—ROOFING COMPOSITION.—W. H. Jones (assignor to himself and D. G. Brumback), Newport, Ky.
107,383.—SPRING MATTRESS.—W. B. Judson, Poughkeepsie, N. Y.
107,384.—PROPELLING APPARATUS.—Richard Kearney, Havre De Grace, Newfoundland.
107,385.—DEVICE FOR FOLDING AND IRONING SHOE-UPPER EDGES.—C. A. Keith, Danvers, Jeremiah Keith, Charlton, and T. K. Keith, Lynn, Mass.
107,386.—BUGGY SPRING.—G. W. Kenan, Upper Sandusky, Ohio.
107,387.—COATING FOR STEAM PIPES, BOILERS, ETC.—W. T. Kosinski, Philadelphia, Pa.
107,388.—PAPERING MACHINE.—George M. Lane, De Graff, Ohio.
107,389.—HAT AND CAP BRACKET.—T. Lawrence (assignor for one half to Romeo Lawrence), Peoria, Ill. Antedated September 3, 1870.
107,390.—WASHING MACHINE.—Reuben Lighthall, Brooklyn, N. Y.
107,391.—SCREW CLAMP FOR PIANO PINS.—C. M. Lindsay, Forreston, Ill.
107,392.—OUTRIGGER FOR ROWBOAT.—A. J. Luffbarry, Jr., Philadelphia, Pa.
107,393.—DITCHER AND GRADER.—John H. Martin and C. D. Bradshaw, Danville, Ill.
107,394.—COOKING STOVE.—Jas. H. McConnell, Beaver Falls, Pa.
107,395.—PROVISION SAFE.—Wait Mead and G. E. Starbuck, Chestertown, N. Y.
107,396.—ROTATING FAN AND FLY-BRUSH.—Oliver Metcalf, Orleans, Ind.
107,397.—SCRUBBING BRUSH.—Damian Minderle, St. Louis, Mo.
107,398.—DEVICE FOR SECURING COVERS UPON SEWING MACHINES.—John H. Mooney, San Francisco, Cal.
107,399.—MACHINE FOR MAKING PAPER COLLARS.—Chas. E. Moore, Boston, and M. L. Wyman, Melrose, Mass.
107,400.—CORN PLOW.—F. G. Mourning, Bascow, Ill.
107,401.—LOCK FOR SEWING MACHINE CASE.—H. O. Nauen, New York city.
107,402.—CORN PLANTER.—H. A. Nicholls (assignor to A. B. Pearson), St. Louis, Mo.
107,403.—APPARATUS FOR CARBURETING AIR.—Henry Oertel, Memphis, Tenn.
107,404.—THILL COUPLING.—Justin H. Ormsby, Dixon, Ill.
107,405.—ICE PRESERVER.—James E. Pilkington, Baltimore, Md.
107,406.—VALVE IN STEAM APPARATUS FOR DRESSING STONE.—Leon Pochet, Vendome, Loir et Cher, France.
107,407.—SAP BUCKET.—C. C. Post, Hinesburg, Vt.
107,408.—JOURNAL BOX FOR RAILWAY CARS.—A. L. Raplee, Edwin, assignor to Carrie R. Laman, Painted Post, N. Y.
107,409.—DOUBLE-SHOVEL PLOW.—S. G. Rayl, Agency City, Iowa.
107,410.—CORN SHELLER.—G. W. Reisinger (assignor to W. A. Middleton), Harrisburgh, Pa.
107,411.—HORSE HAY RAKE.—Macedon J. Robinson, Ashley, Ill.
107,412.—OPERATING THE PICKER STAFF OF LOOMS.—W. Rouse, Taunton, Mass.
107,413.—MORTISING MACHINE.—D. S. Shearer, Waupan, Wis.
107,414.—COMBINATION AND REGISTER PADLOCK.—Henry S. Shepardson, Shelburne Falls, Mass.
107,415.—COMPOUND MACHINE FOR SHEARING, PUNCHING, UPSETTING, AND BENDING METAL.—Wright Sleeper, Coaticooke, Canada.
107,416.—CULTIVATOR. — George H. Smith, Des Moines, Iowa.
107,417.—DRYER.—M. P. Smith, Baltimore, Md.
107,418.—CUPBOARD LATCH.—W. E. Sparks (assignor to Sargent & Co.), New Haven, Conn.
107,419.—SPOON.—G. H. Spencer (assignor to himself and J. B. Glenn), Cleveland, Ohio.
107,420.—FINGER GUARD.—G. H. Spencer (assignor to himself and J. B. Glenn), Cleveland, Ohio.
107,421.—CHIMNEY.—A. J. Sprague, Springfield, Mo.
107,422.—LOCK FOR BAGS, ETC.—Bernard Steinmetz, Paris, France.
107,423.—CURD AGITATOR.—B. G. Swain, Colden, N. Y.
107,424.—CIDER MILL.—Lewis R. Taylor, Clark township, Ind.
107,425.—WRENCH.—Henry Tregellas, Calumet, Mich.
107,426.—WATER ELEVATOR.—Bernard Vater, New York city.
107,427.—METHOD OF GRAFTING.—D. S. Wagener, Pultney, N. Y. Antedated Sept. 3, 1870.
107,428.—COATING EMBOSSED WOOD.—S. P. Wheeler, Bridgeport, Conn. Antedated Sept. 5, 1870.
107,429.—SHINGLE MACHINE.—O. T. Williams, Smithland, Ky.
107,430.—WASHING MACHINE FOR WASTE, ETC.—Wm. F. Witte, Whitemarsh, assignor to Charles Robbins, Philadelphia, Pa.
107,431.—WASHING MACHINE.—J. B. Woolsey, Bloomfield, Iowa.
107,432.—MECHANICAL MOVEMENT.—Daniel Zeigler, Lewistown, Pa.

REISSUES.

4,117.—BALANCE SLIDE VALVE.—T. M. Herriott and Samuel Myers, South Pittsburgh, Pa.—Patent No. 84,378, dated November 24, 1868.
4,118.—CROQUET TABLE.—H. R. Heyl, Philadelphia, Pa.—Patent No. 104,151, dated June 14, 1870; antedated May 30, 1870.
4,119.—PLOW.—James Vandegrift, Princeton, Ill.—Patent No. 69,867, dated Oct. 15, 1867.
4,120.—TOY VELOCIPEDE.—N. S. Warner, Bridgeport, Conn.—Patent No. 94,676, dated Sept. 7, 1869.
4,121.—BOAT FOR TRANSPORTING RAILROAD CARS.—Jesse Wheelock, Lancaster, N. Y.—Patent No. 22,739 dated Jan. 25, 1859.
4,122.—MACHINE FOR ROLLING LEATHER.—Joel Whitney, Winchester, Mass.—Patent No. 37,991, dated March 24, 1863.
4,123.—MOTIVE POWER FOR SEWING AND OTHER MACHINES.—Jacob Zuckermann, San Francisco, Cal.—Patent No. 87,020, dated Feb. 16, 1869.

DESIGNS.

4,346.—COMBINED TOP PLATE, COMBUSTION AND AIR CHAMBER OF A VAPOR GENERATOR AND BURNER.—Joshua Comly, Philadelphia, Pa.
4,347.—STOVE PLATE.—G. W. Eddy, Waterford, N. Y.
4,348.—HANDLE OF SPOON, FORK, ETC.—C. D. Hall (assignor to the "Bristol Brass and Clock Co.), Bristol, Conn.
4,349.—COAL AND WOOD COOKING STOVE.—Conrad Harris and P. W. Zoiner, Cincinnati, Ohio.
4,350 to 4,352 —BOX FOR THE TOP OF BUREAUS.—Cheney Kilburn (assignor to Kilburn & Gates), Philadelphia, Pa. Three Patents.
4,353.—BREAST SLIDE FOR HARNESS.—H. W. Minnemeyer, Allegheny City, Pa.
4,354.—TRACE CARRIER FOR HARNESS.—Samuel Reynolds, Allegheny City, Pa.
4,355.—CLAMP FOR TRUNK CORNER.—Thomas L. Rivers, Newark, N. J.
4,356.—HAT.—Isaac B. Wentworth, New York city.

SCIENTIFIC AMERICAN

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Krupp's 1,000-Pounder Siege Gun.

We give herewith an illustration of the 1,000-pounder Prussian gun from a photograph in our possession. This leviathan breech-loading gun is manufactured in the mammoth establishment of Frederick Krupp, at Essen, in Prussia, and is intended for the arming of coast defenses against the attacks of iron-clad vessels. It consists of an inner tube upon which are shrunk cast-steel rings. The inner tube forms the important part of the gun, and weighs, when finished, twenty tuns. The cast-steel rings are shrunk on the central tube, forming a three-fold layer at the powder chamber and at the muzzle portion a two-fold layer. The rings are manufactured from massive ingots without welding, and when in a completed state weigh thirty tuns.

The shot or shell is raised by block and fall, and is rolled into the side of the breech through an aperture that is closed by a slide. The system of breech-loading is Krupp's patent arrangement.

The total weight of the gun is	50 tuns.
Preponderance	1,500 lbs.
Diameter of bore	14 in.
Total length of gun	17·5 ft.
Number of rifle grooves	40.
Depth of the rifling	0·15 in.
Pitch of the rifling	980 in. and 1014·4 in.
Weight of the solid shot	1,212 lbs.
Weight of the shell	1,080 lbs.

N. B.—The weight of the shell is made up as follows:

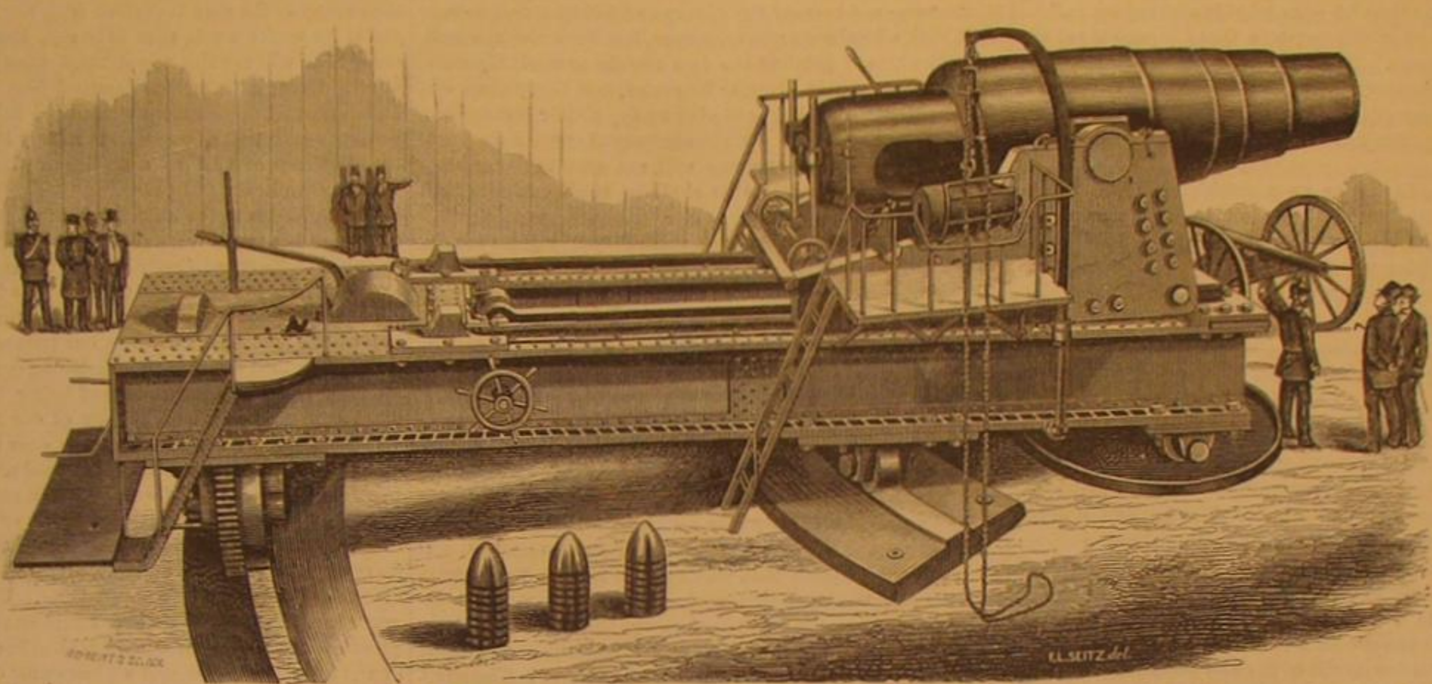
The cast-steel shell	843 lbs.
The lead jacket	220 lbs.
Bursting charge	17 lbs.
	1,080 lbs.

The charge of powder weighs from.....110 lbs. to 130 lbs.

For the transportation of this gun a railway car had to be specially constructed. It is made entirely of iron and steel, rests upon twelve wheels, and weighs twenty-four tuns.

When mounted, the gun rests upon a *steel* carriage weighing fifteen tuns, and the whole is supported upon a turn-table weighing twenty-five tuns. The gun carriage slides smoothly upon the turntable to the check at the back stays at each discharge of the piece. Such is the construction of the mechanism necessary for working the gun that one or two men can quickly and easily elevate, depress, or turn it, to follow and cover a passing iron-clad with expedition and accuracy. Gun, gun-carriage, and turntable give a total weight of ninety tuns.

It is supposed that a single shot from this gun would burst in the side of any iron-clad now afloat, while a few shells thrown from it would make terrible havoc in a large city. Some of the daily papers which have announced that Prussia is without suitable siege guns make a great mistake. No nation is better provided. Herr Krupp's establishment is fully six times larger than the largest works for a like purpose belonging to any government. It covers more than two hundred acres actually under roof, and gives employment to more than twelve thousand men. Last year thousands of tuns of breech-loading cannons of all calibers, from the 1,000-pounders down to 4-pounders, were on hand finished in the works at Essen. It would seem that Prussia is fully prepared for any emergency.



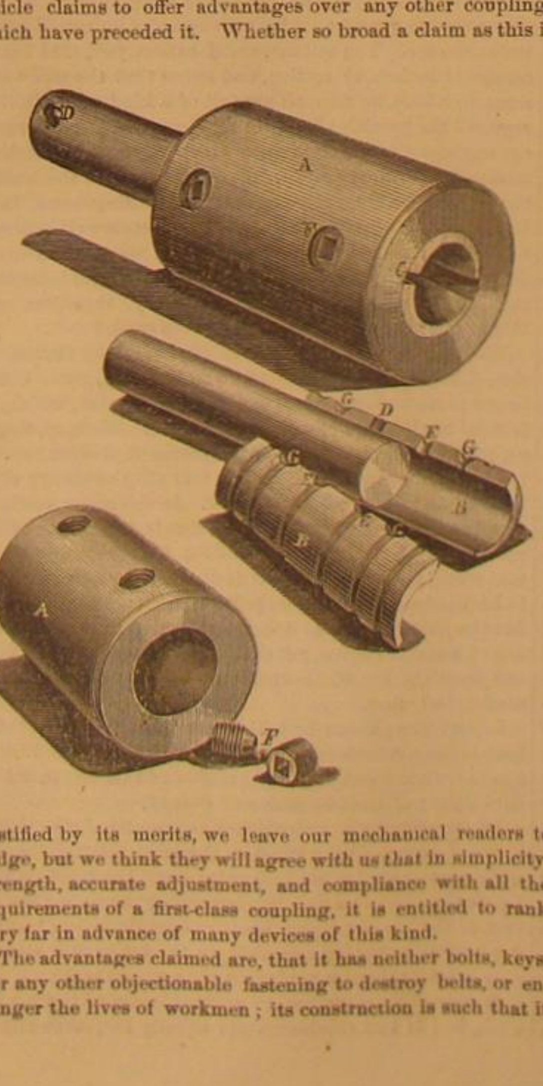
KRUPP'S ONE THOUSAND-POUNDER SIEGE GUN.

Great Circle "Travel."

It is not known by everybody, says George M. Steele, in *Old and New*, though perhaps most people have been told of it several times, that for all purposes of navigation Puget Sound is nearer the great Asiatic marts than is San Francisco. Even if the vessels going out from the Golden Gate took their course direct for Hong Kong or Shanghai, they would, by reason of the longer degrees of latitude farther south, scarcely have less sailing than by bending round more to the north. But in point of fact the prevailing winds and ocean currents of the Pacific are such that vessels from Asia find their most eligible route bringing them within fifty miles of the entrance to Puget Sound; thus making by the Northern Pacific, when completed, a saving of nearly a thousand miles of ocean navigation. This, added to the diminution of distance in the journey overland, gives us a route from our Eastern cities to the coast of Asia shorter than any other by about fifteen hundred miles. When this road shall be in successful operation the time required to reach the Pacific coast by means of it from New York city will not exceed about four days, allowing an average rate of movement of thirty miles an hour. Thence to Shanghai, in China, the voyage will occupy eighteen to nineteen days, at the mean rate of twelve miles an hour; making twenty-two to twenty-three days in all from New York—a less time than is now occupied in making the voyage by the way of the Isthmus to San Francisco.

SHORTT'S SELF-CENTERING SLEEVE COUPLING.

The shaft coupling which forms the subject of the present article claims to offer advantages over any other couplings which have preceded it. Whether so broad a claim as this is justified by its merits, we leave our mechanical readers to judge, but we think they will agree with us that in simplicity, strength, accurate adjustment, and compliance with all the requirements of a first-class coupling, it is entitled to rank very far in advance of many devices of this kind.



The advantages claimed are, that it has neither bolts, keys, nor any other objectionable fastening to destroy belts, or endanger the lives of workmen; its construction is such that it can be put up or taken down in less than one minute; its property of self-compression is positive in direct strain or backlash. It is claimed with a coupling of this pattern, weighing 10¼ pounds, a one inch and a half wrought-iron shaft, of the best manufacture, may be twisted into a broken mass of fibers, similar in appearance to the untwisted strand of a wire cable; and, after exposure to such immense strain, this coupling can be removed as easily as when first put on, and will be found as perfect, in every respect.

It is also self-centering, bringing the ends of the shafts and the pulley coupling to a common center, when the wedging screws are turned down as will be seen upon perusal of the description and inspection of the accompanying engraving.

A is a solid ring or drum of metal bored eccentrically, so that when concentric pieces of metal, B, which are thinner at one edge than at the other, are placed therein and adjusted, as shown at C, they exactly connect the eccentricity of the hole in A. The ends of the shafts to be coupled are provided with pins inserted, as shown at D. These pins, when the shafts are coupled, rest in segments of holes, E, in the concentrics, B, made to fit the pins. These pins serve as guides to the adjustment of the concentrics, which are placed over the ends of the sections of shafting, so as to bring the pins into the recesses, E. The ring or drum, A, is then slipped over all and turned so as to bring the screws, F, over the conical-shaped recesses, G. These screws have conical points which, when they are screwed down into the recesses, G, force the recessed edges of the concentrics, B, asunder, so that the latter act as wedges to grip and compress the ends of the sections in a very powerful manner. The screw holes are countersunk so as to bring the heads of the screws below the surface, when they are screwed home, and the heads of the screws have formed in them square recesses, to receive a suitable key or wrench for turning them.

The outside of the concentrics have formed therein grooves, as shown, to hold tallow or grease, to prevent their rusting fast.

Patented, through the Scientific American Patent Agency, Sept. 28, 1869, by E. G. Shortt. For further information address Grant Coupling Co., Carthage, N. Y., or Fuller, Dana & Fitz, 110 North street, Boston, Mass.

A Chicago Perpetual Motion.

A recent number of the Chicago *Times* contains a description, three columns long, of a perpetual motion machine which is said to be now, and for the past seven months has been running in that enterprising city. A Mr. Wickham, Jr., is the inventor of this marvel of science, and the *Times*, which is otherwise very eulogistic of him and his discovery, speaks of him personally as a "*petite*, long-haired young man, who is a trifle shaky in general knowledge, but is as sound as the pyramids in the matter of inventive faculty."

The machine is described as mounted on a marble slab. It consists of a hollow walking beam containing balls filled with mercury.

"The rocking lever or beam of Mr. Wickham's device looks quite like the walking beam of an ordinary steamer. The latter, however, are always shaped after the form of an elongated diamond, while the upper arm of this new lever is quite straight, the lever being bent at sharp angles three or four times. The balls which are placed inside are only partially filled with mercury. This mineral has the peculiar quality of losing its centre of gravity quicker even than water, and, like water, is ever seeking its own level.

"The balls, once set in motion, roll down the interior of the hollow beam in a vain search after a permanent level, for no sooner do they reach the lower end than the mercury in the spokes of the main wheel overcomes their weight, the beam is forced up, and the balls are again impelled in their onward rush, only to be caught by the valve that is forced open from without, and pushed into the upper arm of the beam or lever, ready to be hustled along upon their never-ending route.

"A delicately adjusted weight and an ingeniously worked brake are attached to the machine, and serve to regulate its nicety of motion and speed, but it is in the hollow spokes and beams, and the untiring balls of quicksilver that the mysterious power lies."

"Of course," says the *Times*, "there are shrewd and scientific people without number who, from even the meager description afforded, will be enabled to sit down at once and by the most conclusive of reasoning show that the device is a failure, and that it cannot work. But they will have to concede one point, and that is, that it *does* work.

"For seven long months has that little beam moved steadily up and down, and the main wheel has ground out its fifty regular revolutions a minute, and the minor cogs have been driven faster still, and the tiny brake has controlled the motions of the whole, the diminutive "governor" regulating all.

"The most astute logic under heaven cannot prove that two and two are not four, and all the reasoning upon the face of the earth cannot do away with the fact that Mr. Wickham's invention has thus far done what is claimed for it."

No one has ever been able to prove that Chicago is *not* the center of the universe. Therefore Chicago *is* the center of the universe, and further discussion of the subject is unnecessary. This is a very popular style of reasoning, and is invariably adopted by the advocates of perpetual motions and other delusions.

To set a machine in motion on a marble slab, and to conceal the motive power from the spectator's eye, is a very easy and common trick of mechanical legerdemain. This is the substance of the Chicago wonder. It is too old a dodge to pay as an exhibition, though perhaps a few simple-minded persons will be duped.

BRONZE VS. STEEL AND IRON FOR FIELD ARTILLERY.

Were no portions of our daily newspapers preserved save the correspondence columns, they in themselves would furnish no contemptible data to a future historian from which to compile the records of a by-gone age. The fact of the existing war has set every one talking or writing about cannon, breech-loaders, and other devices of science for slaying the largest possible number of men in the shortest possible time. At present there is a tolerably vigorous controversy being carried on through the medium of the *Times* and other newspapers as to the relative merits of the new metal, made by Sir Joseph Whitworth for cannon, and the alloy of brass known as bronze for the same purpose. It is of course well known that for military purposes in India it is necessary to have a class of light field piece that combines as high a destructive force as possible with the least possible dead weight. Naturally the design of such a weapon involves the consideration of the following points: First, the adoption of a metal that shall possess the highest attainable coefficient of tenacity, and secondly the description of rifling that will insure at once the longest range, the highest velocity, and the greatest amount of accuracy of flight for the projectile it sends forth on the errand of destruction. *Cæteris paribus*, the gun that can burn most powder will send its shot the farthest. Two considerations affect this point; the one lies in the tenacity of the metal of the gun itself and also its durability; the other is the question of the supposed necessity that a certain proportion must be observed between the actual dead weight of the gun and that of the charge fired from it. The advocates of the use of bronze bring forward as one argument that there is no use in making a gun of a metal possessing a high coefficient of tenacity if you must make the gun so heavy as to enable it to burn sufficient powder to hurl its projectile with maximum effect.

Another point addressing the attention of the artillerist is that of expense. If two metals present themselves as suitable in an equal degree in all respects except the single one of their behavior in the foundery, clearly that metal which gives the smallest number of wasters is the metal to use. Again, as our great guns as well as our small arms are highly finished scientific weapons and no longer mere overgrown gas mains, it is expedient that they should be as durable as possible. In fact, to sum up the theoretical qualities of perfect cannon metal it should be tough, hard, and unlikely to turn out any wasters in the process of casting. Now it is well known that bronze or any metal of a brassy nature is exceedingly difficult to cast so as to insure success, and this class of metal gives, of all others, the largest number of wasters in the foundery. Such is not the case with steel; certainly it is within the memory of most of our readers when steel could only be cast in small quantities. This is altered now, and owing to the large share of attention bestowed on its manufacture steel has become one of the easiest dealt with of metals so long as the necessary conditions are attended to. There can be no question, whatever advocates of bronze may advance to the contrary, that steel is the metal to employ in the formation of cannon, because it contains in a higher degree than bronze the qualities we have already enumerated for the purpose. If we analyze the arguments advanced by the advocates of bronze we find them speedily dwindle to very small proportions. Say these gentlemen: There is no use to have a stronger metal than bronze, because a 9-pounder must be a certain dead weight to give the best results, and as we must have the gun so heavy, it is no use to have a metal of greater tenacity. Arguing in this way they simply ignore the value of a gun more durable because it is of a metal not alone tougher but also harder. They, in order to have their gun a certain weight, adhere to a metal that costs much more both in time and wasters for the sake of this one supposed advantage. Of all weapons a rifled gun needs to be hard in the bore, because, as rifling is the application of a highly scientific principle, it requires that the bore should preserve its peculiar characteristics as long uninjured as possible. A rifled cannon in its way represents features of as great nicety of operation as the link motion of a locomotive. What, then, would be thought of the engineer, who, in order to make his locomotive heavier to get more adhesion, would make all the link motion of bronze instead of steel? or, to put the comparison in another way, who would propose to bush the rods in the links and eccentric rods with bronze instead of with hard steel? Not only has the bore of a gun to withstand the blow of exploding gunpowder, but it has likewise to sustain the rubbing and attrition of the shot moving rapidly along it.

We hear a good deal about the superior trajectory, greater range, etc., of the bronze gun in India, but what peculiar virtue does bronze possess to furnish such advantages? If any of the forms of steel possessed so little value, why was any effort ever made to bush cast-iron guns with it? Yet many attempts of this kind were tried, and the leading causes of failure were not because the theory of bushing a tough outer shell with a hard core was erroneous, but from the mechanical difficulties of getting the two metals to work together. Granting this theory, then, to be sound, is it likely than eminent artillerists are going to give up the matter because of a defect of construction? On the contrary they then reason, if a hard metal and a tough one will not work together, then why not seek for a metal that shall in itself combine both qualities.

Bronze is incapable of being hardened to any great extent, it does not possess remarkable toughness, it is uncertain in the molds. Steel, on the other hand, if dealt with in a proper manner, possesses none of these defects, and we confess we fail to see why it should be put aside on such puerile reasoning as that which says that bronze is strong enough for the required purpose. Might not the question be asked why should it be difficult to desire means to enable a gun of given weight to fire a larger charge of powder than is now asserted to be the most effectual?

So late as six or seven years ago it was considered more than doubtful if a 400-pounder could be ever safely worked on board ship. Now we have much larger guns afloat. If we could accomplish this, why can we not as well devise such a gun-carriage as will, without being heavy, yet so oppose the recoil of the piece as to secure that the gun will be able to give the full effect of the largest charge of powder it can burn without bursting to the shot it delivers? The advocates of bronze overlook the fact that whereas their favorite metal is one of the oldest and in its applicability perhaps the best investigated of all the cannon metals, steel in its various qualities is as yet one of the least so; and if, up to the present, we have got good results from it, what may we not hope from it in the future?—*Mechanics' Magazine*.

THE DISSIPATION OF ENERGY.

BY STEWART in "Nature."

At this point we can imagine some champion of perpetual motion coming forward and proposing conditions of truce. "I acknowledge," he will say, "that perpetual motion, as you have defined it, is quite impossible, for no machine can *create* energy, but yet I do not see from your own stand-point that a machine might not be constructed that would produce work for ever. You tell me, and I believe you, that heat is a species of molecular motion, and hence that the walls of the room in which we now sit are full of a kind of invisible energy, all the particles being in rapid motion." Now, may we not suppose a machine to exist which converts the molecular motion into ordinary work, drawing first of all the heat from the walls, then from the adjacent air; cooling down, in fact, the surrounding universe, and transforming the energy of heat so abstracted into good substantial work? There is no doubt work can be converted into heat—as, for instance, by the blow of a hammer on an anvil—why, therefore, cannot this heat be converted back again into work?

We reply by quoting the laws discovered by Carnot, Clausius, Thomson, and Rankine, who have all, from different points of view, been led to the same conclusion, which, alas! is fatal to all hopes of perpetual motion. We may, they tell us, with the greatest ease convert mechanical work into heat, but we cannot by any means convert all the energy of heat back again into mechanical work. In the steam engine we do what can be done in this way; but it is a very small proportion of the whole energy of heat that is there converted into work, for a large portion is dissipated, and will continue to be dissipated, however perfect our engine may become. Let the greatest care be taken in the construction and working of a steam engine, yet shall we not succeed in converting one fourth of the whole energy of the heat of the coals into mechanical effect.

In fact, the process by which work can be converted into heat is not a completely reversible process, and Sir W. Thomson has worked out the consequences of this fact in his beautiful theory of the dissipation of energy.

As far as human convenience is concerned, the different kinds of energy do not stand on the same footing, for we can make great use of a head of water, or of the wind, or of mechanical motion of any kind, but we can make no use whatever of the energy represented by equally diffused heat. If one body is hotter than another, as the boiler of a steam engine is hotter than its condenser, then we can make use of this difference of temperature to convert some of the heat into work, but if two substances are equally hot, even although their particles contain an enormous amount of molecular energy, they will not yield us a single foot-pound of work.

Energy is thus of different *qualities*, mechanical energy being the best, and universal heat the worst; in fact, this latter description of energy may be likened to the dreary waste heap of the universe, in which the effete forms of energy are suffered to accumulate, and, alas! this desolate waste heap is always continuing to increase. But before attempting to discuss the probable effect of this process of deterioration upon the present system of things, let us look around us and endeavor to estimate the various sources of energy that have been placed at our disposal.

To begin with our own frames, we all of us possess a certain amount of energy in our systems, a certain capacity for doing work. By an effort of his muscles the blacksmith imparts a formidable velocity to the massive hammer which he wields: now, what is consumed in order to produce this? We reply, the tissues of his body are consumed. If he continues working for a long time he will wear out these tissues and nature will call for food and rest: for the former in order to procure the materials out of which new and energetic tissues may be constructed; for the latter, in order to furnish time and leisure for repairing the waste. Ultimately, therefore, the energy of the man is derived from the food which he eats, and if he works much, that is to say, spends a great deal of energy, he will require to eat more than if he hardly works at all. Hence it is well understood that the diet of a man sentenced to imprisonment with hard labor must be more generous than that of one who is merely imprisoned, and that the allowance of food to a soldier in time of war must be greater than in time of peace.

In fact, food is to the animal what fuel is to the engine, only an animal is a much more economical producer of work than an engine. Rumford justly observed that we shall get more work out of a tun of hay if we give it as food to a horse than if we burn it as fuel in an engine. It is in truth the combustion of our food that furnishes our frames with energy, and there is no food capable of nourishing our bodies which, if well dried, is not also capable of being burned in the fire. Having thus traced the energy of our frames to the food which we eat, we next ask whence does this food derive its energy. If we are vegetarians we need not trouble ourselves to go further back, but if we have eaten animal food and have transferred part of the energy of an ox or of a sheep into our own systems, we ask whence has the ox or the sheep derived its energy, and answer undoubtedly, from the food which it consumes, this food being a vegetable. Ultimately, then, we are led to look to the vegetable kingdom as the source of that great energy which our frames possess in common with those of the inferior animals, and we have now only to go back one more step and ask whence vegetables derive the energy which they possess.

In answering this question, let us endeavor to ascertain what really takes place in the leaves of vegetables. A leaf is, in fact, a laboratory in which the active agent is the sun's rays. A certain species of the solar ray enters this laboratory and immediately commences to decompose carbonic acid into its constituents, oxygen and carbon; allowing the oxygen to escape into the air, while the carbon is, in some shape, worked up and assimilated. First of all, then, in this wondrous laboratory of Nature, we have a quantity of carbonic acid drawn in from the air; this is the raw material. Next, we have the source of energy, the active agent; this is light. Thirdly, we have the useful product; that is, the assimilated carbon. Fourthly, we have the product dismissed into the air, and that is oxygen

We thus perceive that the action which takes place in a leaf is the very reverse of that which takes place in an ordinary fire. In a fire, we burn carbon, and make it unite with oxygen in order to form carbonic acid, and in so doing we change the energy of position derived from the separation of two substances having so great an attraction for each other, as oxygen and carbon, into the energy of heat. In a leaf, on the other hand, these two strongly attractive substances are forced asunder, the powerful agent which accomplishes this being the sun's rays, so that it is the energy of these rays which is transformed into the potential energy, or energy of position represented by the chemical separation of this oxygen and carbon. The carbon, or rather the woody fiber into which the carbon enters, is thus a source of potential energy, and when made to combine again with oxygen, either by direct combustion or otherwise, it will in the process give out a deal of energy. When we burn wood in our fires we convert this energy into heat, and when we eat vegetables we assimilate this energy into our systems, where it ultimately produces both heat and work. We are thus enabled to trace the energy of the sun's rays through every step of this most wonderful process, first of all building up vegetable food, in the next place feeding the ox or sheep, and lastly through the shape of the very prosaic but essential joint of beef or mutton entering into and sustaining these frames of ours.

We are not, however, quite done yet with vegetable fiber, for that part of it which does not enter into our frames may, notwithstanding, serve as fuel for our engines, and by this means be converted into useful work. And has not Nature, as if anticipating the wants of our age, provided an almost limitless store of such fuel in the vast deposits of coal, by means of which so large a portion of the useful work of the world is done? In geological ages this coal was the fiber of a species of plant, and it has been stored up as if for the benefit of generations like the present.

But there are other products of the sun's rays besides food and fuel. The miller who makes use of water power or of wind power to grind his corn, the navigator who spreads his sail to catch the breeze, are indebted to our luminary equally with the man who eats meat or who drives an engine. For it is owing to the sun's rays that water is carried up into the atmosphere to be again precipitated so as to form what is called a head of water, and it is also owing to the sun's heat that winds agitate the air. With the trivial exception of tidal energy all the work done in the world is due to the sun, so that we must look to our luminary as the great source of all our energy.

Intimately linked as we are to the sun, it is natural to ask the question, Will the sun last forever, or will he also die out? There is no apparent reason why the sun should form an exception to the fate of all fires, the only difference being one of size and time. It is larger and hotter, and will last longer than the lamp of an hour, but it is nevertheless a lamp. The principle of degradation would appear to hold throughout, and if we regard not mere matter but useful energy, we are driven to contemplate the death of the universe.

ON THE APPLICATION OF THE HOT BLAST TO BLOW-PIPE PURPOSES.

BY W. SKEY.

The useful and well known effects of the hot blast in the process of iron smelting has induced me to try and extend it profitably to other purposes beyond that which prompted its application in the present instance.

My experiments, as yet, have been confined to testing the effects of substituting a hot blast for a cold one, as hitherto used, for the production of the well known blow-pipe flame; a flame so produced will be expected to have its thermal and illuminating effects augmented, but scarcely, perhaps, to that degree which experiment has demonstrated.

I had better state, at the outset, those particulars which it is necessary to know before relating the results.

The temperature of the blast was, approximately, 500° Fah.; the diameter of the jet, regulating its issue, was one-thirtieth of an inch; the combustible for receiving the blast was stearine.

This flame manifested a very marked superiority over the common blow-pipe flame; substances difficult to fuse in the latter, magnetite, potash-felspar, mica, readily yielded under these circumstances; while thick glass tubes, half an inch in diameter, and hard German glass tubes were tractable to an eminent degree.

Carrying my test experiments still further I found several substances for the fusion of which the oxyhydrogen flame or some equivalent of it in heating power is said to be indispensable, also yielded before the blow-pipe flame thus urged; for instance, platinum, pipe clay, fire clay, agate, opal, flint.

Several samples of each were tried, and always with the same results; it could not well be, therefore, that the fusibility of any of these substances was due to the accidental presence of foreign matter in more than usual quantity.

The platinum was the common platinum foil, also a sample prepared especially for the purpose; the only impurity found in it was iron, as traces, communicated to it in the act of forging; possibly minute quantities of some of the other metals of the platinum series might be present, but they would rather tend to increase its infusibility than otherwise.

Alumina only appeared to vitrify, while, after numerous trials with crystallized quartz, I could not succeed in fusing it to a globule; thin splinters, however, curled round upon themselves, like scolezite, and ultimately assumed a glazed appearance, clearly showing that the melting point was all but reached.

It appears from this that a very small amount of some foreign substances exercises a marked effect upon the fusibility of silica, agate, opal, etc., being only a little less pure than rock crystal, though so readily fusible in this flame.

Regarding the illuminating power of the flame so produced, when allowed to impinge upon a solid substance, such as lime or magnesia, it was not only more intense (as would be expected) but the volume of incandescent matter was largely increased.

Before I proceed to urge the further use of hot air for combustions where high temperatures are necessary I wish to call attention to the fact that the temperature of the flame which I have hitherto worked with can be largely and economically increased by increasing that of the blast; this can easily be done to a three-fold extent.

By substituting heated hydrogen (or burnt coal gas), I have also realized all the effects just instanced with greater rapidity and decision: but the greater diffusiveness of this gas, especially when heated, has prevented me, as yet, carrying the experiments further.

While on the subject of heating both combustibles (at least both the substances which take part in these combustions) I cannot refrain from remarking how easily the temperature of the oxyhydrogen flame even could be increased in this manner; the gases would, of course, have to be heated prior to contact. Upon their more vigorous diffusiveness, when rarefied, I should rely for that solidity of flame so necessary where the communication of very high temperature is desired. The jets regulating the issue of the gases would have to be very fine.

Proceeding now to the next part of this subject, the result of these experiments instanced urge me to recommend for trial the substitution of heated air for oxygen in most of those cases where this gas is now employed in conjunction with hydrogen or other combustible matter as a generator of heat or light; for instance:

1. In the metallurgy of platinum that part of it where the metal has to be fused; also in soldering platinum stills for sulphuric acid works.

2. The fusion of alumina in the manufacture of certain gems.

3. In the production of the Drummond and Bude lights.

The fusion of platinum and alumina is now effected by the oxyhydrogen flame.

Relative to the competency of heated air to perform the part of cold oxygen in the production of such intense lights as these (the Drummond and the Bude), I think this can be demonstrated, almost to a certainty, in the following way:

Thus the flame employed in these investigations has certainly a minimum temperature of 4,596° Fah., since this is the fusing point of platinum, the substance most easily fused of all those that I have tried that are infusible in the common flame; doubtless the temperature is considerably higher, but I will take these figures. On the other hand, the actual temperature of the lime, when the Drummond light is in operation, is (on the authority of Tyndal) only 2,000° C.—3,632° Fah.; hence this flame has an excess of temperature over that of the incandescent lime equal to 964° Fah., a pretty good margin for loss, surely sufficient if properly economized; but as I have already shown this excess of temperature can be largely increased.

In view of the greater controllability of the proposed substitute, the absence of all danger in its use, its not requiring chemical preparation, and its cheapness, compared with oxygen—upon these several points respectively the question should be properly tested.

Besides the substitution of oxygen urged above, the possible fusion of the purer clays and certain silicas, etc., in a ready and economical manner may induce the further utilization of these substances, while in experimental chemistry the facility with which such high temperatures can be attained and kept up may lead, among other things, to some cheaper way of extracting certain metals from their oxides, aluminum, for instance, from alumina or clay.

On reviewing these results it does seem not a little singular that a difference of not more than 500° Fah. in the temperature of the blast should make the difference between the fusibility and infusibility of s ch substances as platina, agate, fire-clay, etc., in the blow-pipe flame. It will be recollected, however, that the blast has, in this case, not only taken up the heat required to raise a single volume of it to this temperature, but another portion of heat has been taken up in a latent form, as the air expanded, consumed as it were in lifting against the atmospheric pressure; this may be represented sufficiently well for us by assuming the temperature of the blast, kept to its normal volume, at 700° Fah.

This is as yet, however, but a very slight addition to produce results which so nearly approximate to those obtainable by the oxyhydrogen flame, seeing the latter has an estimated temperature of 14,000° to 15,000° Fah., while that of the present method does not much exceed $5,000 Fah. The gap, as far as effects is concerned, is narrowed so much, and in a manner so unexpected, by the results here given that one is naturally prompted to inquire whether the assigned temperature of the oxyhydrogen flame has been obtained by direct experiment or by caculations based upon the ascertained temperature of other flames. The temperature as calculated indirectly in this last way certainly furnishes us with figures remarkably close to those just quoted.—*Chemical News.*

Cements and How to Use Them.

A great deal has been written concerning different cements, and indeed our periodicals are full of recipes on this subject. But (says the *English Mechanic*), it will be found that the information given is rather in regard to the materials used in compounding these cements than in regard to the manner of using them. And it is unquestionably true that quite as much depends upon the manner in which a cement is applied as upon the cement itself. The best cement that ever was compounded would prove entirely worthless if improperly applied. We have hundreds of recipes for glues, pastes, and cements of different kinds, and yet the public is constantly on the *qui vive* for new ones, and no more acceptable recipe can be sent to our popular journals than one for a new cement. Now, the truth is, that we have cements which answer every reasonable demand, when they are properly prepared and properly used. Good common glue will unite two pieces of wood so firmly that the fibers will part from each other rather than from the cementing material; two pieces of glass can be so joined that they will part anywhere rather than on the line of union; glass can be united to metal, metal to metal, stone to stone, and all so strongly that the joint will certainly not be the weakest part of the resulting mass. What are the rules to be observed in effecting this?

The first point that demands attention is to bring the cement itself into intimate contact with the surface to be united. If glue is employed, the surface should be made so warm that the melted glue will not be chilled before it has time to effect a thorough adhesion. The same is more eminently true in regard to cements that are used in a fused state such as mixtures of resin, shellac, and similar materials. These matters will not adhere to any substance unless the latter has been heated to nearly or quite the fusing point of the cement used. This fact was quite familiar to those who used sealing wax in old days. When the seal was used rapidly, so as to become heated, the sealing wax stuck to it with a firmness that was annoying—so much so that the impression was, in general, destroyed—from the simple fact that the sealing wax would rather part in its own substance than at the point of adhesion to the stamp. Sealing wax, or ordinary electrical cement, is a very good agent for uniting metal to glass or stone, provided the masses to be united are made so hot as to fuse the cement, but if the cement is applied to them while they are cold, it will not stick at all. This fact is well known to those itinerant venders of cement for uniting earthenware. By heating two pieces of delf so that they will fuse shellac, they are able to smear them with a little of this gum, and join them so that they will rather break at any other part than along the line of union. But although people constantly see the operation performed, and buy liberally of the cement, it will be found that, in nine cases out of ten, the cement proves worthless in the hands of the purchasers, simply because they do not know how to use it. They are afraid to heat a delicate glass or porcelain vessel to a sufficient degree, and they are apt to use too much of the material, and the result is a failure.

The great obstacles to the junction of any two surfaces, are air and dirt. The former is universally present, the latter is due to accident or carelessness. All surfaces are covered with a thin adhering layer of air, which it is difficult to remove, and which, although it may at first sight appear improbable, bears a relation to the outer surface of most bodies different from that maintained by the air of a few lines away. The reality of the existence of this adhering layer of air is well known to all who are familiar with electrotype manipulation. It is also seen in the case of highly polished metals, which may be immersed in water without becoming wet. Unless this adhering layer of air is displaced, the cement cannot adhere to the surface to which it is applied simply because it cannot come into contact with it. The most efficient agent in displacing this air is heat. Metals warmed to a point a little above 200°, become instantly and completely wet when immersed in water. Hence, for cements that are used in a fused condition, heat is the most efficient means of bringing them in contact with the surfaces to which they are to be applied. In the case of glue, the adhesion is best attained by moderate pressure and friction. Another very important point is to use as little cement as possible. When the surfaces are separated by a large mass of cement, we have to depend upon the strength of the cement itself, and not upon its adhesion to the surfaces which it is used to join; and, in general, cements are comparatively brittle.

Fitting Down Sills Under Water.

It frequently happens that sills have to be fitted down to the bottom of the water, for the erection of mills, flumes, dams, bridges, and other structures, in situations where the water cannot be turned aside, or kept out without great expense, for coffer-dams, pumping, etc. The following method of obtaining an exact outline or profile of the bottom in all such situations, we have practiced for many years with invariable success:

The first requisite is a level surface on the water under which the sill is to be placed. To obtain this it is sometimes necessary to obstruct the surface current sufficiently to back and deaden the water as far as the sill extends; now fasten up a row of stakes along the intended bed of the sill, and nail a wide, thin board upon edge to these stakes, the entire length, the lower edge at the surface of the water (water line). An exact outline of the bottom, or bed of the sill, is transferred to, and marked upon the board by the following process: Fix two pieces of wood in the form of a T-square, the the tongue-piece longer than the depth of the water, and marked with feet and inches, like a ten-foot pole, the T-head about two feet long, and three or four inches wide, with a mortise through the middle in which the tongue-piece can slide freely up or down, and at the same time be kept plumb. Place the T-head on the edge of the board, and slip the tongue-piece down through the mortise to the bottom, and try the depth along the whole bed, until the deepest spot is found. Here cut a notch, or make a hole in the tongue at the surface of the water, to hold a pencil, and let one man hold the T-head with one hand, and the tongue with the other, moving both hands carefully along the board towards one end, feeling the bottom as he advances, while another man holds the pencil in the hole, marking all the rises and inequalities of the bottom upon the board, taking care to mark only when the tongue piece touches the bottom. When thus marked to one end, commence again at the same low place, and mark to the other end; and the outline of the bottom will be transferred to the board, with the relative level of either end or any other part indicated by the distance of the pencil mark from the lower edge of the board, which is the water line or true level.

The marked boards may now be taken down, and the portion above the pencil mark cut away, when the other portion left will be a pattern by which to fit the under side of a sill to the rock or bottom. It is sometimes better to take the pencil line some inches above the water line at the lowest part, and where the bottom is very uneven it is best to mark the sill by the pattern, so that only the slight inequalities will be cut out of the stick, which will not affect its strength, and where low spots in the bottom occur, short pieces should be spiked on to fill out the pattern. By this plan, such timbers can be fitted to a rock, or other bottom, under water, nearly as accurately as if dry, and with very little more expense.

This method of scribing down a mud sill under water, and the method of taking levels from water, as described in this chapter, are, as far as we are aware, our own inventions.—*The Practical American Millwright and Miller.*

PLINY states that the cedar woodwork of the Temple of Apollo, at Utica, was in a perfect state of preservation after an interval two thousand years. The famous statue of Diana of the Ephesians was formed of cedar, and endured for many centuries. The ancient Egyptians extracted an oil from cedar wood, which they rubbed over the leaves of the papyrus to preserve them from worms, and which also entered into the compositions used for preserving their mummies.

THE BRIDGE DE L'AISNE ON THE RAILWAY FROM SOISSONS TO LAON, IN FRANCE.

The bridge over the Aisne, in France, of which we this week give an engraving, is probably one of those which have been blown up by gunpowder during the present war. It is (or perhaps we shall have to say, *was*, when the full record of destruction shall have been written), a most beautiful structure of stone, presenting from the right point of view lines of the utmost beauty and grace.

It is what is known as a skew bridge, that is, it crosses the stream obliquely. Such bridges present special difficulties in

THE BRIDGE DE L'ASINE, IN FRANCE.

their design and construction, arising from the fact that all the curves become changed from those necessary in a bridge placed at right angles with the banks, in proportion to their obliquity ; arcs of circles becoming portions of ellipses, etc.

Notwithstanding these difficulties, the engineer of the Pont De L'Aisne, M. Martin, has suceeded in producing a most beautiful design, and one that will bear more than a casual inspection.

There are mysteries in this bridge, impenetrable to the unaided eye or imagination of an American reader. Massive, imposing, and enduring as it appears, the piers which sustain its elegant arches, conceal a special provision for its rapid destruction, should the feet of a hostile and invading army attempt its passage.

It said by a French correspondent that M. Martin, when pointing out these magazines, designed to be charged with powder, in case of emergencies like the present, wept at the possible fate of his beautiful design.

Our readers may estimate from the elaborate character of this structure, which most of the French bridges possess in common with it, what the destruction of bridges in France really means. It means the destruction of almost inconceivwealth of architectural design scarcely to be comprehended n our country of wooden trestles and "Cheap John" railway structures.

The Prussian army on its way to Paris have met with many similar structures which have been sacrificed in the desperate but vain attempt of the French to stop their advance. The Prussians express great surprise at this destruction, as they aver that it opposes little or no hindrance to their progress.

Cellars.

The following useful hints regarding the construction of cellars, from an article appearing in the late issue of the London *Architect*, are especially valuable in this country, where our cellars are, as a rule, lacking in the most desirable features of underground rooms :

"The cellar of a house may be likened to the lower hold of a floating ship, and a like difficulty attends the ventilation of both. The first thought is that of the extraction of the foul air Cellars are not always ceiled, and, even when they are, it is in such a coarse manner that the defense thus made against rising exhalations and the effect of a damp atmosphere upon the floor above must be very slight indeed. Some persons fancy that to flag or cement the cellar floor and walls is a preventive of noxious gases forming there. But this is a fallacy. The lower hold of a ship is subject to a similar state of noxious air settlement, but even this has a less influence for mischief upon human existence than has the cellar under the dwelling house, for the tenants of the latter are experiencing the injurious effects for a lifetime, whilst the passengers and crew of a ship have the limit of a voyage to their experience.

"The difficulty in remedying this necessary evil of cellars lies in the perfect expulsion or extraction of the stagnant fetid atmosphere, and this can be effected by either revolving fans, exhausting a flue or flues (either vertical or oblique), or by forcing pumps, propelling fresh external air into, and thereby driving the foul air out of the cellar. There are other means, however, such as the chimney. And, as heat is a conductor which can thus be easily made available, we have at once a solution of the problem of extraction in the simple addition of a continuous flue from cellar to chimney top, which may also have one of the simplest of the patent revolving ventilators, now in use, attached to it. As an aid to this vertical ventilating flue, we would have another flue for the reception of external fresh air at the ground level, which would supply the place of the retreating foul air, and thus maintain a wholesome current ; or, at least, a constant change of atmosphere. In order to build the chimneys to suit this principle of ventilation, it is only necessary to construct two flues four inches square, one at either side of the fireplaces, and occupying a position in the chimney breast nearest the fireplace.

"The object in having two of these four inch flues is to balance each other, and, at the same time, to give in the second one a very desirable servant in any household, namely, an ash-shoot, through an iron trap in which, located on a level with the hearth, the embers, dust, and ashes may be cleanly swept and be instantly precipitated to a receiver or close dust-bin in the cellar. It would be very desirable to have both of these flues made circular, which could easily be effected by the mason using an open tin cylinder, with a handle at the upper end by which he could draw it up as he proceeded with his work. Around this cylinder he should plaster close with lime and cement, in equal proportions, against three times as much sand. Of course, these flues may be square or ever oblong ; but, of whatever shape they may be, it is absolutely necessary that they be carefully pargeted or lined with plaster.

"A more expensive, but far more perfect method of ventilating cellars, would be to ceil over the whole space, and place ventilating thimbles at intervals between the joists. In this way, the spaces between joists may be made to act as air tunnels, having grated openings in to external walls. In order to thoroughly purify the atmosphere of these under ground rooms, called cellars, where a stream of water from a spring is available, a cemented drain, open on top, is excellent for the purpose, the current carrying off all mephitic gases and creating ozone, the purest of atmospheres. Where a running stream from a pure spring cannot be had, its place may be partially supplied by the use of the hydrant at one end and a small pump at the other, thus letting the water in from the street in a continuous stream, running through the cement channel already spoken of, and drawing it off at the other end, unless the sewer be below the bottom of a cellar, in which case the pump is not needed. This artificial flow of water should take place twice each day—in the evening to cool the atmosphere, and in the morning to clear off the exhalations of the past night."

How to Make Cuttings Grow.

Alluding to the manner of propagating cuttings the *New England Farmer* says that it has been ascertained that a cutting will develop roots much sooner in moist sand than in rich soil. But the sand cannot maintain its growth for any length of time. To prepare pots for raising cuttings they should be filled nearly to the brim with rich garden loam, dark and porous, not clayey and soggy ; then pour in one inch in depth of scouring sand ; sea sand will do as well as the yellow sand. Wet this thoroughly, and place the cuttings, from which all but three or four upper leaves have been removed, close to the side of the pot ; the contact of the ware against the stem of the cutting promotes its growth Press the wet sand firmly around the tiny stem. A great deal of your chance for success in raising slips or cuttings depends upon this.

Plant as many cuttings as the pot will hold, from six to a dozen, according to the size of your pot ; when they are firmly set in the sand, two or three can be inserted in the middle of the pot. Set them away in a dark, warm place for twenty-four or thirty-six hours. Thus, cuttings will grow quickly in a hot bed, because the temperature is not dry. Their growth depends a great deal upon light, heat, and moisture.

If a bud is close at the base of a cutting it will strike root more easily—is not so apt to decay. The roots shoot from a bud, and the lower down it is the surer your success. When the leaves drop, the plant is commencing to grow ; if they wither on the stem, it has begun to decay. By following these directions no one can fail to grow all kinds of house plants. Roses and all the rarest flowers of the green houses are propagated in this manner.

INVENTORS will be well repaid for the careful perusal of the decisions of Commissioner Fisher, published elsewhere. The reprimand administered to the patent agent for offering bait appears to be well deserved. It will serve also to warn inventors not to nibble at every bait that is thrown out to catch them.

IMPORTANT PATENT OFFICE DECISIONS.

Commissioner Fisher has refused the application of Wm. Mont Storm for an extension of his patent for an improvement in revolving fire-arms. This is one of the applications authorized by Congress to be made after the patent had run out. An extension was granted to Emily J. Lamson, executrix of Daniel Lamson, for improvements in machines for notching hoops. The evidence shows that this invention was a valuable one, and that the inventor, who was a poor man, was diligent in attempting to introduce his invention until the breaking out of the war, when he enlisted in a Massachusetts regiment and was killed at Fredericksburg. Since his death his widow has continued the manufacture, but with small profits. The commissioner says: "This case is one in which it is eminently proper that an extension should be granted." In the interference case of E. Hewins and D. B. Spooner, applicants for a patent for a water meter, the commissioner affirms the decision of the Board of Appeal, pronouncing Spooner the real inventor. In his decision he is rather severe upon Hewins and the several other members of the Baldwin Patent Meter Company of Boston. One of the party, Mr. Frederick Curtis, comes in for a merited castigation, as follows:

"In the course of the testimony a letter from Mr. Frederick Curtis, of Boston, a solicitor of patents, and one of the parties named above, was put in evidence. I do not see that this letter is relevant to any of the issues of this case, and I have given no weight to it as testimony. I refer to it now, as the publication of this opinion affords me a convenient opportunity of expressing the view which I entertain of its contents.

"The letter was written in February, 1869, to Spooner, in relation to obtaining the second patent upon the Baldwin meter. In this letter Curtis says: 'I have a way now of obtaining the allowance of a patent in six hours after it reaches the Patent Office, by the payment of $75, and I intend to have large fees paid me in excess of this for accomplishing this sort of thing.'

"The first remark which this statement demands is that it is false in fact. No soliciter or any other person has 'a way of obtaining the allowance of a patent in six hours after it reaches the Patent Office.' Cases are received, recorded, and examined in their regular order. They do not reach the examiner until a day or two after they are filed, since they must pass through other rooms, when the fees are received, the cases classified, the application completed, the files made up, and other formal matters attended to. The examiners, under the great pressure of the numerous applications submitted to them, cannot reach a new case under a week or two after it comes into their rooms, so that, under the most favorable circumstances, the thing asserted in this letter is simply impossible. No order is ever granted, under the present administration of the office, to take cases up out of turn, except as provided in the printed rules, even when inventors have come to Washington to attend to their own application, and this because it is simply just that those who send their cases to the office, and trust to the operation of its rules, shall not be set aside at the demand of the clamorous few who choose to attend in person or to demand special privileges by friends or attorneys. The rule is imperative, and it has been faithfully and rigidly adhered to.

"But the writer of this letter intimates that this just rule may be set aside by the payment of money. Cases may go through in six hours, he says, 'by the payment of $75,' and the advantage of knowing this secret he deems to be so great, that he 'intends to have large fees paid to him for accomplishing this sort of thing.

"This insinuation is also false. It is simply a libel on the Patent Office, a libel which has no foundation in fact. Mr. Curtis never had a patent allowed in six hours after the application reached the Patent Office, and he never paid to the Patent Office, or any officer thereof, $75 or any other sum, to secure the allowance of cases out of their regular order.

Inventors ought to know that if they are foolish and wicked enough to pay their money upon such pretenses, it will never reach the pockets of the Government officials for whom they suppose it to be designed. It goes no further than the unscrupulous attorney or agent, who, assuming to trade upon the supposed corruption of sworn officers, is willing to slander honest men, and destroy public confidence in the administration of public affairs, in order that he may enrich himself at the expense of his credulous client.

"Instances have come to my knowledge where money has been extorted from clients by agents after patents had actually been allowed but not yet issued, upon the pretense that it was necessary to bribe the examiner. I know of no case where the money went beyond the solicitor. No practitioner can assert with truth that he possesses any facilities by which he is enabled to procure patents in advance of any of his competitors beyond his knowledge of the forms and routine of the office, and his skill and care in the preparation of his cases. To take money from his clients under the pretense that it is to be used to procure such facilities is to add theft to falsehood."

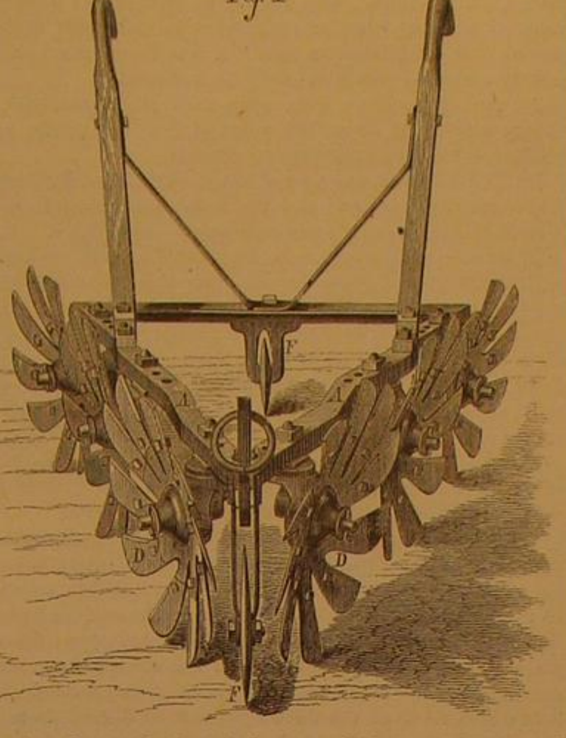
Georgia State Fair.

This Fair will be held at Oglethorpe Park, Atlanta, opening the 19th of October, and closing October 29th, 1870. The manufacturers of machines, implements, instruments, tools, etc., are requested to send their latest published illustrated catalogues and price lists. The secretary requests the contribution of specimens of their machines, etc., for preservation and permanent exhibition in the museum, upon such terms as to expense of thus advertising for the manufacturers as may be agreed upon with the secretary. The arrangement of the office and museum will be designed for the exhibition and advertisement, to the best advantage of all articles thus intrusted to it. Address Col. D. W. Lewis, Secretary, Atlanta, Ga.

BUSSELL'S DISK CULTIVATOR AND HARROW.

We are informed that the implements herewith illustrated are only part of a series, covering the entire range of ground breaking and culture, the same leading elements running through the whole series. They are based on experiments which have extended through the last sixteen years, having

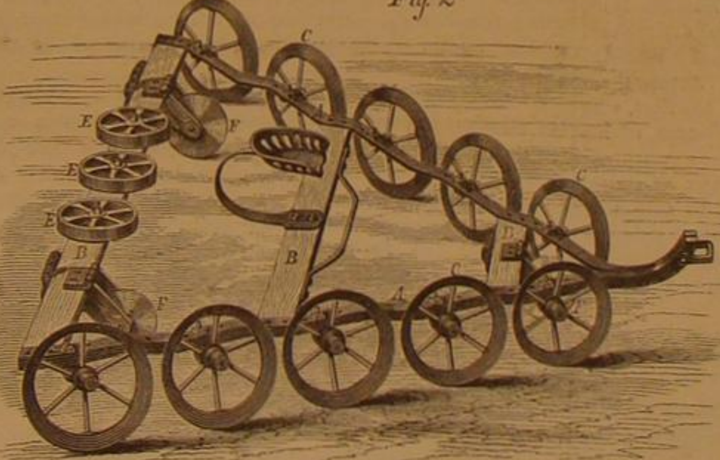
Fig. 1



in view the production of cheap machines to pulverize soil with the least possible expenditure of force, and, at the same time, to bring the subsoil to the surface and thoroughly incorporate it with the surface soil. It is claimed that these ends have been satisfactorily attained.

The cultivator and the harrow are substantially the same—the latter being an enlargement of the former, and provided with a seat for the driver The serrated and continuous rimmed

Fig. 2



disks are interchangeable and may be used on both; the continuous rims being preferable in stalky, trashy, or sod ground.

The armed disks are preferable in crop culture, when stalks and roots do not interfere. They are journaled to swivel brackets which allow of quick and easy changes in the position—*i. e.*, these concavo-convex disks can be turned more or less quartering across the line of draft, according to the requirements of soil and crop.

A is the frame, made of angle iron, and B, the cross-ties of wood binding the sides of the frame; the continuous rimmed disks C, on the harrow, have wrought iron spokes (the rim being cast *narrow*), which form leaves large openings for the

Fig. 3

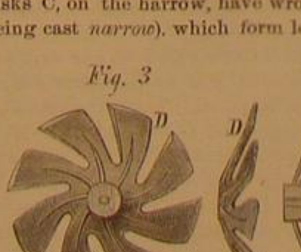
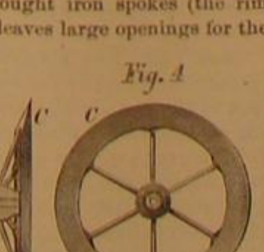


Fig. 4



surface soil to drop through while the rim comes up loaded with the subsoil. It is claimed that this secures level and thorough culture. The armed disks having blade-like points are shown at D, the front edge of each being turned out slightly towards the convex face. These blades penetrate the earth edgewise, gyrate laterally, and emerge laden with the subsoil shedding it in the direction of the row, while the weeds drop through the interstices and are buried out of sight. E E are carrying wheels for transporting the harrow from place to place. They are put into the swinging brackets, where the coulters, F, are used wh [illegible] the ground.

These coulters serve as rudders to steady the running of cultivator and harrow, which it is claimed they do perfectly.

We have never seen this machine at work, and can speak of it only on information forwarded by the inventor. Only actual experiment can demonstrate the validity of his claims, which are for the cultivator, that it has one half less draft than any other cultivator in use; that it does twice the work of any other cultivator, and does it better; that it destroys the weeds more effectually than any other machine; that it cultivates one row *perfectly* at once going through, which no other machine does; that it leaves the ground smooth and level between the rows; that it completely pulverizes all clods, and throws the fine subsoil closely and evenly around the roots; that it largely increases production, by thoroughly loosening and mixing the soil; that it will work wet soil better than any other implement, and leave it in better condition; and that it is cheap and durable, and not as liable as other machines to break or get out of order.

With these claims for its superiority, we submit it to a fair competition with its rivals.

It is claimed for the disk harrow and pulverizer, that it will soon save its cost in horseflesh, owing to its light draft; that it will thoroughly pulverize the soil from four to six inches deep; that it is the best clod-crusher yet invented; that it will thoroughly mix fertilizers with the soil; that it is the best machine in use for preparing sod ground for corn; and that it is simple in construction, cheap, and not liable to get out of order.

Patented, August 9, 1870. Manufacturers' and State rights for sale by the proprietors, Bussell, Tilford & Greene, Indianapolis, Ind.

Swiss and Limburg Cheese.

We learn from the Wisconsin *Farmer*, that within a few miles of Oshkosh, Wis., there will be 50,000 pounds of Swiss cheese made this season. John Ryf, a native of Switzerland, was the pioneer in the business in the vicinity, having commenced work ten years ago. He brought to Wisconsin in that time $700. He now has a farm of 190 acres, with buildings on it which cost $10,000 in cash—the cow barn being a particularly good one—the profits of Swiss cheese making. This year he is making cheese from about 50 cows; commenced manufacturing May 1, and has already a good supply of cheese.

The milk is "set" as in American cheese manufactories. It is heated in a copper kettle, holding 125 gallons, to about 122° to 125°. No salt is put in the curd. A lever instead of a screw press is used. The cheeses are thirty inches in diameter, and about four and a half inches thick, weighing from eighty to one hundred and ten pounds. Salt is rubbed in every day for two or three months, then once in two or three days until cold weather, and then once a week. The cheese ought to be at least one year old before being used, and the older it is the better it is considered. There are small holes in the cheese, and if these are about the size of peas this is considered an evidence of excellence. When the cheese is old these holes become full of butter.

The cheese-room on this farm is small, and no curing room is attached, the cheese being cured in the cellar under the dwelling house. This cellar as well as all about the cheese house, was quite clean, and the entire place gave evidence of good management, neatness, and cleanliness. The cheese, however, would hardly be popular with Americans, either to smell or taste. Yet there is a good demand for it at good prices. Last year Mr. Ryf's sales were made at an everage of twenty-two cents, delivered at Oshkosh, going to the Milwaukee market. He has sold it as high as thirty cents per pound.

There are some four other dairies in the neighborhood making this cheese. We had only opportunity to visit one other, that of Messrs. Boss and Kettle, on the farm of C. L. Rich. We did not find either of the cheese makers. They are engaged somewhat in making.

The Limburg cheese is made in small brick-like pieces, weighing about two pounds each. The milk is not heated after being "set," nor is the curd stirred. The curd is put in small boxes, and pressed only with the hands. As with Swiss cheese, the salt is rubbed on the outside. The cheese are inclosed in tin foil. Owing to the less pressure a greater quantity of cheese can be made from a given quantity of milk than with American cheese—eight pounds milk will make one of cheese. Last year the average price of Limburg cheese at Oshkosh was about fifteen cents.

Analysis of German Silver.—A good method of separating copper, nickel, and zinc, is to dissolve the alloy in hydrochloric acid containing a few drops of nitric acid, and precipitate the copper from the slightly acid solution in the form of sub sulphocyanide of copper. The liquid, after being filtered and reduced, by evaporation, to a small bulk, is treated by excess of caustic potash, and then by hydrocyanic acid, until the precipitate which is at first formed is completely re-dissolved with a yellow color. In this liquid, which contains the double cyanides, the zinc is precipitated in the state of sulphide, by means of protosulphide of potassium (not sulphide of ammonium). After some hours' digestion, and when the precipitate is completely deposited, it is filtered off, and, after boiling the liquid with *aqua regia*, the nickel is precipitated as oxide by caustic potash. This oxide must be calcined after it is dried.—*F. Wöhler.*

Correspondence.

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

Steamboat Speed---The Rams "Avenger" and "Vindicator."

Messrs. Editors:—My attention has been called to an article in the Scientific American, of the 10th inst., on the subject of "Steamboat Speed," in which reference is made to Hill & Payne as the builders of the rams *Avenger* and *Vindicator*, of the war fleet on the Mississippi, with the apparent expectation that we would furnish the public with some information on the subject. Not being used to appearing in print, I feel diffident in writing for your able journal; but if a plain statement of some facts in reference to these remarkable boats shall be deemed worthy a place in your columns, you are welcome to it.

The plans of the rams were designed to carry out to a moderate degree, a theory of ship-building of Mr. R. Germain, of Buffalo, N. Y. We confess that at first we had not much confidence in it. The scientific arguments which he advanced in support of it seemed very strange, but the conclusions which he drew seemed so startling, and, judging by our experience and observations, so improbable, that we shrank from them. We could not but think that some important fact had been overlooked, a fatal error made in his calculations.

We did not expect that these vessels would be failures, but we would have been satisfied had they only developed a full average speed of boats of their size, power, and draft, which would have been some nine or ten miles an hour.

These rams were wide in proportion to their length, as compared with most river crafts.

The *Avenger* had 40 feet beam, and a length of 180 feet; the *Vindicator* had the same beam, but was 210 feet in length. They were built very strong and heavy, with thick casemates of solid timber, and had heavy armaments. Their bottoms were flat, with the exception of the ends. Each of them drew, when light, about six feet of water, while most boats on the Western rivers draw, when light, from two feet to four feet—rarely as much as four feet.

Their power was about the same as ordinary boats of this size—no more. Their models were very peculiar, but there was in them nothing to offend the eye or to suggest a want of adaptation to purposes of utility; on the contrary, they were highly symmetrical, and rather beautiful than otherwise. They looked, as some one quaintly described the *Vindicator*, which was the best embodiment of Mr. Germain's principles of construction, as "spoiling for a race."

He claimed that the *Vindicator* would be able to run sixteen miles an hour. The *Avenger* he did not expect would be as fast. Sixteen miles an hour would be at least one third faster than any boat on the river of their general dimensions, power, and draft. He seemed to stand pretty much alone in his opinion with the exception of two or three. Among them the late Capt. James Brooks, quartermaster of the fleet, who had looked pretty thoroughly into the evidences of his theory.

When the vessels came to be tried there was of course much curiosity to see the result, and you may be sure that there was as much delight as surprise felt at their splendid success; for instead of falling short of his representations, which have been deemed extravagant, it was seen that they were excelled.

I have never seen these vessels since they went down the river to join the squadron, but it was notorious among river men that they were very fast.

As an amusing evidence of the disbelief that they would be fast, I relate the following incident: The *Avenger* was first ready for a trial of speed, a gentleman who had charge of the details of construction—a man of great intelligence and much experience as a steamboat man—fearing that, as they was about to start off, she would not be able to stem the current of the river, about 4 miles an hour, advised that a hawser be attached to prevent her floating too far down the river, as it might not be convenient to get her back again.

You may imagine his surprise when a few minutes thereafter he saw her running up stream with great swiftness. I have since given much reflection to these principles of construction. There seems to be no guess work in Mr. Germain's calculations. All his conclusions are the result of calculations and demonstrations, based on the operations of the laws of fluids, as ascertained by his own experiments; and from the accuracy with which he foretold results, and from the logic of his arguments, I am convinced that his method is the true one to get the highest speed, at the least expense, in navigation.

Whether his expectations will be realized to the extent he states them—to wit.: to double present velocities without the employment of more power in proportion to the size of the boat—I can't say; but by his method much higher speed than has yet been made by steamboats can be attained, I have no doubt.

If this is so, it must sooner or later revolutionize travel and transportation on the water, and be of incalculable benefit to the country.

Why he has held his theory, back from further development, I do not know; but whatever the cause, it is to be hoped it will not long prevent its publication.

I must not fail to mention another important item with reference to the boats, as connected with our river navigation; when the rivers are often crooked and narrow, the *Vindicator* and *Avenger* were found to be most excellent steering crafts—their pilots declare them to be the best steering boats they had ever handled.

A correspondent in your issue of August 6th on the same subject, "Steamboat Speed," stated that the *R. E. Lee* was built in Louisville. This is an error. She was built by Hill, Roberts & Co., of this place; but not on the same plan as the two rams *Vindicator* and *Avenger*.

D. C. Hill, formerly of the firm of Hill & Payne.
New Albany, Ind.

Lightning Rods.

Messrs. Editors:—I read with interest in the Scientific American of Aug. 27th, an article entitled "Thunderbolts and Lightning Rods," in which the writer seems to set aside the theory promulgated to the world by our scientific forefather, Dr. Franklin. One should be well armed with formidable weapons when he undertakes to make war upon a fact as well established as this. A few hours' observation during a single storm will hardly be sufficient.

All are not ready to drop, upon such slight evidence, a theory which cost its author years of profound study, and tedious as well as dangerous experiments.

Dr. Franklin said, and proved to the world, that lightning and electricity were one and the same, and scientific men who have lived since his day corroborate this opinion. It is well known that the approach of a pointed metallic conductor will discharge a Leyden jar or other object charged with electricity; and thus, if Franklin's theory be correct, the approach of a metallic conductor will discharge the electricity from a cloud, which is nothing more than an enormous Leyden jar floating in the atmosphere. The first rod erected by Franklin was on a house in Philadelphia; and during a severe storm which followed, this rod conducted discharges of electricity to the ground without injury to the building, while other buildings in the city, having no rods, were severely shattered by similar discharges.

We have in this vicinity experienced an unusual number of casualties by lightning the present season, there having been no less than seventeen buildings struck within an area of thirty miles in diameter. Ten out of the number had no rods, and eight of the ten were entirely destroyed; the remaining two, one a brick house, and the other a barn, were shattered but not fired. The other seven were provided with rods which received the discharges and conducted them to the ground, in each instance, without doing any damage whatever to the buildings, notwithstanding most of them were filled with freshly cut grain and grass.

We may suppose that there are conditions in which such accidents might happen as your correspondent speaks of, for instance: 1st. An erroneous construction of the rod, by which its area of conducting surface is too small, and, as a consequence, too easily overcharged. 2d. Imperfect insulation by permitting the rod to remain in contact with the combustibles of which the building is composed. 3d. Imperfect connection with the earth, that is, not reaching permanent moisture. 4th. The destruction of the surface of the conductor by rust.

Any one or even all of the above conditions do not affect the principle or preclude the construction and erection of a conductor which shall afford a perfect protection from the fearful effects of lightning.

Barnesville, Ohio. Thompson Frame.

Balancing Cylinders.

Messrs. Editors:—The correct principles for balancing cylinders, pulleys, etc., seem to be very imperfectly understood, and the practice consequently bad and unsatisfactory.

C. E. M., of N. Y., is in trouble, and many others have like troubles when they claim and honestly think—erroneously—that they have their machinery perfectly balanced and mechanically correct. A cylinder or pulley should be balanced in each and all its parts in lines of its circumference, and in no other way can it be done mechanically correct.

W. O. Jacobi, who, although he fails, in his article in the Scientific American, of September 3d, to fully express the mechanical action of such a well-constructed and balanced cylinder, doubtless understands the correct principles of "balancing." He supposes a cylinder some four feet long to be perfectly balanced, and then that a hole be bored in the end of one end of a stave, and a pound of metal inserted. Now the cylinder will be so much out of balance. He then inserts in the opposite end of the cylinder, on the opposite side, an equal weight, and says it will be balanced again if laid on level parallel steel bars, but will be out of balance while running.

Now, I hold that a cylinder so weighted at one end and counter weighted on the opposite side at the other end, is *not*, in any mechanical sense, balanced. The two sides, taken as a whole, are of equal weight, but the cylinder is out of balance, one pound at one end and out of balance a pound at the other end, and the center of the cylinder lengthwise and diametrically is the only point that does not show a disposition to vibrate when put in rapid motion on its bearings (which are supposed to be at each end of the cylinder). Suppose such cylinder to be run 3,000 revolutions per minute, the bearings would soon become worn away on the same side of the weights; one end of the shaft on one side and the opposite side at the other, and the centrifugal force of the extra weight inserted would continually keep that side bearing on the box and heating and wearing, and were it not bound down by the boxes the motion of the shaft would be something like the double crank of a fulling mill, one end one way and the other *vice versa*.

The practice of balancing the heavy side of one pulley with the heavy side of another pulley on the same shaft, and many times some distance apart, is very pernicious, and should not be tolerated, yet many millwrights and machinists who claim to be scientific mechanics, practice it, not knowing the correct, and in fact possessing no knowledge of moment of inertia.

S. H. Barnes.
Lanesboro, Pa.

The Side-Saddle Flower, or Hunters' Cup—"Sarracenia."

Messrs. Editors:—In your issue of September 3, you copy an article from *London Society* describing a curious fly-catching plant among the flowers in Paris. I may be in error, as there is some difference in the description, but I suspect that it is nothing more than our Side-sadddle Flower or Hunter's Cup, which was first sent to Europe in 1752, by Dr. Sarrazin, from which circumstance, it acquired its botanical name *Sarracenia*.

I send you two extracts describing the latter plant, one from Comstock's Botany, the other from the Botany of the State of New York, by Mather.

SARRACENIA.

"We have one native plant growing in the peat bogs of New England, whose leaves hold water. This is the Side-Saddle Flower. Its common name is derived from the resemblance of its stigma to a woman's pillion. The stem rises a foot high and bears a singular but beautiful purple flower. The leaves, which are hollow, are from four to eight to each root and surround the stem like radii from a center, and rest upon the ground. They are of oblong form, swelling in the middle, and gradually contracting to form the stalk. Their open mouths, which are of considerable size, are somewhat elevated and contracted at the border, so that in the natural position they retain the water when nearly full, and on the lower side of the mouth is a broad spreading appendage which catches the water, and directs it into the cup. These cups contain a wine glass of water, and unless pierced by some insect, are seldom empty."—Comstock.

"Common to our swamps and boggy ground is the Side-Saddle Flower, or Hunter's Cup (*Sarracenia*), bearing a single nodding, dark, red flower, a wonder in itself, but more so, when viewed in connection with the wonderful structure of its leaves. These are not flat as in other plants, but hollow and somewhat pitcher-shaped, arranged in a circle around the base of the stem, their open mouths turned upwards to catch the falling rains. At the orifice of each leaf is a broad lip, furnished with short, stiff hairs pointing downwards and forming a trap for numerous insects that seek the water contained in them. A luckless fly once entered, it is impossible for him to return and he is forced to go onward until dropping, he perishes in the water beneath. Of what use in the economy of the plant these dead insects are (the cup being often half filled with them), is not as yet well known, but possibly they serve in some degree for nutriment."—Mather.

Alex. Allan.

Curious Freak of a Thermometer.

Messrs. Editors:—My attention was this evening called to a thermometer that has been in use in an ale brewery for some months past; it is used for getting the temperature of the liquor while in process of making.

The manner of using it is to immerse the bulb of the instrument in the liquor for a short space of time and then withdraw it. The bulb of the instrument having a vessel formed around it for containing a portion of the liquor.

The last time it was used it was immersed in a vessel of water at boiling heat, the mercury ascending immediately to the top of the tube (which is two inches above the boiling point indicated on the instrument), and there remained; although separated at several places in the tube it seemed immovable.

The mercury remaining in the bulb seemed to be in its natural state, but that in the tube seemed to be solid. The experiment of placing the instrument in a very warm place was tried, but without any effect upon it; next was tried making it as cold as possible by putting it in a quantity of salt and ice. This was also without effect; it still remains in the position as when first taken out of the boiling water.

An explanation of the cause of the mercury remaining in the tube of the instrument through the columns of your valuable paper will be thankfully received.

Connellsville, Pa. R. L. C.

Water a Solid.

Messrs. Editors:—I believe that water is practically solid under a swift moving substance, and that the surface of it may be used as a safe and free course of transit, analogous to the railroad on land.

That water is solid, to all intents, under such circumstances, is shown by the cannon ball, which, being fired at an angle, upon its surface, is seen to ricochet until its motion is so far expended that it is left free to sink.

Zanesville, Ohio. Jas. Granger.

The Seventeen-Year Locusts.

Messrs. Editors:—A Boston paper (the *American Traveler*), generally accurate in the minutest dates of history, illustrates the familiar proverb that "Jupiter occasionally nods."

It appears that some author had found a cycle of seventeen years in the Napoleonic dynasty, and the *Traveler* not satisfied with showing various falsities in the statement, concludes that it is "as ridiculous as the seventeen-year locusts." Nor is this skepticism confined to the intelligent Boston editor, inasmuch as a leading New York daily doubts the periodical recurrence of the *Cicada septendecim*.

Now there is no fact better known in all scientific circles, and, indeed, universally through the Middle States, than this locust cycle thus called ridiculous. "If," says the Baltimore *Sun*, "the thorough and admirable work on this kind of locust by the late Dr. G. B. Smith, of this city, who had made this subject a specialty, and embodied the labors of a life in it had been obtained and published by some of the scientific associations, there could scarcely be such ignorance of the most remarkable and interesting facts in natural history as thus exhibited." SEPTENDECIM.

How to Take Off the Fat---Defense of Banting's System.

MESSRS. EDITORS:—In your issue of the 17th instant, on folio 185, you quote an article from *Hall's Journal of Health* on "Fat People," deprecatory of a plan pursued by "Bantam" for the reduction of their adiposity, and in praise of and recommending what purports to be a different and much better system for effecting the same purpose. This is not the first time I have read articles of a similar purport from the same authority.

Assuming that the writer means by "Bantam" William Banting, of Kensington, England, who has published several editions of a "Letter on Corpulence," in which he narrates the means employed by him to rid himself of a great excess of bulk of person, I, with your permission, beg to offer a few words in reply.

It is to be particularly noted that in the article referred to, although a "fleshy gentleman" is spoken of who "began to Bantamize" as well as "Bantam's plan for getting lean," no explanation or description whatever of the "plan" is given; the inference of course is that it is entirely different from the one recommended for the same purpose by the writer of the article.

I will quote from both writers. The one in the *Journal of Health* says:

"The very best and safest way to get rid of fat is to work it off; this may be aided by eating food which contains a large amount of nitrogen and a small amount of carbon. Nitrogenous food is that which gives strength, power to work, as lean meats. *Carbonaceous foods are those which make fat, such as cheese, potatoes, rice, corn, peas, beans, tapioca, arrow root, cornstarch, milk, sugar, sirup, and all oily and fat food;* but, after all, the great reliance should be on exercise and work in the open air." (The italics are mine.)

Mr. Banting says:

"I have proved very satisfactorily that my greatest dietetic enemy was and is sugar and saccharine elements. I have ascertained by repeated experiments that five ounces of sugar, distributed equally over seven days, augment my weight nearly one pound by the end of that short period."—"I very seldom take any butter; certainly not a pound in a year."—"I seldom take milk."—"I occasionally eat a potato with my dinner, possibly to the extent of one pound a week."—"My impression is that any starchy or saccharine matter tends to the disease of corpulence in advanced life."—"I am thoroughly convinced that it is QUALITY alone which requires notice, and not *quantity.*"—"I take the most agreeable and savory viands, meat and game pies, that my cook can concoct, with the best possible jellies, gravies, etc., the fat being strained off; but I never, or very rarely, take a morsel of pie or pudding crusts."—"*Quality* in food is the chief desideratum, and *quantity* is mere moonshine."—"The items from which I was advised to abstain as much as possible were bread, butter, milk, sugar, beer, and potatoes, which had been the main (and I thought innocent) elements of my subsistence."—"'These,' said my excellent adviser, 'contain starch and saccharine matter, tending to create fat, and should be avoided altogether.'"—"My former dietary table was bread and milk for breakfast, or a pint of tea with plenty of milk, sugar, and buttered toast; meat, beer, much bread (of which I was always very fond) and pastry for dinner, and generally a fruit tart or bread and milk for supper. I had little comfort and far less sound sleep."—"Corpulence, though giving no actual pain (as it appears to me) must naturally press with undue violence upon the bodily viscera, driving one part upon another, and stopping the free action of all."—"I do not recommend every corpulent man to rush headlong into such a change of diet, but to act advisedly and after full consultation with a physician."

Six years after printing the first edition of his work, and at seventy-two years of age, Mr. Banting says: "I can conscientiously assert that I never lived so well as under the new plan of dietary which I should have formerly thought a dangerous, extravagant trespass upon health," and he was then reduced thirteen inches in girth and fifty pounds in weight, and cured of several grievous bodily ailments.

My quotations from to the fourth edition of Mr. Banting's work, entitled "A Letter on Corpulence," and published by Harrison, 59 Pall Mall, London. It contains addenda of, I should say, letters from one hundred individuals of all ages—both sexes—and various situations in life, who have tried and succeeded admirably with his system. He says he has 1,800 such.

Query: Does the author of the article you quoted really know what the "plan" is he seeks to throw discredit on? Those who read the above extracts may decide.

Query, again: Where is the proof that the "fleshy gentleman's" "dangerous malady" was induced by following the plan of Mr. Banting? Who paid more or greater attention to his diet than Capt. "Barclay, the great English pedestrian," referred to, in his own and in the training and preparation of others, for the necessary reduction of body preparatory to unusual corporeal or muscular efforts?

The writer of the article quoted says: "After all, the great reliance should be on exercise and work in the open air." Capt. Barclay did not think so. Do not those in active preparation for pugilistic or athletic feats depend as much upon an especial diet as upon exercise to accomplish the desired reduction in their weight? Did not Mr. Banting, following medical advice in this particular, exercise faithfully and constantly in the open air, and not paying proper regard to his diet rapidly *increase* in weight by so doing?

Not agreeing with the author of the article in Hall's *Journal of Health*, that if a man is "as big as a hogshead," and sleeps soundly and has a good appetite he had "better let himself alone," two years ago the writer of this, weighing at the time 200 pounds made a radical change in his diet, pretty much in the manner indicated by Mr. Banting. Neither "Bright's disease" nor any other "dangerous malady" has as yet developed itself; on the contrary, in three months he was, and has ever since remained, thirty-two pounds lighter in his weight, with a variation, according to circumstances, of but one or two pounds. He has been stronger and better in many ways than ever before, and is a firm believer, with many writers of eminence, that "excessive fat is a disease," and that its cure is effected by a simple change in diet, far superior to that generally indiscriminately followed.

In a letter recently received by the writer from Mr. Banting, he says: "I continue in good bodily and mental health; am in my seventy-fourth year, and maintain my normal condition; few men of my age more active."

Excuse the length of my communication, but every little while I see in some paper or other a dab at "Bantam's" (unkind cut) or Banting's system, and sometimes by those who evidently have not the slightest knowledge of what said system is; in this case I feel hurt to see one of your influence disseminating an article containing sentiments doing manifest injustice to a man who sought to do good to a great portion of his fellow men from no other than the kindest motives and without a shadow of desire for pecuniary reward.

Malden, Mass. J. H. B.

Obituary---Death of Thomas Ewbank.

The Hon. Thomas Ewbank, whose death was briefly announced in our last number, was throughout his long life an enthusiastic student of the natural and the exact sciences, and he acquired distinction in their pursuit. His book on hydraulics has taken a place among standard literature, and his other writings rank with the best scientific and philosophic works which this country has produced. His abilities gained him the appointment of Commissioner of Patents under President Taylor, an office which he filled for several years.

Mr. Ewbank was born at Barnard Castle, Durham, England, in 1792, and at the age of 13 was apprenticed to a tin and copper smith in his native place. When he was 20 years old he went to London, and succeeded in getting employment there at making cans for preserved meat. He succeeded in saving enough from his wages to purchase a few books, and to them every hour he could spare from his work was devoted. During the seven years he stayed in London he pursued a comprehensive course of scientific study. He had been elected a member of several learned societies and was on the high road to business prosperity, when in 1819 he gave up his English prospects and came to New York. Here he occupied for a short time the factory at Powle's Hook which had belonged to Robert Fulton. In 1820, he engaged in the manufacture of lead, tin, and copper tubing, which business he carried on until 1836. Since that time he has devoted himself entirely to his private pursuit—science. His first published work, "A Descriptive and Historical Account of Hydraulics and other Machines for raising Water, both Ancient and Modern," appeared in 1842. In 1849, he was made Commissioner of Patents, holding that position until 1852. His annual reports to Congress during this time were distinguished for the amount of information and of original suggestion they contained in them.

In 1855, he published "The World a Workshop; or the Physical Relation of Man to the Earth," and in 1857, an interesting volume entitled "Life in Brazil; or the Land of the Cocoa and the Palm," embodying the results of a visit to Brazil, made in 1845. This work contained valuable illustrations of ancient South American arts, and of antique works in stone and metal found in Brazil. In 1859, the "Reminiscences in the Patent Office, and of Things and Scenes in Washington," appeared. Among the best known of Mr. Ewbank's minor works were an essay called, "Thoughts on Matter and Force," published in 1858; an essay read before the American Ethnological Society on "The Inorganic Forces Ordained to Supersede Human Slavery"; an essay on "Experiments in Marine Propulsion." As a member of the commission to examine into the strength of the marbles offered for the extension of the Capitol at Washington he rendered valuable service, and discovered a method of largely increasing the resisting power of all kinds of building stones. Mr. Ewbank's mind retained its activity, and he was a frequent contributor to scientific journals up to the time of his death, though he was nearly 79 years old. The funeral took place on the 19th inst., from Mr. Ewbank's late residence, No. 14 East Thirty-first street. The Rev. Dr. Drown, of Brooklyn, read the services and pronounced a short eulogy. The interment took place in Greenwood Cemetery.

Underground Defenses of Paris.

The Paris correspondent of the *Daily News* writes: What think you of the enemy entering a modern city by its subterranean passages ways; and at a given signal appearing above ground? The chance of the Prussians attempting this in Paris is actually being canvassed, and the few people who have been at pains to ascertain for themselves, and by nauseous personal experience, what the sewers of a well-drained capital are like, what it is to walk in them and to follow their course, will admit the possibility of a vast force finding its way below ground to any portion of the city. For example, every street in the city of London has its hidden counterpart below. The sewer map of the engineer to the corporation, Mr. Hayward, is as complete in its general outline as a map of the city itself, and beneath all the larger thoroughfares men can walk erect, and in many of them three or four abreast. The subterranean works of Paris are more wonderful still, and are admitted to surpass those of ancient Rome. From the suburb of Asnières to the Place de la Concorde an enormous subway runs, which is sixteen feet and a half high, eighteen feet broad, and more than three miles long. Besides this are below the city three spacious galleries running on each side of the Seine, the whole being provided with air-traps at regular intervals, and lighted with oil lamps. Descend into either of these, and you find them to be well built, and with facilities for cleansing them which are extremely suggestive of their value for strategical purposes. The subterranean drains or galleries, are furnished with iron tramways, along which small carts run, which are pushed by three men and furnished with a drop-plank, which fits exactly into the drain, and pushes the mud before it as it advances. On the turbid waters of the great collector, between Asnières and the Place de la Concorde, a good sized boat is navigated, and the wildest stories are abroad respecting its possible uses to the enemy. Most of these may be dismissed as idle, but I am in a position to affirm that a careful inspection of these subterranean works has been made, and that Paris is preparing itself, down even to the waters under the earth, for the possible reception of its foe. If gunpowder will blow up iron traps, water will spoil gunpowder, and the sanitary rite known as flushing the sewers would effectually dispose of an intruding force. The catacombs, again, into which seventy different staircases lead, and which extend not merely under the Faubourgs St. Germain, St. Jacques, and St. Marcel, but under such important buildings as the Palace of the Luxemburg and the Pantheon, have had more attention paid them within the last two days than has been the case for years. Their uses under contingencies, which it is inexpedient to name, their size and value as repositories, are all canvassed eagerly, and nothing shows more plainly the anticipations of the people of Paris than the keen interest they display in such topics as these.

A Valuable Indorsement.

The New Jersey *Journal*, published at Elizabeth, is now in its ninety-third year. In a recent issue it says: "Inventors and patentees are invited by Messrs. Munn & Co., to call at the SCIENTIFIC AMERICAN office, No. 37 Park Row, New York, and obtain, *free of charge*, a pamphlet of 108 pages of useful information, with law of patents, how to proceed, etc. To recommend these gentlemen, at this late day (as procurers of patents), to the inventors of New Jersey, would amount almost to a reflection upon the intelligence of the latter, seeing that it is scarcely possible that *any* individual possessed of the *mind* enabling him to *originate* a useful discovery, *could* have remained ignorant up to the present time of the existence of a firm so widely celebrated as that of Messrs. M. & Co. It is no exaggeration, indeed, to say that, after nearly 25 years' experience in procuring patents—an experience supported, too, by abilities of the first order on the part of the members of this highly-respected firm, the latter have a just claim to be considered at once pre-eminent and unequaled in their vocation as procurers of patents, a fact which inventors desirous of securing the same should not lose sight of."

The New York Evening Mail.

We are right glad to learn from our friend Major J. M. Bundy, the editor of the New York *Evening Mail*, that that spirited and excellent paper is meeting with the success it deserves. Its circulation has increased very largely within the last six months. The editor now offers to prove that it exceeds in this respect any other two-cent paper published in the city. Large as is the circulation Major Bundy informs us the sale of thousands of copies has been lost daily for want of facilities to print enough to meet the demand in time for the supply of certain localities. New and extended facilities have, however, now been provided, and a large increase of sales is confidently expected. The *Evening Mail* is one of the best of our dailies, and doubtless its future success will equal the most sanguine expectations of its accomplished, gentlemanly, and scholarly editor.

THE Lavoisier medal has been granted this year to M. H. Sainte-Claire Deville, for the great number of useful researches made by him in chemistry, and the applications these researches have received in practice. Among the subjects enumerated are: Researches on platinum; the industrial value of sodium; the discovery of the hydraulicity of magnesia; the researches on the application of dead and other heavy hydro-carbon oils as fuel for steam boilers; the dissociation of bodies by heat.

A LEGISLATIVE BLUNDER.—It appears that the bill revising the patent and copyright law enacted July 8, 1870, by a singular blunder repeals the acts of March 3, 1849, that provide for the establishment of the Department of the Interior. According to this state of things Secretary Cox is not now a member of the Cabinet. Although a blunder appears to have been committed' the act is now treated as a dead letter.

THE highest mine in the world is the silver mine of Potosi, in the Andes of Peru, which is stated as being 11,367 feet above the level of the sea; and the deepest mine is the salt mine of Neusalzwerk (Westphalia) which is said to be 2,050 feet below the sea.

THE Panama and West India Telegraph cable was opened for public business to Jamaica on September 10.

Machine for Decorticating and Drying Grain.

This machine consists in an arrangement within a hollow cylinder of another hollow cylinder having on its exterior surface a corrugated spiral blade for rubbing the grain, within which interior cylinder is still another cylinder also provided with a corrugated spiral blade for rubbing and acting upon the grain which is conveyed to it, while either steam, or hot or cold air is admitted through the axle or shaft of the nner screw flange or propeller.

The grain is put into the hopper in batches, passed through the outer cylinder, and retained in the decorticator a longer or shorter time, according to the kind operated upon.

In combination with this portion of the device there is also an air-tight receptacle into which a batch of grain being put, the hulls are loosened by first extracting the air with an air pump and then admitting the air suddenly, repeating the process as many times as is requisite to partially detach the hulls.

A heater and a fan blower are also employed to force heated air into the decorticating cylinders.

Fig. 1 is a top view of the apparatus, and Fig. 2 is a section through the principal cylinder, showing the positions and operation of the corrugated spiral blades and the cylinders upon which they are formed.

A, Figs. 1 and 2, is the external cylinder containing the cylinder, B, Fig. 2, which also incloses the cylinder, C. The two latter cylinders carry the corrugated spiral flanges above mentioned. The cylinder, C, is made hollow. The cylinder, B, has openings through its side at the ends at D and E, through one of which, E, the grain passes into its interior from the space between the cylinders, A and B, as it revolves, the passage being compelled by a scraper attach ed at the aperture, E.

The hollow cylinder, C, is a continuation of the pulley shaft, though made larger than the bearings, as shown. Its spiral blade acts to force the grain along to the opening, D, when it is again passed back into the space between A and B by a scraper. The grain thus makes the circuit over and over again through the spaces between the cylinders, being acted upon by the corrugated screw blades and a corrugated disk, F, Fig. 2, which by their friction decorticate it. When the grain is sufficiently operated upon it is withdrawn through a chute and passed over a screen or sieve, G, Figs. 1 and 2.

During the decorticating process a stream of heated air from the furnace and fan blower, I, is passed into the hollow shaft or cylinder, C, and issues through apertures made in its sides. This stream of air passing through the grain takes up the dust caused by the decortication of the grain, and passing it through a chute, H, at the top of one end of the cylinder, A, keeps the grain cleaned, and dries it when necessary.

The chute, H, is so constructed that if any grain be carried along by the blast it drops before issuing from the chute, and is carried back into the machine. Cold air and steam are also employed, according to the nature of the grain; steam being admitted to the cylinder, C, from a pipe through a stuffing box provided for that purpose.

Belts from the drum, J, are so arranged that they turn the cylinders in opposite directions.

K is an air chamber into which batches of grain are put, and the air being exhausted therefrom by the air pump, N, the air is allowed to rush in violently a number of times to detach partially the hulls or husks of the grain, after which the grain is let out into a receptacle at the bottom, from whence it is carried up to the conveyer, L, which passes it along to the elevator, M, which throws it into the hopper from which it passes into A for the subsequent decorticating process. The violent action of the air on grain in the air chamber, K, is intended to detach partially the hulls from the grain and to render the subsequent process more rapid. The progress of the operation is determined by taking small samples from the discharge chute.

Steam is employed for decorticating peas, beans, and corn intended for hominy.

When rice is dressed it is also passed through a revolving screen and burnisher. The machine is intended to also prepare coffee, and all other grains not mentioned in the above description, usually subjected to such a process.

The apparatus is simple, compact, cheaply made, and durable. Acting by frictional contact it does not, it is claimed, cut, break, or grind the grains.

The patentee of this machine took the three first premiums at the Louisiana State Fair last year on the following machines; namely, rice huller, burnishing and finishing device, and hominy mill.

In a letter of the 1st ult. to this office, he says: "Yesterday, through your Agency, I received a patent for my machine for decorticating and drying grain, etc., which is the sixth patent issued to me through your house since 1857. The business capacity, energy, and fidelity you have evinced in all my transactions with you should entitle your establishment to the fullest confidence of all persons interested in the procuring of patents."

Patented, August 23, 1870, through the Scientific American Patent Agency, to Evan Skelly, whom address for further information, at Plaquemine, Iberville parish, La.

Fig 1

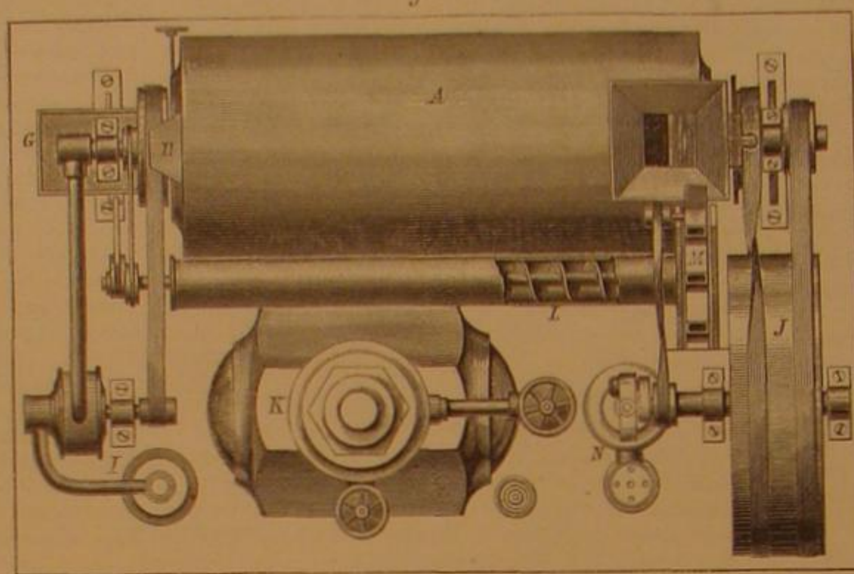
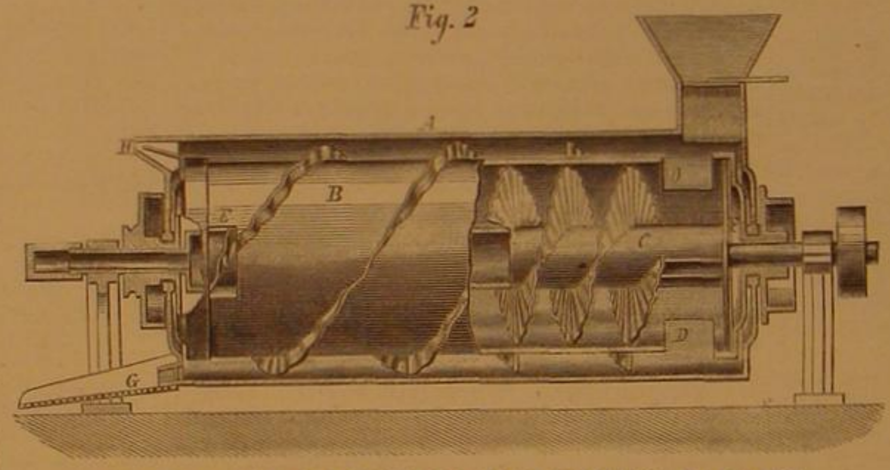


Fig. 2



SKELLY'S DECORTICATING AND DRYING MACHINE.

Dynamical Refrigerator.

A Frenchman, M. Tasseli, has invented a contrivance consisting mainly of a tube wound round a central axis, and movable in a trough partly filled with water, and not unlike the trough in use for grindstones. By the rapid motion of the tube through the water that fluid enters the tube; while the water which is outside of it evaporates rapidly, and, by that evaporation, causes the cooling of the water inside, which, by the developed centrifugal force, is carried through the windings of the tube, and thus affords means for obtaining a supply of comparatively cold water. The author stated that he has found by experiment that, even when the initial temperature of the water is 36° C., it may be cooled down to 18·5°; and when a ventilator is simultaneously used, so as to produce a strong current of air upon the convolutions of the tube, and thus accelerate the evaporation, the cooling effect is greatly increased. The speed to be given to the metallic tube is very moderate.

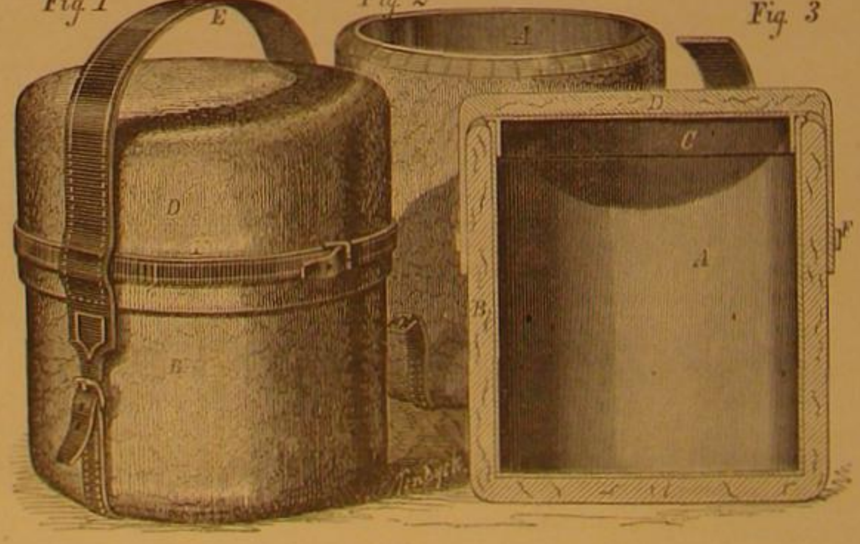
Improved Family Ice Preserver.

The object of this improvement is to furnish for family use a neat, convenient, and portable apparatus for preserving ice in small quantities. The mode heretofore pursued has been to wrap the ice not needed for immediate use in a blanket or other woolen cloth, and then stow it away in a cool place until needed; the disadvantage of which process is that the blanket not being a perfect nonconductor even when dry, soon becomes wet by the melting of the ice, and in that condition it conveys away the heat rapidly, the result of which is, when ice is looked for only a wet blanket is found. The blanket, to be fit for use next day, is to be wrung and dried, and it is to save the trouble of wringing and drying and the disappointment of finding no ice when it is wanted that this simple little apparatus is offered. Fig. 1 is a view of the apparatus as it appears when closed and in use. It is a simple felt case of any convenient size for carrying, with a leather strap, E, over the top in the shape of a bail handle, which, extending down the sides, serves to bind together the case and its hood or cover. Fig. 2 is a sectional view, showing the construction, in which A is a tin or other water-tight vessel, with a close fitting lid, C.

This vessel is incased in a tightly fitting cover of felt, B, from half an inch to an inch in thickness, as shown in perspective in Fig. 3. D is a hood or cover of felt, half an inch or an inch thick on top, but not thicker than an ordinary felt hat on the sides. F is a narrow strap and buckle passing around the circumference, and intended to bind the hood tightly around the case so as to prevent the passage of air.

In practical operation the ice is washed, put into the vessel A, Fig. 3, the tight-fitting tin lid, C, Fig. 2, is then put on, and the hood, D, drawn over all, strapped down by strap, E, and hugged around by strap F, and the ice is secured in a vessel made as practically nonconducting as it can be with ordinary means. Whatever melting of the ice takes place is by this means all economized, because the clear, coll, ice water remains in the vessel fit for drinking, and is not lost in the blanket. There is no wet blanket to be cared for, and the apparatus is ready always for immediate use. Being compact and portable it is admirably designed for picnics, excursions, etc. A patent has been ordered to issue, and the inventor is desirous to communicate with manufacturers or others interested. Address Jas. E. Pilkington, Baltimore, Md.

Fig 1 Fig. 2 Fig. 3



PILKINGTON'S FAMILY ICE PRESERVER.

The Hartford Steam Boiler Inspection and Insurance Company.

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

During the month, 425 visits of inspection have been made, and 703 boilers examined, 636 externally and 180 internally, while 81 have been tested by hydraulic pressure. Number of defects in all discovered, 446; of which 45 were regarded as dangerous. Defects in detail were as follows:

Furnaces out of shape, 19—1 dangerous; fractures, 34—2 dangerous; burned plates, 33—3 dangerous; blistered plates, 37—1 dangerous; cases of sediment and deposit, 83—8 dangerous; cases of incrustation and scale, 62—8 dangerous; external corrosion, 24—4 dangerous; internal corrosion, 13—1 dangerous; internal grooving, 4; water gages out of order, 14—1 dangerous; blow-out apparatus out of order, 4; safety valves overloaded, 27—3 dangerous; pressure gages out of order, 61, varying from —3 to +4; boilers without gages, 4; cases of deficiency of water, 3—2 dangerous; broken braces and stays, 13—4 dangerous; boilers without gage cocks, 4; rip seams, 2—2 dangerous; boilers condemned as unsafe to use, 5.

The above record shows the importance of making frequent examinations of boilers. It will be seen in the record of explosions that in one case there was no steam gage on the boiler, and an extra weight had been placed on the safety valve lever—three men were killed and others wounded. This case alone shows the importance of having boilers and all their attachments in the most perfect condition. A boiler without steam gage and with safety valve overloaded, is a most dangerous thing to have in the vicinity of human beings, and a person who would allow a boiler to be used on his premises under such circumstances, exposing lives other than his own should be held guilty of criminal neglect.

There were nine explosions during the month, killing outright fourteen persons and maiming nineteen others. Whether these occurred from want of care, poor construction, or carelessness, we are unable to say, as we had never examined any of these boilers.

Cause of the Fires of Pine Forests.—A French scientist, F. Schrader, thinks that the cause of the very frequent fires of pine forests in summer time and remote from any habitation, is not due, as has been often surmised, to willful arson or accidental imprudence, but is produced by the action of the concentration of the sun's rays upon the hollow globules of resin which exude from the trees acting as burning lenses, and becoming inflamed, thus causing the combustion to begin, and, once begun, to spread rapidly, in consequence of the highly inflammable nature of the resinous and turpentine-containing wood.

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NEW YORK, SATURDAY, OCTOBER 1, 1870.

Contents:

(Illustrated articles are marked with an asterisk.)

NEW RELATIONS OF SILICA.

Something akin to a hoax was recently widely copied into the secular press that an Hungarian with a most unpronounceable name had discovered a new solvent for carbon and silex by which we should soon be able to manufacture diamonds and quartz crystals at pleasure. The story had its origin in the imperfect understanding of a really important discovery of new chemical relations of silica recently made in France.

Professor Friedel, of the School of Mines in Paris, and Professor Crafts, of the Cornell University, have for a long time devoted much attention to the organic compounds of silicium, and have published several valuable papers on the subject. They have combined silicon with the radical of the ethyle group, under the name of silicium ethyle, and also with iodine.

The iodide of silicium is prepared by passing a mixture of the vapor of iodine and carbonic acid over heated silicium. It is a highly volatile substance, and burns in the air the same as carbureted hydrogen; when mixed with oxygen it produces a highly explosive compound. Professor Friedel has also prepared a substitution compound called silicidioform, which is in fact a chloroform, in which carbon is replaced by silicium. These investigations have paved the way for the discovery of other organic compounds containing silicium, an account of which we find in a recent number of the *Comptes Rendus*. Professor Friedel, in conjunction with Ladenburg, has prepared several ethyle compounds, one of which they call *silicopropionic acid*. This acid is analogous to silicic acid, but is distinguished from it by its inflammability, as it burns like tinder when ignited. In this respect it resembles the hydrated oxide of silicium, discovered by Woehler, which glows when heated in the air, and changes into amorpous silica. The new acid is insoluble in water, but readily soluble in warm concentrated potash, the same as infusorial silica. It is a feeble acid, analogous to silicic acid, and is said by the discoverers to constitute one term of a series of homologous acids. It is, in fact, a carbureted silicic acid. This is the first discovery of a direct compound of carbon and silicium, and in its consequences is of great importance, as it affords a clue to the mystery of the assimilation by plants and infusoria of the silica of the soil.

The announcement of Friedel's paper in the Academy called out a communication from Paul Thenard, in which that chemist announces that the humic acid group, under certain modifications, has the power to dissolve silica. He does not describe the experiments fully by which he arrives at this result, but simply mentions that by a molecular combination of ammonia with the acids of the humous series he produces the new compounds that have the power of dissolving silica.

He has succeeded in forming four distinct acids of the humic acid type, which, as they contain nitrogen, he calls *azo-humic*, or, as we should say in English, nitro-humic. These nitro-humic acids are remarkably permanent, and only give up their nitrogen at a high heat. They combine with silica to form new acids, *siliconitro-humic*, which combine with the alkalies, from which they may be again separated unchanged.

Thenard has traced these nitro-humic acids to soils, and concludes that the soluble silica of soils is to be attributed to this origin. The proportion of silicon taken up by the nitro-humic acids depends upon the amount of nitrogen present, and varies between 7·5 to 24 per cent. Here we would seem to have a new explanation of the value of ammonia and of nitrogen to soils in promoting the growth of vegetation, and also why muck and rotten wood add to the fertility of soils. Professor Henry Wurtz, the accomplished editor of the *Gas Light Journal*, in commenting upon the importance of these discoveries of the chemical relations of silica, very properly ascribes great value to them. He says that they afford at once "a theory, not only of new relations of plant decay to plant nutrition, but also of the far broader subject of the transformation and migration of silica throughout all past geological ages, and of the continued and (as the writer believes) *sole* agency of life in these, as in the past and present migrations and transformations of carbon."

The diamond has long been looked upon as being of organic origin, and these new researches may throw some light on the subject. Solvents for carbon and silica are of great interest, and we may eventually by means of them be able to crystallize diamonds and quartz through their instrumentality, but such an application of the discovery would be insignificant in comparison with the probable solution of the far more important questions of the growth and decay of plants, and the origin of silica in rocks and soils. We shall therefore follow with great interest the subsequent researches of Friedel, Crafts, and Thenard on this subject.

HISTORY AND PROGRESS OF PHOTOGRAPHY.

Dr. H. Vogel, whose recent visit to this country will be remembered with so much pleasure by every one who had the good fortune to meet him, has sent us his treatise on photography (Lehrbuch der Photographie) in a royal octavo volume of 500 pages, from which we propose to extract some of the leading facts in reference to the history and progress of this science.

Although the art and science of photography has only existed twenty-five years, yet it is safe to say that in no other department of investigation has there been greater progress than in this. At first it was confined to taking portraits, and was looked upon as a trade rather than as a science; now its applications extend into every branch of human knowledge; it gives to the naturalist true pictures of animals, plants, and minerals, and to the geographer, plans for charts; by it the engineer in a few minutes can make true copies of the most difficult drawings, for the preparation of which the most skillful draftsman would require many weeks. In lithography and porcelain painting there is now extensive application of photography. The finest productions of artists are copied and easily multiplied, so as to be accessible to the poorest man, and in this way photography serves to cultivate the tastes of the people for art, just as printing disseminates a knowledge of science. There are few branches of science into which photography has not penetrated, and where its services have not been of the most signal importance.

The first attempt to take a picture by chemical means appears to have been in 1802 when Wedgewood and Davy immersed a piece of paper in a silver bath, and afterwards exposed it with a silhouette to the action of the light. A copy of the silhouette was thus obtained, but the picture was transitory, as the portions that had remained white gradually became dark in consequence of the silver salt still remaining in the paper, and thus the same agency that made the picture afterwards destroyed it.

About the same time with Davy's researches Niépce in France was attempting to take pictures with other agents than silver. He made use of a solution of asphalt in lavender oil. He sensitized a plate with this solution and exposed it for hours in a camera. All the portions acted on by light were thus rendered insoluble, so that when the plate was worked in ethereal oil the picture became visible. Niépce as early as 1826 made pictures in this way, called heliographs, but the operation was too long and tedious to be of any practical value.

In 1829 Niépce entered into association with Daguerre, who had for some time been devoting himself to similar researches, and the two worked together for the accomplishment of the great result; but Niépce died in 1833, without witnessing the realization of his dreams. Daguerre continued the work undiscouraged by failure, undismayed by the skepticism of others, until, in 1838, he presented to three members of the French Institute—Humboldt, Biot, and Arago—permanent pictures taken by aid of light in an easy and practical manner. They created immense excitement. Everybody was anxious to become acquainted with the secret of their preparation.

Through the influence of Arago, Daguerre was induced to make known his process in return for a yearly pension of 6,000 francs, guaranteed to him by the government. At the same time a son of Niépce received a pension of 4,000 francs. The 19th of August, 1839, was appointed for making known the secret of the method at a meeting of the Academy of Sciences, and the rush for seats was tremendous. The hall was soon filled to suffocation, and large numbers crowded the courts and blocked the streets eager to catch the first news of the wonderful discovery. The story was soon told, and the printing press rapidly spread the intelligence to all parts of the world.

Daguerre attained his object in an entirely different way from Niépce and Wedgewood. He employed the iodide of silver as his sensitive agent, which he produced by the action of the vapor of iodine on plates of silver. The action of the light on such an iodized silver plate after exposure in the camera, is not visible to the naked eye until it has been subjected to the action of the vapor of mercury. This latter operation is the distinguishing characteristic of Daguerre's discovery. While other experimenters sought to obtain pictures at once visible by the direct action of the sunlight, he brought out invisible pictures by means of a secondary agent, now called the developer.

It is said, though not by Professor Vogel, that Daguerre found this developer by accident. Some old silver plates had been put away in a dark closet in which were numerous chemicals, and, among others, a bottle of mercury. On taking them out for renewed experiment, Daguerre, greatly to his astonishment, found that several of them showed distinct pictures. Here was the accomplishment of all that he had been striving to obtain; but what was the secret agent that had brought out the picture? The closet contained numerous chemicals, each of which had to be tried in turn, and when mercury was reached, and its vapors expelled beneath an exposed plate, the picture was developed, and the secret disclosed at the same time. We give the story for what it is worth, premising, however, that it is more probable that Daguerre aimed at a knowledge of the action of quicksilver by direct experiment, and not by accident. The new art was very properly named after the discoverer, daguerreotype.

At the same time with these discoveries in France, a wealthy Englishman, Fox Talbot, was occupied with attempts to make paper negatives, which he developed by means of gallic acid and some salt of silver. He published an account of his process in 1841, but the rough surface of the paper and the inferiority of the pictures to daguerreotypes left an unfavorable impression, and the method was soon forgotten. A nephew of Niépce, Niépce de St. Victor, recently deceased, substituted glass for paper, which he coated with sensitized albumen, and thus introduced glass negatives, and prepared the way for the use of collodion upon wet plates. Archer in England, published, in 1851, a full description of his collodion process, which soon took the place of all other methods, and is now the one almost universally employed.

The solubility of gun cotton in a mixture of ether and alcohol was first made known by Dr. Maynard, of Boston, and as soon as the fact was published collodion was suggested as the best solution for fastening a film upon glass. The collodion process gave us negatives, and Talbot's paper enabled us to copy them and fix them. Thus by degrees the art was developed until it reached its present high state of perfection. The great demand for cameras turned attention to that instrument, and very great improvement has been made in the construction of photographic lenses. Chemical agents of all kinds have been improved and purified, and are now manufactured on an immense scale. Some of these chemicals were formerly so rare that they could only be found in the cabinet of some university. Now they are manufactured by the ton, and their price has diminished more than a hundredfold. One of them, the hyposulphite of soda, is now suggested as a substitute for common washing soda in the laundry, so readily can it be obtained.

From small beginnings the art of taking pictures by the aid of light has become one of the most important of the many applications of science to the arts, and a work of 500 pages is now required to describe even superficially all that it is required to know on the subject. Professor Vogel has performed the task he has undertaken in the most creditable manner, and it is to be hoped that his book will be translated into English, so as to be available to American readers.

THE USE OF BALLOONS IN WARFARE.

"Find out what your adversary wants you to do and then don't do it" is a military maxim attributed, whether authentically or not, to the first Napoleon. But, besides finding out what your adversary wants you to do, it is of the first importance to find out just what *he* is doing and intending to do.

It is plain, therefore, that any means of penetrating the secrecy with which in war each party seeks to cover its movements is of incalculable value.

With this object the use of balloons for the purpose of reconnoissances was at one time thought to promise great results. The French, always among the first to utilize any discovery in science or the arts, in the latter part of the eighteenth century instituted a secret school of aerostation, with a view to the use of balloons in war, and it is stated that Napoleon had a balloon sent with his army in his Egyptian campaign, and also that the use of the balloon was of great value to the French under Gen. Jourdan in the campaign against the Austrians in 1794.

In the present war in Europe, balloons are again being employed, and it is quite possible they may prove of much service from the absence of the principal cause of their failure in our recent civil war.

Danger from long range guns, want of military and topographical knowledge on the part of the aeronauts, and the impracticability of operating balloons in cloudy, rainy, or foggy weather, were the causes of failure with us; the want of knowledge on the part of aeronauts being the worst of all. They neither knew what to look for, nor recognized it when they saw it. With well trained men skillful in the practice of reconnoitering from an elevated position, and thoroughly versed in military affairs, as well as the topography of the country, the case might have been very different.

Canadians can now apply for patents in the United States upon the same terms as citizens. Full information can be obtained by applying to the publishers of the Scientific American.

FAIR OF THE AMERICAN INSTITUTE.

The close of the second week of this fair still finds the arrangements not complete, although they are sufficiently so to give a fair idea of what the exhibition will be. The display of fancy articles and the various articles of merchandise and manufacture usually exhibited is full, and as good as usual. The machinery department is not as full as heretofore, and it contains less of interest than this department exhibited last year. We shall endeavor to say something about the machinists' tools next week. The display of wood working machinery is not as full as it was last year. The falling off is doubtless due partly to the fact that the American Institute held no fair the year before last, and that there was last year an accumulation of inventions which those interested were anxious to exhibit, and also partly to the fact that the course of the management in the award of premiums on steam engines at the last exhibition was such as to shake public faith in the fairness of the awards. The

STEAM ENGINES

exhibited are few, but there are some good ones. A first-class horizontal engine, called the Allen engine, is exhibited by the Allen Engine Works, Fourth avenue, One-hundred-and-thirtieth and One-hundred-thirty-first streets New York. The engine is employed to drive the machinery on exhibition, and is the most attractive object in the room where it stands. It is noticeable that it runs at an extraordinary speed for an engine of this size. It makes one hundred and thirty revolutions per minute. Yet so well is it constructed and so firmly set that it makes no jar. Indicator diagrams taken from this engine show that the exhaust and admission approximate very closely to perfection. The exhaust valves are upon the opposite side of the cylinder from the induction valves, and are operated independently by a rock shaft connected with the eccentric by means of a link. The link is attached directly to the band of the eccentric, and also operates another rock shaft, which drives the induction valves. The valves are plain slides, and are all balanced. They run with the greatest ease. The end of the connecting rod which operates the rock shaft, belonging to the induction valve gear, plays in the slot of the eccentric as it is operated upon by the governor, making a variable cut-off of great simplicity and efficiency. The governor is that known as "Porter's Governor," and is so well known to engineers that we need not describe it minutely. No one familiar with steam engines can inspect this engine without being convinced that as a specimen of good workmanship and engineering skill it can be equaled by few engines known to the American public.

Green, Trowbridge & Baldwin of 326 and 328 Delancy street, New York, show a very compact and evidently a very well constructed engine of 40 horse power. It is an inverted walking beam engine, so arranged that the crank and pitman balance the piston-rod and cross-head. A noticeable feature of this engine appeared in the SCIENTIFIC AMERICAN of February 27, 1869, to which the reader is referred for further particulars.

PORTABLE ENGINES.

There are the following: The Baxter Engine, exhibited by Russell & Speer, Newark, New Jersey, attracts much attention, and is undoubtedly worthy of it. A full description of this engine, with engravings, will be found on page 353, Vol. XX., of the SCIENTIFIC AMERICAN, to which the reader is referred.

The New York Safety Steam Power Company, No. 44 Cortlandt street, New York, exhibit a vertical portable engine, in which the slides and pillow-blocks are cast with the column, and the parts are duplicated by special machinery which permits of any part being replaced quickly and cheaply.

A Wood and Mann horizontal portable engine is exhibited by C. Edward Copeland of 42 Cortlandt street, New York. Our readers are so familiar with the features of this engine, of which there are great numbers in use in various parts of the country, that we need not enter upon details of its construction.

S. S. Zabriskie of Bergen Point, New Jersey, exhibits a portable engine, designed to be as cheap as possible, and free from complications, so as to be specially adapted to pumping and other agricultural operations. A novelty on this engine is the omission of the cross-head, the stuffing-box of the steam cylinder being made long to serve as a means for securing parallel motion in the piston-rod.

The Economy Steam Engine Company, 119 Liberty street, New York, exhibit a reaction and direct action rotary engine.

Edward P. Hampson of 38 Cortlandt street, New York, exhibits the Ames Agricultural Portable Engine, illustrated and described on page 311, last volume of the SCIENTIFIC AMERICAN.

Merrick & Sons, 430 Washington avenue, Philadelphia, Pa., exhibit an oscillating engine with D slide valves, intended to obviate the objections usually made to oscillators having a valve motion, depending for its efficiency on rubbing surfaces either flat or radial, with the center of motion of the cylinder, and which cannot be kept tight for any length of time. The machinery in the shops of the manufacturers in Philadelphia has been driven for a number of years by engines of this pattern.

The Rider Vertical Engine, exhibited by Handren & Ripley, was recently described and illustrated in our columns. It is a highly finished and very economical engine.

An Ericsson Caloric Pumping Engine is shown by J. A. Robinson, 120 Broadway, New York.

STEAM BOILERS.

There are but very few boilers on exhibition.

L. Phleger & Co., 142 South Third street, Philadelphia, Pa., exhibit a Steam Generator which consists of a combination of series of horizontal and inclined tubes, the furnaces being built of a series of tubes, which form the grate bar, afterward curving in a V-shape, to make the top or ceiling of the surface. Both ends of the tubes in this series are fitted and secured respectively into tube sheets, connected with a series of horizontal tubes, by means of cast iron semi-circular caps or water-ways. The ends of the tubes are incased by semi-circular water caps, properly secured by flanges and bolts to the tube sheets by means of bolts. Stand pipes are also placed on both sides of the tubes at the front end of the generator, and connect with them by means of openings leading to and covered by the caps or water-ways. It also has a steam drum of cast or wrought iron, intended to collect all water from the steam and deliver it in a dry state to the engine.

A boiler called Weigand's Safe Steam Generator, is employed to drive the Allen engine above described. We unfortunately did not obtain the address of the exhibiters. It is a tubular boiler, consisting of a series of vertical tubes, with inner tubes through which the cooler water descends, the hotter rising within the annular spaces between the pipes. The vertical pipes are connected with a horizontal series and a steam drum.

The New York Safety Steam Power Company, 44 Cortlandt street, New York, also exhibit a tubular boiler, constructed on a somewhat similar principle.

Among minor steam engineering devices we notice the American Eagle Steam Gage, exhibited by the American Eagle Steam Gage Co., 190 Market Street, Newark, N. J., which is undoubtedly a good one, belonging to the type known as mercurial gages. It consists of a cast-iron chamber fitted to receive a thin corrugated steel diaphragm or disk, properly tempered, and plated with nickel, to prevent corrosion. The pressure acts upon the under side of it, the mercury covering the top side of the same, from which extends an open vertical glass tube, supported and protected by a metal case, having a graduated scale of pressure. Any slight movement of the disk will fill the tube with the mercury to a greater or less degree, whereby the pressure is correctly indicated. There is a screw by which the starting point of the mercury can be readily adjusted, so that whatever the temperature of the surrounding atmosphere may be, the indication of the pressure will be correctly indicated. The latter feature is a very important and valuable one, and combined as it is with the absence of wheels, levers, clock-work, or gearing of any kind, renders this gage worthy the attention of such visitors to the fair as are interested in such improvements.

A recording pressure gage is shown by Charles G. Willing, of 88 John Street, New York, which gives a continuous and exact record of the pressure, and the time at which the pressure was sustained, automatically. The principle of recording is the tracing on a rotating disk of a pencil point in the end of the index hand.

W. H. Place, 8 Attorney Street, New York, exhibits an improved governor and valve, of novel construction, and apparently of great effectiveness. The exhibitor offers a $500 challenge to any who wish to compete with it. Mr. Place, the inventor, was formerly Chief Engineer of the Central American Transit Company. His invention consists of a vertical cylinder or case, in which are placed and attached thereto a series of inclined or spiral formed ribs, within which revolves (in water or other liquid), a propellor wheel, revolving and leading in an opposite direction from said spiral ribs in said cylinder, making the shaft, by passing through a series of friction rolls attached to the throttle valve, check or increase the motion of the engine, the stem of the shaft of the propeller wheel passing through friction rolls without packing, causing instantaneous and sensitive motion to depress or elevate the throttle valve. The governor is operated from the main shaft by means of a belt and pulleys.

Berryman's Automatic Boiler Feed Regulator and Electric Low Water Alarm, is attached to one of the principal boilers at the fair. It is an ingenious device, but as it is shortly to be illustrated and described in these columns, we will not anticipate our description. It is exhibited by the Berryman Regulator and Alarm Company, Hartford, Conn.

SCALES, SAFES, AND LOCKS.

There are a few things worthy of notice in this department of the exhibition.

Herring, Farrel & Sherman exhibit a new style of burglar-proof safe, made of Franklinite, or *spiegeleisen*, combined with welded steel and iron. It is cylindrical, and the top is raised to open the safe or lowered to close it by a very strong vertical screw in the center of the cylinder. As the top is raised, the wood work, containing drawers and pigeon-holes, also is raised, so as to become accessible. A combination lock fastens the top when closed, so that it is held in a very secure manner. This safe appears to be a very difficult thing for burglars to deal with, and we judge will not often be attempted by that ingenious fraternity. A desk safe, also of new style, exhibited by the same firm, is worthy of notice.

An application of electricity to bank locks, exhibited by the Electro-Bank Lock Company, No. 9 Willoughby street, Brooklyn, is a most ingenious affair. A combination lock is worked entirely by electro-magnetism, and is placed within the safe on the *back wall*, opposite the door. Its wheels are worked by electro-magnetism, the circuit being controlled entirely by circuit-breakers placed in an office desk or any other convenient place. No one can unlock the safe without knowing the combination, and no key-hole or any other aperture in the walls of the safe exists whereby powder can be inserted. Burglars could only enter a safe provided with this lock by actually penetrating the wall. The lock itself is absolutely exempt from all tampering.

Ellison & Co. of 3 Park Place, exhibit a fine line of platform, railroad, and hay scales, counter scales, and balances Similar exhibitions are made by Wm. R. Cock, 85 Liberty street, New York agent for Riehle Brothers, Philadelphia.

MINOR MACHINISTS' TOOLS, ETC.

Among the minor machinists' tools and similar articles on exhibition, we notice a fine case of twist drills and chucks, exhibited by *Geo. Place & Co.*, 126 and 128 Chambers street, New York.

Post & Goddard, 109 Liberty street, New York, exhibit a beautiful line of twist drills, taps, dies, reamers, etc., a very large variety, and admirably arranged for inspection.

The Baxter Screw Wrench Company exhibited a fine line of their adjustable S wrenches, one of the most ingenious, simple, and useful wrenches in market. An illustrated description of this wrench appeared on page 116, Vol. XX., of the SCIENTIFIC AMERICAN.

The Centerbrook Manufacturing Company exhibit a fine assortment of augers and bits; a good variety and of excellent finish.

A novelty in the display of minor tools is Jones' Patent Joint and Miter Planer, a hand tool whereby a perfect right-angled or miter joint may be made, or a piece be planed square or to any required angle, with ease and accuracy, even by the inexpert. This is accomplished by an adjustable table, upon which the piece is laid, and brought up to the cutting iron of the plane, at the angle desired. The plane proper runs on ways, and thus has a perfectly parallel motion.

[Special Correspondence of the Scientific American].

RESOURCES OF THE SOUTH---NOTES OF A TRIP FROM NEW YORK TO WESTERN TEXAS.

MEMPHIS, TENN., Sept., 1870.

Southern Air Line—West Virginia and East Tennessee—Chattanooga—Northern Alabama—Memphis River Steamers—Cotton-Seed Oil Works, Broom Factories, etc.—Future of the City.

We arrived here by what is called the Great Southern Air Line. As a freight route it has no superior, for we are told that in the season they carry a bale of cotton from Memphis to New York for $5. As a passenger route it is at present a failure, for there are no less than five changes of cars.

We struck the line of this route proper at Lynchburgh,—it really commencing at Norfolk, where it connects with steamers and sail to New York. We thus allude to it because it is an illustration of new ideas in the South, and one of the main types of the great progress that section has made since the war. Favors of any kind they have not bestowed, nor have we asked them.

On the cars we spoke of the great energy of Gen. Mahone. A gentleman remarked, "He is the best hated man in Virginia."

"Why so?"

"Well, he sold himself out to the Northern men."

In conversation with another we mentioned this, and he said, "Sir, Mahone is hated simply because he isn't an old fogy. This railroad was about played out; we didn't have the money to re-build; and what chance was there for a man of life and spirit but to get money from the North?"

The route commences at Norfolk, is under Gen. Mahone to Bristol, then is consolidated to Chattanooga, thence via M. & C. R. R. to Memphis and to New Orleans, via Mississippi Central, etc. Cars loaded with freight run through without change, as the whole line is five-foot gage. A new road is now building from Chattanooga to New Orleans, and the Selma, Rome, and Dalton line is also being extended. A glance of the map will show with these latter two lines a perfect air line from New York to New Orleans.

Southwest Virginia is a grass country. We met on the cars drovers going out there for cattle for the markets of Baltimore, Philadelphia, and New York. Good beef cattle are worth there $40 to $50 per head; veal calves, $25 to $30. The grass is similar to the blue grass of Kentucky. It grows almost spontaneously. The valleys produce corn and wheat in abundance. The rock formation of the country is limestone. The metallic ores are iron, zinc, copper, and lead. The lead mines near Wytheville supplied fully one half of that used by the late Confederate Government. Salt and bituminous coal are also found in greatest abundance. It is an immensely rich county therefore in all the great resources, but can hardly be said to be improved. Land is worth from $1 to $20 per acre, according to the amount of valley or bottom land which goes with it. There is a good sized iron works near Wytheville, but as time did not permit of a visit, we can give no statistics.

East Tennessee is also a country underlaid by limestone rock, full of ores of iron, etc. We saw everywhere along the route thriving fields of timothy—an article hardly known ten years ago.

We have as yet seen no section of the South which has improved so much since the war. Mowers, reapers, subsoil plows, and every variety of labor-saving machinery has been introduced. One merchant told us that he had sold 250 dozen apple-parers. We must confess that this great improvement surprised us. Ten years ago it had the same resources; to-day they are being developed and utilized.

All along the western slope of the Smoky Mountains exist immense beds of iron ore. These are being developed. Previous to the war they were worked to some extent, but not in a systematic manner. Northern capital has come in and bought up the sites of former works, improved them, or erected new ones. There are now five furnaces running in East Tennessee, which have a capacity of twenty five tuns of pig iron per day. All but one run on charcoal, that one uses coke and raw coal. The ore used by is brown hematite the Tennessee dye-stone ore, and one uses a species of franklinite.

Bituminous coal is abundant in the north and west, but a few miles from Knoxville. At that place is a flourishing and well-conducted rolling mill, which turns out about ten tuns of merchant iron per day. One of the owners of a furnace near Jonesboro told me he made 4 tuns of pig iron day, and sold it at the railroad depot at $45 per tun. From his figures he made his iron cost him a fraction less than $20 per tun. He owns sixty thousand acres of wooded land, for which he paid $1 per acre. The immense forests yet in their primeval growth so near these valuable deposits of ore must make the production of charcoal iron one of the great industries of East Tennessee. Labor is cheap, and the fertile soil yields bountifully of the various grains and grasses.

Chattanooga is a small place, but delightfully located in a valley on the Tennessee River. It is a great railroad center. The surrounding scenery is beautiful, and for industrial purposes, there exist practically inexhaustible supplies of coal, iron, and limestone. The small rolling mill which existed here before the war has been elarged, and a new one for railroad bars is to be erected. East on the borders of North Carolina are the Ducktown Copper mines, now yielding largely, but we could not get any statistics.

On the railroad from Knoxville we saw a very neat cotton factory driven by water power, which we were informed was paying large profits.

Memphis has grown more than any Southern city, except Atlanta, and shows more signs of life now. It is favorably located, and has enterprising citizens. A railroad is rapidly being built to Little Rock, Ark., thence it goes to Shreveport, where it is to connect with the Texas Central, and also from Little Rock sends out an arm to El Paso. This city is now more the attraction of Northern capitalists than any other, and is destined to be *the* great city of the South. Located on high ground it can be perfectly drained, which New Orleans never can be. It is the keyhold of the great Southwest. Everything about it is life and vigor. New stores and factories are being erected which would do credit to Broadway in New York. Its manufacturing interests, too, are now large, and rapidly increasing. The culture of broom corn having become a staple in the South, we find here two flourishing broom factories.

The manufacture of cotton-seed oil has been of great importance, and is increasing. There are now three factories, and one more of large size building. Northern capital furnishes at least the initiatory of all these. Before the war but two existed, which manufactured about 3,000 tuns of cake, and 120,000 gallons of oil. The Panola Co. made last year over 2,500 tuns of cake and 100,000 gallons of oil; the Memphis Co. about the same, and the smaller concern about half as much.

The new concern of Baldwin, Fenton & Co. are putting in presses to manufacture 5,000 tuns of cake and a proportionate quantity of oil per year. Then, too, except the two small concerns in Memphis, one in New Orleans, and one in Providence, there were no others in the United States, now there are at least twelve others in the South alone. The planter gets from $8 to $12 per tun for his seed. The cake was formerly shipped to Europe, but its great value as a fertilizer having been demonstrated, and the small price realized from shipment abroad, several of the companies have in themselves or through others, effected arrangements to put it before the people here as a fertilizer.

The Panola Co. mix cotton seed meal, sulphate of lime, salt, and the ashes of the hulls. These latter contain much more potash than wood ashes. All the companies claim to have made no money last year, which may be so, but we can hardly conceive such a result unless by carelessness or bad management.

I shall not here enter into the details of the business; but having looked into it in other places, may at a future time give you the results of my observations on this new and great industry of the South. Now for the swamps of Louisiana.

H. E. C.

NEW MECHANICAL MOVEMENTS.

On page 71, current volume, we offered four mechanical problems for solution, to which we have received a large number of solutions and attempts at solutions. All the problems have received correct solutions at the hands of some who have attempted them, but many have failed in their attempts, some by not observing the conditions of the problems, while others have produced devices that will not work at all.

We shall give a recapitulation of the problems, and the correct solutions that have been sent us.

PROBLEM 1.

It is required to produce continuously, in one direction, four revolutions in one shaft, to every one of the shaft from which it originally derives its motion, without the intervention of belts, or any rotating device between the two shafts, such as gears, pinions, or pulleys, although the shafts may themselves have upon them pulleys or other rotary device, but they must not be placed in contact or connected by belts.

PROBLEM 2.

Required to produce continuous rotation in one shaft from the rotation of a second shaft, the shafts to revolve in opposite directions, without the use of endless belts, toothed wheels, or friction gearing, pitmans, rocking levers, cams, or fly-wheels, and the shafts to be separated to any reasonable required distance.

PROBLEM 3.

Required to drive one shaft by means of a belt and pulleys, the power to be received from another shaft lying in the same plane, but not parallel to the first, the inclination of the second shaft to the first to be forty degrees, if necessary, and no intermediate friction pulleys or idlers to be used, that is, the belt must run straight, without any intermediate device, from the pulley on the driving shaft to that on the driver.

PROBLEM 4.

Required, by means of a *belt alone*, to not only transmit rotary motion from one pulley to another pulley, but to impart to the shaft of the driven pulley a longitudinal motion, the same as would be given to it by a screw thread cut upon it, but without the use of a screw or cam groove on the shaft, which shall be simply a plain shaft, of the ordinary kind, running without shoulders in plain bearings, and the pulley to be also a plain pulley of the ordinary kind keyed to the shaft.

Mr. J. Atkins, of Augusta, Me., sends the folloing solutions of the first two:

PROBLEM 1. NO. 1.

The cam groove in the driving wheel, A, Fig. 1, receives the pin, *a*, and, through it, drives the rod, B, and link, C, which latter revolves the crank pin, D, and its shaft four times to each revolution of A and its shaft, as required. The link, C,

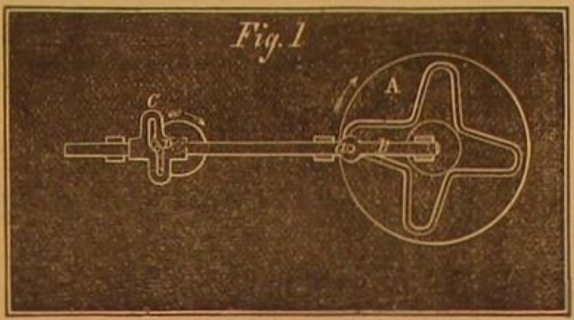
Fig. 1

for converting reciprocating into rotary motion I remember having seen in the SCIENTIFIC AMERICAN a year or two ago. Of course, the throw of the link must exceed that of pin, D, to the extent of the former's offset.

PROBLEM 1. No. 2.

Attached to the face of the driving pulley, A, Fig. 2, are eight segments, *a a a a* and *a'a' a' a'*, each of which extends half the length of A, and one-eighth its circumference. These are alternated around the pulley, a a a a on one end, and *a' a' a' a'* on the other, the former acting on the upper part of the frame, B, and the latter on the lower part. A, while in con-

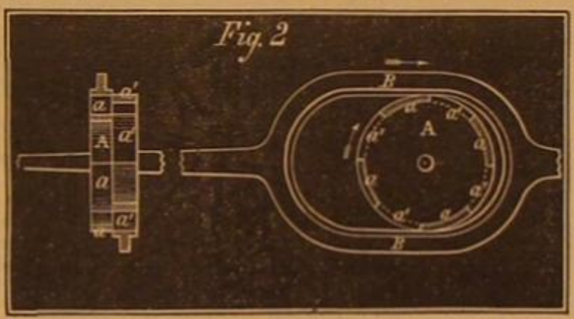
Fig. 2

tact with B, carries it in the direction of the arrow, and, at the moment that contact ceases, *a'*, on the opposite side of the pulley, commences to carry B in the opposite direction, and so on to the end of the chapter. One revolution of A gives four entire reciprocations of B, which are converted into revolutions of D by the same device as in No. 1.

PROBLEM 2.

The crank pin, P, in the driving shaft, A, Fig. 3, carries the link, B, and the same device as in the foregoing converts the reciprocating into a rotary motion, as shown in the sketch.

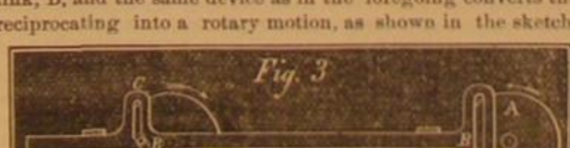
Fig. 3

To make both shafts revolve in the same direction, simply invert the link, C, while both shafts and crank pins remain in the positions shown in the sketch.

Mr. A. Roberts, of St. Catharines, C. W., gives the following solution for Problem 1. The same solution has also been given by C. H. Palmer, of New York city, Courtney Heath of Toledo, Ohio, Wm. C Grimes, of Decatur, Ill., Wilber H. Conders, of Cleveland, Ohio, and George Koch, of Cass, Pa.

A, Fig. 4, is a circular disk placed on the driving shaft with four sets of eccentric grooves, *a a a a*, in which works a pin in

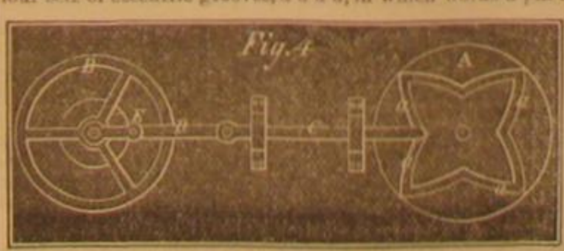
Fig. 4

the end of the slide, C. To the other end of the slide is jointed the pitman, D, which engages with the crank pin, E, on the driven shaft.

Charles T. Moore, of White Sulphur Springs, Va., sends the following solution for Problem 1:

W, Fig. 5, represents the driving shaft, and W2 the shaft to be driven. One half the circumference of the wheel, W, is toothed as represented, and the other half left smooth, so one half a revolution of the wheel, W, will throw the rack, R, forward, and rack, R3, will turn the shaft, W2, twice, and in its forward movement will depress the springs, S and S2, at the same time bringing the friction rollers, F and F2, opposite the apertures, A and A2, at which point the springs, S

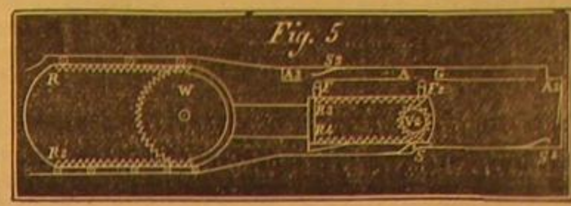
Fig. 5

and S2, rise, placing the friction rollers, F and F2, above, and in the slot, G, disengaging the rack, R3, from the top of the wheel, W2, and engaging rack, R4, with the under portion of the wheel, so the other half revolution of wheel, W, will throw the rack back and cause two more revolutions of wheel, W2, which will bring the friction rollers, F and F2, to the apertures, A and A3, when the front will fall of its own weight, the back being assisted by spring, S3, when the operation may be repeated as before.

The same correspondent also solves Problem 2 by a water or air connection between the shafts, put in operation by water. The end of the driving shaft, Fig. 6, is placed in the cylinder, C, eccentrically, and fitted with a piston which will be forced backward and forward by the inclined wall of the

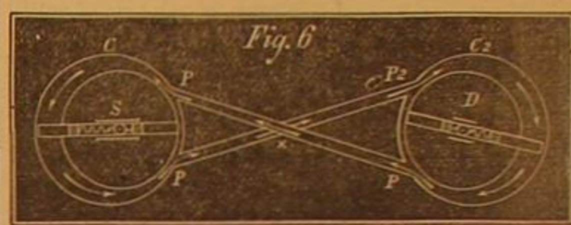
Fig. 6

cylinder, C. C2 is *fac-simile* of C, and by crossing the pipes, P and P2, and revolving the shaft, S, the water will be withdrawn from one side of C2 and forced in on the other, thus causing it to revolve in an opposite direction. Air may be used instead of water.

B. B. Stuart, of New York, solves this problem in the same manner, and also extends it to the solution of Problem 1, by making one rotary pump larger than the other. Still another solution to Problem 1 is, to connect the multiplying link movement invented by Courtney Heath, and illustrated on page 401, Vol. XXII., by means of pitmans and cranks to the driving and driven shafts. This solution is concurred in by C. Heath, of Toledo, Ohio, Wm. C. Grimes, of Decatur, Ill., John W. Grill, of Ind., James Carleton, of Cold Water, Mich., A. W. Johnson, of Lower Providence, Pa., and George Koch, of Cass, Pa.

Problem 2 is correctly solved by several correspondents, who would connect the two shafts by universal joints, but as this solution can not be said to be original, or new, we pass it without further comment.

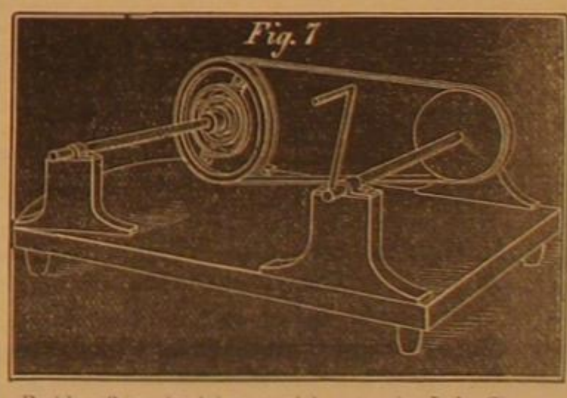
Fig. 7

Problem 3 is solved by a model sent us by Luke Chapman, of Collinsville, Conn., and by drawings, to the same effect, from A. Robertson, of St. Catharines, C. W., Geo. Koch, of Cass, Pa., Ira Bucklin, of Lebanon, N. H., J. W. Harkness, of Keeseville, N. Y., Jas. Carleton, of Coldwater, Mich., Wm. Trowbridge, of New Orleans, La., P. Porter, of Newark, N. J., E. S. Wicklin, of Irving, Kansas, H. Fuller, Masonville, Iowa, C. H. Palmer, of New York city, C. Grimes, of Decatur, Ill., Courtney Heath, of Toledo, Ohio, and T. H. Luders, Olney, Ill., and J. Atkins, of Augusta, Me. One pulley is attached to its shaft by a universal joint, Fig. 7. The model sent us works perfectly. Guide wheels or springs, to keep the jointed pulley in line with the other, suggested by some of our correspondents are unnecessary.

Problem 4 has received only two solutions. One is by Court-

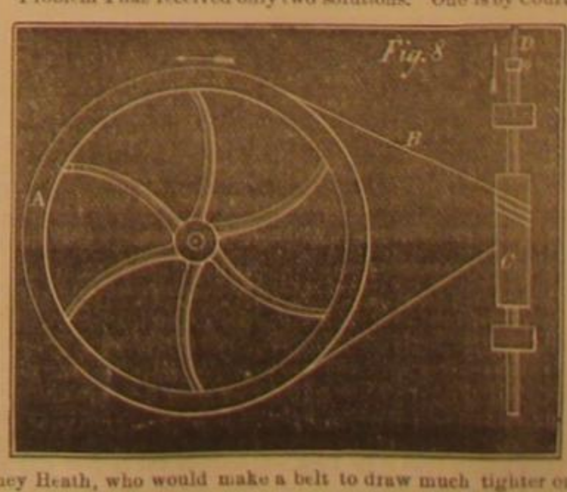
Fig. 8

ney Heath, who would make a belt to draw much tighter on one edge than it does on the ether, which he accomplishes on a small scale by cutting the belt out of a plane piece of leather in the form of a ring. This causes the belt to travel on the pulleys, laterally, from one end to the other, in the direction of the slack side of the belt. The travel of the belt on the driving pulley may be prevented by a flange, or by placing the pulleys at a small angle with each other. A better solution is given by a Brooklyn correspondent, a top view of which is given in Fig. 8.

A is a horizontal driving pulley, grooved to carry the cord belt, B. This cord belt winds thrice about the driven pulley, C, as shown, the journals of the driven shaft being long, as shown, and without shoulders. When the pulley, A, revolves in the direction of the arrow, the driven shaft will regularly advance in the direction of D, and *vice versa*. This movement has been used with success on a light boring machine. The rate of longitudinal traverse depends wholly on the pitch of the belt coils.

SCIENTIFIC INTELLIGENCE.

TEST FOR WOOD FIBER

Mr. Voelter, an extension of whose valuable patent for the manufacture of wood pulp by mechanical means was recently obtained through this agency, exhibited to us a simple method for detecting the presence of wood fiber in paper or fabrics, which ought to be more generally known. The reagent employed is a weak aqueous solution of sulphate of aniline. If a drop of this liquid on a pointed glass rod be applied to paper, if wood be present, even in minute quantity, an intense yellow color will be immediately visible; but the test is only applicable when the wood pulp has been prepared in a mechanical way. Chemically prepared, wood does not yield the same reaction.

GAS MANUFACTURE IN NEW YORK.

The amount of gas manufactured in the city of New York during one month is something prodigious, involving a large consumption of fuel in the form of coke and of bituminous coal for the retorts. According to the *American Gas Light Journal* the following are the returns for the month of July 1870:

	Cubic feet.
Harlem Gas Light Co.	5,369,972
Metropolitan Gas Light Co.	15,565,432
New York Gas Light Co.	29,451,460
Manhattan Gas Light Co.	54,333,427
	104,720,291

We have no means of knowing what the average yield of gas is per tun, but as a poorer quality of coal is used in the summer time than in the winter season, it probably does not exceed six or seven thousand cubic feet, but even this yield involves the distillation of about 17,000 tuns a month, or over 200,000 tuns in a year.

SOLUBLE OXIDE OF IRON.

M. Liebert prepares this oxide by dissolving sugar in a cold solution of pernitrate of iron, and adding a diluted solution of ammonia and sugar. The clear liquid thus obtained is mixed with four or five times its volume of strong alcohol, and the separation thus determined of yellowish brown flakes, which are washed with alcohol. This precipitate, when dry, was found to contain 43·59 per cent of oxide of iron. It is a compound of sugar and iron, of a brown color, inodorous, tasteless, easily soluble in water, from which it is again precipitated by boiling.

Dissolved in water it does not give the usual reactions of iron with ferrocyanide or sulphocyanide of potassium; tannic acid causes a precipitate after some time, and sulphide of ammonium immediately decomposes it.

This oxide of iron is admirably adapted for medicinal purposes, as a sirup can be prepared from it, having a beautiful reddish-brown color, and without disagreeable taste.

THE annual meeting of the Dental Convention was held in this city on the 20th inst. By invitation of the proprietors the members visited the dental warehouse of Mr. White to witness the workings of a pneumatic burr engine, an instrument which resembles an exaggerated pencil case, one end of which is crowned by a small box containing a wheel, which is put in motion by a current of air from a bellows beneath the operator's foot. This wheel imparts a rotary motion to the shaft contained in the tube. By means of this instrument the operations of boring the teeth, scraping, etc., are made more speedy. Files, polishers, and mallets may take the place of the burr attached to the shaft. The rapidity of revolution may be regulated by the operator, 1,500 revolutions per minute being the maximum limit.

THE Brooklyn *Union* says: "The SCIENTIFIC AMERICAN is too well known to everybody interested in science and the mechanic arts to need much commendation at the hands of any one. Its columns for September 17 are filled with its usual array of matter, and will prove as interesting and instructive as the preceding numbers have been, during the many years of its usefulness. Every one at all interested in the objects to which it is devoted, knows its character, and we need only say that character is well sustained in the present number."

THE new census shows Brooklyn to have 406,097 inhabitants. Ten years ago it numbered 266,714. It is now in population the third city in the Union, and its proportional growth much more rapid than New York. If the growth of Brooklyn continues to accelerate in the future, as it has during the past, it will not be many years before it will number more people than New York, and become the largest city in the Union

A sweater for New Yorkers is the tax levy for 1870 which amounts to *twenty-three million, nine hundred and seventy-two thousand, five hundred and fifty-six dollars.*

THE State Fair of San Francisco, which closed on Saturday, September 17th, has been financially a success, the receipts being $30,000.

ON Monday, September 19, the British Association for the Advancement of Science adjourned, after having elected Mr. Thomson chairman of the next meeting.

GAS companies are liable to a special tax under the revenue laws, according to a decision of the Acting Commissioner of Internal Revenue.

NEW BOOKS AND PUBLICATIONS.

THE HEARTH AND HOME,

A finely illustrated family journal of a high character, hitherto issued by Messrs. Pettengill, Bates & Co., has been purchased by Messrs. Orange Judd & Co., of 245 Broadway, New York, the well-known publishers of the *American Agriculturist*. The change will not at all affect the *American Agriculturist*, which will continue on independently as heretofore. The illustrations and reading matter of the two journals will be entirely different. Either of the journals will be furnished from now to the end of 1871 (fifteen months), at the yearly subscription rate, namely, the weekly *Hearth and Home*, at $3·00; the monthly *American Agriculturist*, $1·50; or the two for $4·00.

WENTWORTH'S AMERICAN HARDWARE AND METAL TRADES DIRECTORY

We call attention to the advertisement of this valuable work. It is very useful to those who wish to obtain the address of those engaged in those branches of industry.

Answers to Correspondents.

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

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

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

J. F., of Cal.—We find that the approved practice of engravers in transferring printed designs to wood blocks, is to employ a saturated solution of potash in alcohol. The paper is steeped in this for a longer or shorter period, varying with its character. No rule for the time can be given; experience can only guide in this particular. When taken from the solution the paper has a greasy appearance. It should now be washed in pure water until it loses this appearance. As soon as this takes place, it is placed on the block and backed by several layers of bibulous paper. The whole is then pressed in a lithographer's press, which completes the operation.

W. A. M., of Pa., wishes a "dip" to give a fine copper color to hard brass.

W. F. H., of O.—See answer to H. H., of Mo., in this column.

A. McG., of Vt., is troubled with the fly wheel of the crank shaft in one of the old English upright sawmills. The saw has a two-foot stroke. The weight of the pitman and gate is balanced by a weight on the fly wheel placed opposite. It does not run steadily, and he wishes advice. He may learn something of balancing by perusing the correspondence on this subject now being published in our columns, but if some one who has had special experience in balancing saws would give his experience on this particular case, more than one might be benefited.

D. A., of N. Y.—If you desire to become a locomotive engineer on a railway, the best course for you to take is to enter a locomotive shop, and serve a regular apprenticeship as a machinist. Post yourself as much as possible on the theory of steam by reading, and a few trips with an engineer of experience would render you fit to take charge of a locomotive anywhere, provided you have the necessary ability, courage, and coolness in times of emergency.

G. W. B., of Mo.—We do not at present recollect a particular instance of the result of lightning striking a tin (tinned sheet iron?) roof, but an authority on the subject remarks that "edifices having flat terminations and a great quantity of metal insulated on the top, are often struck, and it is but seldom they escape without great damage." The Encyclopædia Britannica (Vol. VIII page 647) advises the metallic connection of every piece of metal on a roof with the conductor.

E. D. L., of ——.—We do not know whether the plastic slate has proved itself as good as was at first claimed for roofing purposes. There are many preparations for roofing; you must judge for yourself as to their merits. We do not think the paint on the metallic roof of your barn will continue long to contaminate the water in the cistern of the building. All new paint gives odor and taste to water at first.

G. G. H., of Ill.—The information you desire relative to varnishes and varnishing can be obtained in the "Painter, Gilder, and Varnisher's Companion," and "Riffault, Vergnaud, and Toussaint's Treatise on the Manufacture of Varnishes," both published by Henry Carey Baird, 406 Walnut st., Philadelphia, Pa.

N. A. L., of Ind.—Your query can only be answered by experiment. We do not think the elevating power of any of the devices, except balloons, intended to navigate the air, has ever been actually determined, except in so far that it has been shown to be a minus quantity in a great majority of them.

W. B. V. V., of ——.—A lady asks in a late number for something to remove a musty scent and mold from heavy carpets. A few drops "oil pennyroyal" on the lining or under side will accomplish the desired end, and keep out moths and fleas.

H. H., of Mo.—To galvanize cast iron clean the surface thoroughly by the use of sulphuric acid, diluted with ten parts water, and a wire scratch brush. Then dip in a bath of melted zinc, having its surface covered with sal ammoniac.

E. J. M., of Cal.—The two applications of the toggle joint, of which you send diagrams, are capable of performing the same work; their mechanical power is exactly equal.

Business and Personal.

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

Recent American and Foreign Patents.

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

Hame Fastening.—Sinclair D. G. Niles, Helena, Ark.—This invention relates to a new fastening for hames, and has for its object to get rid of the hame strings now in use, which, being of leather and either tied or buckled, will soon wear out, besides being difficult to hold in place.

Device for Propelling Canal Boats and other Vessels.—Edward K. Watson, Shokan, N. Y.—This invention has for its object to furnish an improved device designed more particularly for attachment to canal boats, but which may be attached to other kinds of vessels, and which shall be simple in construction and effective in operation, preventing any injurious wash of the banks.

Organ Tremulant.—T. P. Sanborn, Boston, Mass.—This invention relates to a new and useful improvement in a device for producing the tremulous sound of the pipes of the church organ, and consists in a cylinder and valve, with a vibrating rod with balls or weights thereon, and with a thumb screw for regulating the motion of the valve.

Device for Operating Hand Fans.—William A. Ireland, New York city.—This invention has for its object to furnish an improved device for operating a hand fan, which shall be simple in construction and effective in operation, enabling the fan to be vibrated easily and conveniently.

Self-Winding Counter Spool.—W. J. Fox, Morrisania, N. Y.—This invention has for its object to furnish an improved counter spool for holding cord to be used for tying up packages and other uses, and which shall be so constructed that when the end of a ball of cord is attached to the spool the spool will revolve and wind the cord upon it.

Plow Beam.—J. W. Sursa, San Francisco, Cal.—This invention relates to a new and useful improvement in beams for plows, more especially designed for gang plows, but applicable to other kinds of plows, and consists in making the beam or beams of angle iron.

Molding Sash Weights.—Wm. Ferguson and James Anderson, New York city.—This invention relates to improvements in molding sash weights, and it consists in making the molds for the principal parts in sand, without partings, and arranging the molds so formed for the application of chills for making the holes in the ends for attaching the cords, and for smoothing the same to protect the cords.

Machine for Upsetting Wagon Tire and other Purposes.—Wm. Hunt, Oskaloosa, Iowa.—The object of this invention is to provide a machine for blacksmiths' use, by means of which wagon or carriage tires or iron bands or bars may be upset or made less in diameter or length, and by which iron may be punched and cut.

Electric Gas Lighting Apparatus.—Charles N. Ealer, Opelousas, La.—The object of this invention is to construct an electric apparatus for lighting a suitable number of gas lights in succession, so that a number of machines may be used in connection.

Seed Planter and Guano Distributor.—E. Blacklidge, Abbeville, Ala.—This invention relates to a new seed and guano planter, of extremely simple construction, and which can be used to deposit at once two different substances, and is not apt to get out of order or become injured by ordinary wear.

Fire Grate and Tile.—Joseph Hackett, Louisville, Ky.—This invention relates to certain improvements in the construction of basket grates made in sections to be readily taken apart and put together.

Device for Securing Hubs to Axles.—George E. Clow, Jeffersonville Ind.—This invention consists of an axle-box provided with a tube passing radially through one side of the box, and through the inclosing hub, in combination with a key, which, when placed in said tube, project into the axle-box; and with an axle provided with a transverse circumferential groove which the inner end of the key enters, thus connecting the axle and box; the tube being externally threaded in order that a cap may be screwed upon it, and serving also as an oil reservoir, the escape of oil from which is regulated by the key.

Street Car Signal.—William Brown, Duncannon, Pa.—This invention has for its object to enable conductors to show inside street cars a label bearing the name of the street the car is running on, and at every corner a label bearing the name of the street about to be crossed, for the purpose of saving the conductor the trouble of making, and the passengers the difficulty often experienced of understanding, verbal announcements.

Potato Digger.—S. E. Anthony, Stillwater, N. Y.—This invention has for its object to break up the hills in which potatoes lie during the period of their growth, and to separate the roots from such broken-up earth.

Music Stand.—Lewis V. Brown, Salisbury, N. C.—This invention relates to a new and useful improvement in stands for holding sheet music, designed more especially for performers in brass bands, but convenient for all instrumental performers, singers, public readers, lecturers, etc., and it consists in an extension staff provided in the socket cap for a candle or lamp, and with adjustable arms with springs attached thereto for holding the sheet or sheets.

Adjustable Awning.—L. Yenne, N. Y. city and C. Schneider, Newark, N. J.—This invention relates to a new flexible awning, so arranged that it can be extended or contracted at pleasure. The invention consists first in the construction of the swinging frame which holds the flexible cover with a ratchet and spring pawl, whereby the degree of extension can be nicely regulated.

Ditching Machine.—Ralph Robert Osgood, Troy, N. Y.—This invention relates to a new ditching machine, which is provided with a rotary wheel that carries buckets at both sides by means of which the digging is done; the buckets are hung to the sides of the wheel in such manner that their outer, working ends will be in line with the edge of the wheel, so that they obtain the full power of the wheel.

Bridge.—Isaac H. Wheeler, Sciotoville, O.—This invention relates to improvements in trussed bridges, and consists in the employment, in connection with the upper and lower chords, of an intermediate chord and an arrangement with the truss braces and chords of short braces, calculated to impart greater strength than when only two chords and long braces are used, the said chords and braces being made single or double, or triple, as may be required by the case in hand, but usually the lower and middle chord is double and the upper one single. The invention also relates to the arrangement of the cord ties and lateral braces at the top, and in a diagonal arrangement of the floor and connection of the lower chord ties for lateral bracing in substitution of the lateral braces commonly used at the bottom.

Fences.—Lester Philips, Eau Claire, Wis.—This invention relates to improvements in the construction of farm fences, and consists in certain details of construction, whereby a cheap, durable, portable fence is provided which is adapted for being set vertically on side hills or level ground, and made so that the parts may be all fitted in the shop for putting together in the field, in a simple manner, the like parts being interchangeable.

Machine for Dressing Tile.—George Barney, Swanton, Vt., and V. G. Barney, Minneapolis, Minn.—This invention relates to improvements in machines for squaring and facing floor tile, and consists in an arrangement of a squaring frame, above a horizontal, revolving dressing disk, and certain peculiar attachments thereto for holding the tile to be squared and dressed on the edges. Also, an improved arrangement of apparatus for holding the tile upon the disk for facing, and also improvements in sand and water-feeding apparatus.

Oiler.—John Gates, Portland, Oregon.—This invention relates to improvements in oilers for steam cylinders, journal bearings, and the like, and consists in the arrangement of oilers for the employment of water, in connection with the vessel to contain the oil, under pressure, for forcing the oil from the vessel to the part to be lubricated, either in jets or in a slow, continuous feed, the water being admitted to the vessel to force the oil out the top.

Corn Planter.—William M. Meyers, New Brunswick, N. J.—This invention has for its object to furnish a simple, convenient, and effective corn planter, which shall be so constructed and arranged that it may be readily adjusted to drop more or less kernals at a time or to plant the rows at a greater or less distance apart, as may be desired.

Corn Planter.—Joseph Cosand, Russiaville, Ind.—This invention has for its object to furnish an improved corn planter, which shall be so constructed as to plant two rows at the same time, and in such a way as to be in complete check row without the land's being previously marked, and which shall, at the same time, be accurate and uniform in its operation.

Mud and Ore Mills.—John Kellet, Elizabethport, N. J.—This invention relates to that class of mud and ore crushing mills wherein the pan is caused to revolve under the vertically revolving crushers, and consists in an arrangement therewith of a shovel on a long sweep or lever, balanced at or near the center, on a crotched and horizontally revolving or oscillating support, so arranged relatively to the pan that the contents thereof may be shoveled out of the pan with safety and convenience when the mill is running.

Screw Propeller.—J. D. Ford, Baltimore, Md.—This invention relates to improvements in screw propellers, and consists in an arrangement for changing and securing the blades of a propeller on apparatus worked within the vessel, so that they may be adjusted to and secured in the position for working, or the two sets of blades may be brought into the same axial plane, for moving through the water, when not revolving, so as to encounter less resistance from the water than when in the working position.

Smoking Pipe.—Chas. F. Hitselberger, Libertytown, Md.—This invention relates to improvements in smoking pipes, and consists in a pipe provided with a nicotine cup attached to the bowl, a water vessel for cooling and purifying the smoke, on an intermediate tube leading from the bowl to the stem, and a saliva cup, attached to the lower end of the latter, all arranged in a way calculated to protect the smoker from the nicotine, heat, and other offensive tastes of the tobacco, and to prevent the stoppage of the smoke passage.

Sap Feeder.—Geo. D. Chandler, West Concord, Vt.—This invention relates to improvements in automatic sap feeders, such as described in a patent dated Nov. 2, 1869, No. 96,392, and consists in an improved arrangement of the float lever by which the admission passage is opened and closed, for adjustment for varying hights of the sap in the boilers; also, in an arrangement for attaching the regulating apparatus to the side of the boiling kettle, and connecting it with the reservoir by a flexible pipe, the connection of the flexible pipe being such that it may be readily detached.

Safety Valve.—W. R. Reece, Tremont, Pa.—This invention relates to improvements in safety valve apparatus for steam boilers, and consists in an arrangement of the valve lever in connection with a float inside of the boiler, so that when the water falls too low therein the weight of the float will cause the fastening for the short arm of the lever to be tripped, so that the valve will be raised, and let the steam escape, and thereby prevent the boilers from exploding.

Washing Machine.—A. L. Van Norman, Clinton, Pa.—This invention relates to improvements in washing machines, and consists in a combination with a tub, having a corrugated concave bottom, and a vertical central dividing wall, which may be readily applied or removed, to make one or two compartments, of a pair of vibrating arms or pendulums, mounted in suitable bearings or pivots, at the top of the cover, and carrying, at the lower ends, roller frames which work back and forth above the bottom, moving in opposite directions, being connected to a double cranked shaft above the pivots.

Carriage Brake.—H. B. S. Davis, Farmington, Ill.—This invention relates to improvements in brakes for carriages, wagons, and the like, and consists in an arrangement, in connection with a sliding brake-support, of the front axle, to slide back under the bolster, when the animals hold back, against the brake support, and press the brakes against the hind wheels, and to slide forward again and release the brakes when the animals pull ahead. It also consists in the employment of cam-shaped brake shoes, pivoted to the supports in a way calculated to increase their efficiency.

Index.—Stephen S. Nash, New York city.—This invention relates to a new and useful index for school and other uses, where it is desirable to keep a changeable record or index of the good or bad standing of scholars, and the the like. The invention consists in a number of blocks or tablets of wood, paper, or other substance, having the names of scholars marked on them, or it may be numbers or other characters, which tablets are laid, one upon another, or side by side, in a case, confining the ends by rails or bars, one of which is hinged so as to be readily turned away from the tablets to admit of taking them out and putting them in again, for changing the order of their arrangement.

Balanced Slide Valve.—Collier & Masterman, Sacramento, Cal.—This invention relates to improvements in balanced slide valves, and consists in the arrangement in a cylindrical or other case, attached to the top of the steam chest, and opening into it, of a cylinder suspended above so as to swing back and forth with the valve, having a piston, the rod of which is jointed to the valve, one side of the piston being exposed to the steam in the valve chest, and the other to the atmosphere, so that the downward pressure on the valve is counteracted by the upward pressure of the steam on the under side of the piston, which is intended to be of such area as to regulate the pressure of the valve upon its seat, as may be required.

Machine for Scouring Grain.—J. N. Harshbarger, Bloomington, Wis.—This invention relates to improvements in machines for scouring grain, and consists in a hollow cylinder of sheet metal, or other substance, mounted vertically in a suitable frame, and provided with a roughened inner surface, and with curved hollow arms on the lower portion, which are also roughened on the inner surfaces, in which cylinder is another, with a roughened exterior, but of considerable lesser size, which cylinders are revolved in opposite directions, and the grain is passed through the outer one and subjected to the action of both, after which it is discharged through the aforesaid arms, into an air-tight space, from which the dust and other light matters, detached by the scouring surfaces and taken out by a fan, mounted on the said air-tight case.

Snow Plow.—R. C. Harris, Maple Green, New Brunswick.—This invention relates to a new snow plow which is to be secured in front of a locomotive or railroad train for the purpose of clearing the track from the snow. The invention consists in the general new arrangement of an elevating scoop, screw, and discharge wheel, or "fling," all combined to elevate and scatter the snow, and also in making the said screw vertically extensible or contractible for the purpose of adjusting the apparatus to snow of varying depth

Fruit Can Funnel.—L. P. Edwards, Hamlinton, Pa.—This invention relates to a new and useful improvement in funnels for delivering fruit into cans, in the process of canning fruit, whereby much labor and trouble is saved, having especial reference to the class of fruit cans which are sealed by screw covers, and it consists in a funnel constructed with a lower delivery section which screws on to the top of the can.

Cultivator.—J. H. Hamilton, Stevenson, Ala.—This invention has for its object to furnish an improved cultivator which shall be simple in construction, strong, durable, and effective in operation, and which may be be easily adjusted for the plows to work farther apart or closer together as may be desired.

Adjustable Arm for Working Slide Valves, etc.—Hubbard Hendrickson, Red Bank, N. J.—This invention has for its object to provide an adjustible arm by means of which the stroke of a slide or other valve in a steam chest can be regulated at will, so that the steam can be used more or less expansively, as may be desired.

Balanced Rock Valve.—J. C. King, New York city.—This invention relates to a new rock valve for pumps, steam chests, etc., and has for its object to so construct the same that it will be fully balanced.

Milk Cans.—J. C. Milligan, Brooklyn, N. Y.—This invention relates to improvements in the construction of milk cans, and consists in the arrangements having for their object to provide the strongest can with the least amount of metal and the simplest construction.

Bedstead Fastening.—W. H. Carter, Candor, N. Y.—This invention relates to a new device for connecting the side rails and posts of bed steads, and consists in the use of a metal bow secured to the rail, and of a perforated bar or plate on the post, the said bar having slots to receive the dovetail end of the bow, and rests for the supports of said ends.

Solar Camera.—Norman Bryan, Thomaston, Ga.—This invention relates to improvements in solar cameras, and consists in improvements in arrangements of apparatus for turning the reflectors by clock-work attached for the purpose; also in improved adjusting apparatus for varying the reflectors according to the sun's variations.

Music Leaf Turner.—J. W. Mellor, Philadelphia, Pa.—This invention relates to a new apparatus for holding the leaves of music on a piano or other musical instrument, and for turning the same by the action of a foo on a pedal.

Valve Gear for Steam Pumps, Engines, etc.—J. C. King, New York city.—The object of this invention is to construct a link motion for operating the valves of steam pumps and engines which adjusts the same so rapidly that the water or steam will be suddenly reversed, so that the dead center is entirely overcome.

Wind Wheel.—B. C. Terry, Keyport, N. J.—This invention relates to improvements in wind wheels, and consists in an improved arrangement of means for feathering the vanes or fans.

Official List of Patents.

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FOR THE WEEK ENDING Sept. 20, 1870.

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107,433.—Potato Digger.—S. E. Anthony, Stillwater, N. Y. Antedated September 10, 1870.
107,434.—Hydrant.—William Bailey, Troy, N. Y.
107,435.—Machine for Dressing Tiles.—George Barney, Swanton, Vt., and V. G. Barney, Minneapolis, Minn.
107,436.—Seed and Guano Distributer.—Edward Blacklidge, Abbeville, Ala.
107,437.—Self-Locking Hinge.—G. E. Boisselier, St. Louis, Mo.
107,438.—Bolt Cutter.—James R. Brown, Cambridgeport, Mass.
107,439.—Seat for Row Boats.—Walter Brown, Boston, Mass.
107,440.—Street Indicator for City Cars.—Wm. Brown, Duncannon, Pa. Antedated September 14, 1870.
107,441.—Solar Camera.—Norman Bryan, Thomaston, Ga.
107,442.—Toy Gun.—Edward Buckman and Alexander Buckman, Brooklyn, N. Y. Antedated September 5, 1870.
107,443.—Washing Machine.—E. L. Bullock, Hartford, Conn.
107,444.—Hoisting Grapple.—John A. Burgess (assignor to himself and Joshua Standish), Plymouth, Mass.
107,445.—Broom-corn Seed Stripper.—G. E. Burt and E. A. Hildreth, Harvard, Mass.
107,446.—Clothes Basket.—Leander Carman and A. C. Carman McCoy's Station, Ohio.
107,447.—Removing Burrs from Wool.—Peter Casson, San Francisco, Cal.
107,448.—Sap Feeder to Sugar Evaporators.—George D. Chandler, West Concord, Vt. Antedated September 10, 1870.
107,449.—Fruit Jar.—T. A. Clark and H. C. Mascroft, Worcester, Mass.
107,450.—Shaving Mug.—Frank B. Clock, Boston, Mass.
107,451.—Earth Closet.—Lewis G. Clock, Manchester, N. H.
107,452.—Securing Hubs to Axles.—G. E. Clow, Jeffersonville, Ind.
107,453.—Balanced Slide Valve.—Orrin Collier and Wm. H. Masterman, Sacramento, Cal.
107,454.—Knitting Machine.—F. M. Comstock, Cleveland, Ohio.
107,455.—Folding or Knock-down Chair.—J. K. Coolidge, and N. H. Hill, Cincinnati, Ohio.
107,456.—Horse Hoe.—Ira Copeland, North Bridgewater, Mass.
107,457.—Corn Planter.—Joseph Cosand, Russiaville, Ind.
107,458.—Soldering Machine.—E. T. Covell, Brooklyn, N.Y Antedated September 10, 1870.
107,459.—Device for Balancing Fanning-Mill Shoes.—William Crane, Millgrove, Ind.
107,460.—Signal Box for Fire-Alarm Telegraphs.—S. D. Cushman, New Lisbon, assignor to the Automatic Fire-Alarm Company, Leetona, Ohio.
107,461.—Combined Harrow and Roller.—Frank A. Dann and James McKibben, Wellsville, Mo.
107,462.—Carriage Brake.—H. B. S. Davis, Farmington, Me.
107,463.—Extension Table and Settee.—Martin Debzell Wabash, Ind.
107,464.—Churn.—Levi Dederick, New York city.
107,465.—Electric Gas-Lighting Apparatus.—C. N. Ealer Opelousas, La.
107,466.—Meat Chopper.—J. A. Eberly (assignor to himself and Abraham Godshalk), Reamstown, Pa.
107,467.—Seed Planter.—C. R. Edwards, Bowling Green Ky.
107,468.—Folding Sash Weight.—William Ferguson and James Anderson, New York city.
107,469.—Ironing Board.—Jacob Fischer, Pittsburgh, Pa.
107,470.—Washing Machine.—Charles Ford and Frank C Garbutt, Mason, Ill.
107,471.—Propeller.—John D. Ford, Baltimore, Md.
107,472.—Locomotive.—William A. Foster, Fitchburg, Mass.
107,473.—Bung.—Vincent Fountain, Jr., West New Brighton N. Y.
107,474.—Mechanical Hand Motor.—Harvey Fowler Washington, D. C.
107,475.—Mechanical Hand Motor.—Harvey Fowler Washington, D. C.
107,476.—Box Stereoscope.—Thomas Fugate, Cincinnati Ohio.
107,477.—Cooking Apparatus.—John Gallagher, Cleveland Ohio.
107,478.—Lubricator.—John Gates, Portland, Oregon.
107,479.—Combined Dressing Bureau and Bath Tub.—Jane E. Gilman, Hartford, Conn.
107,480.—Apparatus for Decorticating, Separating and Drying Grain.—A. J. Glass, London, England. Patented in England, December 17, 1869.
107,481.—Plow.—Charles M. Gordon, La Porte, Ind.
107,482.—Shield for Carriage Step.—Chas. H. Gould (assignor to himself and William Lumb), Boston, Mass.

107,483.—Fireplace Grate.—Joseph Hackett, Louisville Ky.
107,484.—Cultivator.—J. H. Hamilton, Stevenson, Ala.
107,485.—Snow Plow.—R. C. Harris, Maple Green, New Brunswick.
107,486.—Grain Scourer.—I. N. Harshbarger, Bloomington, Wis.
107,487.—Harvester.—Andrew J. Haswell and J. W. Irwin, Circleville, Ohio. Antedated September 12, 1870.
107,488.—Washing Machine.—Peter Hayden, Pittsburgh, Pa.
107,489.—Composition for Pavement.—J. R. Hayes, New York city.
107,490.—Preparation of Composition for Pavement.—J. R. Hayes, New York city.
107,491.—Shoemakers' Edge Plane.—A. P. Hazard, North Bridgewater, Mass.
107,492.—Adjustable Arms for Working Slide Valves.—Hubbard Hendrickson, Red Bank, N. J.
107,493.—Stand for Cleaning Window.—Edward Herdster, Chicago, Ill.
107,494.—Extension Lounge.—Nathan H. Hill, Cincinnati, Ohio.
107,495.—Smoking Pipe.—Charles F. Hitselberger, Libertytown, Md.
107,496.—Kiln for Burning Tiles, Pipes, etc.—John Hornsby, Woodbridge, N. J.
107,497.—Wagon Hub.—Jerome B. Hubbell, Naugatuck, Conn.
107,498.—Sash Holder.—H. C. Hunt, Amboy, Ill.
107,499.—Life-preserving Mattress.—Joshua Hunt, Providence, R. I.
107,500.—Compound Machine for Upsetting, Punching, and Cutting Metal.—Wm. Hunt, Oskaloosa, Iowa.
107,501.—Device for Operating Hand Fan.—W. A. Ireland, New York city.
107,502.—Planing Machine.—Anson Judson, Brooklyn, N. Y.
107,503.—Mud and Ore Mill.—John Kellet, Elizabethport, N. J.
107,504.—Valve Gear for Steam Pump, Engine, etc.—J. C. King (assignor to himself, G. M. Woodward, and G. A. Blood), New York city.
107,505.—Balanced Rock Valve.—John C. King (assignor to himself, George M. Woodward, and George A. Blood), New York city.
107,506.—Harrow Teeth.—Henry R. Kinney, Portsmouth, Ohio.
107,507.—Caster.—Joseph Kintz (assignor to himself and P. J. Clark), West Meriden, Conn.
107,508.—Corn Planter.—M. L. Kissell and J. B. Kissell, Springfield, Ohio.
107,509.—Bedstead and Cot.—H. W. Ladd, Chelsea, Mass. Antedated Sept. 8, 1870.
107,510.—Thrashing Machine Separator.—Isaac Lebo, Wintersville, Pa.
107,511.—Locomotive Attachment.—Clark Lewis, Cassville, N. Y.
107,512.—Bolting Reel.—F. B. Lewis, Tiffin, Ohio.
107,513.—Turning Lathe.—Harvey Locke, Grand Rapids, Mich.
107,514.—Lamp.—G. H. Lomax, Somerville, Mass.
107,515.—Egg Beater.—Thomas Marsh (assignor of one half his right to James Callaghan), Pawtucket, R. I.
107,516.—Fruit and Vegetable Slicer.—W. A. Mayhew, Peabody, Mass.
107,517.—Hedge Trimmer.—Joseph McAnulty, Bentley, Ill.
107,518.—Clothes Wringer.—John McLaughlin, Steubenville, Ohio.
107,519.—Music Leaf Turner.—James W. Mellor, Philadelphia, Pa.
107,520.—Corn Planter.—William M. Meyers, New Brunswick, N. J.
107,521.—Milk Can.—J. C. Milligan, Brooklyn, N. Y.
107,522.—Harvester Dropper.—T. C. Moore (assignor to himself and J. G. Wickersham), Dublin, Ind.
107,523.—Evaporating Salt Water and other Liquids.—F. A. Morley, Syracuse, N. Y.
107,524.—Double Piston Engine.—A. W. Morrell, Nile, Mich., assignor of one half his right to Perley Hale, Jr.
107,525.—Folding Chair.—William Morstatt and Francis Kips, New York city; Francis Kips assigns his right to William Morstatt.
107,526.—Cultivator.—John Neff, Jr., Pultney, N. Y.
107,527.—Floor Clamp.—David Nettleton, Humbird, Wis.
107,528.—Hame Fastening.—Sinclair D. G. Niles, Helena, Arkansas.
107,529.—Ditching Machine.—Ralph Robert Osgood, Troy, N. Y.
107,530.—Track Rail for Sliding Doors.—Emery Parker, New Britain, Conn.
107,531.—Hay Fork and Hook.—Thos. W. Peirce, Minneapolis, Minn.
107,532.—Animal Trap.—Lionel Vernon Percival and Joseph Link, United States Army; said Percival assigns his right to said Link.
107,533.—Fence.—Lester Philips, Eau Claire, Wis.
107,534.—Manner of Mounting Hollow Revolving Cylinders.—L. B. Pitcher, Salina, N. Y.
107,535.—Process and Machinery for Making Mortar.—L. B. Pitcher, Salina, N. Y.
107,536.—Wagon Bed.—W. H. Porter, Brazil, Ind.
107,537.—Inside Sole for Boots and Shoes.—W. E. Prall, Washington, D. C.
107,538.—Cover for Boots and Shoes.—W. E. Prall, Washington, D. C.
107,539.—Wrench.—F. P. Rand, Pawtucket, R. I.
107,540.—Safety Valve.—W. R. Reece (assignor to himself, Wm. Garrett, and Michael Moll), Tremont, Pa.
107,541.—Machine for Tempering Sickle Sections, Plane Irons, etc.—S. F. Reynolds, Auburn, N. Y.
107,542.—Pruning Knife.—Wm. Richard, Clyde, Ohio.
107,543.—Carriage Wheel.—Joseph Ridge, Wayne Co., Ind., assignor to S. S. Strattan of one quarter his right.
107,544.—Glass Lamp.—D. C. Ripley, Pittsburgh, Pa.
107,545.—Alley Board for Ball Game.—Chas. Robinson, Boston, Mass.
107,546.—Wagon-tongue Support.—D. D. Robinson, Niles, Mich.
107,547.—Check-rein Connector.—Andrew H. Rockwell, Harpersville, N. Y.
107,548.—Beehive.—Hiram F. Rohm, West Providence, Pa.
107,549.—Organ Tremulants.—T. Prentiss Sanborn, Boston, Mass.
107,550.—Clasp for Elastic Band.—Antoine Scheydecker, Amsterdam, N. Y.
107,551.—Combined Lantern and Candlestick.—M. A. Shepard, Fort Branch, Ind.
107,552.—Burial Case.—George Shilling, Baltimore, Md.
107,553.—Desulphurizing Auro-pyrites and other Ores.—Lorenzo Sibert, Staunton, Va. Antedated Sept. 5, 1870.
107,554.—Shovel for Seeder.—David Slaughter, Mountville, Pa. Antedated Sept. 12, 1870.
107,555.—Machine for Dovetailing Window Sash.—De Witt C. Smith, Montgomery, Ill.
107,556.—Twine Holder Stand.—J. S. Smith, Middletown, Conn.
107,557.—Blind Slat Operator.—John B. Smith, Samuel A. Greely, and Arthur Campaigne, Chicago, Ill.
107,558.—Flower Pot.—C. L. Steele, Boston, Mass.
107,559.—Broom Handle.—Joel Strong, College Hill, Ohio.
107,560.—Gang Plow Beam.—J. W. Surse, San Francisco, Cal.
107,561.—Machine for Turning the Heads of Bolts.—W. F. Swathel (assignor to himself and W. W. Woodruff), Mt. Carmel, Conn.
107,562.—Machine for Breaking Hides and Working Leather.—Isaac D. Taylor and William Bade, Hornellsville, N. Y.
107,563.—Wind Wheel.—Benjamin C. Terry, Keyport, N. J.
107,564.—Tool Rest.—Alfred Thomas, Worcester, Mass.
107,565.—Rasp.—Ira F. Thompson, Providence, R. I.
107,566.—Center Plate for Stove Top.—John Thornley, Fallston, Pa.
107,567.—Ratchet Feed Mechanism.—Andrew Turnbull, New Britain, Conn.
107,568.—Wood Bucket.—Samuel S. Vail, Keokuk, Iowa. Antedated Sept. 12, 1870.
107,569.—Washing Machine.—A. L. Van Norman, Clinton, La.
107,570.—Button Machine.—Christoph Volkert, New York city.
107,571.—Car Coupling.—William Walker, Woodside, Cal., assignor to himself and R. O. Tripp.
107,572.—Shoe Fastening.—Wm. P. Ware, New York city. Antedated September 5, 1870.
107,573.—Propelling Canal Boat.—E. K. Watson, Shokan, N. Y.
107,574.—Card Rack.—W. Wendell, Milwaukee, Wis. Antedated Sept. 17, 1870.
107,575.—Sash Holder.—G. W. Wheat, Philipsburg, Pa.
107,576.—Bridge.—I. H. Wheeler, Sciotoville, Ohio.
107,577.—Pruning Shears.—Frederick A. Will, San Francisco, Cal.
107,578.—Knob Latch.—John Theophilus Williams, Chicago, Ill.
107,579.—Compound for Stuffing and Finishing Leather.—T. D. Williams, Chicago, Ill.
107,580.—Bedstead and Table.—George Wilson, Chicago, Ill.
107,581.—Adjustable Chair.—George Wilson, Chicago, Ill.
107,582.—Bottle-corking Machine.—Julius Wolff, New York city, and W. N. Nunsen, Baltimore, Md.
107,583.—Printing Press.—C. D. Writhington, Fairhaven, Mass.
107,584.—Adjustable Awning.—L. Yenne, New York city, and Charles Schneider, Newark, N. J.
107,585.—Lock for Pianos, etc.—Hermann Ahrend, Newark, N. J.
107,586.—Mail Box.—A. W. Allen and Charles Reitz, Indianapolis, Ind.
107,587.—Reversible Knob Latch.—H. P. Appleton (assignor to W. A. Aiken), Norwich, Conn.
107,588.—Bracelet.—John Barclay, Bergen, N. J.
107,589.—Latch for Gates.—E. Barks and L. H. Emmons, Noblesville, Ind.
107,590.—Permutation Lock.—J. E. Barnes, Danvers Centre, and L. P. Barnes, Fitchburg, Mass.
107,591.—Wash Boiler.—J. W. Bates and Mary A. Bates, St. Paul, Minn.
107,592.—Meat and Vegetable Cutter.—Paul Bonfils and John Grossmann, West Hoboken, N. J.
107,593.—Saw.—W. E. Brooke, Trenton, N. J.
107,594.—Hand Corn Planter.—George Burson, East Palestine, Ohio.
107,595.—Hand Corn Planter.—G. Burson, East Palestine, Ohio.
107,596.—Device for Curling and Dressing Hair.—Paul Ceredo, Dusseldorf, Prussia, assignor to himself and Thomas Ferguson Miller.
107,597.—Base-burning Coal Stove.—Albert C. Corse, New York city.
107,598.—Fruit Jar.—Edward Croft (assignor to himself and Henry Coulter), Philadelphia, Pa.
107,599.—Combined Furnace, or Oven, and Tempering Die.—Henry Disston, Philadelphia, Pa.
107,600.—Apparatus for Roasting and Drying Ores and other Materials.—Alfred Duvall, Baltimore, Md. Antedated Sept. 19, 1870.
107,601.—Electro-Magnetic Railroad Signal Apparatus—A. J. Elder, Chicago, Ill.
107,602.—Art of Manufacturing Spikes.—David Eynon (assignor to the Tredegar Company), Richmond, Va.
107,603.—Exhaust Nozzle.—A. F. Du Faur, New York city
107,604.—Washing Machine.—J. A. Fletcher, Eyota, Minn.
107,605.—Exhaust Nozzle for Steam Engine.—W. A. Foster, Fitchburg, Mass.
107,606.—Plow.—F. M. Franklin (assignor to himself and Asahel Franklin) Springfield, Ohio.
107,607.—Liquid Meter.—W. H. Fruen, Boston, Mass.
107,608.—Protecting Dikes and Embankments against the Ravages of Animals, etc.—Smith Gardner (assignor to himself and Hiram Howe) New York city.
107,609.—Nut Lock.—Robert Gilliland, Hudson, Mich.
107,610.—Machine for Drilling and Cutting Screw Threads.—J. J. Grant (assignor to himself and L. C. Pratt), Greenfield, Mass.
107,611.—Chute for Delivering Timber.—J. W. Haines, Genoa, Nevada.
107,612.—Kiln.—B. R. Hawley, Normal, Ill.
107,613.—Machine for Welding Chain-Links.—W. B. Hayden, Columbus, Ohio.
107,614.—Fastening for Epaulet.—E. J. Helwig (assignor to R. M. Robinson & Co.), Philadelphia, Pa.
107,615.—Device for Moving Building.—Stephen Inman, Rockford, Ill.
107,616.—Door Spring.—Melvin Jincks, Wallace, N. Y.
107,617.—Lamp Wick Regulator.—L. W. Leary, Norfolk, Va.
107,618.—Bed Rail Fastener.—John Lemman, Cincinnati, Ohio.
107,619.—Compound Treadle.—O. H. Needham, New York city.
107,620.—Preserving and Hardening Wood.—B. R. Nickerson, San Francisco, Cal.
107,621.—Apparatus for Mixing, Heating, and Cooling Substances.—Melchior Nolden, Frankfort-on-the-Main, Prussia.
107,622.—Hoop Shaving Machine.—Stillman Parker, Altoona, Pa.
107,623.—Apparatus for Coupling Cars.—R. F. Randolph, Jr., East Palestine, Ohio.
107,624.—Water Wheel Case.—James Raney, Newcastle, Pa.
107,625.—Machinery for Dressing Skins.—H. P. Reed and T. E. Wilson, Peabody, Mass.
107,626.—Electro-Magnetic Apparatus for Medical Use.—Charles Reitz, Indianapolis, Ind.
107,627.—Water Wheel.—T. H. Risdon, Mount Holly, N. J.
107,628.—Bee Hive.—H. F. Rohm, West Providence, Pa.
107,629.—Base-Burning Cooking Stone.—T. P. Rossiter, Cold Spring, N. Y.
107,630.—Derrick Boat.—Thomas Saulpaugh, Rock Island, Ill.
107,631.—Car Axle Lubricator.—Thomas Sayles, Chicago, Ill.
107,632.—Grass Cutter.—S. W. Sears, New York city.
107,633.—Portable Sprinkling Pump.—William Servant (assignor to himself and J. A. Whitman), Providence, R. I.
107,634.—Fastening for Neck-Ties.—P. J. Shirts, Highland Falls, N. Y.
107,635.—Rotary Air Wheel for Gas Carburetters.—J. F. Spence, Brooklyn, N. Y., and L. D. Towsley, Newark, N. J.
107,636.—Slide for Extension Tables.—Stephen Stilwell, Waterloo, N. Y.
107,637.—Method of Setting Posts.—U. B. Stribling, Madison, Ind.
107,638.—Gate.—J. J. Tofflemire and J. D. Linnell, Rockford, Ill.
107,639.—Rotary Power Plow.—James Tranter, Joseph Kissey, and J. M. Carr, Cincinnati, Ohio.
107,640.—Grinding Mill.—Amos Verbeck, Sterling, Ill.
107,641.—Rounding-up Machine for Shoes.—H. S. Vrooman, Boston, Mass.
107,642.—Fabric for the Manufacture of Shoes, etc.—Enoch Waite, Franklin, Mass.
107,643.—Railway.—C. H. White, Emmett Township, Mich.
107,644.—Machine for Hulling and Scouring Grain, Rice, Coffee, etc.—L. H. Whitney, Washington, D. C.
107,645.—Rectifying and Improving Alcoholic Spirits. Daniel Worthen, Brooklyn, N. Y.

REISSUES.

4,124.—Division A.—Harvester.—Rufus Dutton, Yonkers, N. Y.—Patent No. 31,378, dated February 12, 1861.
4,125.—Division B.—Harvester.—Rufus Dutton, Yonkers, N. Y.—Patent No. 31,378, dated February 12, 1861.
4,126.—Reversible Knob Latch.—H. H. Elwell, South Norwalk, assignor, through mesne assignments, to the Russell and Erwin Manufacturing Company, New Britain, Conn.—Patent No. 53,536, dated March 27, 1866.
4,127.—Polishing Machine.—P. F. Randolph, Jerseyville, Ill.—Patent No. 95,365, dated September 28, 1869.
4,128.—Horse Hay Rake.—J. H. Shireman, York, Pa, assignee of G. S. Reynolds.—Patent No. 23,943, dated May 10, 1859.

DESIGNS.

4,357.—Box for Top of Bureaus.—Cheney Kilburn (assignor to Kilburn & Gates) Philadelphia, Pa.
4,358.—Shawl Fabric.—Martin Landenberger, Philadelphia, Pa.
4,359.—Berry Box.—J. W. Leslie, South Pass, Ill.
4,360.—Stove Plate.—N. S. Vedder, Troy, and T. S. Heister, Lansingburg, N. Y., assignors to N. S. Vedder.

EXTENSIONS.

Improved Buckle for Wearing Apparel.—Edward Parker, of Plymouth, Conn.—Letters Patent No. 15,666, dated September 2, 1856.
Reducing Wood Fibers to Paper Pulp.—Henry Voelter, of Heidenhein, Kingdom of Wurtemburg, Germany.—Letters Patent No. 21,161, dated August 10, 1858; antedated August 29, 1856: reissue No. 3,361, dated April 6, 1869.
Saw Gummer.—R. H. Garrigues, of Salem, Ohio, administrator of L. A. Dole, deceased. Letters Patent No. 15,718, dated September 9, 1856.
Repairing Railway Bars.—George Johnson, of Marshall, Mich, administrator of J. D. Cawood, deceased.—Letters Patent No 15,687. dated September 9, 1856.
Machinery for Combing Wool.—M. H. Simpson, of Boston, Mass.—Letters Patent No. 16,864, dated March 17, 1857; antedated September 17, 1856.

Inventions Patented in England by Americans.

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

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2,303.—Manufacture of Superphosphate of Lime.—C. Morfitt, Baltimore, Md. August 20, 1870.
2,323.—Knitting Machine.—W. H. Abel, Lowell, Mass. August 23, 1870.
1,366.—Apparatus for Removing Snow from Lines of Railways.—J. W. Elliot, Ontario, Canada. May 13, 1870.

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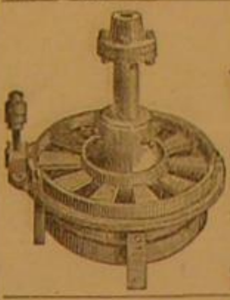

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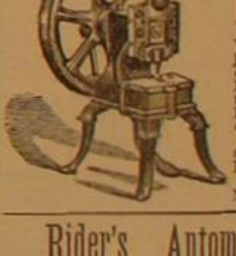

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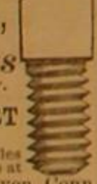

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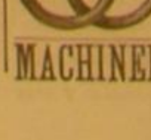

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SCIENTIFIC AMERICAN

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

Vol. XXIII.—No. 15. [NEW SERIES.] NEW YORK, OCTOBER 8, 1870. $3 per Annum. [IN ADVANCE.]

Boiler-Feed Regulator, Low-water Alarm, and Steam Trap.

It is needless to preface our description of the instruments shown in our engravings by any remarks upon the value of boiler-feed regulators or low-water alarms. Our readers have had their attention so often called to this subject that they are fully prepared to appreciate its importance.

The instruments we illustrate and describe have been tested, and found to be very sensitive and quick in their action.

Fig. 1

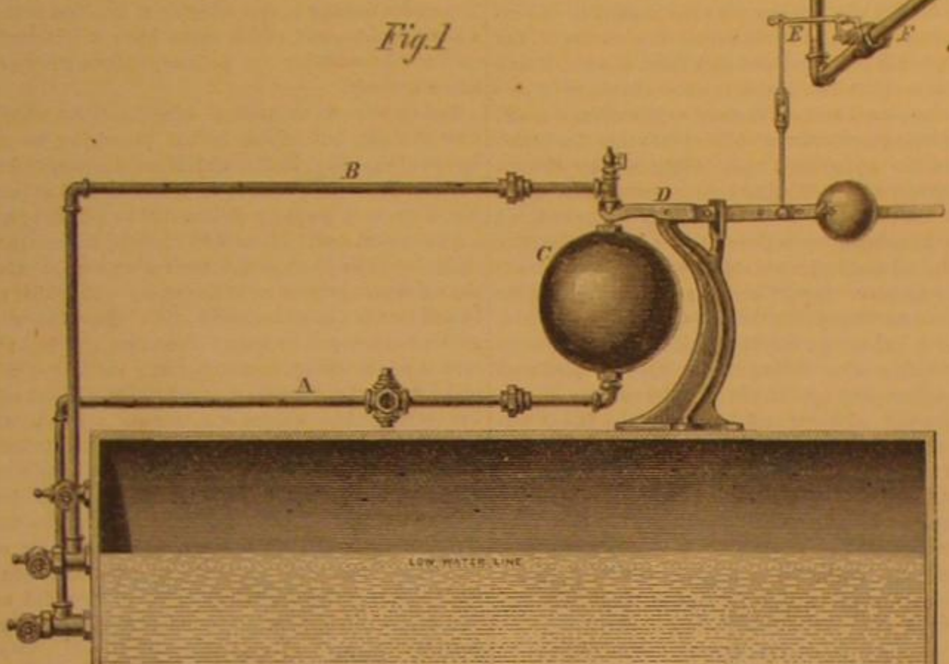
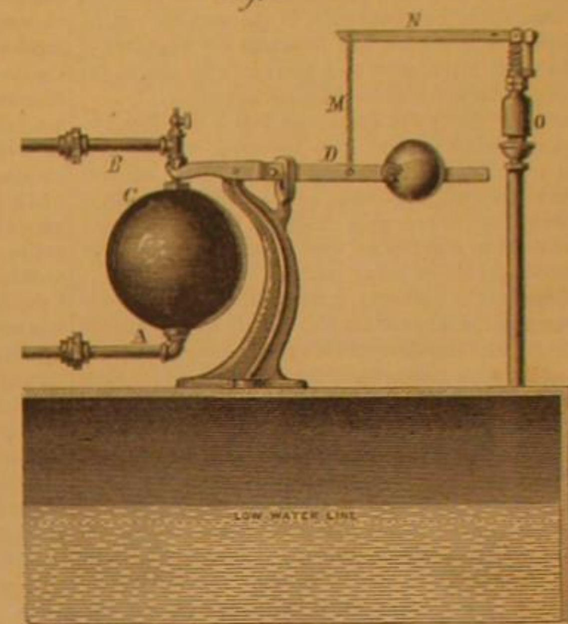


Fig. 3



BERRYMAN'S BOILER-FEED REGULATOR.

At the Fair of the American Institute, where they are now on exhibition, they attract much attention and favorable comment from engineers.

The construction of these instruments is based upon one general principle—that is, the action of gravity upon a counterpoised hollow sphere, the weight of which, together with its contents and that of the counterpoise, is made to oscillate a lever, according to the varying weight of the contents of the sphere, which may be water, water and steam, or steam alone, as will be seen by the description appended.

Fig. 1 shows the boiler-feed regulator. In this form of the instrument, pipes, A and B, connect the interior of the globe, C, with the interior of the boiler; the end of the pipe, A, called the discharge pipe, descending below the low-water line and that of the pipe, B, descending to this line. It is evident if the air contained in the pipes and globe, C, be allowed to escape through a pet-cock in the top of the globe, and the boiler be filled to the proper level, that, as soon as steam is raised in the boiler, water will be forced up along the pipes, A and B, by the accumulating pressure of steam and fill the globe, C.

The globe, C, is suspended on one end of a counterpoised lever, D, playing on knife edges like a scale beam. As soon as the globe is weighted with water its weight overbalances the counterpoise on the lever, D, and the latter makes an oscillation, and being connected with a bell-crank lever, E, operates through it to close or partially close a valve in the steam pipe, F, which supplies the pump, thereby checking the action of the pump and stopping the flow of water into the boiler. As soon, however, as the water in the boiler lowers through evaporation so that the end of the pipe, B, is uncovered, steam enters this pipe, and the water in the globe, C, descends by its own gravity to the boiler. The counterpoise on the lever, D, now overbalances the weight of the globe. The lever oscillates to the original position operating through the bell-crank, E, to open the valve in the pipe, F, letting steam into the steam cylinder of the pump, and setting the latter into action to supply water to the boiler again.

As soon as the water now rises to close the mouth of the pipe, B, steam no longer enters this pipe. The steam in the globe, C, condenses, and the pressure of steam in the boiler again forces water up the pipes filling the globe, which again descending cuts off steam from the pump and checks the supply of water to the boiler. In this way the supply of water is constantly regulated within certain limits depending altogether upon the position of the counterpoise on the lever, D, which may be set so that the globe will descend when only partially filled with water, if desired.

Fig 2

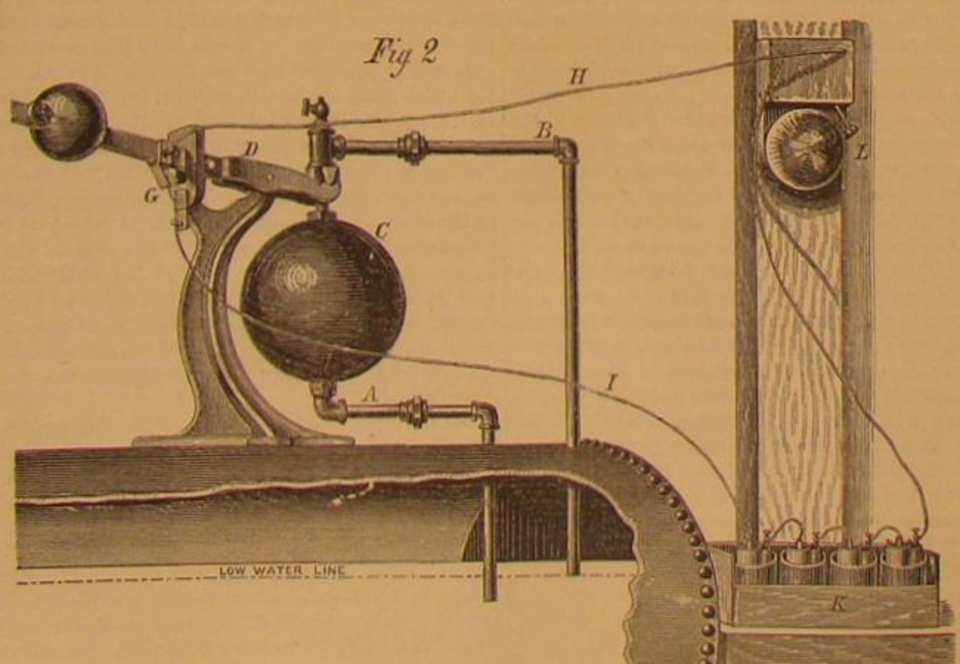
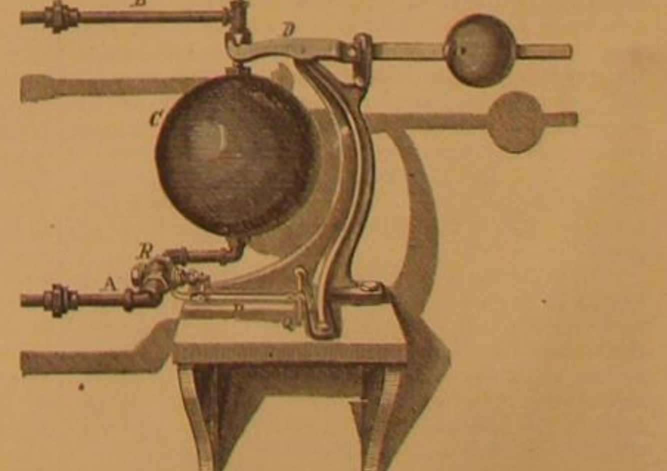


Fig. 4.



BERRYMAN'S LOW-WATER ALARM.

We have seen this and the other instruments described below in actual work, and are much pleased with the sensitiveness and the promptness of their action. They require no attention after the first adjustment, except perhaps to blow out dirt, which may in some instances accumulate in the pipes and globes, this is done through three-way cocks in the pipe, A, provided for that purpose.

It might at first seem that the pipes, A and B, would oppose the motion of the counterpoised lever and its appurtenances, but when it is said that these pipes are six feet long and only one half an inch in diameter, it will be seen that their flexibility will admit of the slight motion required. In practice they are found not to interfere in the least with the desired sensitiveness of the instrument.

Fig. 2 shows the operation of a modification of the same device, so as by means of an electric alarm to give notice of low water in a boiler. In this case, when the water falls below the pipe, B—called in this instance the "alarm pipe"—the globe rising closes the circuit maker and breaker, G, of the galvanic battery, K. The electric current now passes through the wires, H and I, setting in motion the electric alarm, L, which continues to sound until water is supplied to the boiler sufficient to raise the level enough to close the mouth of the alarm pipe, B.

Fig. 3 shows another modification whereby a whistle, O, is sounded by the opening of its valve through the medium of the chain, M, and the valve lever, N. This occurs whenever the water falls below the mouth of the pipe, B, and continues until the water rises again to its proper level.

Fig. 4 shows the application of the same device to a steam trap. In this case the globe, C, is filled (or partially filled, according as the instrument is adjusted) with water condensed from steam in its passage through pipes, etc. As soon as the water accumulates to the prescribed quantity the globe descends, moving the bell-crank valve lever, P, pivoted on the pin, Q, and opens a valve, R, in the discharge pipe, A, allowing the water to flow out. As soon as the water has escaped, the globe rises, and closes the valve, R, until such time as a further accumulation has been made. As we have said, all of these instruments are in full operation at the present Fair of the American Institute. Many of them are in use in various parts of the country, and we have been shown many testimonials from engineers who have tried them, speaking in high terms of their reliability and efficiency.

For further information, address R. M. Pratt, Treasurer, Berryman Regulator & Alarm Co., Hartford, Conn.

DYSPEPTICS should never eat fruit except at meal time, and then not to excess.

INAUGURAL ADDRESS OF THE PRESIDENT, THOMAS H. HUXLEY, LL.D., F.R.S., ETC., BEFORE THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

It has long been the custom for the newly-installed President of the British Association for the Advancement of Science to take advantage of the elevation of the position in which the suffrages of his colleagues had, for the time, placed him, and, casting his eyes around the horizon of the scientific world, to report to them what could be seen from his watch tower; in what direction the multitudinous divisions of the noble army of the improvers of natural knowledge were marching; what important strongholds of the great enemy of us all, Ignorance, had been recently captured; and, also, with due impartiality, to mark where the advanced posts of science had been driven in, or a long-continued siege had made no progress.

I propose to endeavor to follow this ancient precedent, in a manner suited to the limitations of my knowledge and of my capacity. I shall not presume to attempt a panoramic survey of the world of Science, nor even to give a sketch of what is doing in the one great province of Biology, with some portions of which my ordinary occupations render me familiar. But I shall endeavor to put before you the history of the rise and progress of a single biological doctrine; and I shall try to give some notion of the fruits, both intellectual and practical, which we owe, directly or indirectly, to the working out, by seven generations of patient and laborious investigators, of the thought which arose, more than two centuries ago, in the mind of a sagacious and observant Italian naturalist.

It is a matter of every day experience that it is difficult to prevent many articles of food from becoming covered with mold; that fruit, sound enough to all appearance, often contains grubs at the core; that meat, left to itself in the air, is apt to putrefy and swarm with maggots. Even ordinary water, if allowed to stand in an open vessel, sooner or later becomes turbid and full of living matter.

The philosophers of antiquity, interrogated as to the cause of these phenomena, were provided with a ready and a plausible answer. It did not enter their minds even to doubt that these low forms of life were generated in the matters in which they made their appearance. Lucretius, who had drunk deeper of the scientific spirit than any poet of ancient or modern times except Goethe, intends to speak as a philosopher, rather than as a poet, when he writes that "with good reason the earth has gotten the name of mother, since all things are produced out of the earth. And many living creatures, even now, spring out of the earth, taking form by the rains and the heat of the sun." The axiom of ancient science, "that the corruption of one thing is the birth of another," had its popular embodiment in the notion that a seed dies before the young plant springs from it; a belief so widespread and so fixed, that Saint Paul appeals to it in one of the most splendid outbursts of his fervid eloquence:

"Thou fool, that which thou sowest is not quickened, except it die."

The proposition that life may, and does, proceed from that which has no life, then, was held alike by the philosophers, the poets, and the people, of the most enlightened nations, eighteen hundred years ago; and it remained the accepted doctrine of learned and unlearned Europe, through the Middle Ages, down even to the seventeenth century.

It is commonly counted among the many merits of our great countryman, Harvey, that he was the first to declare the opposition of fact to venerable authority in this, as in other matters; but I can discover no justification for this widespread notion. After careful search through the "Exercitationes de Generatione," the most that appears clear to me is, that Harvey believed all animals and plants to spring from what he terms a "*primordium vegetale*," a phrase which may now-a-days be rendered "a vegetable germ; and this, he says, is *oviforme*," or "egg-like;" not, he is careful to add, that it necessarily has the shape of an egg, but because it has the constitution and nature of one. That this "*primordium oviforme*" must needs, in all cases, proceed from a living parent is nowhere expressly maintained by Harvey, though such an opinion may be thought to be implied in one or two passages; while, on the other hand, he does, more than once, use language which is consistent only with a full belief in spontaneous or equivocal generation. In fact, the main concern of Harvey's wonderful little treatise is not with generation, in the physiological sense, at all, but with development; and his great object is the establishment of the doctrine of epigenesis.

The first distinct enunciation of the hypothesis that all living matter has sprung from pre-existing living matter, came from a cotemporary, though a junior, of Harvey, a native of that country, fertile in men great in all departments of human activity, which was to intellectual Europe, in the sixteenth and seventeenth centuries, what Germany is in the nineteenth. It was in Italy, and from Italian teachers that Harvey received the most important part of his scientific education. And it was a student trained in the same schools, Francesco Redi—a man of the widest knowledge and versatile abilities, distinguished alike as scholar, poet, physician, and naturalist—who just two hundred and two years ago, published his "Esperienze intorno alla Generazione degl' Insetti," and gave to the world the idea, the growth of which it is my purpose to trace. Redi's book went through five editions in twenty years; and the extreme simplicity of his experiments, and the clearness of his arguments, gained for his views, and for their consequences, almost universal acceptance.

Redi did not trouble himself much with speculative considerations, but attacked particular cases of what was supposed to be "spontaneous generation" experimentally. Here are dead animals, or pieces of meat, says he; I expose them to the air in hot weather, and in a few days they swarm with maggots. You tell me that these are generated in the dead flesh; but if I put similar bodies, while quite fresh, into a jar, and tie some fine gauze over the jar, not a maggot makes its appearance, while the dead substances, nevertheless, putrefy just in the same way as before. It is obvious therefore that the maggots are not generated by the corruption of the meat; and that the cause of their formation must be a something which is kept away by gauze. But the gauze will not keep away aeriform bodies or fluids. This something must, therefore, exist in the form of solid particles too big to get through the gauze. Nor is one left in doubt what these solid particles are; for the blowflies, attracted by the odor of the meat, swarm round the vessel, and, urged by a powerful, but in this case, misleading instinct, lay eggs, out of which maggots are immediately hatched, upon the guaze. The conclusion, therefore, is unavoidable; the maggots are not generated by the meat, but the eggs which give rise to them are brought through the air by the flies.

These experiments seem almost childishly simple, and one wonders how it was that no one ever thought of them before. Simple as they are, however, they are worthy of the most careful study, for every piece of experimental work since done, in regard to this subject, has been shaped on the model furnished by the Italian philosopher. As the results of his experiments were the same, however varied the nature of the material he used, it is not wonderful that there arose in Redi's mind a presumption that, in all such cases of the seeming production of life from dead matter, the real explanation was the introduction of living germs from without into that dead matter. And thus the hypothesis that living matter always arises by the agency of pre-existing living matter, took definite shape; and had, henceforward, a right to be considered and a claim to be refuted, in each particular case, before the production of living matter in any other way could be admitted by careful reasoners. It will be necessary for me to refer to this hypothesis so frequently, that, to save circumlocution, I shall call it the hypothesis of *Biogenesis*; and I shall term the contrary doctrine—that living matter may be produced by not living matter—the hypothesis of *Abiogenesis*.

In the seventeenth century, as I have said, the latter was the dominant view, sanctioned alike by antiquity and by authority; and it is interesting to observe that Redi did not escape the customary tax upon a discoverer of having to defend himself against the charge of impugning the authority of the Scriptures; for his adversaries declared that the generation of bees from the carcass of a dead lion is affirmed, in the book of Judges, to have been the origin of the famous riddle with which Sampson perplexed the Philistines—

"Out of the eater came forth meat,
And out of the strong came forth sweetness."

Against all odds, however, Redi, strong with the strength of demonstrable fact, did splendid battle for Biogenesis; but it is remarkable that he held the doctrine in a sense which, if he had lived in these times, would have infallibly caused him to be classed among the defenders of "spontaneous generation." "*Omne vivum ex vivo*," "no life without antecedent life," aphoristically sums up Redi's doctrine; but he went no further. It is most remarkable evidence of the philosophic caution and impartiality of his mind, that, although he had speculatively anticipated the manner in which grubs really are deposited in fruits and in the galls of plants, he deliberately admits that the evidence is insufficient to bear him out; and he therefore prefers the supposition that they are generated by a modification of the living substance of the plants themselves. Indeed, he regards these vegetable growths as organs, by means of which the plant gives rise to an animal, and looks upon this production of specific animals as the final cause of the galls, and of at any rate some fruits. And he proposes to explain the occurrence of parasites within the animal body in the same way.

It is of great importance to apprehend Redi's position rightly; for the lines of thought he laid down for us are those upon which naturalists have been working ever since. Clearly he held *Biogenesis* as against *Abiogenesis*; and I shall immediately proceed, in the first place, to inquire how far subsequent investigation has borne him out in so doing.

But Redi also thought that there were two modes of Biogenesis. By the one method, which is that of common and ordinary occurrence, the living parent gives rise to offspring which passes through the same cycle of changes as itself—like gives rise to like; and this has been termed *Homogenesis*. By the other mode the living parent was supposed to give rise to offspring which passed through a totally different series of states from those exhibited by the parent, and did not return into the cycle of the parent; this is what ought to be called *Heterogenesis*, the offspring being altogether, and permanently, unlike the parent. The term Heterogenesis, however, has unfortunately been used in a different sense, and M. Milne-Edwards has, therefore, substituted for it *Xenogenesis*, which means the generation of something foreign. After discussing Redi's hypothesis of universal Biogenesis, then, I shall go on to ask how far the growth of science justifies his other hypothesis of Xenogenesis.

This progress of the hypothesis of Biogenesis was triumphant and unchecked for nearly a century. The application of the microscope to anatomy in the hands of Grew, Leeuwenhock, Swammerdam, Lyonet, Vallisnieri, Reaumur, and other illustrious investigators of nature of that day, displayed such a complexity of organization in the lowest and minutest forms, and everywhere revealed such a prodigality of provision for their multiplication by germs of one sort or another, that the hypothesis of Abiogenesis began to appear not only untrue, but absurd; and, in the middle of the eighteenth century, when Needham and Buffon took up the question, it was almost universally discredited.

But the skill of the microscope makers of the eighteenth century soon reached its limit. A microscope magnifying 400 diameters was a *chef d'œuvre* of the opticians of that day; and, at the same time, by no means trustworthy. But a magnifying power of 400 diameters, even when definition reaches the exquisite perfection of our modern achromatic lenses, hardly suffices for the mere discernment of the smallest forms of life. A speck only $\frac{1}{25}$ of an inch in diameter has, at ten inches from the eye, the same apparent size as an object $\frac{1}{10000}$ of an inch in diameter, when magnified 400 times; but forms of living matter abound the diameter of which is not more than $\frac{1}{40000}$ of an inch. A filtered infusion of hay, allowed to stand for two days, will swarm with living things, among which any which reaches the diameter of a human red blood corpuscle, or about $\frac{1}{3200}$ of an inch, is a giant. It is only by bearing these facts in mind that we can deal fairly with the remarkable statements and speculations put forward by Buffon and Needham in the middle of the eighteenth century.

When a portion of any animal or vegetable body is infused in water it gradually softens and disintegrates; and, as it does so, the water is found to swarm with minute active creatures, the so-called Infusorial Animalcules, none of which can be seen except by the aid of the microscope; while a large proportion belong to the category of smallest things of which I have spoken, and which must have all looked like mere dots and lines under the ordinary microscopes of the eighteenth century.

Led by various theoretical considerations which I cannot now discuss, but which looked promising enough in the lights of that day, Buffon and Needham doubted the applicability of Redi's hypothesis to the infusorial animalcules, and Needham very properly endeavored to put the question to an experimental test. He said to himself, if these infusorial animalcules come from germs, their germs must exist either in the substance infused or in the water with which the infusion is made or in the superjacent air. Now the vitality of all germs is destroyed by heat. Therefore, if I boil the infusion, cork it up carefully, cementing the cork over with mastic, and then heat the whole vessel by heaping hot ashes over it, I must needs kill whatever germs are present. Consequently, if Redi's hypothesis holds good, when the infusion is taken away, and allowed to cool, no animalcules ought to be developed in it; whereas, if the animalcules are not dependent on pre-existing germs, but are generated from the infused substance, they ought, by and by, to make their appearance. Needham found that under the circumstances in which he made his experiments, animalcules always did arise in the infusions when a sufficient time had elapsed to allow of their development.

In much of his work Needham was associated with Buffon, and the results of their experiments fitted in admirably with the great French naturalist's hypothesis of "organic molecules, according to which life is the indefeasible property of certain indestructible molecules of matter, which exist in all living things, and have inherent activities by which they are distinguished from not living matter. Each individual living organism is formed by their temporary combination. They stand to it in the relation of the particles of water to a cascade or a whirlpool or a mold into which the water is poured. The form of the organism is thus determined by the reaction between external conditions and the inherent activities of the organic molecules of which it is composed; and, as the stoppage of a whirlpool destroys nothing but a form, and leaves the molecules of the water, with all their inherent activities, intact, so, what we call the death and putrefaction of an animal or of a plant is merely the breaking up of the form or manner of association of its constituent organic molecules, which are then set free as infusorial animalcules.

It will be perceived that this doctrine is by no means identical with *Abiogenesis*, with which it is often confounded. On this hypothesis, a piece of beef, or a handful of hay, is dead only in a limited sense. The beef is dead ox, and the hay is dead grass; but the "organic molecules" of the beef or hay are not dead, but are ready to manifest their vitality as soon as the bovine or herbaceous shrouds in which they are imprisoned are rent by the macerating action of water. The hypothesis, therefore, must be classified under Xenogenesis, rather than under Abiogenesis. Such as it was, I think it will appear, to those who will be just enough to remember that it was propounded before the birth of modern chemistry and of the modern optical arts, to be a most ingenious and suggestive speculation.

But the great tragedy of science—the slaying of a beautiful hypothesis by an ugly fact—which is so constantly being enacted under the eyes of philosophers, was played, almost immediately, for the benefit of Buffon and Needham.

Once more, an Italian, the Abbé Spallanzani, a worthy successor and representative of Redi in his acuteness, his ingenuity, and his learning, subjected the experiments and the conclusions of Needham to a searching criticism. It might be true that Needham's experiments yielded results such as he had described, but did they bear out his arguments? Was it not possible, in the first place, that he had not completely excluded the air by his corks and mastic? And was it not possible, in the second place, that he had not sufficiently heated his infusions and the superjacent air? Spallanzani joined issue with the English naturalist on both these pleas; and he showed that if, in the first place, the glass vessels in which the infusions were contained were hermetically sealed, by fusing their necks; and if, in the second place, they were exposed to the temperature of boiling water for three quarters of an hour, no animalcules ever made their appearance within them. It must be admitted that the experiments and arguments of Spallanzani furnish a complete and crushing reply to those of Needham. But we all too often forget that it is one thing to refute a proposition and another to prove the truth of a doctrine which implicitly, or explicitly, contradicts that proposition; and the advance of science soon showed that, though Needham might be quite wrong, it did not follow that Spallanzani was quite right.

Modern Chemistry, the birth of the latter half of the eighteenth century, grew apace, and soon found herself face to face with the great problems which Biology had vainly tried to attack without her help. The discovery of oxygen led to the laying of the foundations of a scientific theory of respiration, and to an examination of the marvelous interactions of organic substances with oxygen. The presence of free oxygen appeared to be one of the conditions of the existence of life, and of those singular changes in organic matters which are known as fermentation and putrefaction. The question of the generation of the infusory animalcules thus passed into a new phase. For what might not have happened to the organic matter of the infusions, or to the oxygen of the air, in Spallanzani's experiments? What security was there that the development of life which ought to have taken place had not been checked, or prevented, by these changes?

The battle had to be fought again. It was needful to repeat the experiments under conditions which would make sure that neither the oxygen of the air, nor the composition of the organic matter, was altered, in such a manner as to interfere with the existence of life.

Schulze and Schwann took up the question from this point of view in 1836 and 1837. The passage of air through red-hot glass tubes, or through strong sulphuric acid, does not alter the proportion of its oxygen, while it must needs arrest or destroy any organic matter which may be contained in the air. These experimenters, therefore, contrived arrangements by which the only air which should come into contact with a boiled infusion should be such as had either passed through red-hot tubes or through strong sulphuric acid. The result which they obtained was, that an infusion so treated developed no living things, while, if the same infusion was afterwards exposed to the air, such things appeared rapidly and abundantly. The accuracy of these experiments has been alternately denied and affirmed. Supposing them to be accepted, however, all that they really proved was, that the treatment to which the air was subjected destroyed *something* that was essential to the development of life in the infusion. This "something" might be gaseous, fluid, or solid; that it consisted of germs remained only an hypothesis of greater or less probability.

Cotemporaneously with these investigations, a remarkable discovery was made by Cagniard de la Tour. He found that common yeast is composed of a vast accumulation of minute plants. The fermentation of must, or of wort, in the fabrication of wine or of beer is always accompanied by the rapid growth and multiplication of these *Torulæ*. Thus, fermentation, in so far as it was accompanied by the development of microscopial organisms in enormous numbers, became assimilated to the decomposition of an infusion of ordinary animal or vegetable matter; and it was an obvious suggestion that the organisms were, in some way or other, the causes both of fermentation and of putrefaction. The chemists, with Berzelius and Liebig at their head, at first laughed this idea to scorn; but, in 1843, a man, then very young, who has since performed the unexampled feat of attaining to high eminence, alike in mathematics, physics, and physiology—I speak of the illustrious Helmholtz—reduced the matter to the test of experiment by a method alike elegant and conclusive. Helmholtz separated a putrefying, or a fermenting, liquid, from one which was simply putrescible or fermentable, by a membrane, which allowed the fluids to pass through and become intermixed, but stopped the passage of solids. The result was that, while the putrescible, or the fermentable, liquids became impregnated with the results of the putrescence, or fermentation, which was going on at the other side of the membrane, they neither putrefied (in the ordinary way) nor fermented; nor were any of the organisms which abounded in the fermenting or putrefying liquid generated in them. Therefore, the cause of a development of these organisms must lie in something which cannot pass through membrane; and as Helmholtz's investigations were long antecedent to Graham's researches upon colloids, his natural conclusion was that the agent thus intercepted must be a solid material. In point of fact, Helmholtz's experiments narrowed the issue to this: That which excites fermentation and putrefaction, and at the same time gives rise to living forms in a fermentable or putrescible fluid, is not a gas and is not a diffusible fluid; therefore, it is either a colloid, or it is matter divided into very minute solid particles.

The researches of Schroeder and Dusch, in 1854, and of Schroeder alone, in 1859, cleared up this point by experiments which are simply refinements upon those of Redi. A lump of cotton-wool is, physically speaking, a pile of many thicknesses of a very fine gauze, the fineness of the meshes of which depends upon the closeness of the compression of the wool. Now Schroeder and Dusch found that in the case of all the putrefiable materials which they used (except milk and yolk of egg), an infusion boiled, and then allowed to come into contact with no air but such as had been filtered through cotton-wool, neither putrefied nor fermented, nor developed living forms. It is hard to imagine what the fine sieve formed by the cotton-wool could have stopped except minute solid particles. Still the evidence was incomplete until it had been positively shown, first, that ordinary air does contain such particles; and, secondly, that filtration through cotton-wool arrests these particles and allows only physically pure air to pass. This demonstration has been furnished within the last year by the remarkable experiments of Professor Tyndall. It has been a common objection of Abiogenesists that, if the doctrine of Biogeny is true, the air must be thick with germs; and they regard this as the hight of absurdity. But nature is occasionally exceedingly unreasonable, and Professor Tyndall has proved that this particular absurdity may, nevertheless, be a reality. He has demonstrated that ordinary air is no better than a sort of stirabout of excessively minute solid particles; but these particles are almost wholly destructible by heat; and that they are strained off, and the air rendered optically pure, by being passed through cotton-wool.

But it remains yet in the order of logic, though not of history, to show that, among these solid destructible particles, there really do exist germs capable of giving rise to the development of living forms in suitable menstrua. This piece of work was done by M. Pasteur in those beautiful researches which will ever render his name famous; and which, in spite of all attacks upon them, appear to me now, as they did seven years ago, to be models of accurate experimentation and logical reasoning. He strained air through cotton-wool, and found, as Schroeder and Dusch had done, that it contained nothing competent to give rise to the development of life in fluids highly fitted for that purpose. But the important further links in the chain of evidence added by Pasteur are three. In the first place, he subjected to microscopic examination the cotton-wool which had served as strainer, and found that sundry bodies clearly recognizable as germs, were among the solid particles strained off. Secondly, he proved that these germs were competent to give rise to living forms by simply sowing them in a solution fitted for their development. And, thirdly, he showed that the incapacity of air strained through cotton-wool to give rise to life, was not due to any occult change effected in constituents of the air by the wool, by proving that the cotton-wool might be dispensed with altogether, and perfectly free access left between the exterior air and that in the experimental flask. If the neck of the flask is drawn out into a tube and bent downwards; and if, after the contained fluid had been carefully boiled, the tube is heated sufficiently to destroy any germs which may be present in the air which enters as the fluid cools, the apparatus may be left to itself for any time, and no life will appear in the fluid. The reason is plain. Although there is free communication between the atmosphere laden with germs and the germless air in the flask, contact between the two takes place only in the tube; and as the germs cannot fall upwards, and there are no currents, they never reach the interior of the flask. But if the tube be broken short off where it proceeds from the flask, and free access be thus given to germs falling vertically out of the air, the fluid which has remained clear and desert for months, becomes, in a few days, turbid and full of life.

These experiments have been repeated over and over again by independent observers with entire success; and there is one very simple mode of seeing the facts for oneself, which I may as well describe.

Prepare a solution (much used by M. Pasteur, and often called "Pasteur's solution") composed of water with tartrate of ammonia, sugar, and yeast-ash dissolved therein. Divide it into three portions in as many flasks; boil all three for a quarter of an hour; and, while the steam is passing out, stop the neck of one with a large plug of cotton wool, so that this also may be thoroughly steamed. Now set the flasks aside to cool, and when their contents are cold, add to one of the open ones a drop of filtered infusion of hay, which has stood for twenty-four hours, and is, consequently, full of the active and excessively minute organisms known as *Bacteria*. In a couple of days of ordinary warm weather, the contents of this flask will be milky, from the enormous multiplication of *Bacteria*. The other flask, open and exposed to the air, will, sooner or later, become milky with *Bacteria*, and patches of mold may appear in it; while the liquid in the flask, the neck of which is plugged with cotton wool, will remain clear for an indefinite time. I have sought in vain for an explanation of these facts, except the obvious one, that the air contains germs competent to give rise to *Bacteria*, such as those with which the first solution has been knowingly and purposely inoculated, and to the mold *fungi*. And I have not yet been able to meet with any advocate of Abiogenesis who seriously maintains that the atoms of sugar, tartrate of ammonia, yeast-ash, and water, under no influence but that of free access of air and the ordinary temperature, re-arrange themselves and give rise to the protoplasm of *Bacterium*. But the alternative is to admit that these *Bacteria* arise from germs in the air; and if they are thus propagated, the burden of proof, that other like forms are generated in a different manner, must rest with the assertor of that proposition.

[Remainder next week].

Another Case of Spontaneous Combustion.

The recent great fire in Chicago is now supposed to have been spontaneously originated in a bundle of greasy rags. How long will it be before people generally understand that such rags are dangerous? The general carelessness in the storage of these and similar dangerous substances is only equaled by that in the domestic use of matches. We saw a business man the other day throw without thinking an unextinguished match into his paper waste basket. We not unfrequently step on matches in walking through public buildings or on the ferry boats which detonate under our feet. How many men, women, or children when they drop a match never think of stooping to pick it up, but take a new one from the box, rather than subject themselves to a slight inconvenience, which might perhaps prevent the destruction of thousands of dollars' worth of property. To always extinguish matches before throwing them away, and always pick them up when dropped, are habits which should be taught to every child.

THE MANUFACTURE OF SOLUBLE GLASS.

[From Feuchtwanger's "Treatise on Soluble Glass."]

The potash soluble glass is obtained by mixing 15 parts powdered quartz or pure sand with 10 parts purified pearl ashes, and 1 part charcoal in a Hessian crucible, and exposing the mixture so long to a heat until the mass after six hours has become vitrified. Charcoal is employed for assisting, by its decomposition, the production of carbonic acid, as also some sulphuric acid which may have been produced. It is at present, however, omitted, and if manufactured on a large scale the vitrification is done in a reverberatory furnace capable of holding from 1,200 to 1,500 pounds. The ashes and sand must be well mixed togther for some time and the furnace must be very hot before throwing the mixture in it, and the heat must be constantly kept up until the entire mass is in a liquid condition. The tough mass is then raked out and thrown upon a stone hearth and left to cool. The glass mass so obtained appears to be hard and blistery, of blackish gray color, and if the ashes were not quite pure it will also be adulterated with foreign salts. By pulverizing and exposing it to the air it will absorb the acidity, and by degrees the foreign salts will, after frequent agitation and stirring, be completely separated, particularly after pouring over the mass some cold water, which dissolves them, but not the soluble glass. The purified mass is now put into an iron cauldron, containing five times the quantity of hot water, in small portions, and with constant agitation, and replacing occasionally hot water for that which evaporated during the boiling, and after five or six hours the entire mass is dissolved; the liquid is removed and left to settle over night, in order to be able to separate any undecomposed silex. The next day it is evaporated still more until it has assumed the consistency of a sirup, and standing 28° B. and is composed of 28 per cent potash, 62 per cent silica, and 12 per cent water. It has an alkaline taste, and is soluble in all proportions of water, and is precipitated by alcohol, and if any salts do effervesce they may be wiped off. The color is not quite white, but assumes a greenish or yellowish white color.

MANUFACTURE OF SODA SOLUBLE GLASS.

To 45 parts silica or white river sand are added 23 parts carbonate of soda fully calcined, and 3 parts charcoal, and is then treated in the same manner as the other glass. The proportions of the mixture are altered by the different manufacturers, some propose to 100 parts silex, 60 parts anhydrous glauber salt, and 15 to 20 parts charcoal. By the addition of some copper scales to the mixture, the sulphur will be separated. Another method is proposed by dissolving the fine silex in caustic soda lye. Kuhlman employs the powdered flint, which is dissolved in an iron cauldron under a pressure of 7 to 8 atmospheres. According to Liebig the infusorial earth is recommended in place of sand on account of being readily soluble in caustic lye, and he proposes to use 120 parts infusorial earth to 75 parts caustic soda, from which 240 parts silica jelly may be obtained. His mode is to calcine the earth so as to become of white colors, and passing it through sieves. The lye he prepares from 75 ounces calcined soda, dissolved in five times the quantity of boiling water, and then treated by 56 ounces of dry slacked lime; this lye is concentrated by boiling down to 48 deg. B.; in this boiling lye 120 ounces of the prepared infusorial earth are added by degrees, and very readily dissolved, leaving scarcely any sediment. It has then to undergo several operations for making it suitable for use, such as treating again with lime water, boiling it, and separate any precipate forming thereby, which by continued boiling forms into balls, and which can then be separated from the liquid. This clear liquid is then evaporated to consistency of sirup, forms a jelly slightly colored, feels dry and not sticky, and is easily soluble in boiling water.

The difference between potash and soda soluble glass is not material; the first may be preferred in whitewashing with plaster of Paris, while the soda glass is more fluidly divisible.

It may be observed that before applying either soluble glass, it ought to be exposed to the air for ten to twelve days, in order to allow an efflorescence of any excess of alkali, which might act injuriously.

DOUBLE SOLUBLE GLASS.

This is a compound of potash and soda, and is prepared from 100 parts quartz, 28 parts purified pearl ashes, 22 parts anhydrous bicarbonate of soda, and 6 parts of charcoal, which are spread in such manner as already described. If the mass is fully evaporated to dryness, it forms a vitreous solid glass which cannot be scratched by steel, has a conchoidal fracture, of sea-green color, translucent and even transparent, and has specific gravity of 1·43.

Soluble glass, after Kaulbach, for the use of sterro-chromic painting, is obtained by fusing 3 parts of pure carbonate soda and 2 parts powdered quartz, from which a concentrated solution is prepared, and 1 part of which is then added to 4 parts of a concentrated and fully saturated solution of potash glass solution, by which it assumes a more condensed amount of silica with the alkalies; and which solution has been found to work well for paint. Siemen's patent for the manufacture of soluble glass, consists in the production of a *liquid quartz* by digesting the sand or quartz in a steam boiler tightly closed and at a temperature corresponding to 4-5 atmospheres, with the common caustic alkalies, which are hereby capacitated to dissolve from three to four times the weight of silica to a thin liquid. The apparatus, which was patented in 1845, is well known in this country; as some persons, many years later, obtained a patent for the same apparatus in the United States, which on inspection does not differ from that of Siemens Brothers.

SCREW REVERSING GEAR FOR LOCOMOTIVES.

The value of screw-reversing gear for locomotives is daily more appreciated. In goods and shunting engines especially it saves a driver a great deal of labor. But the great difficulty hitherto encountered in its use lies in the fact that in cases of emergency it is impossible to reverse with promptitude.

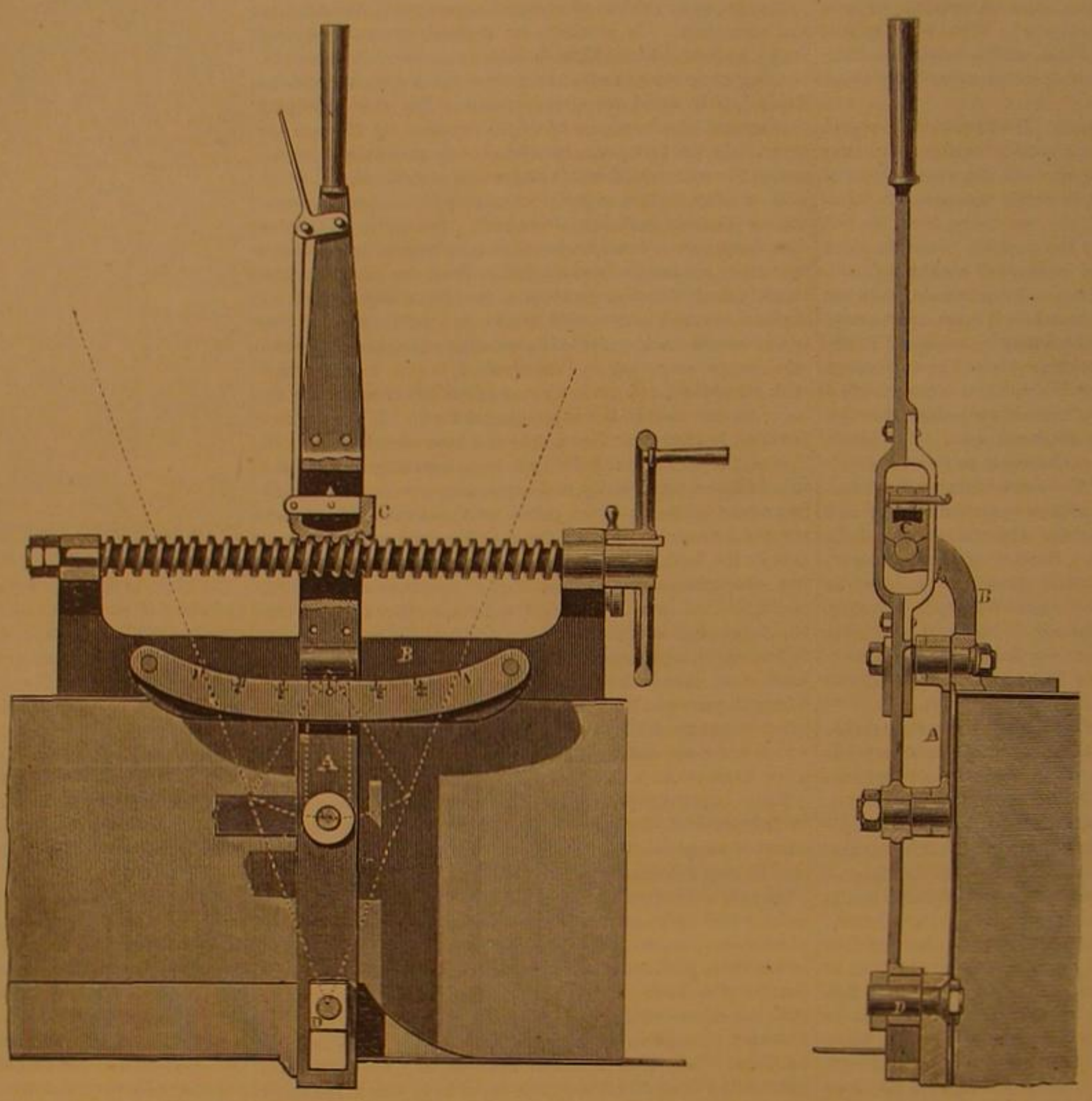
In the annexed engraving we show an arrangement, invented and patented by Mr. A. Alexander, of the Worcester Engine Works Company, England, and fitted with success to a large number of locomotives built by the company for the Nicholas Railway, Russia.

This reversing lever differs from others hitherto introduced for working both by hand and screw, in having a straight cylindrical screw of the ordinary form, rigidly fixed in bearings at each end. The screw, when the lever is moved by hand, acts in place of the common notched quadrant.

The motion of the detent in the lever is kept parallel to the axis of the screw by the application of a radius link, A. An end of this link is fastened to the frame, B, which carries a straight double-thread screw, and the other end is attached to the lever. By means of this parallel motion the teeth of the detent, C, when drawn up, move when the lever is worked backward and forward nearly in a straight line parallel with the axis of the screw.

Owing to the form of the detent, C, about three teeth are always in gear with the screw in every position. In the engine frame is a stud carrying a block, D, and on this the lower end of the reversing lever, which has an oblong slot, moves up and down as the lever is moved, either by hand or screw.

It should be observed that the first design of lever on this system had an ordinary single detent falling between the threads of the screw. The present form of detent block keeping several teeth in gear was suggested by Mr. Thow, of the Worcester Engine Works. It is a decided improvement.—*The Engineer.*



SCREW REVERSING GEAR FOR LOCOMOTIVES.

Guns and Gun-Making.

The annual produce, writes a cotemporary, on the authority of a competent correspondent, of arms and ammunition in France exceeds in value 15,000,000 francs, or $3,000,000. Of this amount two thirds are represented by guns and bayonets, and the residue by side arms, caps, and cartridges. The trade employs in the aggregate 15,000 work people. Its principal seat—the Birmingham of France—is St. Etienne. The raw material employed, both iron and steel, is produced in France. Iron costs thirty-three francs per cwt., and steel varies in value from forty-seven francs to eighty francs per cwt. The use of steel in the manufacture of rifle barrels is proportionately greater than in England, the total quantity used being 2,500 tuns per annum. The wood of which the stocks are made is grown in France. Since the year 1855 the gun trade of France has been characterized by a very extended employment of the best machinery. It is admitted by Birmingham gunsmiths that the barrels used by French producers of small arms are as good as they can possibly be. The locks are not so good. They "speak" well, but pull unequally, and come up at last with a jerk. Compared with the sweet oily action of our best English "Brazier" locks, the French productions are positively inferior. On the average, the guns produced in France are much higher in price than those of Birmingham manufacture.

It is mentioned that a noticeable feature in the chassepot, as in the Prussian needle gun, is the absence of a lock, the discharge being effected by a sliding bolt in the back part of the breech action, which is shot forth by a spiral spring. This spring is said to be the weak point of the chassepot. If, however, it has a tendency to become weaker after much using, as is supposed to be the case, it could still be easily replaced. A stronger objection seems to lie in the great force required to push the bolt back into full cock. This had to be done by the direct pressure of the hand or thumb of the soldier upon the whole force of power of the spring. In pulling up an ordinary lock a powerful leverage is obtained in the hammer, which makes the action easy and pleasant. This, on the contrary, is heavy and fatiguing, and must tell in the course of a day's work.

The Belgian gunsmiths, especially in what are termed *armes de luxe*, are woefully behind the French, although to the latter they are indebted for most of their designs; the barrels are the best features of Belgian guns, being well made, clean, and of almost infinite variety in their twistings. A minute observer remarks: "The Damascus patterns in Belgium are even more varied and intricate than in France, and they are produced at astonishingly low prices for what they are or seem to be, for tales are rife about the Belgians veneering their barrels with Damascus iron." The locks are quite as defective as the French, but it is noticeable that quotations of arms in Belgium are considerably lower than in France. A common breech-loader marked in Paris 90 francs is quoted 56 francs in Brussels. The commonest muzzle-loader, a double gun, sells as low as 14½ francs, and a single gun of equal quality is quoted 6 francs; but neither are safe to use.

Again, the Belgians have a very soft and easily workable malleable iron, which they know how to cast to perfection; and they make a very liberal use of it indeed in the manufacture of their revolvers. The bodies, the barrels, and sometimes even the chambers, are made of it, and every workman knows how much easier it is to file up a clean casting in soft iron than a lump of wrought iron, however shapely it may be forged. This is a very important item in the cost. Soft as the iron may be, the pistols are made very light, but the metal is evenly distributed. Even the hammers and triggers are made of cast iron. The springs have not much strength, but sufficient to strike a pin cartridge, and for pin cartridges the Belgian revolvers are invariably made. They are at the outset cheaper than English revolvers, but they do not last so long, and therefore in the long run they are dearer.

The best guns of Prussian make are chiefly remarkable for their very chaste and elaborate decoration. In other respects they are heavy, and have great cheek pieces on the butts. In the Prussian needle gun, as in the chassepot and other military breech-loaders of note, one leading idea seems to prevail. This is the opening of the breech by the pulling back of a bolt, which, when the charge is inserted, is pushed home and turned down.

In the Snider another plan is adopted. A solid block is lifted out of the breech, pushing the charge into the barrel in front of it, and replacing it. The various ways of hinging this block and securing it when down form half the varieties of breech-loaders. In one the block turns over to the right, in another to the left; in one backwards, in another forwards; all differing in some minor, though perhaps essential, detail, but the leading idea is the same, and had its origin, no doubt, in the Armstrong gun.

The method of converting the Enfield into the Snider rifle is very simple. About two inches of the upper part of the Enfield barrel are cut away at the breech, and a solid breech stopper working sideways on a hinge is placed in the opening thus made. A piston passes through the stopper, and when the breech is closed, one end of it receives the blow from the hammer, and the other communicates it to the center of the cartridge, and fires it. There is an arrangement for withdrawing the old cartridge cases after each discharge.

Casting a Steel Ingot.

A casting designed for the beam of the screw steamship *Munster*, belonging to the City of Dublin Steam Packet Company, has just been made at the Norfolk Works, Saville street, Sheffield. The mold in which the ingot was cast was upwards of 14 feet in length, and 3 feet in diameter, and was fixed in the middle of the principal melting furnace. About 300 men were in attendance, under the personal superintendence of Mr. Mark Firth. Almost military precision was observed in bringing from distant parts of the works the crucibles containing molten steel ready to be poured into the mold. This was fixed in a central position, and close at hand were 150 "holes," with tributaries from many other parts of the premises, and we believe that altogether there were 270 in operation. In about half an hour the contents of 544 crucibles, of 64 lbs. each, were poured into the mold, making a total of 34,816 lbs.

Bromine and Iodine.

The bromine of commerce was derived mostly from salines until the salt mines of Stassfurt were opened. The method of manufacture is similar to that followed in the separation of iodine.

Upon opening the mines at Stassfurt, bromine was found in the mother liquors in considerable quantities, and at present the principal part of the European product is derived from this source. As high as 300 grns. per gallon have been obtained from these mother-liquors. Although but two or three of the manufactories at this place have economized this substance, the price of bromine has greatly decreased during the last five years. This decrease has been hastened by the large production of bromine in the United States.

Although the amount of bromides in the Saratoga waters is considerable, yet the comparatively limited flow of water here and the large consumption of these waters for medicinal purposes precludes the manufacture. But from the strong salines our supply is derived in large quantities. At Tarentum, Sligo, and Natrona, in Western Pennsylvania, Pomeroy, Ohio, and Kanawha, West Virginia, the manufacture of bromine has become of considerable importance. The production of 1870 will reach 126,000 pounds, a quantity probably in excess of our consumption. In 1867 the Stassfurt product of bromine was nearly 20,000 pounds.

The total product of iodine in Great Britain and France is about 200,000 pounds annually, and outside these two countries very little is produced. As the average product of iodine is about ten pounds to the tun of kelp, and it requires twenty tuns of wet weed to produce one tun of kelp, this total product represents the burning of 400,000 tuns of sea-weed. At the present price, the iodine produced is of more value than the alkaline salts, which were the original object of the industry.

Iodine is not produced in the United States. Since its use was first established here the price has fallen from $16 to $5 per pound. At present, bromine is furnished for less than $1·50 per pound.

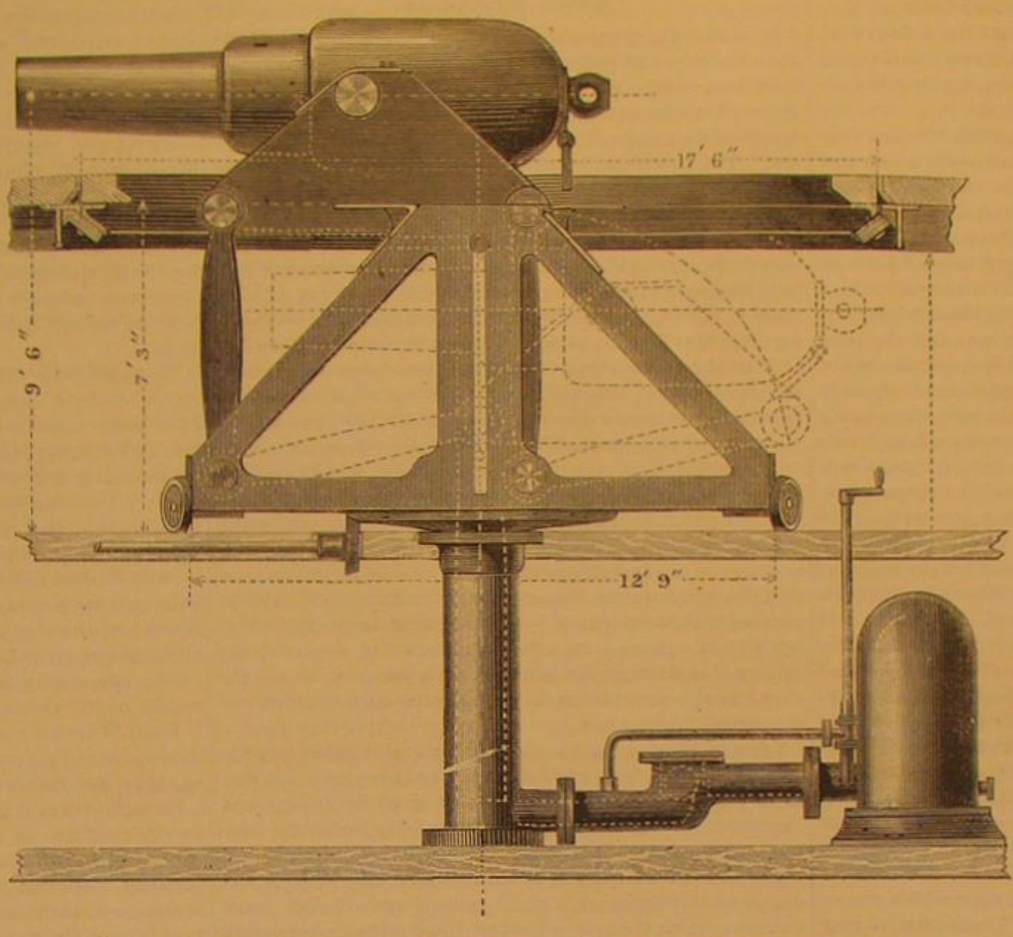
The chief consumption of iodine and bromine is for medicinal purposes in the form of iodides and bromides of potash, soda, or ammonium. A small proportion is consumed in photography. Bromine has been proposed as a discharge in calico printing, and during the late war was to some extent employed as a disinfectant. As yet, but a small proportion of the bromine of the saline mother-liquors is economized but should the manufacturers turn their attention to this important substance, the consequent reduction in price will render its economical employment in other directions possible —*American Chemist.*

A House Built by one Man.

The *South London Press* tells a story of perseverance. About four years ago an eccentric personage, who follows the pursuit of bird-catching, purchased a small plot of land on the eastern side of Nunhead Cemetery. Here he resolved to build a good-sized six-roomed brick house with his own hands. He at once set to work, and, strange to say, has nearly finished his task. He has been his own architect, his own bricklayer, his own laborer, his own joiner, his own plumber and glazier, and, what is still more strange, has built the house without one particle of scaffolding, and even carried his own bricks from the maker by the armful as he was able to afford them. The work is said to appear very substantial, and to do him great credit. During the operations he has been living in a small brick hut, built by himself on the plot at the outset, in company with a little son and a loquacious parrot. He probably thought himself a second Crusoe on an uninhabited island, and behaved as such.

HYDRO-PNEUMATIC GUN CARRIAGE.

We illustrate herewith, from *Engineering*, the revolving hydro-pneumatic gun carriage, especially designed for naval purposes. The engraving we now publish shows the perfected system in all its details, and indicates both the loading and firing position of the gun, which is mounted upon a revolving carriage. The circular travel described by the wheels upon the lower deck is 12 feet 9 inches, and at the upper deck the framework is free to turn round an inclined path 17 feet 6 inches diameter, upon which rollers set at an angle take their bearing, the revolving motion being effected by bevel gearing, as shown. Under the carriage is placed an hydraulic cylinder, the ram of which has a T-shaped head, and is provided with small rollers which bear upon the under side of the moving part of the carriage. In the lower part of the carriage, that which has no movement except a circular one, a vertical opening is left on each side, as shown, and these serve as guides for the ascending or descending ram, the end of the T-head, projecting through the openings on either side. Parallel links, the position of which, when the gun is in firing position, is vertical, are secured at the lower end to the bottom of the fixed part of the carriage, and at the upper end to the movable part, their motion being the same as the links in a parallel ruler, as the gun rises or falls. Connected with the hydraulic cylinder is a pipe leading to an air vessel, and having a valve chamber containing a spherical valve. A bye-pass pipe, which can be opened or closed by a lever from the gun platform, establishes an independent communication between the air chamber and that portion of the main pipe between the valve chamber and the hydraulic cylinder. In the rear of the air chamber is a small pipe for supplying water-deficiencies by leakage. The action of the mechanism is as follows: Water is pumped into the apparatus until the air in the air chamber is placed under a considerable pressure. When the gun is loaded, and it is desired to raise it, the opening of the bye-pass establishes a communication with the hydraulic cylinder, the ram of which rises carrying with it the gun. The valve is then closed, and when the piece is fired the recoil throws it back with a constantly decreasing velocity, due partly to the increasing resistance of the coupling links, and partly to the increasing pressure within the air chamber.



MONCRIEFF'S HYDRO-PNEUMATIC GUN CARRIAGE.

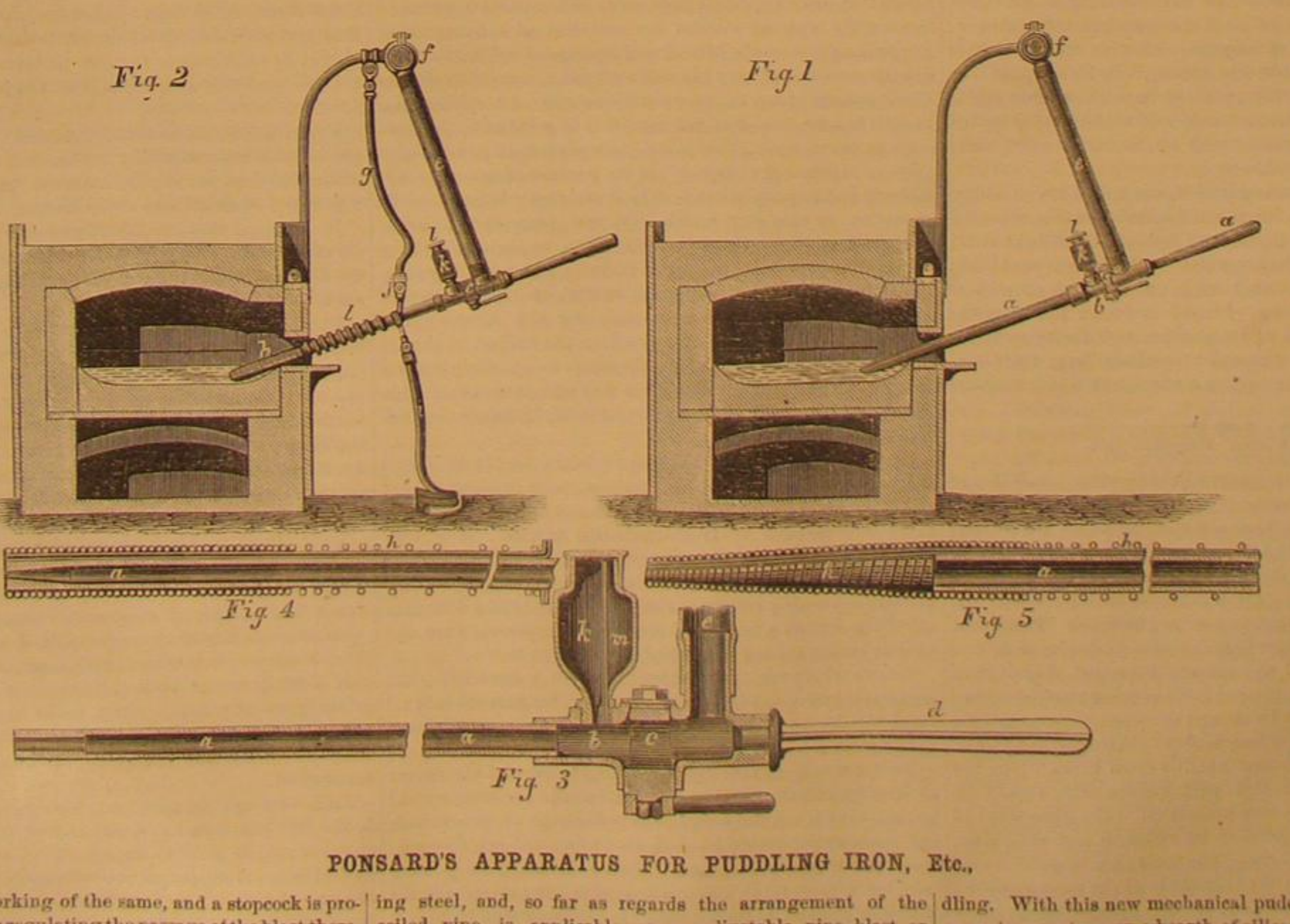
PONSARD'S IMPROVEMENTS IN APPARATUS FOR PUDDLING IRON, ETC.

[From Mechanics' Magazine].

According to this invention, just patented by Mr. A. Ponsard, of Paris, it is proposed to combine with a tubular stirrer which is suspended at or near its center of gravity so as to be easily manuvered a coil of pipe, which is made to closely surround the fore part of the stirrer, through which coil cold water is caused to circulate for the purpose of preventing the burning of the end of the stirrer. The stirrer itself is suspended by a flexible pipe or by a properly-jointed metallic pipe from an overhead fixed main pipe extending along any number of furnaces, and supplied with compressed air from a blower or other source, such air passing down the interior of the stirrer into the liquid metal in the furnace. A handle is fitted on to the rear end of the stirrer for facilitating the working of the same, and a stopcock is provided on the stirrer for regulating the passage of the blast through. A second stopcock is also fitted on to the cold-water pipe in a position convenient to the hand of the puddler. The cold water is also supplied through a flexible pipe from a fixed main overhead, and is carried direct to the point of the stirrer, either by quick coils or by a straight length of pipe parallel to the stirrer itself, and then returns by a series of close coils back to the rear part of the stirrer, where it communicates with a flexible pipe for carrying off the water which has been heated by the metal in the furnace. The stirrer may either consist of a tube extending the full length required, or this tube may stop some distance short of the end of the stirrer, the remaining length being composed solely of the cold-water coils, before referred to, closely brazed together.

In order to facilitate the admixture of any of the well-known chemical reagents employed in the manufacture of iron and steel in a dried and pulverized state with the metal, a closed box or receptacle is fitted on to the stirrer, and communicates therewith, an air pipe being caused to enter the said box from the interior of the stirrer, so as to maintain an equal pressure therein and facilitate thereby the descent of the ordinary or any other suitable dried and pulverized chemical reagents into the tubular stirrer, whence they are forcibly expelled by the blast into the molten metal. The same apparatus may be used with a reverberatory furnace for making steel, and, so far as regards the arrangement of the coiled pipe, is applicable as an adjustable pipe blast or tweer in substitution for the ordinary water tweer. Figs. 1 and 2 of the engravings show in section the application of the improved rabble to a puddling furnace; Fig. 3 is a longitudinal section drawn to an enlarged scale of the rabble detached, and Figs. 4 and 5 show in longitudinal section on an enlarged scale two different arrangements for applying cold water circulation to the rabble. This rabble is composed, as shown in Fig. 1, of an iron tube, *a*, attached to a tube, *b*, which carries a cock, *c*, and a handle, *d*, for the purpose of manipulation. The tube, *b*, is by means of a flexible tube, E, placed in communication with a conduit, *f*, fed by a blast engine, which may serve to supply one or more puddling furnaces. The flexible tube, *e*, may be composed of metal and jointed, or of caoutchouc, leather, or strong cloth coated with caoutchouc, and provided with an external strengthening covering. It is arranged so as to form also a support to the rabble, and thus relieve the workman, who has simply to conduct it into the molten cast iron, the agitation of which is effected by the outlet of the air which escapes from the end of the rabble. In order to prevent the tube, *a*, from being injuriously affected by the high temperature to which it is subjected there is suspended at the side of the air inlet tube another flexible tube, *g*, Fig. 2, maintained constantly supplied with cold water from a reservoir, where it is compressed under considerable pressure. This tube is connected to the iron tube, *h*, which is laid along the rabble to its extremity, and then wound around it spirally and brought back to its starting point, where it is attached to another flexible tube, *i*, which serves to carry away the water which has become heated. A cock, *j*, is provided within reach of the workman for the purpose of regulating at will the rate of flow of the water in order to prevent its vaporizing in the tube, *h*. In the arrangement shown in Fig. 4 the inlet water pipe, *h*, is laid in a straight line along the rabble to its extremity, whence it returns in the form of spirals or coils towards the handle.

Fig. 5 shows a modification of the preceding arrangements. In this the iron tube which forms the hollow rabble is dispensed with at the end which enters the furnace, and the spirals of the water tube, *h*, are brazed and welded together, thus forming a rigid durable tube of themselves. Whichever arrangement may be adopted the rabble as it is constantly cooled by the current of water traversing over or around it cannot be deteriorated or burned by contact with the incandescent matters in fusion, or if so, only very slightly. The operation of puddling takes place in the following manner: After having melted the cast iron on the hearth of the furnace the workman lays hold of the hollow rabble by the handle, *d*, and after having opened the cocks, *c* and *j*, plunges it into the molten cast iron so as to submit every portion of the material to the action of the air in order to refine it. This operation may be arrested at any stage; thus it may be suspended at the desired point in order to obtain puddled steel, or prolonged to produce wrought iron. By the simple forms and arrangements adopted for this tool these various operations are facilitated and rendered more convenient; the rabble may be readily withdrawn in order to test the degree of refining of the cast iron. This method of puddling at a high temperature admits of the steel being run into ingots in lieu c withdrawing it fro the furnace in bloor as in ordinary pt dling. With this new mechanical puddler it will be advar geous to operate upon a hearth of silica for pure cast irons.



PONSARD'S APPARATUS FOR PUDDLING IRON, Etc., for cast irons containing phosphorus to a marked extent it is desirable to operate upon a hearth of magnesia or of carbon agglomerated with lime, it order that it may be less liable to be effected by the basic matters which the puddling of these cast irons necessitates.

For pure cast iron it is evident that this system of puddling may be carried out with facility, and will give good results, but the greatest advantage that it presents is its application to the puddling of the common cast irons containing phosphorus, which it has been attempted to purify by the use of raw tartar and alkaline carbonates, nitrate of soda, chloride of sodium, hyperchlorites, and such-like reagents. But it is difficult to use these reagents in reverberatory furnaces, their relative volatility rendering the reactions very imperfect. The contact between these matters and the cast iron is purely superficial, and the stirring of the workmen cannot sufficiently remedy it.

The improved puddling apparatus or rabble admits of the whole of these reagents being used in a more efficient manner by driving them with the air in fine jets through the cast iron, thus multiplying with the orifice the points of contact. For the puddling of impure cast irons this puddling apparatus is provided with a distributing receptacle, *k*, fixed on the tube, *b*, as shown in the drawing. This receptacle may be composed of thin sheet metal or malleable cast iron, the upper part being by preference contracted, and the neck closed by means of a capsule, *l*, secured by a bayonet screw or other joint. The lower part terminates in a small opening of about 1-8in. diameter, through which the salts or reagents employed (which are contained in the receptacle, *k*,) fall into the tube, *a*. They are carried along the tube, *a*, by the current of air under pressure and driven into the molten metal. In order that the pressure of the air may not prevent the salts or reagents from falling freely a small tube, *m*, is provided and fixed in the receptacle, *k*, so as to admit of the entrance of compressed air into its upper portion. The salts employed should be thoroughly dried and pulverized. The method of operating with the distributor is exceedingly simple. The rabble being out of the furnace and the cocks, *c* and *j*, closed the workman raises the capsule, *l*, and inserts in the receptacle, *k*, the reactive or purifying agents (such as salts or oxides) to be blown into the furnace; he then closes the capsule, opens quickly the cocks, *c* and *j*, and introduces the rabble into the molten cast iron, into which the salts or reagents, which are carried along by the current of air, are forced in fine jets. When the whole charge has been forced in, the rabble is withdrawn from the furnace, the cocks, *c* and *j*, closed, and the receptacle refitted; after which the refining of the cast iron may be resumed. This operation may be renewed several times during the working of one charge, but this is left to the judgment of the workman.

In the puddling of cast irons containing sulphur or phosphorus it is desirable to remove the slag or scoriæ containing the sulphur and phosphorus, and to replace it by scoriæ free from such impurities, which may be effected either by introducing into the molten mass oxides of manganese or titaniferous iron ore forced in through the improved rabble. By operating in this manner the whole of the phosphorus in the cast iron may be removed and pure wrought iron produced from the most impure cast iron.

It will be readily perceived that this mechanical puddler facilitates the refining of the cast iron, since it relieves the workman of the more laborious part of the operation, and since the stirring or agitation is much more energetic by the injection of air than by the ordinary method; a saving of time is therefore effected; it admits of compressed air being applied in a practical manner to the puddling of cast iron and to the manufacture of steel in a reverberatory furnace; and of the employment of reagents, either as oxidants or as fluxes, by being forced into the furnace. By its adoption the quality of the wrought iron produced from phosphoric pig is greatly improved, and also a considerable saving, both in fuel and time, is effected, together with an increase in the daily yield of the puddling furnaces.

Either of the above arrangements, as applied to the rabble, is applicable to tweers for metallurgical furnaces, whereby their durability is increased to an almost unlimited extent, while the use of the ordinary water tweers is dispensed with. This arrangement of tweer with an internal current of water admits of its being plunged more or less into the furnace, and in general of its position and direction being varied without any deterioration resulting from their contact with the fuel or the molten materials in which they are immersed.

Oiling Farm Implements.

The Boston *Cultivator* gives the following sensible and practical advice to its readers:

"Every farmer should have a can of linseed oil and a brush on hand, and whenever he buys a new tool, he should soak it well with the oil and dry it by the fire or in the sun, before using. The wood by this treatment is toughened and strengthened, and rendered impervious to water. Wet a new hay rake and when it dries it will begin to be loose in the joints; but if well oiled, the wet will have but slight effect. Shovels and forks are preserved from checking and cracking in the top of the handle by oiling; the wood becomes smooth as glass by use, and is far less liable to blister the hand when long used. Ax and hammer handles often break where the wood enters the iron; this part particularly should be toughened with oil to secure durability. Oiling the wood in the eye of the axe will prevent its swelling and shrinking, and sometimes getting loose. The tools on a large farm cost a heavy sum of money; they should be of the most approved kinds. It is a poor economy, at the present extravagant prices of labor, to set men at work with ordinary old-fashioned implements. Laborers should be required to return the tools to the places provided for them; after using, they should be put away clean, bright, and oiled. The mold-boards of plows are apt to get rusty from one season to another, even if sheltered; they should be brushed over with a few drops of oil when put away, and they will then remain in good order until wanted."

Correspondence.

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

Boiler Explosions.

Messrs. Editors:—Ignorance and stupidity still hang upon the minds of ordinary men respecting those perennial inflictions, known as "fatal boiler explosions." Unfortunately, much difference of opinion exists in the minds of the engineering community, regarding the cause of these disasters. The distinction between the bursting and the exploding of a boiler has not been defined with any degree of accuracy.

Some engineers are very fond of airing their ignorance, by asserting that when boilers burst nothing serious can result therefrom, save extinguishing the fires, and causing slight local damages to the boiler. To this too prevalent opinion there are strong reasons for not subscribing. Suffice it to say, that it is difficult to escape the conviction that much loss of life and property results from its general acceptance. Huge boilers of several hundred-horse power are often allowed to burn and corrode, for several years, without any examination whatever as to their condition. If the plates be so rust-eaten and corroded that a pocket-knife could be thrust through them without difficulty, the owner and those in charge of the engine and furnace, take the matter very quietly, comforting themselves with the assurance that the only danger connected with the management of a boiler is an explosion, and that due attention to the pump and indicator will always prevent that contingency. On the other hand, the act of bursting is a mere local affair, conveniently limited to the forcing of a rivet, or the rending of a tube, by which the elements of destruction are released in the most harmless and accommodating manner.

Some of these danger-scorning people will go so far as to affirm that there is no absolute necessity to overhaul a boiler, as it will always give timely warning of its rickety and dangerous condition, by bursting in that particular and commodious spot where it is weakest.

Has any one who has inquired into this subject, with any degree of thoroughness, a right to be surprised that boiler disasters are on the increase, when those directly concerned appear so devoted to the crab-like direction of progress in the matter? The most provoking peculiarities connected with the inquiries into these casualties are, that no one is to blame, and that the killing and maiming of a score or two of human beings are considered as circumstances belonging to the natural order of things.

There are, doubtless, many boiler casualties which are caused by ignorance and carelessness on the part of operatives; but it is scarcely going too far to say that most of the phenomena called explosions are simply the bursting or rending of boilers corroded and worn out by excessive wear. In this case the whole of the rickety fabric suddenly gives way under an increase of pressure, which a sounder structure could bear with perfect safety.

The system at present in use of embedding the large class of boilers in masses of solid masonry, should be unreservedly condemned, as it is the indirect cause of more than half the disasters that occur with such frequency. When a boiler cannot be thoroughly repaired without the necessity of disintegrating and pulling down walls of brick and mortar several feet in thickness, it requires no very blamable degree of suspicion that in nine cases out of ten no repairs will be made. A very dim idea, in fact, can be formed of the condition of a boiler under such circumstances, seeing that it is completely buried out of sight. "Out of sight, out of mind" is an ancient adage, not inapplicable to the present case. There are many boilers now in operation in this city which have not been overhauled or examined for many years, because much expense and delay would be incurred in "getting at them." The presiding functionary treats the matter in question with an indifference that makes a prudent observer tremble for the future. The opinion that is generally expressed on the subject is, that it will be quite time enough for a thorough overhauling when a flue, tube, or something else gives way and puts out the fires. Surely such an order of things imperiously demands legislative correction.

Some effective measures should be taken for the thorough inspection of boilers at stated periods, quite irrespective of the delay and cost which may be incurred by disemboweling them from massive layers of brick and mortar. It is said, with some truth, that wise men often quail at the very things which fill the thoughtless with a sense of security. The mode of managing boilers at the present day would doubtless afford the former a boundless source of uneasiness, were the subject looked into as searchingly as it ought to be.

Boilers which are "bricked up" present a neat and compact appearance, and it is too often taken for granted it is all right within, when the demon of devastation may break loose at any moment.

Boilers should be thoroughly covered to prevent the escape of heat by radiation and convection, but the covering should be such that it can not only be easily removed when required, but the material should be such that steam can readily penetrate so as to expose leakages. There is evidently an opening here for improvement, and any one who can successfully fill it will be entitled to rank among the benefactors of mankind.

C. M. O. Hara, C. E.

Gas and Air Carbureters.

Messrs. Editors:—The want of a safe, reliable, cheap, convenient, and stationary method for domestic illumination, where heat is not a means of production, and the great number of, and increasing patented contrivances therefor, prompt me to respectfully submit the following remarks upon this highly important subject:

A consecutive history of the progress in carbureting illuminating gas and air would be most interesting, but would require more space than is designed for this paper.

More than forty years ago the late and world renowned Mr. William Clegg, of London, who first practically introduced commercial gas, tried several plans to increase its illuminating power by combining it with the vapors of some light hydrocarbon, and for some years after those trials other persons atempted it. Yet, while several were, like Mr. Clegg, temporarily successful, all of them finally abandoned it.

About the year 1848 the late eminent and widely known Mr. Charles B. Mansfield, also of London, succeeded in carbureting atmospheric air, but he was compelled to manufacture his naphtha "benzole," a distillate from coal tar, by a new process. His invention was made public at the time, but was found too expensive for general introduction. Other inventions were patented subsequently for the same use, but practical objections, more or less serious, were found to all of them.

Up to the year 1858, the hydrocarbons to be obtained were either charged with some non-volatilizable property, or, if pure, were made in limited quantities, and they were expensive and difficult to obtain. But after the improved method for distilling petroleum, coal tar, etc., by gradual heat and distinct vaporization, then those naphthaline products were first obtained in a condition of purity, quantity, and cost, to warrant the popular introduction of carbureters, which had increased in variety, in this country and Europe, since the year 1865 for treating either common gas or air. Embarrassments are, however, still encountered in the attempt to treat either gas or air in this way.

The carbureting features of the various systems employed consist of four classes, each being enveloped in a close vessel.

First. Where the medium to be carbureted passes directly into the fluid by a series of small openings from the conducting pipe, and thence to the service pipe.

Second. Where it passes into and through some absorbing porous medium, as sponge, cotton, wool, shavings, pumice stone, etc., which is saturated by the fluid, in some cases by capillary attraction from a shallow reservoir below in which it rests, and in others where the fluid is allowed to fall or trickle upon the mass from above.

Third. Where it passes over a series of shallow trays or channels lined with a warm fabric that is kept saturated automatically with the fluid.

Fourth. Where a woven or a spun fabric or a fibrous woody material is arranged in a regular fixed position, and either stands in or upon or is rotated in the fluid below it.

In all of which systems the result is that the vapors of the fluid are mixed, with more or less facility or uniformity, with the gas or the air which passes through the instrument.

The difficulties have chiefly arisen from the following causes:

First—Quality of the fluid. The hydrocarbons obtainable were charged with oily or resinous matters, which, collecting in the apparatus, rendered it inoperative until cleared of its contents.

Second—Uniformity of pressure and size of flame. This difficulty particularly pertains to carbureters for commercial gas, the pressure of which is only equal to a column of water about three inches high: hence its passage through the instrument should be quite unobstructed, the size of the burner should be enlarged, or the gas pressure increased, which latter will tend to induce leakage at the joints of gas pipes and fixtures.

This difficulty is, however, modified by the fact that if the gas be well and uniformly carbureted, the light thus being intensified does not require a size of flame to produce a light due to the standard size of the burner.

It is found this trouble of pressure applies often, also, to air carbureters, owing to their construction, which impedes the flow and varies the size of the flame, as more or less burners are worked.

Third—Tendency to surcharge the gas or the air with the vapor, and its condensation in the pipes. As the volume or density of the vapors taken into the pipes is always due to the temperature of the medium passing into the carbureter—the mixture being mechanical, only—and while the higher the temperature the greater is the load this medium will take up, it follows that if after leaving the instrument the temperature be lowered, as is often the fact, a due proportion of those vapors must separate there and accumulate.

They finally trickle down and along to the burners, so that on turning the cock and applying the match, you will have, instead of an upward flame of gas, a downward stream of liquid fire, igniting all combustible matter within its reach.

Fourth—Refrigeration. A result of all evaporation is refrigeration, and this causes, with most carbureters, a diminution of temperature upon their exteriors, so that when in a cellar or other place holding moist atmosphere, water becomes condensed upon the apparatus and frozen there as solid ice, to the detriment, and often involving the safety, of the instrument.

Fifth—Safety. In addition to the insecurity, as represented in the two last mentioned difficulties, are others attending the charging of fluid to the apparatus, and the necessity of skilled attendants, which embarrassments or hazards from the use of this class of inventions have induced combined opposition to them from our most respected and powerful underwriters.

Summary.—The following are essential requisites to the successful use, safety, and convenience of apparatus for naphthalizing of gas or air for illuminating or for heating purposes:

First. The apparatus should be substantial, not liable to derangement, simple in construction, requiring no special skill in its management, easily taken apart, readily put together again, and uniform in its action.

Second. It should present the largest possible surface for evaporation for its bulk or cubic contents, and be safe or doubly safe against any possible accident from leakage of gas or naphthaline, with facilities for charging it readily, without risk of escape of fluid or vapor, and by the least possible trouble.

Third. Its construction should be such that the pressure of the medium entering the apparatus should not be diminished at the outlet pipe, so that the size of flame will always be the same, irrespective of the number of lights used within the capacity of the instrument.

Fourth. It should be provided with a surrounding air chamber af a non-conducting medium to avoid the accumulating of intense cold on the exterior of the apparatus, insuring a depressed temperature to the vaporized medium below that to be assumed by the gas or mixture after entering the service pipes.

Fifth. The fluid should leave no residue or deposit when evaporated.

Sixth. Its cost to consumers should be within the reach of persons of moderate means.

The time has arrived when this important category of economic art should take its proper rank of usefulness and value in popular domestic comfort and economy, and also those branches of trade where in heating with gas it must be found indispensable.

J. Burrows Hyde.

Carpenters Poisoned by Chemicalized Wood.

Messrs. Editors:—The St. Louis, Vandalia & Terre-Haute Railroad Co. have just finished building a freight depot in this city, the timbers—shingles included—of about half the building were saturated with a poisonous compound—arsenic, corrosive sublimate, and salt. If anything else, I do not know.

Inclosed is a slip of newspaper containing an account of the death of one of the carpenters employed on the building:

"Levi Willison, one of the men poisoned sometime since by working on the timbers and shingles of the Vandalia depot building, which had been saturated with some chemical preparation to render them non-combustible, died yesterday. No inquest was held. Another workman, whose name we could not ascertain, is not expected to recover."

Nearly all the carpenters were in a condition similar to the patients that are to be seen in a venereal hospital. The genital parts were most affected. Perhaps he poison would not affect them so if the work was done in cold weather. The timber so prepared will only smoulder away when put in a fire—no blaze.

I consider the inventor anything but a public benefactor unless he can invent some means to save the workmen. The harm outweighs the good.

John O'Connell.

East St. Louis, Ill.

[We wish our correspondent would ascertain and inform us whose process was employed in the preparation of this timber.—Eds.

Mississippi State Fair.

Messrs. Editors:—You were kind enough to announce in June that our State Fair would be held Oct. 10th. The time was soon after changed to Oct. 24th, so as not to conflict with the St. Louis and Memphis fairs, from which peints we expect many visitors.

The Mississippi State Fair will open at Jackson on Monday, Oct. 24th, and will continue to include the Saturday following. Machinery can be entered and placed in position after Oct. 15th. We are well prepared for a grand exhibition of the industry of our State, and there will be thousands of planters here to note what is new and useful in the way of agricultural implements, machinery, etc.

We are pleased to know that the Scientific American will be represented by Prof. Colton, from whom we have had the pleasure of a call.

I. L. Power.

Jackson, Miss.

FORTIFICATIONS AND HISTORY OF STRASBOURG.

This city, the capital, in old times, of the half German province of Alsace, and now the capital of the department of the Lower Rhine, boasts its five hundred cannon and its eighty-two thousand inhabitants, and is one of the strongest fortresses in France. It stands on the Ill, about a mile and a half from the broad Rhine, and the stream beside which it is built intersects it with many channels.

Louis the Fourteenth, in 1681, always unscrupulous in his ambition, got possession of Strasbourg, which was then a free imperial town, by an unexpected foray upon it during a time of peace. It was the ambition of France, even then, to extend her Rhenish frontier and push Germany further back. Vauban instantly set to work to secure the conquest by strengthening what was weak, and increasing what was already strong. He built a pentagonal fortress or citadel of five bastions, besides five sluice houses, whose outer works extend to the arm of the Rhine. He gave this stronghold—which will hold seventeen hundred and fifty men—the motto, "Servat et observat." He also constructed large sluices at the spot where the Ill enters the town, so as to lay the whole country round, between the Rhine and the Ill, under water, in case of need. On the side of the Porte-des-Mines, which could not be inundated, the glacis was mined. The arsenal contains—or did before the present war—arms and equipments for nearly four hundred thousand men, and it has also nine hundred and fifty-two cannon, including the five hundred and fifty required for the ramparts and for the citadel. To all these resources of the semi-German town, facing the Duchy of Baden, we must add a cannon foundery, which, every year, produces three hundred pieces of artillery of various calibers, and boasts one furnace that will contain twenty-six thousand four hundred kilogrammes. The town, as a military center, also possesses eight barracks, sufficient for the accommodation of ten thousand men, a military hospital, built for twelve or eighteen hundred beds, and used, since 1814, as a military hospital school. The stronghold is also the seat of a regimental school of artillery, under the command of a general. It is impossible for the traveller to forget, when in Strasbourg, that the town is an important fortress, for all the seven gates are shut in the winter at eight, and in summer at ten o'clock, though diligences are allowed to enter later, as well as travelers by post or steamboat.

The greatest modern event that has taken place at Strasbourg was the wild attempt at an insurrection made in that city by a certain Prince Louis Bonaparte—a man not yet altogether forgotten—on the 30th of October, 1836, the year Charles the Tenth died. The misguided prince, son of Louis, the ex-King of Holland, had been educated in Switzerland, and was a captain of artillery in the army of that country. Having entered into a treasonable correspondence with Col. Vaudry, of the Strasbourg garrison, who gained over a few of the men, and filled the adventurer's mind with too sanguine hopes, the prince came to Strasbourg to fire the train and try for the throne. On the morning of the 30th of October, the prince, dressed as like his uncle as possible, and wearing decorations and a cordonrouge, proceeded to the barracks. The zealous colonel, assembling his men instantly, told them, with great alacrity in lying, that there had been a revolution in Paris; that Louis Philippe was no more; lastly, that Napoleon the Second, a descendant of the "great man," had been proclaimed; and that there, in fact (pushing forward the prince), he stood before them. The coup de théâtre succeeded for the moment. The soldiers, pleased at the remarkable attention paid to them by the new emperor, shouted and followed him as their commander. The prefect was arrested in his bed, and a guard was placed over him. A body of the mutineers, led by a Colonel Pargin, then marched to the house of General Voirot, the commander of the division, and requested his allegiance to the new chief. The general, however, calmly addressing the soldiers, soon convinced them that they had been tricked. The general, being then set at liberty, at once secured the citadel.

In the mean time, the emperor of an hour and his zealous colonel had proceeded to the barracks of the Forty-Sixth Regiment, and tried the old plan. But an aid-de-camp of General Voirot gave notice to the colonel of the regiment, who, going to the barracks, found the prince and his plotters reasoning with the soldiers, and trying to gain them over. The colonel was prompt; he at once closed the gates, and trapped the whole party. General Voirot then, having released the prefect, came down from the citadel, and carried the prince and his accomplices straight to prison. The minor conspirators were tried and punished, but the arch plotter, treated in a generous and somewhat contemptuous way by Louis Philippe, was packed off from L'Orient to the United States, on the 21st of November, in a French frigate. Singularly enough, a similar attempt was made at Vendôme on the very same day by an hussar sergeant, who wished to proclaim the rights of man, arm the pioneers, and march on Tours. He shot a brigadier who tried to arrest him, and then gave himself up. He was condemned to death.

The choicest promenades of Strasbourg are beyond the enceinte. The two finest are called the Contades and the Robertsau. The latter is composed of huge lawns, intersected by walks designed by Le Notre, Louis the Fourteenth's great gardener, of a splendid orangery (twelve hundred trees), where the Empress Josephine lodged in 1806 and 1809, of an English garden, a suspension bridge that leads to the Isle of Wacken, and of a smiling and coquettish village.

The two great celebrities of Strasbourg, besides the immortal but unknown discoverer of the pâté, are Kleber, Napoleon's general, and Guttenberg, the supposed discoverer of printing. A monument to Kleber stands in the center of the square named after him, and is raised over the hero's body, originally interred in the minster. This brave man, who, after many victories in Egypt, was assassinated by an Arab fanatic under a tree still shown in a garden at Cairo, was much esteemed by Napoleon. "Kleber sometimes sleeps," he said; "but when he awakes it is the awaking of the lion." There was a little of the German unreadiness and phlegm about this brave Alsacian until battle roused him. He was never seen at his best but when under fire.

Guttenberg, who practiced printing as early as 1436, at Strasbourg, perfected his invention at Mayence. His assistant, Peter Schöffer, who made metal letters with even greater success than his master, was a native of Strasbourg. The statue of Guttenberg in the herb market, now called the Place Guttenberg, was modeled by David.

But the wonder and delight of Strasbourg is the cathedral—one of the masterpieces of Gothic architecture. Founded by Clovis, in 510, reconstructed by Pepin and Charlemagne, destroyed by lightning in 1007, it was rebuilt in 1015 by Erwin de Steinbach, and finished in 1413 by Jean Hultz, of Cologne, after the tower had been four hundred and twenty-four years incomplete. According to tradition, ten thousand workmen toiled at the holy work for the good of their souls, "all for love, and nothing for reward."

An epitome of Gothic art, this cathedral contains specimens of every style, from the Byzantine upwards. Heaven send it a safe deliverance from Prussian shot and shell; let the gunners aim wide of that noble, heaven-piercing spire, which, according to the best guide books, rises four hundred and sixty-eight feet above the pavement—that is twenty-four feet higher than the great Pyramid—and sixty-four feet higher than St. Paul's, the body of the church itself being higher than the towers of York Minster. The view from this network of stone repays the giddiest person. Beyond the dull red roofs, and the high-roofed and many-windowed houses, spreads the whole country of the Rhine and Black Forest, and on the side of France you see those Vosges Mountains, that might have been held against the world. Hope describes the netting of detached arcades and pillars over the west end of the cathedral to be like a veil of the finest cast iron, so sharp and bright is the carving of the durable stone; while Dr. Whewell, comparing the building to an edifice placed under a rich open casket of woven stone, laments the sacrifice of distinctness from the multiplicity and intersection of the lines. The triple portal is peculiarly fine, and is, in itself, a world of quaint statues, and bas-reliefs. The middle arch is adorned with no less than fourteen statues of the Old Testament prophets; on the right arch are the Ten Virgins, and on the left the Virgins treading under foot the Seven Capital Sins. In the Revolution these carvings were destroyed, and the great brass doors melted down into money, but they have been restored with a most reverential care. The choir is plain and simple Romanesque, but the nave is the choicest early decorated German Gothic. The town's special treasures are the fine stained windows of the Fourteenth Century, recently restored (spare them, gentle gunners), the vast marigold windows, and the famous astronomic clock, one of the wonders of Europe, comprising a perpetual calendar, a planetarium on the Copernican system, and shows the hour, the day of the week, the month of the year. It was made in 1571, and, after tsanding still for fifty-six years (a good rest), was repaired in 1842 by a mechanician of the town. This part of the cathedral is supported by a single pillar of great symmetry, and above the Gothic cornice appears the effigy of Erwin de Steinbach, the architect of this vast building, whose tombstone was discovered, in 1855, in a humble little court behind the chapel of St. John. In an old house at the southwest corner of the Minster Platz there are preserved some curious ancient architectural drawings belonging to the cathedral.

The church of St. Thomas (Protestant) deserves a visit for its fine monument of Marshal Saxe, which cost the sculptor, Pigalle, whom Louis the Fifteenth employed, twenty-five years' labor. It represents the old warrior descending to the grave. France, a female figure, tries in vain to deter him, and, at the same time, to repel Death. Theatrical, say the critics, and French, but the expression of affection and anxiety in the woman's face is very tender and touching. This monument would have been destroyed by the revolutionary iconoclasts, had not a Strasbourg man named Mangelschott, when the church was turned into a straw warehouse, covered it up with bundles of hay. They also show in this church the mummies, curiously preserved, of a Count of Nassau Searwerden and his daughter.

The Jews of Strasbourg have now a splendid synagogue. In the middle ages they went through much here. In 1348 there was a wholesale holocaust of these poor wanderers, for two thousand of them, suspected by the ignorant citizens of poisoning wells and fountains, were burned in the Brand Gasse, where the Prefecture now stands. Rage and fear had seized the people and no Jew was henceforward allowed to sleep within the walls. Every evening, at the signal of a horn blown on the Minster Tower, the detested people were compelled to depart to their houses in the suburbs. The new church contains fragments of a Dance of Death, that grim allegory carried at last to a climax by Holbein.

The Academy, originally a Protestant school, formed in 1532, and made a university in 1621, was suppressed at the Revolution. Here the good Oberlin and Schöpflein and Schweighauser, and last, but not least of all, Goethe, studied. Goethe took his doctor's degree here in 1772. The Museum of Natural History is rich in Alsacian fossils, especially those of red marl and trias, and the fossil plants found at Sultz-les-Bains and Mulhausen. The botanical collection includes a section of the trunk of a silver fir from the Hochwald, near Bair; its diameter was eight ft., its hight one hundred and fifty.

The public library, near the new church, contains one hundred thousand volumes (be merciful to these treasures, too, O amiable artillerymen)! Among the priceless curiosities are the Landsberg Missal, or Garden of Delights; it is full of early Byzantine miniatures, circa 1180, and belonged to Herrade, Abbess of Stohenberg. Among the early printed books are Cicero, by Faust, 1465, a Strasbourg Bible, by Eggesteur, 1446, and a Mentchin Bible, printed at the same place in the same year. In the two halls are stored some Roman antiquities found in Alsace, the old town standard of Strasbourg, a statue of Rudolph of Hapsburg, and some painted glass from Molsteins. The hope that all these treasures may escape the chances of war will not be confined to students alone.

[Since the above was in type, Strasbourg has capitulated, and is now occupied by the Prussian forces. The defense was very stubborn and heroic.

The work of erecting a water battery on the south side of Governor's Island, between Castle William and the South Battery, is now going on under the direction of General Newton and Colonel Eggleston. The battery will be mounted by thirty six guns, and will be in every respect a formidable work.

Lemonade can be cheaply made from citric acid and water flavored with essence of lemon.

Improved Damper Rings for Stoves and Flue Kettle.

These improvements consist in an arrangement of the flues of stoves in connection with dampers on the cover rings, and a flue kettle hereinafter described.

Fig. 1 is a view of the top of a stove provided with these damper rings. Fig. 2 is a diagram showing the walls of the flues, and the way the damper rings act to direct the course of the flame and hot gases. Fig. 3 is a view of one of the damper rings with a part broken off to show how the improvements may be applied by manufacturers to any stoves in use, by a very slight alteration of the patterns described below.

We shall describe only such parts of the stove as are necessary to explain the action of the damper rings, and the flue kettle.

A, Fig. 2, represents the partition walls which divide the space under the top plate into compartments or flues, communicating with each other by openings, B, when these openings are not closed by the dampers of the rings, as shown at C.

One of the damper rings is shown at D, Fig. 1. It is made like the ordinary ring except that it has cast thereon a descending damper, E, which, when properly turned, stops one of the openings, C, as shown in Fig. 2.

It will be seen that this arrangement enables the flame to be carried around under the kettle holes just as may be desired, heating or cooling parts, or the whole of the top plate, and applying the heat in the most efficient and economical manner, and also in conjunction with the side flues, F, carrying the heat to the oven or the smoke pipe at the will of the operator.

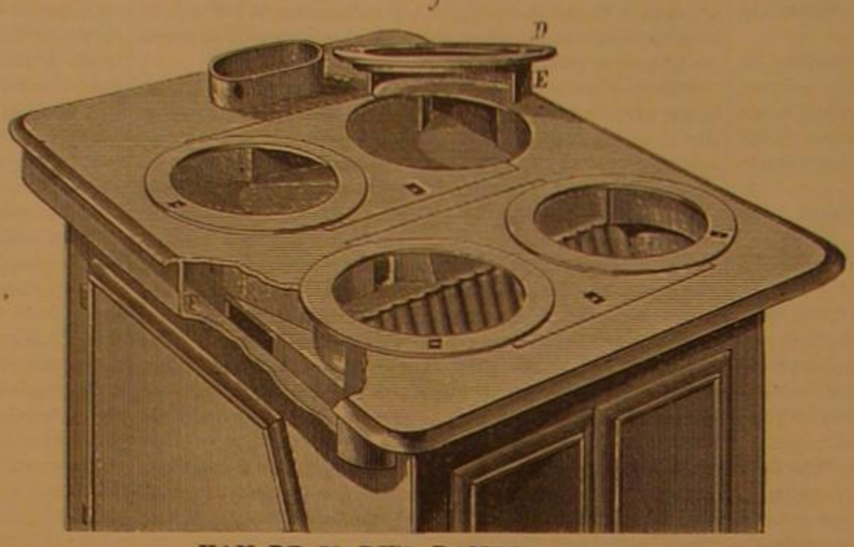
The flue kettle is shown in Fig. 4, with a portion of the outer shell broken off to show the internal construction. It will be seen that it consists of an outer and inner shell inclosing an annular space divided by a vertical partition, G. The bottom of the annular space is closed by a bottom wall except at the openings, H and I. A special damper ring is employed with the kettle, having the damper made as shown at J, forming a sort of chute through which the gases descend to the stove flues after having passed up through the aperture, H, and around the inner wall of the kettle, the inclination of which causes the gases to impinge against it, and heat it very effectually.

The kettle may be made of cast or sheet metal, and will, we think, be found a convenient and economical utensil. The inventor states that he can boil its contents very much quicker with the same fire than in a kettle of the ordinary construction.

The damper ring used with the kettle is provided with stops which secure its rapid and accurate adjustment. In stoves of any pattern this kettle can be used in connection with its ordinary furniture by putting in the proper partitions under the top plate, and altering the pattern of the top plate so that one side of the hole is cut out as shown at K, Fig. 3, say, one quarter of an inch. This amount of cutting will not unfit the hole for the common furniture, while it will allow the flue kettle and damper rings to operate.

Patented, Jan. 25, 1870, by Charles Van De Mark, whom address for further information, at Phelps, N. Y.

Fig. 1



VAN DE MARK'S DAMPER RINGS.

Fig. 2

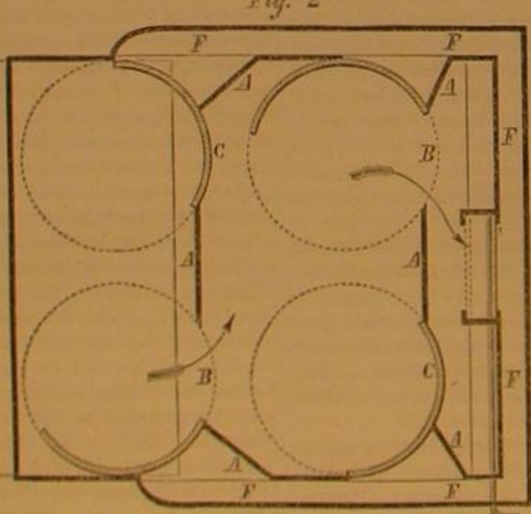


Fig. 3

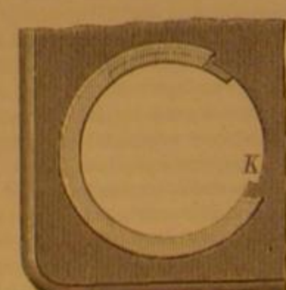
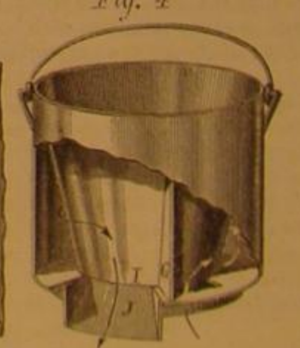


Fig. 4



Iron Girders.

Beams or girders of any kind are acted on by weights placed on them at stated places, inversely as the square of the distances of such places to the supports; thus, taking a length of 6 feet and another of 12 feet from one common support to one girder, it will (supposing it to be equally strong throughout its length) support more on that place the position of which will, when squared, be less than the square of the other place, having its distance from the nearest place of support greater. As, for instance, the one being 6 feet, which, when squared, is 36, and the other 12 feet, which, squared, gives 144, and 144 being four times 36, then, as these are to be taken inversely, the place that gives 36 will bear four times the weight that the place squaring 144 will do.

Now, commencing with the unit one, and taking a piece of iron which shall be two feet long between its supports and one inch square, and, say, that will sustain at one foot from its supports four tuns (breaking weight) then the square of one is one. Then, suppose we want to support the same weight at, say, 10 feet from the supports, then the square of $10=100$, and, as we have seen, the square of one is one; therefore, on the inverse principle, our one inch square iron will be of $\frac{1}{100}$ the necessary strength. Now, it also happens that the strength of beams increases as the square of their depths; and so, if we make the depth of our beam so that it shall square 100 times its present square, we shall, so far as strength is concerned, have effected our object, making in this the one inch deep the unit, then the $1^2=1$, as before, and $10^2=100=100\times1$, which gives us our original strength, theoretically, but not necessarily practically; for it would require some means to give it lateral stiffness; this must be done by reducing the depth and increasing the breadth, so as to retain the same strength. Now, it is evident that if two separate beams of the same dimensions be placed side by side, they will bear twice the weight that one will; and, therefore, one beam equal in size to the two will bear the same weight, provided there be not a faulty place in such beam, which, were it to occur in one of the two smaller ones, could not reduce more than half the strength of the two taken together; and consequently a beam will increase in strength in proportion to its breadth.

Now, as a beam increases in strength as the square of its depth, it will be found that doubling the depth of any beam must quadruple its strength; but to double its breadth only doubles its strength; then, not considering lateral action, any beam may be made twice as strong by doubling its depth and taking half its width away *ad infinitum*. This will not do practically, but as the proportion of the breadth to the depth is in a measure dependent on circumstances, no exact rule is invariably given, and in cast iron girders the areas of the flanges may alone be given.

If a girder should break, the lower part will be torn asunder, and the upper part will assist the tensile strength of the lower in proportion to its capability to resist compression. In cast iron this is said to be about six times as great as its power to resist tension; therefore it appears advisable to have in the lower part six times the metal there is in the upper; this would, at first sight, suggest a section to be, say, seven inches deep and one inch wide at top, and six inches wide at bottom, being in form like a perpendicular section through the imaginary apex of a truncated pyramid, but here we should have a great quantity of metal in the center doing little or no service. It will be economy to remove it, and to have the usual form of top and bottom flanges—the bottom being six times the area of the top; but then, this is to carry a load on the top, but when it becomes desirable to place the load on the bottom flange, then that flange would be liable to be broken off sideways from the web unless it would resist a pressure in that way greater than the strength of the girder; and when we come to consider that this flange will be acted on only in places, and in these with a corresponding increase of weight, we shall at once see that, to prevent portions of the bottom flange from being broken out at those places, an increase in depth or thickness of the bottom flange must be necessary; but, at the same time, it would appear probable that the counteracting influence of the two flanges would remain undisturbed by the weight being on the lower instead of the upper flange, provided that the lower flange remained uninjured by the weight; and if this be so, then it is probable that the differences in proportion of the flanges under the differing conditions of the weight being on the upper or lower flange, is a question deserving of actual trial and experiment, to enable us to know what weight would really break a piece out of a bottom flange of say two inches in thickness; it would appear, however, that the lower flange, when carrying the weight, should first be made to sustain its weight, and the upper one made to correspond to the usual proportion, which would appear in that case to necessitate a larger area of section. But in using any formula we should remember that the varieties of iron are widely different in their properties.—*The Builder.*

Steam Road Rolling in England.

The steam road-roller, says the *Engineer*, has now been more or less in use in Paris for the last ten years. In carrying out their six years' contract with the Paris municipality the engines of the contracting company there have already rolled down nearly half a million of cubic yards of road metalling. That the interests of the users of the roads whether human or equine, are fully served, is evident to the most casual observer amongst the visitors of that beautiful city. Knowing many European capitals, we feel free to say that the Paris roads are unequaled, whether for their regular and smooth surfaces, their precise contours, or their freedom from mud in winter and dust in summer. It has been officially estimated that the diminution in draft due to the steam rolled surface saves an enormous annual sum to Parisian owners of horses and vehicles. This is easily accounted for when we remember that the draft on loose metalling is five times more than where the stones have been "run in" by the traffic; and that draft progressively rises to this five-fold amount on patches in varying states of consolidation.

Apart from equine and vehicular wear and tear caused by increased draft, it continually happens that horses are injured on the loose sharp stones by spraining the joints of their legs; especially on stones of too large a size to be consolidated by the comparatively narrow and light fellies of ordinary vehicles.

During this very season we know that more than one wealthy carriage owner proposed to bring actions for damage done in this way to horses passing on the macadamized part of Piccadilly. Still, much as West-end people object to loose metalling, they prefer its occasional appearance to the dangerous slipperiness of stone setts. No rider with any care for his own neck or his horse's knees will, if he can help it, ride over pavement. There are qualities in which a macadamized road must always excel paving. It is cheaper to lay down, it gives a better foothold, and it is free from the fearful noise of paved setts.

At first sight it might be expected that such roads as in Paris must be dearly paid for in maintenance. In England, at any rate, consolidating roads by rolling is looked upon as merely a luxury for parks and pleasure grounds; as it is believed that common vehicles roll roads down at no cost to road maintainers. In all probability road rolling was thus regarded when first used in France and Prussia; or, at the most, it was hoped to prevent injuries to horses, vehicles, and harness. But the virtue here displayed was found to be its own reward in the form of much saving in maintenance. It was in our pages that attention was in England first markedly drawn by Mr. Paget to the waste of metalling on unrolled roads, and generally to the great economical advantages of the process. From seven estimates, formed at different times, under the most varying circumstances, by different engineers—amongst whom are Field-Marshal Sir John Burgoyne, the engineer of the Seine Department, and Mr. Holmes, the Sheffield borough engineer—an average of 40 per cent saving in metalling can be proved to be produced by the imperfect process of horse road rolling as against traffic rolling. Now the experience of the last ten years in Paris, as compared with the experience of the previous thirty years or thereabouts, since horse rolling was adopted, has shown the French engineers that the steam rolled roads last twice as long as horse-rolled roads; or, in other words, while the horse roller diminishes road maintenance by 40 per cent, the remaining 60 per cent of any total to be expended, when no rolling is used, is itself brought down by one half where the steam roller is applied.

An Immense Irrigating Canal.—The Colorado *Tribune* of September 7 says: "Engineers go out on Monday to commence the surveys of one of the grandest enterprises for the improvement of an unsettled country that ever secured the attention of man. This is no less than the building of a gigantic irrigating canal, more than 100 miles in length, commencing in Platte Cañon, before the river debouches upon the plains, and extending to the head of the Republican River, in the eastern part of the territory. This immense canal will irrigate no less than *three million acres of land*, now useless except for stock purposes, and will be, if constructed, the means of making a place where a million people may find homes. The money to pay for the survey is raised, and the parties pushing it on can control the means to build the canal."

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Contents:

(Illustrated articles are marked with an asterisk.)

NAVAL ARCHITECTURE AND ENGINEERING.

A cotemporary remarks that "the loss of the British iron-clad *Captain* is an event that cannot fail to exert an important influence on naval architecture in the future," and there is no doubt of the truth of the remark. Within the last ten years there has been something almost constantly turning up or going down, to modify naval architecture.

This is not to be wondered at. The transition from wood to iron, as the material for the construction of war vessels, could scarcely have been accomplished without some failures and disasters. To suppose that it could, would be to suppose engineers incapable of error, iron incapable of penetration by shot, and the power of invention to devise means of attack, to be inferior to the same talent in devising means of defense.

There have, therefore, naturally been many mistakes made, as well as modifications necessitated by the continued improvement in the methods and instruments of attack.

The *Captain* seems to have been one of these mistakes. Her enormous weight of armor appears to have rendered her unfit to endure heavy weather. The query now arises whether such enormous weight of metal can be made by any modification of model compatible with good sea-going qualities in a ship. We do not believe any one is yet prepared to give a satisfactory answer to this question. There is no end of theorizing, and plenty of men will be found to take the affirmative, as well as the negative side in the debate, but experience with heavy iron-clad vessels has been such as to rather emphatically point to the negative as the ultimate decision of engineers. The advances secured in the weight and penetrating power of artillery seem to necessitate even as great or greater weight than that of the *Captain* in order to withstand the now well-nigh irresistible force of projectiles.

One serious difficulty in practical experiments with such vessels, is the enormous expense attending them. The *Captain* must have cost the British Government nearly or quite as much as a fleet of wooden war vessels. It is impossible, therefore, that in the race for naval supremacy such rapid progress can be made as some seem to expect. Some of the blunders committed, however, seem certainly too gross for the present state of knowledge on this subject.

For instance the French naval squadron, especially designed for service in the Baltic, has been found to draw too much water for that service, and has been withdrawn from it.

The Prussians have employed well known means to render difficult the navigation of the shallow waters on the south Baltic coast. The usual lights have been extinguished, and false lights substituted, and the inlets and entrances to rivers filled with torpedoes, and protected by light-draft gunboats which can run where the French ships are totally unable to follow them. Think of ships drawing from twenty to thirty feet of water sent upon such a service.

Of all the blunders committed by the French in the initiation and conduct of the present war, scarcely anything can exceed this. France has expended vast sums in experiment and in construction to produce a formidable navy that is at most worthless to her in her present crisis.

England made a similar blunder in the Crimean war. She also sent to the Baltic a fleet of heavy-draft vessels, which proved of no use, yet with this lesson of history so recently learned and written, France has followed the example of England with the same results. How long is it to be before naval constructors will learn that only light-draft vessels are fit for such service.

But then here comes in the difficulty. To make formidable iron-clads of light-draft seems almost an impossible problem.

A NEW ARTIFICIAL LIGHT.

One of the arguments employed in our works on chemistry to prove that the atmosphere is a chemical mixture and not a true compound is derived from an experiment upon the solubility of air in water. Roscoe says, in his admirable treatise:

"When air is shaken up with a small quantity of water, some of the air is dissolved by the water; this dissolved air is easily expelled again from the water by boiling, and on analysis this expelled air is found to consist of oxygen and nitrogen in the relative proportions of 1 and 1·87. Had the air been a chemical compound, it would be impossible to decompose it by simply shaking it up with water; the compound would then have dissolved as a whole, and, on examination of the air expelled by boiling, it would have been found to consist of oxygen and nitrogen in the same proportions as in the original air, viz., as 1 to 4. This experiment shows, therefore, that the air is only a mixture, a larger proportion of the oxygen being dissolved than corresponds to that contained in the atmosphere, owing to this gas being *more soluble in water than nitrogen*."

It is somewhat remarkable that no practical application of this experiment has been attempted until recently. The principle above enunciated is now applied to the manufacture of oxygen from the air. By compressing atmospheric air into receivers filled with water, more than the usual quantity of oxygen will be dissolved, and the dissolved air can be forced into a second and third receiver, becoming each time more and more rich in oxygen, until an atmosphere is finally obtained that consists of 90 per cent of that gas. Some use for the nitrogen may be invented, but at present it is of little value. It is probable that this method will eventually prove the cheapest for the manufacture of oxygen. Experiments have established the fact that an atmosphere containing 50 per cent of oxygen yields results nearly equal to what can be obtained from pure oxygen. Thus far the chief investigations have been made in this direction of furnishing a new and cheap artificial light. As soon as we can feed an air to our lamps containing 30 or 40 per cent more than the usual proportion of oxygen contained in the atmosphere, the brilliancy of the light will be greatly increased and it will afford a much healthier light than is now given by our gas. A lamp has been invented in Cologne, called the Phillips Carbo-oxygen lamp where the oil is some cheap hydrocarbon, the wick of non-combustible material, probably asbestos, and oxygen is supplied from a reservoir by a peculiarly constructed apparatus. The flame is made to assume the form of a star, and any heating of the wick holder is prevented by the manner in which the oxygen jet is permitted to feed it. It is said that the lamp needs no special attention beyond that of filling it with the patented hydrocarbon liquid. The wick requires no trimming, and explosions are impossible, as the oxygen does not in any way mix with the gases that might be produced by the heat of the combustion. The light of a lamp consuming five and a half cubic feet of gas per hour is equal to 90 or 100 candles, or ten times that of an ordinary gas jet. In diffusive power it would, however, probably not equal a less brilliant light. For lighthouses, fog signals, and photographic purposes, and for studies for the microscope, such a lamp would be of great value. The usefulness of this method of obtaining oxygen would not be confined to the production of light. There are other important applications for that gas, and the moment that we can obtain it cheaply it will enter into metallurgical operations, into compound blow-pipes, into laboratory and pharmaceutical uses, and, in fact, be applied in a thousand ways. It is possible that we may find some other liquid than water that has great solvent power for oxygen with none for nitrogen. The receivers once filled with such a liquid need not be filled a second time, but an indefinite quantity of air could be absorbed and expelled from the same apparatus, and it is possible that this operation could be carried on by clock-work or some other mechanical means. We are manifestly on the eve of the discovery of an easy and cheap method for the manufacture of oxygen for artificial light and other purposes, and the source of the gas appears likely to be the atmosphere.

AFFAIRS IN PARIS.

In consequence of the hostilities at Paris, the office of the Scientific American Patent Agency has been temporarily removed to Fécamp, Seine-Inférieure, No. 22 Rue des Cordieries. Fécamp is not likely to be bombarded by the Prussians, and may be conveniently reached by our clients via Bordeaux or Marseilles.

A Paris correspondent of the New York *Tribune*, who lately went to call on some of his friends, says: "I found everyone engaged in measuring the distance from the hostile batteries to his particular house. One friend I found seated in a cellar, with a quantity of mattresses over it to make it bomb-proof. He emerged from his subterraneous "Patmos" to talk to me and after ordering his servant to pile on a few more mattresses, retreated again. Anything so dull as existence it is difficult to imagine."

Communication between Paris and the interior of France is now maintained by means of balloons and carrier pigeons. M. Durnorf, the aeronaut, lately carried a large mail from the beleaguered city. He left the Place St. Pierre, Montmartre, Paris, at eight o'clock in the morning. A strong east wind was blowing. He rose three thousand yards, and with a telescope saw the Prussians pointing cannon at him. The infantry also tried their rifles, but he was out of range. He descended near Evreup, and thence by rail to Tours.

The roar of cannon is now continuous at Paris, as the contending armies are constantly at work, harassing and destroying each other.

The French, judging from their own accounts, have devised an ingenious system of night attacks, by which they deprive the Prussians of rest, and frequently obtain important advantages over them by capturing prisoners. In these attacks the French use the electric light to blind the eyes of the enemy. Preparations have been made to light the city with petroleum if it becomes necessary to cut off all the gas.

THE SIEGE OF PARIS.

As London is the chief European center of commerce, Paris is the center of fashion and gaiety for the entire world. In time of peace its hotels are always crowded with people of every country and race, who bring to it and leave with it vast sums of money annually. The first Napoleon having in view the brilliant future of this modern Babylon, ravished every city which fell into his hands for works of art to decorate the streets, parks, and palaces of the French capital; thereby rendering it, in connection with its more modern improvements, undoubtedly the most attractive and splendid city the world has ever seen in any age.

One shudders at the probable condition of this beautiful city and its inhabitants at the present moment. The Palace of the Tuileries, the Palace of the Luxembourg, the Grand Hotel, and other public buildings are turned into hospitals and lazar houses, as shown by the yellow flags displayed upon them, and the city is crowded with probably fifteen hundred thousand non-combatants. The long list of disasters to the French arms has been crowned with news of the fall of Strasbourg which must strike to the hearts of the Parisians like the final death-blow to all hope of success for their cause. Their parks are dismantled, their beautiful groves destroyed, and their rich bronzes melted down as material for artillery. They are cut off from external intercourse with the world, and can only get such news of external affairs as the Prussians permit to pass their lines. They are consequently well posted as to their disasters, but anything calculated to raise hope could only, if it existed, reach them by devious and doubtful means. To crown all, it is reported that riots rage in the streets, and that firing can be both seen and heard from a distance between unknown factions, which must, whatever their character, add to the confusion and dismay of the populace.

It is hard for those who have not visited and sojourned in Paris to form any adequate idea of her former beauty, and what must be the aspect she now presents in her distress. Even though familiar with her splendid hotels, theaters, and churches, her boulevards, parks, and gardens, our imagination finds it impossible to picture the reality of the death and misery which now fill them all with cries of desolation and despair; and though we have felt that this war originated entirely with the French, and was begun on the most flimsy and insufficient pretext, we cannot withhold a sentiment of keenest pity and sorrow for the helpless misery of the—with all their faults—most refined, cultivated, and pleasant people the world has ever produced, nor help regretting the too probable fate of this unrivaled city.

THE CHEAP PRODUCTION OF POTASH.

In Vol. XXII., page 399, Scientific American, we gave the various methods employed for obtaining potash from feldspar, published in foreign journals, but failed to do credit to a distinguished American scientist who was one of the first to propose a practicable method for the resolution of minerals containing this alkali. The subject is of sufficient importance to recur to it once more.

At the meeting of the American Association for the Advancement of Science, held in New Haven in August, 1850, Professor Henry Wurtz, read a paper on green sand, which was afterwards published in *Silliman's Journal*, Vol. X., page 329, from which we quote the following:

"The pulverized and ignited marl (green sand) was mixed with a sufficient quantity of chloride of calcium to form upon the fusion of the latter a pasty mass. The decomposition of the green sand takes place in this case, at a low temperature and is so complete that I have founded upon this circumstance a method of decomposing minerals in the process of analysis which I have had the honor of presenting to the Association before. The mass, after fusion, falls to pieces in water, yielding to this solvent, in most cases, all the potash which was contained in the green sand employed in the form of chloride of potassium."

In the previous communication alluded to above, the process is given of fusing feldspar, hornblende, scapolite, etc., with chloride of calcium and chloride of barium. Subsequently to Professor Wurtz's valuable paper, to wit, in 1853, Prof. J. Lawrence Smith published in *Silliman's Journal* a process for "determining alkalies in minerals," which was essentially the one proposed by Dr. Wurtz, with the slight modification of the substitution for chloride of calcium of an equivalent mixture of carbonate of lime and sal ammoniac convertible by heat into carbonate of ammonia which passes off, and chloride of calcium which remains and accomplishes the decomposition. Professor Wurtz has found that his original plan, while less complex, is preferable on many accounts to Dr. Smith's modification. Dr. Smith's modification of Prof. Wurtz's method for the resolution of minerals by the "lime process," has become quite celebrated, and is given in all its details by Prof. S. W. Johnson, in his admirable edition of "Fresenius' Quantitative Analysis." Either of the methods accomplishes the object and appears preferable to any hitherto proposed.

In August, 1864, Professor Wurtz published in the *American Gas Light Journal and Mining Reporter*, an article entitled: "A Neglected Source of Wealth," in which he called attention to the importance of economizing the alkali of the green sand marl. He says, "it may be assumed that the average of potash in washed green sand of a good quality will be at least seven per cent. This is equivalent to 157 lbs. of anhydrous potash, or 188 lbs. of pure hydrate of potash per tun of 2,240 lbs. Now the very best qualities of American potashes, worth at the present (1864) market rates $14 per cwt., contain not more than seventy per cent of pure hydrate; so that a simple calculation shows that one tun of washed green sand marl, which should be delivered in New York for probably $7 or $8, contains $37·60 worth of potash. The green sand could also be employed for making alum by heating it red hot, then acting upon it with dilute sulphuric acid, crystallizing the solution, adding to the mother liquors a small quantity of chloride of potassium, obtained by another method from the green sand itself, which converts the iron alum formed into common alum and crystallizing again. If only five of the seven per cent of potash present were thus obtained in the form of alum, the quantity of alum from a tun would be 1,120 lbs.; only ten per cent of the crystallized alum being potash."

The treatment of green sand and all feldspathetic rocks proposed by Professor Wurtz does indeed contain the germ of neglected wealth. In view of the great amount of potash now accessible from the Stassfurt mines, it would hardly pay from a commercial point of view to work feldspar or green sand for that alkali, but there is another direction in which great benefit can be derived by the application of the method to the resolution of granitic rocks, greenstone, feldspar, basalt, green sand, hornblende, mica, scapolite, and other rocks and minerals for enriching our farming lands. It would hardly require any thing more complicated than a lime kiln for the fusion and subsequent leaching of these minerals. Many farmers already understand how to grind up bones and treat them with sulphuric acid to manufacture superphosphate. It would be just as simple an operation to heat the broken rocks and while still hot to project them into dilute sulphuric acid, and thus to disintegrate them or to fuse them, according to Dr. Wurtz's plan, with chloride of calcium or with carbonate of lime and sal ammoniac, after Dr. Lawrence Smith's method, or wanting all these substances, to heat the rocks red hot, then plunge them suddenly in cold water to render them friable, then grind them and mix with lime, and heat in a kiln, and afterwards leach out with water.

A practicable and simple method for economizing the potash of our common rocks would be a great boon to the country, and the solution of this question ought to command the attention of our men of science. An acre of ordinary wheat soil, ten inches deep, will weigh somewhere in the neighborhood of 1,000 tuns, and according to the estimate of skilled chemists, contains at any one time, of potash soluble in water, about seventy pounds. Two crops of wheat and hay would remove the whole of this, and the soil would be utterly exhausted unless some provision was made for supplying the waste. The natural source from which this waste is supplied is found in the rocks and minerals contained in the soil, and we have recently pointed out the newly discovered property of humic acid to dissolve silica, and thus help to decompose the rocks. Plowing, tilling, draining, all have their share in asserting the necessary decomposition, but these are at best but slow operations, and it would greatly facilitate matters to have a cheap supply of potash and phosphoric acid to add to the soil, in proportion to the removal of these substances by the crops.

Our works on agricultural chemistry contain full tables of the amount of mineral matter taken from the ground by every variety of crop. The wheat grains, the straw, the husks, the corn, everything has been analyzed, and the precise figures are given, so that a debit and credit account can be kept by the farmer with every field, and as the cattle are fed with food, so ought the ground to have returned to it all that it is deprived of by the crops, in this way an equilibrium can be established, and the farm can never be exhausted. In most instances the air, the water, and the rocks will furnish us all that we need if we only know how to manipulate them and make them do our bidding.

The saying of Benjamin Franklin is still true: "Every man has a gold mine on his own farm, and that lies only plow deep."

Common-Sense Chairs.

The above quaint expression is used in the heading of a circular before us, advertising a class of old-fashioned easy chairs, manufactured on a large scale, by F. A. Sinclair, at Mottville, Onondaga Co., N. Y.

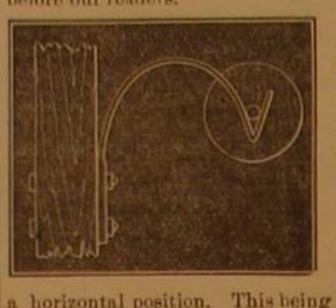
As applied, the title is most appropriate, for we have not seen, since the days of our grandmother, chairs combining so much strength and comfort as the articles to which it refers. The seats are composed of woven splints of ash, and the frames are made of hard wood, firmly secured together. A variety of patterns are made and sold under appropriate names, "Union Arm Chair," "Old Puritan," "Grandmothers' Rockers," etc. The largest size contains nearly as much timber as we have seen used by some speculators in constructing small houses in the vicinity of this city.

For watering-place hotels and piazzas in the country, we know of nothing so comfortable and appropriate as these chairs, but as to office use, for which the manufacturer recommends them, we disagree with him—they are too comfortable for business purposes.

Send to Mr. Sinclair as above for illustrated circulars, or call and see the articles, at 199 Fulton street, New York.

BALANCING CYLINDERS.

Our answer to C. E. M., of N. Y., on page 106, current volume, has called out a most valuable correspondence on the subject of balancing cylinders, of which we propose to give a summary in the present article. Our readers will recollect a letter from W. O. Jacobi, published on page 148, in which he stated that cylinders could be tested while running so as to balance them intelligently and perfectly. We expressed in a remark appended to that letter some doubt that this could be done. Since the appearance of the letter referred to we have been favored by a call from Mr. Jacobi, who has convinced us that cylinders can be tested as he proposes; and his method is so simple and ingenious that we gladly lay it before our readers.



The accompanying diagram shows the apparatus employed: A bent steel spring bar, having a V-shaped bearing, in which one of the journals of the cylinder to be balanced rests; the other end rests in a bearing adjustable vertically, so that the cylinder may be brought into a horizontal position. This being accomplished, the cylinder is set revolving at moderate speed by a belt and pulley on the end opposite the spring bar, and a piece of chalk is held so as to just touch it at the end resting in the bearing of the spring bar. If the end of the cylinder is out of balance it revolves around a center, which is not the center of the cylinder, and the chalk mark, clearly points out the place to add the counterpoising weight.

Mr. Jacobi states that in his establishment he has employed this method with perfect success in balancing the "fancys" in carding machines, these cylinders being long in proportion to diameter, and more difficult to balance than those short in proportion to diameter.

Mr. John Mitchell prefers balancing on pivots to using steel bars. He first balances the heads separately on the shaft, then marks the centers of the horizontal bars or "lags," suspends the cylinder on pivot centers, and balances by chipping or drilling. We tried this method in all its essential features some years since, but could never get so nice a balance as when we used steel bars. With the latter we never failed, but the cylinders we operated upon were very strong, and short in proportion to diameter. Mr. Mitchell would have added to the value of his communication by stating the character of the cylinders he has balanced in the method described, their size, and the speed at which they are run.

Another correspondent, who does not give his name, loosens the boxes allowing the cylinder room to jump, and marks with the sharp point of a file in the way prescribed by Mr. Jacobi with the chalk, operating on one bearing at a time. It seems impossible to reach the nicest adjustment in this way, and we should much prefer Mr. Jacobi's plan, the elasticity of the spring bar permitting motion from the slightest inaccuracy in balance.

This correspondent remarks that a crank shaft cannot be perfectly balanced, because the weight cannot be applied opposite the crank pin; but by suspending the bearings so as to allow the crank wheel to find its center of gravity, he has succeeded on a 20-pound crank wheel in balancing a 4-pound pitman rod, having a 5-inch stroke, running at a speed of 4,000 revolutions per minute.

Mr. G. Westinghener, of Schenectady, N. Y., balances cylinders from two to three feet in length, designed to run 1,500 revolutions per minute, as follows: The cylinders weigh about 200 pounds, and have a shell of wood. He uses small pointed pieces of iron rod, about an inch and one half in length as weights driving them partially in, so that they will not fly out when the cylinder is rapidly revolved. They are inserted one at each end, directly opposite each other. The cylinder is then set in motion to see whether it is more or less out of balance than before the insertion of the spikes, the positions of which are changed until the cylinder runs without shaking. He says this sometimes involves a number of experiments, but he always succeeds in getting them to run steady, and this he does on a bench that can be shaken easily by the hand

We have no doubt a cylinder can be balanced in this way, but it seems a very slow and unmechanical method. The revolving of the cylinder to see whether it has lost or gained in balance cannot be called a very scientific method of test, if indeed it deserves the name of test at all. Mr. Jacobi's method, on the contrary, not only determines that the cylinder is out of balance, but at once indicates the point to add weight in order to correct the inaccuracy, in accordance with scientific principles. The one is mere "cut and try," the other proceeds directly to the object in view.

Mr. Phillip Strickler, who claims to have had a long experience in balancing cylinders and runner millstones, uses the steel bars for balancing cylinders, balancing successively each head as it is put on the shaft. Then if it is to be lagged with staves of wood or metal, he centers each on the edges, and balances them endwise separately on pivot centers. Then he places them on the heads in exactly the order they are to remain, and balances the whole on the steel bars, distributing the counterpoising weight along the light side, not concentrating it at a single point.

We know this method will secure a good balance, but it is positively essential that everything should be complete before balancing, and no alteration made afterward. Mr. Strickler's method of balancing runner millstones will be found with diagrams in our next issue. We also publish another letter on the subject of balancing in our correspondence columns this week.

The subject is one of the highest practical importance, and its full discussion is very desirable.

FAIR OF THE AMERICAN INSTITUTE.

We found, at our last visit, that notwithstanding the Fair has been now opened three weeks, still active preparations for the opening were still in progress. The shafting is not all running, and there is not steam power enough furnished by the boilers to run such machinery as is ready to run at any proper degree of speed. We, however, give this week brief notices of such machines as were present, and of which we were able to get some information. There are only three inclosures of

MACHINISTS' TOOLS.

Lucius W. Pond, of 98 Liberty street, New York, shows a fine collection, consisting of one 22-inch lathe with compound rest and cross feed, very strong and powerful; one 32-inch planer—a four-tun machine; one 22-inch planer—1½-tun machine, and one upright drill press. Mr. Pond has, within the last two years, completely re-organized his establishment, and now uses entirely new patterns, which give greater power and simplicity to the well-known and highly-appreciated tools of his manufacture. The old Jersey City Locomotive Works have recently been re-fitted and supplied throughout with Mr. Pond's tools made after these new patterns. The patterns of his lathes have been changed so as to give increased size to the parts which receive strain, and they are in all respects excellent tools. The 32-inch planer is very heavy and powerful, and both it and the smaller one alluded to, run with great smoothness of action. By using a simple train of cut gears and racks to drive the tables of his planers, Mr. Pond does away with stud gears ordinarily used with single belts, and is enabled to increase backing speed at pleasure. This collection of tools will not fail to please all mechanics who examine them.

The New York Steam Engine Company, 126 and 128 Chambers street, New York, exhibit one 20-in. planer, one 32-in. lathe, two drill presses, one car wheel boring machine, a machine for turning nuts, one shaping machine, one slotting machine, and a punching press. These are all fine tools, but the punching press shown is perhaps the most noticeable feature of the collection.

George W. Moore, of Worcester, Mass., shows in connection with the tools in this inclosure, a simple and useful gage to turn bevels of gears to agree with the drawing.

The Union Vise Company, 80 Milk street, Boston, Mass., exhibit two beautiful milling machines of different sizes, evidently both excellent tools. They also show a universal head for milling machine or planer by which spur and bevel gears can be cut, or work held upon an arbor or chuck can be milled at any angle, and in almost any position. They also show a machine for cutting spirals, either straight or conical, right or left hand, and of almost any pitch, the changes being made by the ordinary gears of an engine lathe. They show lastly the James Ross Steam Permeator or oil and tallow cup for lubricating the valves and cylinders of steam engines. They are beautifully designed and finished, and rank among the best of this class of devices.

Cowin & Johnson, of Lambertville, N. J., exhibit a universal lathe chuck, of peculiar construction, in which a socket wrench applied to one end of a worm shaft causes the jaws to simultaneously and firmly grasp the work. The working parts of this chuck are all covered, so as to be out of the reach of dirt, chips, etc., which often interfere with the action of chucks of this class.

PUMPS AND BLOWERS.

Knowles & Sibley, of 126 Liberty street, New York, exhibit various sizes of the Knowles Patent Steam Pump. This pump has neither cranks nor fly wheels. The main steam valve of the pump is not a rotary valve, but is an ordinary flat slide valve. The slight rotary motion given the valve rod simply puts the valve in a position to be driven horizontally on its seat. The steam cylinders are fitted with spring ring packing, with screws and springs, for proper adjustment. The water cylinders are fitted with composition heads and rings, adjustable by screws, or with leather rings or a patent fibrous head, according to the nature of the work required. All the joints are ground to fit, and require no packing. The glands and piston rods are solid composition. The valve seats are composition, and the valves, either rubber or metal, are very durable, and are placed in the pump so as to be easily accessible, and in the larger sizes, for fire or marine purposes, are got at immediately without removing any nuts or bolts.

J. H. A. Gerricke, 169 Broadway, New York, exhibits a turbinate force pump. It consists of a wheel case containing a turbinate wheel secured to shaft, and having vanes or paddles of different lengths at its curved periphery, which are bent at their discharge ends, closely fitting the space between it and the case, within which it revolves without touching. In the end of the wheel is an anti-friction pin (used in the vertical pumps) which revolves in a female step, secured in the case. An upper chamber contains anti-friction partitions and a bottom plate which withholds the weight of the water from the wheel.

The Valley Machine Company exhibit a bucket and plunger steam pump, being a vertical steam pump composed of the parts of a simple slide valve and eccentric steam engine attached in a novel and compact manner to a bucket and plunger pump that discharges water at both strokes of the piston. The water valves, which are of either metal or rubber, are placed in such position that access can be had to them by the simple removal of one bolt and without disturbing any of the pipes; the bearing surfaces subject to wear are either lined with Babbitt metal or fitted up with adjustable boxes, so that the wear can be taken up easily, or the bearings replaced at very little expense. These pumps are made by special machinery, and with uniformity of workmanship, which allows of any part being quickly and cheaply replaced when worn out or broken by accident.

The Woodward Steam Pump Manufacturing Company, 76, 78, and 80 Center street, New York, show a fine line of their pumps. These pumps are so widely known, and their reputation is so well established that we may pass them without further comment.

Charles B. Hardick, 23 Adams street, Brooklyn, exhibits several sizes of the Niagara Steam Pump. The valves of this pump may be removed by simply unscrewing a single nut, and any carpenter can make in a few minutes a set of valves for it of wood if the original ones should give out.

William D. Andrews & Brother, 44 Water street, New York, exhibit one central discharge centrifugal pump and one antifriction centrifugal pump. These pumps have long been before the American public, and are well known as most effective machines of their class.

George W. Nye, of Monmouth, Ill., exhibits a steam vacuum pump, the details of the construction of which we could not obtain.

The Rahway Manufacturing Co. exhibit one of Clark's Multiplying Pressure Fan Blowers. This powerful blower produces great intensity of blast with slow speed. Its construction is extremely simple, but comprises some nice scientific and mechanical principles. For full description and engraving of this blower, the reader is referred to page 183, Vol. XXII., of the SCIENTIFIC AMERICAN.

HOISTING MACHINES.

A number of these machines are on exhibition. Otis, Bros. & Co. show one of their hotel elevators by a working model of exquisite finish. In this elevator is comprised an automatic clutching apparatus, which prevents any descent of the car should the ropes break. Should a trunk projecting into the way of the elevator from any of the floors interfere with the descent of the car, brakes are automatically applied, and the steam is cut off; the car then stops, and the obstruction may be removed without damage.

Merrick & Son's improved hoisting apparatus, with Seller's attachment, is shown by Solon Farrar, 212 Grand street, New York. The platform of this elevator is secured from falling by gravity pawls which act automatically upon breakage of the ropes.

Wm. D. Andrews & Bro. exhibit a friction-grooved hoisting machine and portable engine combined. This is a fine powerful machine, running without noise, and the speed of which can be changed instantaneously.

F. P. Canfield, 71 Sudbury street, Boston, Mass., shows a self-hoisting machine, with a bell-crank lever brake operated by the hoisting rope.

Hinton & Furney Bros., 552, 554, and 556 West Twenty-seventh street, New York, show what they style the "Epicycloidal" hoisting machine, employing a peculiar mechanical movement by which, with a gear six inches in diameter, the same speed, and also, it is claimed, greater strength are attained than in the old method, with a gear eight feet in diameter. The machine does not recoil or run back, as in the old method. Hence safety pawls are dispensed with. The gears, which are only two in number, are covered from dirt and liability to accident, either to themselves or the workingmen. Pulley blocks are dispened with, as the proper speed is obtained by the gear without their use. Hence, stronger but shorter ropes are employed.

C. H. Delamater, foot of West Thirteenth street, New York, shows one of Bacon's hoisting engines. This machine was described on page 120, current volume.

WOOD-WORKING MACHINERY.

The display in this department, though fair, is not equal to that made last year.

John B. Schenck, 118 Liberty street, New York, exhibit one of his large "Schenck Woodworth" planers. This machine is so well known to our readers that we need not describe it.

R. Ball & Co., of Worcester, Mass., exhibit the Russ Monitor Molding Machine, a very fine machine, capable of doing a great variety of excellent work. They also show a very ingenious and excellent hub-mortising machine, a hand boring machine, and a blind-slat tenoning machine.

H. B. Smith, of Smithville, N. J., displays a molding machine, a combined molding, planing, and matching machine, very fine, a heavy resawing machine, also very fine, a self-operating blind-stile boring machine, and a mortising machine. All these machines will well repay inspection.

J. T. Plass, of 202 and 204 East Twenty-ninth street, New York, exhibits the safety band saw, illustrated and described on page 129, Vol., XXI., of the SCIENTIFIC AMERICAN. The breaking of the saw on this machine does not endanger the operator.

First & Pryibil, 452, 454, and 456 Tenth avenue, New York, show a splendid band-saw machine made to saw bevel as well as straight. This is effected by moving the upper wheel sideways, without even taking off the saw or stopping the machine. The table, which works on a slide, is perfectly level, and connected with a lever, which again is connected with the upper sideway slide, being a radius from the center of lower shaft; the whole is moved by a screw.

C. B. Rogers & Co., of Norwich, Conn., also exhibit a very compact and strong band-sawing machine.

A very fine and simple jig-saw is shown by Thos. Connell, Birmingham, Conn. The saw is strained between two leather straps which run over two small pulleys. The ends of the straps remote from the saw are connected by straining wires to another strap which runs over another tightening pulley at the side of the machine. No cross-heads are employed, and the saw has a positive motion. It runs very rapidly, and some excellent specimens of work performed on it may be seen, which will reward the examination of the curious.

Close beside the latter machine stands Beach's Scroll Saw, illustrated and described on page 63, current volume of this journal. It is hard to say which of these saws is the superior one, and we shall leave it for the judges to decide this question. They are both well worth the examination of all who are interested in wood working.

A circular wood-working machine, shown by A. Wood, of Far Rockaway, N. Y., is a hand machine of great power, but which may be driven by other power if desired. It is designed to supply joiners and cabinet-makers with a cheap and effective machine that could be economically employed in expeditiously sawing boards, and in rabbeting, grooving, sash-sticking, etc.

An ingenious machine for shaving barrel hoops is shown by A. McAlpine, of Pittston, Pa. It will shave either straight or crooked hoops with great rapidity and uniformity. The machine is exceedingly simple, and well worth an examination from visitors.

Danger from Tobacco.

A writer in the London *Spectator* has taken some pains to point out what he believes to be "the true danger of tobacco." After adverting to the general use of this weed, which might, he alleges, be considered a harmless luxury but for one exceptional fact, he asks: "Has not tobacco a property belonging to very few substances, which makes its use exceptionally dangerous—the property, when administered in an overdose, of effecting some permanent change, probably in the spinal cord, which renders the victim forever after liable to injury from the minutest dose?"

Three cases are quoted from Dr. Druben's work on tobacco as pointing to the real danger arising from its use. The first case was that of a lawyer, thirty years of age, of athletic frame, who for five years had shown symptoms of a spinal affection, which had resisted all remedies. On the recommendation of Dr. Druben this person gave up the use of tobacco, in which he had indulged to excess. The result was that all the symptoms disappeared, as if by enchantment, and at the end of one month the cure was complete." The restoration to health lasted for some time, and until one day, dining with the doctor, he indulged himself, contrary to the earnest remonstrance of the former, in a cigar. No sooner had he finished the second one than he felt that all his old sensations had returned. Warned by this decisive intimation, the gentleman henceforth entirely gave up his cigar, took tonics for a month, and has ever since enjoyed excellent health.

The second case was that of a person who felt his energies declining, lost his appetite, and only found comfort in smoking very strong cigars. He complained of acute pain in the region of his stomach every afternoon, which only ceased at night, trembling of the limbs, palpitation, and sometimes sickness. On his relinquishing the use of tobacco for one month all the symptoms disappeared; but preferring the pleasure from tobacco to health, he resumed its use, and had in return a renewal of all his pains.

In the third case the patient, aged forty-five years, extremely sober and very regular in all his habits, was troubled by the premonitory symptoms of melancholy mania. He was perfectly aware of his hallucinations, but could not escape them. After two or three weeks' medical treatment, during which he felt no desire to use tobacco, these symptoms passed away, but they returned as soon as he resumed his cigar. Admonished by this experience he renounced tobacco entirely, and from that day has had no recurrence of the symptoms.

Other cases of a similar character are brought under the notice of physicians. The most determined devotee of tobacco who takes an overdose, or uses a much larger quantity than usual, will suffer more or less severely, and not only at the time, but at intervals afterwards, if the effects of the common dose be not carried off as rapidly as usual.

A more enlarged view of the deleterious effects of tobacco on the human system would lead to a great extension of the list of what the London writer chooses to call exceptional cases. It would be found that the stomach, the heart, and the lungs and the different senses are all made to suffer, and to become sadly deranged in their allotted offices by the prolonged and not always by the excessive use of tobacco. In minor degree the cases of interference with good and pleasant feelings from the constant use of tobacco are legion, and should make us modify not a little the word "harmless luxury," as applied to the general use of this weed. It is indeed a luxury, but it is a luxury for which the indulger has to pay very high taxes in addition to those levied by the internal revenue laws.

The writer in the *Spectator* is disposed to lay down as an axiom that men of highly strung, sensitive, nervous organizations, and men who habitually eat little, are better without tobacco. He adds the wholesome advice to all sufferers from tobacco that "there is no remedy whatever except total abstinence. If the mischief has once been done, one cigar or one pinch of snuff is as bad as a hundred."

Some persons can give up the practice at once, as we have known in the case of a printer, who, on being assured by hi physician that he would be better without his quid, took it out of his mouth, and exclaiming, "There it goes!" threw it in the fire. Years passed on, and this man persisted in his abstinence, much, as he alleged, to his gain in increased strength and readiness to work. In other cases we have known men of strong religious convictions, and who, from the injury done to their health, conscientiously believed it to be their duty to desist from the use of tobacco, struggle long and hard before they triumphed over the enslaving habit.

Nails for Out-door Work.

Every one is familiar, says the *American Builder*, with the fact that a piece of rusty iron, wrapped in cotton or linen cloth, soon destroys the texture of the fabric. A rusty nail, for example, if laid upon a few rags, will soon produce large holes in them, or it will, at least, render every point it touches so rotten that the cloth will readily fall to pieces at these points, and holes will be produced by the slightest hard usage.

Iron, during the process of rusting, tends to destroy any vegetable fiber with which it may be in contact. This explains, to a certain extent, the rapid destruction of the wood that surrounds the nails used in out-door work, whereby the nail is soon left in a hole much larger than itself, and all power of adhesion is lost. Part of this effect is, no doubt, due to the action of air and water, which creep along the surface of the nail by capillary attraction, and tend to produce rottenness in the wood as well as oxidation in the nail. But when we compare an old nail hole with a similar hole that has been exposed during an equal time, but filled with a wooden pin instead of an iron nail, we find the wood surrounding the wooden pin has suffered least, and we may, therefore, fairly attribute a destructive action to the rusting of the iron. It might, at first sight, be supposed that, as the oxide of iron is more bulky than the pure iron, the hole would be filled more tightly and the nail held more firmly to its place. But, although this effect is produced in the first instance, yet the destruction of the woody fiber and the pulverization of the oxide soon overbalance it, and the nail becomes loose. Of course, the iron itself is also destroyed, its strength being diminished, and we have, therefore, a double incentive for preventing or diminishing the action we have described.

The only way to prevent this action is to cover the nail with some substance that will prevent oxidation. This might be done by tinning, as is common with carpet-tacks. Coating them with oil or tallow would be efficient if the act of driving did not remove protecting matter entirely from a large portion of the surface. But, even then, it will be found that the oil or fat is stripped off the point, and gathered about the head in such a way as to prevent the entrance of air and moisture into the hole. The most efficient way to coat nails with grease is to heat them to a point sufficient to cause the grease to smoke, and then pour the grease over them, stirring them about in a pot or other vessel. When the nails are hot, the melted grease will attach itself to them more firmly than it would have done if they were cold—indeed, so firmly that it will require actual abrasion of the metal to separate it.

In erecting fences, laying plank or board sidewalks, and the like, it becomes an important matter to secure the nails against the influence we have mentioned, and yet the work must be done rapidly and cheaply. Nails may be readily prepared as described, or they may be simply dipped in oil or paint at the moment when they are driven in. In cases where it is not advisable to paint the whole fence, it is a good plan to touch the head of every nail with a brush dipped in oil or paint of the same color as of old wood.

Nils Ericsson.

It is with great regret we notice an announcement of the death of Nils Ericsson, the greatest engineer Sweden ever possessed. Nils Ericsson, who was born in the year 1802, was the son of Olaf Ericsson, an ironmaster of Langbanshyttan, and he was the elder brother of Captain John Ericsson, the celebrated engineer, who has achieved so great a name on both sides of the Atlantic. During his lifetime Nils Ericsson received many honors at the hands of his Government; but it is not for them, but for his executed works, and his labors to promote the prosperity of his country, that his name will be remembered by the people of Sweden. It was to his skill and energy that the construction of the system of State railways in Sweden was mainly due, and among the many important works carried out by him we may mention the reconstruction of the celebrated Trollhätte canal, the docks at Stockholm, and the canal between Saimen and the Gulf of Finland.—*Engineering*.

New Machinery.

In one of the mills in Lowell, where the new system of cotton picking is said to have been reduced to less than $1\frac{1}{4}$ mills per pound on the amount of cloth produced, and the work at the same time very much improved. This improvement is being introduced into Lowell, Fall River, and other places. By actual test two of these machines will take the place of one Creighton opener and four English lappers of two beaters each, taking out more dirt than the five machines combined, and leaves the cotton in better condition. For small mills that are now using an opener and two lappers of the ordinary kind (breaker and finisher), one of these machines, it is said, will do the work of the three in a much better manner. The laps when finished (ready for the card) are so even that they only vary a quarter of an ounce to the yard. Cotton manufacturers and insurance agents will do well to investigate this system, of which R. Kitson, of Lowell, is the patentee.—*Commercial Bulletin*.

Arrangement and Maintenance of Batteries.

The quantity of electricity which exists in the form of a current upon a given length, size, and quality of wire, is proportional to the number of cells in the battery; for, while the quantity of electricity produced by a battery is proportional to the amount of zinc decomposed in each cell, and is no greater in a battery of one hundred cells than in any one single element of that one hundred cells, the electro-motive force which is required to overcome the resistance of the conductors, or to force the quantity generated by a single cell through the wire, increases with every additional cell.

The quantity of electricity existing in the form of a current upon a telegraph wire from a given number of battery cells, is inversely proportional to the resistance of the wire, relays, and battery. To summarize: The electro-motive force being constant, the quantity of electricity which flows through any circuit is inversely proportional to the resistance.

The resistance being constant, the quantity of electricity which flows through any circuit is directly proportional to the electro-motive force.

It is evident from the above considerations that the number of cells employed in a battery for working a telegraph wire should be strictly proportional to the resistance of the wire and relays. If a battery of a certain number of cells is employed to work several wires, the resistances of all the circuits should be approximately the same; for if a wire one hundred miles long is attached to a battery which supplies another wire of twice the length, the shorter wire will have twice the quantity of current that the longer wire receives. If, therefore, the electro-motive force of the battery is sufficient to work the longer wire, it is twice as great as the shorter wire requires, and the surplus strength is wasted. In estimating the length of a wire, of course the resistances of the relays must be included, and the size and condition of the wire, or its conductivity, properly considered.

Applying the foregoing principles, the strength of current upon each of the following wires when supplied from separate batteries of 50 cells each, will be found as stated in the eighth column. When all the wires are supplied from one battery of 50 cells the strength of current upon each will be as stated in the ninth column.

Number of Line.	Resistance of Line.	Resistance of Relays.	Resistance of Line and Relays.	Resistance of Line and Relays increased by 50—Battery.	Conductivity of Wires.	Conductivity of Wires, each increased by 50 ohms.	Strength of Current when supplied by separate batteries of 50 cells each.	Strength of Current when supplied from one battery of 50 cells.
1	3000	7600	10600	10650	·00009433	·00009389	4,694	4,198
2	3000	6800	9800	9850	·00010204	·00010152	5,076	4,443
3	3000	5800	8800	8850	·00011363	·00011299	5,649	4,948
4	3000	4800	7800	7850	·00012820	·00012764	6,382	5,382
5	3000	3600	6600	6650	·00015151	·00015037	7,518	6,507
6	1700	2800	4500	4550	·00022222	·00021978	10,989	9,677
	3400	1400	4800	4850	·00020833	·00020618	10,309	9,072
8	2000	2600	4600	4650	·00021739	·00021505	10,752	9,466
9	2000	1000	3000	3050	·00033333	·00032786	16,393	14,515
10	2000	600	2600	2650	·00038461	·00037735	18,867	16,748
11	3000	400	3400	3450	·00029411	·00028985	14,492	12,807
12	1000	400	1400	1450	·00071428	·00068965	34,482	31,104

The problem of working the twelve wires from one battery is a case of branch circuits, and the question is, What is the joint or combined resistance of the twelve branches? This will readily be found to be R=337,384. If now we add to this the common resistance of the battery R=50, the total resistance of the circuit will be R+R=387,384, and the strength of current flowing through the battery, or generated by it, will be $S=\frac{50000}{387384}=129{\cdot}0709$. Now, this strength of current divides itself among the twelve branches in proportion to their several conductivities, as exhibited in the sixth column (conductivity is reciprocal of resistance, thus $\frac{1}{10600}$ =·00009433).

If the resistance of the battery were less than 50, the strengths of current in the last column would approach more nearly to those in the eighth column; but, on the contrary, were the resistance of the battery more than 50, the strengths of current upon the wires supplied from a common battery would depart more widely from those supplied by separate batteries of the same electro-motive force.—*George B. Prescott in the Journal of the Telegraph.*

Use for Blast Furnace Slags.

We have published several articles on this subject, giving an account of the manufacture of chemical salts, cements, pavements, and the like, from what has always been a waste material, and now hear of the proposition to cast the cinder from the furnaces into slabs, garden rollers, posts, pillars, and so forth. In certain metallurgical operations these articles can be made to resemble porphyry. In some parts of Germany the slag is cast in molds, and is at first used by the workmen for cooking and heating purposes, and afterwards for building houses and walls. The prospect is fair of furnace slags becoming valuable for many purposes.

Professor Huxley's Address Before the British Association.

Our readers will find in another column a portion of Professor Huxley's inaugural address before the British Association for the Advancement of Science. As a discussion of the origin of life and the various hypotheses in regard to this interesting subject, and as a clear expression of the views of one of the greatest biologists of the age, it will be found worthy of the most careful perusal. We shall conclude the address in our next issue.

STEEL TYPES FOR TYPOGRAPHICAL USE.—By an ingenious mechanical contrivance, not unlike that in use for making nails, previously softened steel wire is converted into types which are afterwards hardened. With a single machine and a one-horse power steam engine it is said in an English journal 35,000 types can be made in twelve hours, while the types thus made are of a superior finish, and cheaper, also, on account of the less expense of the steel as compared with the ordinary type metal (usually an alloy of antimony and lead, in the proportion of one part of antimony to four of lead, with a very small quantity of copper, the latter being usually present in sufficient quantity in what is termed hard lead).

ARITHMETICAL.—Any number of figures you may wish to multiply by 5 will give the same result if divided by 2—a much quicker operation; but you must remember to annex a cipher to the answer when there is no remainder, and when there is a remainder, whatever it may be, annex a 5 to the answer. Multiply 464 by 5, and the answer will be 2,320; divide the same by 2, and you have 232, and as there is no remainder, you add a cipher. Now take 359—multiply by 5, the answer is 1,795; on dividing this by 2 there is 179 and a remainder; you therefore place a 5 at the end of the line, and the result is again 1,795.

IT is stated that an average Egyptian can see nothing distinctly at a distance of more than 500 yards, and has no acuteness in detecting an object within as many feet. A recent traveler says that when the railway was constructed the utmost difficulty was found in procuring men capable of seeing or recognizing the difference between signals only a hundred yards off. Many candidates came, but few passed the test. One man was nearly passed, but the engineer was not quite satisfied that the fellow had not been "making good shots" at the colors. So he held up his hat at 150 yards, and the hapless signalman pronounced it to be "the red flag."

THE Hoosac Tunnel, during last month, advanced 150 feet at the east end, and 112 at the west. The central shaft reached the grade of the tunnel August 13, and a force was employed during the remainder of the month in trimming pouches of rock and putting in new timbers and machinery.

WE are indebted to James R. Smedburg, C. E., of the San Francisco (Cal.) Gas Works, for a copy of the Engineers' Index to the *London Journal of Gas Lighting*, covering the first seventeen volumes of that valuable publication. This Index will be of great value to all who are interested in the science and laws of gas engineering.

Two thousand of Krupp's workmen are said to have enlisted in the German army. Krupp's guns are also in the same army, and are giving good reports.

NEW BOOKS AND PUBLICATIONS.

A PRACTICAL TREATISE ON SOLUBLE OR WATER GLASS, Silicates of Soda, and Potash for Silicifying Stones, Mortar, Concrete, and Hydraulic Lime, Rendering Wood and Timber Fire and Dry Rot Proof, etc., with Hundreds of Recipes for Soap, Cements, Paints, and Whitewashes, Railroad Sleepers, Wooden Pavements, Shingles, etc. By Dr. Lewis Feuchtwanger, Chemist, and Mineralogist. Concluded with various Essays on the Origin and Functions of Carbonic Acid, Limestones, Alkalies, and Silica; and a Complete Guide for Manufacturing Plain and Colored Glass. With several Wood-cuts. New York: Published by L. and J. W. Feuchtwanger, 55 Cedar street.

It will be seen by this title that a great variety of practical subjects are discussed by the author, who is well known as a man thoroughly posted in these and cognate matters, and also as the author of a valuable treatise on gems. The author was the first to introduce the use of soluble glass to the American public, and has devoted much time in experiments with it. Whoever reads the book will not be disappointed in finding much information on points not generally well understood in this country. An extract from the work will be found in another column.

THE CANADIAN ILLUSTRATED NEWS.

This excellent weekly periodical, which is about the size of the SCIENTIFIC AMERICAN and other current illustrated papers, now comes to us greatly improved in its style of illustrations. Our Canadian cotemporary has from the first exhibited a commendable spirit of enterprise in the production of all its engravings by the photographic process, and now, by the recent introduction of improved steam presses, it is enabled to print its photographic pictures as quickly and in almost as good style, as the ordinary hand-cut wood engravings. We have seen some admirable specimens of printed photographs from nature done by the same method as that employed for the illustrations of the *Canadian News*, namely, Leggo's process, of Montreal. The publisher of the *Canadian Illustrated News* is Mr. George E. Desbarats, a practical printer of much experience, ability, and enterprise. The credit of establishing a weekly newspaper, profusely and regularly illustrated by photographic plates, belongs to Canada. There is no other paper like it in the world, that we know of. The Leggo process above alluded to, was some time ago fully described in the SCIENTIFIC AMERICAN.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

1,431.—LOOMS AND SHUTTLES.—H. E. Towle, New York city. May, 18, 1870.

2,051.—TOILET AND OTHER MIRRORS.—G. H. Chinnock and E. P. Williams, New York city. July 20, 1870.

2,334.—PRINTING PRESSES.—W. Braidwood, New York city. August 24, 1870.

2,336.—PRINTING MACHINERY.—R. M. Hoe, New York city. August 24, 1870.

2,338.—LIQUID METERS.—J. F. De Navarro, New York city. August 25, 1870.

2,340.—TRAMWAYS AND ROAD SURFACES.—S. D. Tillman, Jersey City, N.J. August 25, 1870.

2,353.—TUNNELING.—W. Sykes, Toronto, Canada. August 27, 1870.

2,356.—SEWING MACHINE ATTACHMENT.—G. H. Collins, New York city. August 27, 1870.

2,359.—TACKS AND NAILS.—H. W. Wright Taunton Mass. August 27 1870.

Answers to Correspondents.

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

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

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

A. S. W., of Ca.—Evidently your chimney is not of sufficient capacity for your boiler furnace. Undoubtedly the cheapest way in the long run will be to increase the hight of the chimney by masonry, not by a 11-inch pipe, as proposed, in one corner of the chimney. Such a pipe would reduce the sectional area of the chimney flue, now 400 square inches, to 95 square inches. We consider the area of 400 square inches small enough for your boiler. The best thing for you to do is to get a competent engineer to calculate for you the proper dimensions of the chimney, and correct its deficiencies under his direction.

A. G. G., of N. Y., wishes to know the correct spelling of the name of the frame which supports the step and spindle of a flouring-mill stone. He says it is spelled by different people. "*Hearsh*," "*Burst*," and "*Husk*." We answer that the latter spelling is correct, and that the word is pronounced as spelled, "*Husk*."

B. B. D., of N. Y., wants to know if imperfectly glazed earthenware bottles may be rendered so tight by the use of water glass that they will not leak under the pressure of fermentation when holding root beer?—The beer is put into the bottles while hot. As water glass is dissolved in hot water, this substance will not answer the purpose. Perhaps some of our correspondents may have met with a similar difficulty, and found a good way to remedy it.

H. L., of Wis.—The scale which adheres to the inside of tea-kettles is difficult to remove without injury to the kettle. There are no acids we can recommend for the purpose. It may often be mechanically removed by tapping the outside of the kettle with a hammer. Sometimes boiling oak bark, or slippery elm bark in the kettle will start the scale. More often, however, it resists removal, except by chipping with a pointed steel instrument—a tedious operation.

F. E. M., of Pa.—The explanations you seek comprise a somewhat extensive course of reading. They cannot be made in our columns. They cover nearly the whole fundamental basis of mechanics and physics. For enlightenment you should peruse some able treatises on celestial and terrestrial physics and mechanics.

D. P. R., of Mo.—Colza oil is a general commercial name employed in France, Belgium, etc., for the oil manufactured by expression from the seeds of different species of *Brassica*, and has there the same signification as "rape oil" in England. "Colza" koolzaad, means cole or cabbage seed. "Colza" is the French name for "rape seed."

L. V. R., of N. Y.—A "noggin" is a wooden cup or mug of no definite capacity. We do not recollect ever seeing it used in any work as a definite measure, though it would seem that it has been, since the treatise on dyeing, of which you speak, so uses it. We are informed that in Ireland it is a measure of one gill.

R. S., of Pa.—The gas issuing from the spring you describe is undoubtedly sulphureted hydrogen. You can test it by holding over the spring a piece of paper wet with solution of acetate of lead. If sulphureted hydrogen be present it will turn the paper black.

W. J. H., of Ind.—Directions for softening water for manufacturing purposes, may be found on page 217, Vol. XXI., of the SCIENTIFIC AMERICAN, and in any good and complete treatise on dyeing.

N. A. H., of Ca., has tried several recipes for covering the soles of boots with rubber without success. He now appeals to our correspondents for information. If any have been successful we shall be happy to publish their method.

S. R. V., of Tenn.—A preparation for marking the glossy black letters used on show cards, and highly recommended, is lamp black, from which the oil has been removed by roasting, mixed with whites of eggs.

L. M., of N. Y.—The words upward and downward, when applied to direction, mean away from or toward the earth's center, in radial lines. It is obvious, therefore, that up or down, is not precisely the same direction for any two persons on the earth's surface.

W. P. D., of Vt.—The smell of petroleum is very difficult to remove from barrels which have contained it. We know of no method whereby you can accomplish it.

D. L. M. of Va.—The pressure of a vertical shaft and its appurtenances upon the step, is just the same while revolving, as when at rest.

C. L. P., of Minn.—Temper your brass plates for springs by hammering them cold. You can give elasticity to the softest brass in this way.

D. T. D., of R. I.—The notion that a given head of water will drive a wheel faster in the night than in the daytime, is a mistaken one.

L. P. W., of La.—The plates upon which music is engraved are made of 90 parts block tin, and 10 parts antimony.

Recent American and Foreign Patents.

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

WASHER CUTTER.—Patrick McCormick, Newark, N. J.—This invention has for its object to provide an instrument by means of which two or more concentric washers can at once be cut from one piece, and their size regulated at will.

CURTAIN FIXTURE.—W. P. Yates, Elmira, N. Y.—This invention relates to a new and useful improvement in curtain fixtures, having particular reference to the mode of revolving the cutter roller, and consists in so applying the power to the roller that a variable purchase is obtained, and so that at one point in each revolution the curtain will balance the spring.

LOCK NUT.—James Moorcroft, Newport, R. I.—This invention relates to a new manner of locking a nut by applying it to the split end of a bolt, together with a conical screw for expanding said bolt within the nut, whereby the nut will be securely fastened.

METALLIC ROOF.—W. M. Barry, Nashville, Tenn.—This invention relates to a new and useful improvement in the construction of roofs for railroad and other purposes, whereby many of the objections which have hitherto been met with in the construction of roofs are obviated.

JOINTED OAR.—C. Dann, La Crosse, Wis.—The object of this invention is to provide an oar which can be operated by a person facing the bow of a at.

PEPPER SAUCE.—E. McIlhenny, New Iberia, La.—This invention relates to a new process of preparing an aromatic and strong sauce from the pepper known in the market as Tobasco pepper.

SHUTTER BAR.—Julius Berbecker, New York city.—This invention relates to a new construction of the shutter bars or fastenings used on inside shutters.

WASHING MACHINE.—E. S. Harper, Sutherland Springs, Texas.—This invention has for its object to furnish an improved washing machine, which shall be simple in construction, effective in operation, and easily operated, and which will not injure the clothes.

MOUSE TRAP.—W. K. Bachman, Columbia, S. C.—This invention has for its object to furnish an improved mouse trap, which shall be simple in construction, not liable to get out of order, easily se and reliable in operation.

OYSTER TONGS.—Edward Ward, Smyrna, Del.—This invention relates to a new and useful improvement in tongs for taking oysters from the water, and consists in such a construction and arrangement of parts that the tongs are opened and closed by means of cords.

MELODEANS.—J. C. Briggs, Ansonia, Conn.—The object of the present invention is to provide for a more even motion of the valve in an expression chamber, and not to allow the sudden violent movements of the same which are produced if the air only acts on one side of the pivot.

HORSE HAY RAKE.—G. E. Carleton, Oldtown, Me.—This invention has for its object to improve the construction of horse hay rakes, so that the rake may be raised to discharge the collected hay by the advance of the machine.

WHEAT STEAMER AND DRYER.—C. T. Hanna, Keokuk, Iowa.—This invention has for its object to furnish an improved apparatus for steaming and drying wheat to soften it preparatory to grinding, which apparatus shall be simple in construction, effective in operation, and easily applied.

HEMMER.—Abel H. Bartlett, Spuyten Duyvil, N. Y.—This invention relates to improvements in that class of hemmers for sewing machines which are designed for making hems of different widths, and which are attached to the presser foot.

STEM-WINDING ATTACHMENT FOR WATCHES.—Fritz Robert Theurer, Chaux de Fonde, Switzerland.—This invention relates to improvements in attachments to watches for winding and setting them by turning the stem, and consists in an improved arrangement of means having for its object, mainly, to provide an apparatus which may be applied to watches already made, as well as to those being made.

ELEVATORS.—Theo. H. Rudiger, Lawrence, Kansas.—This invention relates to improvements in elevators, and consists in arranging the spout on to which the articles elevated by the buckets are dumped, so that previous to the dumping the upper end will swing back under the bucket, so as to ensure the receiving of all the contents of the bucket, and then swing out of the way of the downward movement of the bucket in time to let it pass without obstruction.

WAGON SEATS.—C. E. Hollenbeck, Kirkville, Mo.—This invention relates to improvements in the detachable spring wagon seats, used by placing them on the tops of the sideboards of the wagon boxes, or on cleats or ribs attached to the sides. The invention consists in an improved construction and arrangement of the springs.

WIPING ATTACHMENT FOR FEED ROLLERS.—Lyman Crawford, Holyoke, Mass.—This invention relates to improvements in wiping apparatus for the feed rollers of carding machinery, and consists in a combination with the rollers of wiping plates, one placed above the upper rollers, and another below the lower ones, each plate, having a concave face, to be provided with a wiping cloth, acting on the surface of the roller; also, a slot behind the wiper, through which the substance wiped from the said rollers, and collecting in masses, may escape or be removed, and the lower wiping plate is provided with a guard or scraper plate, arranged in conjunction with the lower roller to prevent any large collections of waste from being carried up by the said roller to the sliver.

DUMPING CAR.—Ed. C. Hegeler, La Salle, Ill.—This invention relates to improvements in dumping cars, and consists in arranging the boxes with one side, or end, as the case may be, sloping from about the center of the bottom upward, and providing the sloping side with rockers, on which the box, in tilting, will roll towards the edge for dumping, instead of tilting on hinges, as heretofore. The said rockers are provided with flanges, to keep them on the rails whereon they roll, and they have chains attached to their ends, and to the truck frame, in a way to prevent them from sliding on the rails they roll upon.

FURNACE GRATE.—Abraham L. Pennock, Upper Darby, Pa.—This invention relates to a new and useful improvement in grate bars for furnaces, whereby they are made cheaper, more useful, and more durable than they have heretofore been, and it consists in locking the bars together by means of locking pins running through, and at right angles with the bars, the said locking pins having notches for holding the bars, by means of which the distance of the bars apart may be varied so as to adapt the grate to either coarse or fine coal.

COTTON-SEED PLANTER.—Fletcher Sloan, Bolivar, Tenn.—This invention has for its object to furnish an improved cotton-seed planter, simple in construction, and effective in operation, and which shall be so constructed that it may be readily adjusted for planting corn, peas, and other seeds, and for distributing guano and other fine fertilizers.

PLOW.—David Morris, Bunker Hill, Ill.—This invention has for its object to improve the construction of plows in such a way as to enable the beam to be adjusted laterally to adapt the plows for use as a two or three-horse plow, as may be required, and which shall, at the same time, be simple in construction and effective in operation, holding the beam securely however adjusted.

ATTACHING DRAFT TO PLOWS, ETC.—George W. Kidwell, Elwood, Ind.—This invention has for its object to furnish an improvement in attaching draft to plows, harrows, reapers, mowers, and other machinery where the draft is attached by means of a clevis, which shall be so constructed that should the plow or other machine strike a stone or other obstruction, the horses will be kept from being injured and the machine from being broken by the sudden shock, and which will enable the line of draft to be adjusted to cause the plow to cut a wider or narrower furrow, as may be desired.

EARRINGS, DROPS, ETC.—Gottfried Haberland, Bloomington, Ill.—The object of this invention is to so construct earrings and drops that the same may be applied without requiring the perforation of the lobes. The invention consists in constructing the earring in form of a spring which will retain itself on the ear by spring pressure; the application and removal of earrings and drops is thereby considerably facilitated.

MANUFACTURE OF HYDROCARBON OILS.—William Spears, Jamestown, N. Y.—The object of this invention is to produce a highly valuable hydrocarbon oil or liquid for illuminating or other purposes, from the products of distillation in the process of manufacturing oils from crude petroleum, and consists in uniting (by the application of heat) the first and most volatile product of distillation (benzine) with the refuse tar, thereby forming a compound from which a highly valuable oil is distilled.

VALVE COCK.—John C. Macdonald, St. Louis, Mo.—This invention has for its object to improve the construction of valve cocks so as to enable them to be ground to their seat at any time when necessary without removing them from their fittings, and, at the same time, to have a true working guide while being re-ground.

Official List of Patents.

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FOR THE WEEK ENDING Sept. 27, 1870.

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107,646.—PULLEY FOR GATES.—Ephraim S. Axtell, Macomb Mich.
107,647.—MOUSE TRAP.—William K. Bachman, Columbia S. C.
107,648.—TRUSS.—Sir William Baker, Austin, Texas.
107,649.—METALLIC ROOF.—William M. Barry, Nashville, Tenn.
107,650.—HEMMER FOR SEWING MACHINES.—A. H. Bartlett, Spuyten Duyvil, N. Y.
107,651.—SHUTTLE FASTENING.—Julius Berbecker, New York city.
107,652.—WASHING MACHINE. — John T. Bever, Lathrop, Mo.
107,653.—TOOL FOR CUTTING WOOD MOLDINGS.—Charles E. Boynton (assignor to himself and Isaac N. Vosburg), San Francisco, Cal.
107,654.—MACHINE FOR CUTTING MATERIAL FOR BASKETS.—L. H. Bridgeman, Rock Stream, New York.
107,655.—MELODEON.—J. C. Briggs, Ansonia, Conn.
107,656.—COUPLING JACK.—H. A. Brown and E. B. Keith, Galesburg, Mich.
107,657.—FLUTING MACHINE.—Samuel G. Cabell, Washington, D. C.
107,658.—AGEING SPIRITS.—Andrew Caldwell, Lexington, Ky.
107,659.—FLOOD GATE.—John Campbell and Addison Watson, London, Ohio.
107,660.—HORSE HAY RAKE.—Guy E. Carleton, Old Town, Me.
107,661.—WASH STAND AND TANK.—H. W. Catlin, Burlington, Vt.
107,662.—STALK CUTTER.—Martin Caywood, Peoria, Ill.
107,663.—MODE OF INSERTING GLASS IN VAULT LIGHTS.—Zenas Cobb, Chicago, Ill.
107,664.—TIN ROOFING.—Benjamin Coddington, La Fayette, Ind.
107,665.—BLOWER.—W. S. Colwell, Pittsburgh, Pa.
107,666.—ROLLER FOR SEWING MACHINES.—R. W. Courts, Russellville, Ky.
107,667.—WIPING APPARATUS FOR FEED AND OTHER ROLLERS.—Lyman Crawford, Holyoke, Mass.
107,668.—CARRIAGE GEARING.—Cornelius Custer, Norristown, Pa. Antedated Sept. 17, 1870.
107,669.—JOINTED OAR.—Christian Dann, La Crosse, Wis.
107,670.—MACHINE FOR SHAPING THE HEADS OF HORSESHOE NAILS.—Norman Dexter, Bower Hill, Pa.
107,671.—BLIND-SLAT TENONING MACHINE. — Frank Douglass, Norwich, Conn.
107,672.—PENCIL CASE.—Charles H. Downes, Hudson City N. J.
107,673.—EGG BEATER.—Timothy Earle, Valley Falls, Smithfield, and Gilbert K. Dearborn, Pawtucket, R. I., assignors, by mesne assignments, to Timothy Earle and E. D. Goodrich, Boston, Mass.
107,674.—KNIFE SCOURER.—H. E. French, Unity, N. H.
107,675.—MACHINE FOR SAWING MARBLE.—J. E. French and J. M. Stephenson, Pendleton, Ind.
107,676.—PLOW.—David Fulton, St. Helena, Cal.
107,677.—SEWING MACHINE.—Charles W. Godown, Lambertville, N. J.
107,678.—MACHINE FOR JOINTING STAVES.—S. S. Gray, Boston, Mass.
107,679.—EAR RING.—Gottfried Haberland, Bloomington, Ill.
107,680.—WHEAT STEAMER AND DRIER.—Cyrus T. Hanna, Keokuk, Iowa.
107,681.—WASHING MACHINE.—Elijah S. Harper, Sutherland Springs, Texas.
107,682.—CARPET LINING.—J. R. Harrington (assignor to G. K. Harrington), Brooklyn, N. Y.
107,683.—DUMPING CAR.—E. C. Hegeler (assignor to F. W Matthiesson & Hegeler), La Salle, Ill.
107,684.—WAGON SEAT.—Charles F. Hollenbeck, Kirkville, Mo.
107,685.—CHAIR AND FURNITURE TIPS.—Francis H. Holton, Brooklyn, N. Y.
107,686.—APPARATUS FOR PREPARING PARCHMENT OR WATER-PROOF PAPER.—E. P. Hudson, New York city, assignor to New York Water-proof Paper Co., New York city.
107,687.—MANUFACTURE OF RUBBER-COATED PARCHMENT PAPER.—E. P. Hudson, New York city, assignor to New York Water-proof Paper Co., New York city.
107,688.—BALING PRESS.—Wm. Iler, Shreveport, La.
107,689.—METHOD OF PRESERVING FRUIT. — Geo. Jaques, Boston, Mass.
107,690.—COMPOSITION OF MATTER FOR PRESERVING FRUITS FROM DECAY.—Geo. Jaques, Boston, Mass.
107,691.—SASH HOLDER.—William F. Kells, San Francisco Cal.
107,692.—ATTACHING DRAFT TO PLOWS.—G. W. Kidwell, Elwood, Ind.
107,693.—CHEWING GUM.—Weston W. Kilbourn, Sanford, N. Y.
107,694.—CHIMNEY ATTACHMENT.—A. H. Lanphear, Atchison, Kansas.
107,695.—HAY ELEVATOR. — James Linderman, Bullville, N. Y.
107,696.—HEATING STOVE. — Adolphus Lotze, Cincinnati, Ohio.
107,697.—VALVE COCK. — John C. Macdonald, St. Louis Mo.
107,698.—POTATO DIGGER.—George M. Marks, Half Moon, Pa.
107,699.—LAMP BRACKET. — Riverius Marsh, New York city.
107,700.—WASHER CUTTER.—Patrick McCormick, Newark, N. J.
107,701.—PEPPERSAUCE.—Edmund McIlhenny, New Iberia, La.
107,702.—FRICTION LOCOMOTIVE.—T. S. Minniss, Meadville, Pa. Antedated Sept. 17, 1870.
107,703.—GRAIN-BINDING ATTACHMENT FOR HARVESTERS.—T. S. Minniss, Meadville, Pa. Antedated Sept. 17, 1870.
107,704.—NUT LOCK.—James Moorcroft, Newport, R. I.
107,705.—PLOW.—David Morris, Bunker Hill, Ill.
107,706.—SCAFFOLD BRACKET.—Charles Mudge, Ovid, Mich. Antedated Sept. 17, 1870.
107,707.—WASHING MACHINE. — Abraham Mutersbaugh, Lewinsville, Va.
107,708.—FOLDING CHAIR.—Julius Nicoli, Boston, Mass.
107,709.—CORN PLOW AND PLANTER.—H. C. Osborn, Clark county, Ohio.
107,710.—DITCHING MACHINE.—Jason C. Osgood, Troy N. Y

107,711.—Treating Tin Scrap for the Manufacture of Stannate of Potash, etc.—Adolph Ott, New York city.

107,712.—Furnace for Smelting Scrap Iron.—Adolph Ott, New York city.

107,713.—Tanning.—C. F. Panknin, Charleston, S. C.

107,714.—Ironing Machine.—C. F. Parker, Greenfield, assignor to Joseph Parker, Goodhope, Ohio.

107,915.—Furnace Grate.—A. L. Pennock, Upper Darby, Pa.

107,716.—Car Ventilator and Refrigerator.—William E. Phelps, Elmwood, Ill.

107,717.—Treadle for Sewing and other Machines.—B. C. Cole, Washington, D. C.

107,718.—Machine for Ornamenting the Surface of Wood, etc.—T. T. Ponsonby, Nottingham, England.

107,719.—Steering Apparatus.—T. C. Purington, Vallejo, Cal.

107,720.—Shutter Fastening.—Joshua Pusey, Philadelphia, Pa.

107,721.—Harvester Rake.—Amos Rank, Salem, Ohio.

107,722.—Cover for Stovepipe Holes.—Jos. A. Reed, Philadelphia, Pa.

107,723.—Steam Engine.—W. F. Richardson, Pittsburgh, Pa.

107,724.—Hinge for School Desks.—A. E. Roberts, Des Moines, Iowa.

107,725.—Tweer.—Joseph Rogers, Detroit, Mich.

107,726.—Elevator.—Theodore H. Rudiger, Lawrence, Kansas.

107,727.—Horse-detaching Device.—Anton Schmitt, Cincinnati, Ohio.

107,728.—Head-block for Saw Mills.—George Selden, Erie, Pa.

107,729.—Process of Uniting Rubber with Wood.—F. B. Shearer, Columbus, Ohio.

107,730.—Cotton-seed Planter.—Fletcher Sloan, Bolivar, Tenn.

107,731.—Metallic Tubing.—C. G. Smith, Chelsea, assignor to American Metallic Tubing Co., Boston, Mass.

107,732.—Beehive.—Jonathan L. Smith, Liberty Centre, Ill.

107,733.—Saw Set.—Wm. A. Smith, Dresserville, N. Y.

107,734.—Manufacture of Hydrocarbon Oils.—William Spears, Jamestown, N. Y.

107,735.—Kiln.—P. C. Taylor, San Antonio, Texas.

107,736.—Stem-winding and Setting Attachment to Watches.—F. R. Theurer, Chaux De Fond, Switzerland.

107,737.—Vapor Burner.—Wm. Thompson, Cleveland, assignor to himself, Jeremiah S. Bollman, and M. H. Kline, Mansfield, Ohio.

107,738.—Snapper Cleat.—John T. Thompson, Southport, Me.

107,739.—Lubricator.—Ernest Von Jeinsen, San Francisco, Cal.

107,740.—Oyster Tongs.—Edward Ward, Smyrna, Del.

107,741.—Vapor Burner.—Henry Wellington, Chicago, Ill.

107,742.—Brush.—John L. Whiting, Boston, Mass.

107,743.—Gas Carbonizing Attachment for Street and other Lights.—Samuel Whitney, Newark, N. J.

107,744.—Fastening for Necktie.—W. A. Wicks, Baltimore, Md.

107,745.—Mill Pick.—S. G. Williams, Trumansburg, N. Y.

107,746.—Automatic Cut-off for Steam Engine.—D. A. Woodbury, Rochester, N. Y.

107,747.—Curtain Fixture.—William P. Yates, Elmira, N. Y.

107,748.—Steam Engine Condenser.—Harrison Anderson, Peoria, Ill.

107,749.—Knit Fabric.—C. J. Appleton (assignor to himself Earl L. Stimson, and S. E. Stimson, Cohoes), N. Y.

107,750.—Knitting Machine.—C. J. Appleton (assignor to himself, Earl L. Stimson, and S. E. Stimson, Cohoes), N. Y.

107,751.—Feeding Device for Carding Machines.—J. W. Barbour, Winooski Falls, Vt., assignor to himself and William Earl, Nashua, N. H.

107,752.—Polled Sheet Iron.—Silas Barker and Henry S. Pratt, Hartford, Conn.

107,753.—Show Case.—Milo M. Belding, Brooklyn, N. Y.

107,754.—Cultivator Plow.—Victor Bolis, St. Mary's parish, La.

107,755.—Reed Board for Organs.—Riley Burdett, Chicago, Ill.

107,756.—Cement Walk, Pavement, and Road.—Charles Burgess, Rochester, N. Y.

107,757.—Plane.—T. O. Callahan, Boston, Mass.

107,758.—Saddle for Spinning Machines.—J. S. Casey, Voluntown, Conn.

107,759.—Fanning Mill.—G. E. Clarke, Racine, Wis.

107,760.—Corn Cultivator.—Jesse Clements, Blooming Grove, Ind.

107,761.—Corn Sheller, etc.—G. S. Coleman, Alexandria, Va. Antedated September 21, 1870.

107,762.—Adjustable Stop for Caster for Stove Legs.—William Coughlin, Clarksville, Ohio.

107,763.—Clothes Dryer.—Lewis Cutting, San Francisco, Cal.

107,764.—Curtain Fixture.—John Doyle, Hoboken, N. J.

107,765.—Splint Plane.—P. N. Drake and David Drummond, McGregor, Iowa.

107,766.—Ingot Mold.—Z. S. Durfee, Troy, N. Y.

107,767.—Removable Shoe Lining.—H. A. Everts, Cedar Falls, Iowa.

107,768.—Grindstone or Tool-Sharpener.—Uriah Faris and Abraham Miller, Red Rock, Iowa.

107,769.—Liquid Meter.—Wilhelm Fischer (assignor to Fischer & Stiehl), Essen, Prussia.

107,770.—Setting of Fence Posts.—William Fulkerson, Three Rivers, Mich.

107,771.—Coffee Roaster.—H. M. Gilbert, Ada, Ill.

107,772.—Picker Collar.—J. M. Gotham, Blackstone, Mass., assignor to himself and Lewis Devlin, Central Falls, R. I.

107,773.—Sash Holder.—P. W. Greenwood, Peterborough, N. H.

107,774.—Bedstead Clamp.—T. B. Gregory, Champaign, Ill.

107,775.—Permutation Lock.—W. N. Hall, Springfield, Iowa.

107,776.—Sled.—B. E. Heminway (assignor to himself and W. L. Prince, Portland, Me.

107,777.—Cultivator.—Louis Homrighouse, Baltimore, Ohio.

107,778.—Locking-Cap for Bottle.—J. T. Hough, New York city. Antedated September 26, 1870.

107,779.—Self-acting Tilts for Barrels.—Isaac Hudson and William Minshall, Stockport, Great Britain.

107,780.—Grate for Furnace.—R. A. Hutchinson, Bergen, N. J.

107,781.—Converting Cast Iron and Cast Iron Articles into Steel.—R. A. Jackson (assignor to himself, William Reynolds Hugh Bleasly, H. P. McIntosh, F. M. Orr, and Peter Keplinger), Alliance, Ohio.

107,782.—Thill Coupling.—J. H. Jenings, New Bedford, Mass.

107,783.—Carriage Axle.—Henry Killam, New Haven, Conn.

107,784.—Harvester Cutter Holder for Grinders.—T. E. King, Cleveland, and G. C. Dolph, West Andover, Ohio.

107,785.—Whiffletree Hook.—Judson Knight, Newark, N. J.

107,786.—Spool Holder.—J. C. Koch and B. J. Beck, Brooklyn, assignors to Koch, Sons & Co., New York city.

107,787.—Manufacture of Spirits from Starch.—Herrmann Koehler, New York city.

107,788.—Pitman Head.—J. L. Kretser, Tusten, Wis.

107,789.—Water Wheel.—Dennis Lane, Montpelier, Vt.

107,790.—Wrench.—O. C. Lawbaugh, Shanesville, Ohio.

107,791.—Music Stand.—Carl Lehnert, West Roxbury, assignor to B. F. Richardson, Cambridge, Mass.

107,792.—Bee Hive.—Joseph Leffel and Edward Harrison, Springfield, Ohio.

107,793.—Washing Machine.—Gottlob Lieb, Coeyman's Hollow, N. Y.

107,794.—Apple Corer and Quarterer.—B. J. McFeely, Chestnut Springs, Pa.

107,795.—Machine for Ruling and Copying.—Green McHenry, Losira, Ky.

107,796.—Planter and Distributor.—Duncan McKellar, Selma, Ala.

107,797.—Grain Binder.—Daniel McPherson, Caledonia, N. Y.

107,798.—Railway Rail.—Richard Montgomery, New York city.

107,799.—Earth Closet.—W. H. Newton, Newport, R. I.

107,800.—Dyeing Furs.—Philip Norden and Hermann Mischo, New York city.

107,801.—Automatic Gate.—Michael Orewiler (assignor to J. R. Ancherman), Bucyrus, Ohio.

107,802.—Bird Cage.—G. R. Osborn, Bridgeport, Conn.

107,803.—Cover for Cooking Utensils.—L. B. Oviatt Brooklyn Village, Ohio.

107,804.—Harvester Reel.—C. N. Owen, Salem, Ohio.

107,805.—Water Wheel.—Ezra Parker, Beverly, Ohio.

107,806.—Heating Stove.—Nathan Parish, Kalamazoo, Mich. Antedated September 21, 1870.

107,807—Hoisting Machine.—Nathan Parish, Kalamazoo, Mich.

107,808.—Saw.—John Phillips, Chicago, Ill.

107,809.—Manufacture of Illumination Gas.—E. A. Pond, G. H. Pond, and M. S. Richardson, Rutland, Vt. Antedated September 24, 1870.

107,810.—Manufacture of Friction Match Cigar Lighter.—William Porter, St. Stephen, Canada.

107,811.—Liquid for Galvanic Batteries.—Emil Prevost, New York city.

107,812.—Bedstead Fastening.—C. D. Purdy, La Porte, Ind.

107,813.—Spring Hinge for Doors, etc.—Andrew Rankin, Philadelphia, Pa.

107,814.—Car Coupling.—Bennett R. Rose, Kansas City, Mo.

107,815.—Manufacture of Asphaltic Composition for Pavements, Roads, etc.—Albert Ruttkay, New York city.

107,816.—Vapor Generating Burner for Stoves.—D. E. Ryan, St. Louis, Mo.

107,817.—Kitchen Boiler.—William B. Scaife, Pittsburgh, Pa.

107,818.—Saucepan.—Fridolin Schifferle, St. Louis, Mo.

107,819.—Spring Hinge for Doors, etc.—A. F. Schiffling, Evansville, Ind.

107,820.—Stone-working Machine.—C. F. Schlickeysen, Berlin, Prussia.

107,821.—Refrigertor.—Samuel R. Scoggins, Baltimore, Md.

107,822.—Extension Ladder.—J. W. Scott, Philadelphia, Pa.

107,823.—Grain Binder.—Gilman A. Scribner, Rochester, N. Y.

107,824.—Shield for Gas Burners.—Ira W. Shaler, Brooklyn, N. Y.

107,825.—Stovepipe Shelf.—James H. Shaut, Andover, N. Y.

107,826.—Lubricator.—Levi F. Smith, Philadelphia, Pa.

107,827.—Shovel.—Wm. H. Smith, Jackson, Pa.

107,828.—Plow.—Cyrus Snyder, Middletown, Ill.

107,829.—Gang Plow.—Naaman Spencer, Jr., Eagle Point, Ill.

107,830.—Device for Actuating the Valves of Fluid Meters.—D. B. Spooner, Syracuse, N. Y.

107,831.—Corpse Preserver.—Samuel Stockton and John Schepler, Lambertville, N. J.

107,832.—Horse Hay Rake.—J. C. Stoddard, Worcester, Mass.

107,833.—Separating Animal from Vegetable Fibers.—James Stuart, London, England. Patented in England, August 6, 1869.

107,834.—Milk Pail.—Church Tabor, Craftsbury, Vt.

107,835.—Lantern.—Church Tabor, Craftsbury, Vt.

107,836.—Paper File.—Church Tabor, Craftsbury, Vt.

107,837.—Car Coupling—G. B. Terry, Pittsford, and W. G. Hawley, Gorham, N. Y.

107,838.—Water Pipe.—John F. Ward, Jersey City, N. J.

107,839.—Meat Hook.—Samuel Weaver, Pottstown, Pa.

107,840.—Steam Generator.—William Weston, William R. Weston, N. R. Weston, and Burt Brett, Stevens' Point, Wis.

107,841.—Pump Valve.—James T. Whipple, Chicago, Ill.

107,842.—Carding-Machine Teeth.—William H. Whiting, Wilmington, Conn., assignor to himself and Marcus M. Johnson.

107,843.—Harness Saddle-Tree.—P. H. Wiedersum, New York city.

107,844.—Animal Trap.—John J. Wood, North Manchester, Ind. Antedated September 17, 1870.

107,845.—Whip-Socket Clasp.—Alva Worden, Ypsilanti, Mich.

107,846.—Wool-Washing Machine.—John Yewdall and Wm. Yewdall, Philadelphia, Pa.

107,847.—Machine for Cutting Stone.—Hugh Young, Middletown, Conn., and James L. Young, New York city. Antedated September 26, 1870.

107,848.—Manufacture of Illuminating Gas.—William Young, Magdalen Bridge, and Peter Brash, Leith, Scotland. Patented in England, April 6, 1870.

REISSUES.

4,129.—Tanning and Stuffing Leather.—W. B. Brittingham, La Fayette, Ind. Patent No. 98,916, dated January 18, 1870.

4,130.—Coffee Mill.—Thomas W. Brown, Boston, Mass., assignor to Charles Parker, Meriden, Conn.—Patent 105,545; dated July 19, 1870.

4,131.—Lubricator.—H. A. Daniels (assignor to the Daniels, Nichols & Gaylord Manufacturing Company), Waterbury, Conn. Patent No. 92,283, dated July 6, 1869.

4,132.—Furnace for Roasting Ores.—E. P. Hudson, New York city, assignor to the Hudson Ore-Refining Company. Patent No. 78,456, dated June 2, 1868.

4,133.—Rein Holder for Carriages.—Elias C. Patterson, Rochester, N. Y. Patent No. 62,879, dated March 12, 1867.

4,134.—Composition for Covering Steam Boilers, Steam Pipes, etc.—John Riley and C. W. Bissell (assignors, through mesne assignments, to the United States and Foreign Salamander Felting Co.), Troy, N. Y.—Patent No. 95,517, dated October 5, 1869.

4,135.—Millstone Dress.—Joseph Sedgebeer, Painesville, Ohio.—Patent No. 35,858, dated July 8, 1862.

4,136.—Solar Camera.—W. H. Masters, Princeton, Ill.—Patent No. 59,917, dated November 20, 1866.

DESIGNS.

4,361.—Blower Holder.—F. W. Brocksieper (assignor to Sargent & Co.), New Haven, Conn.

4,362.—Fire-Set Holder.—F. W. Brocksieper (assignor to Sargent & Co.), New Haven, Conn.

4,363.—Fire-Dog.—F. W. Brocksieper (assignor to Sargent & Co.), New Haven, Conn.

4,364.—Door Pull.—F. W. Brocksieper (assignor to Sargent & Co.), New Haven, Conn.

4,365.—Cook Stove.—Henry H. Culver, Kansas City, Mo.

4,366 and 4,367.—Corset.—D. H. Fanning, Worcester, Mass. Two patents.

4,368.—Figure of a Mechanical Toy.—Wm. C. Goodwin, Hamden, Conn.

4,369.—Mechanical Toy Figure.—Wm. C. Goodwin, Hamden, Conn.

4,370.—Figure of a Mechanical Toy.—Wm. C. Goodwin, Hamden, Conn.

4,371.—Cradle-Plate of Gate Latch.—Job Johnson, Brooklyn, N. Y.

4,372.—Badge.—William Riker, Newark, N. J.

4,373.—Punch Drawer.—Alonzo H. Rowe, Newburyport, Mass.

4,374.—Stove Plate.—N. S. Vedder and Francis Ritchie, Troy, N. Y., assignors to N. S. Vedder.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

Method of Applying Steam to, and of Cutting Scarfs from Wood.—George U. White, Belfast, Me., has petitioned for the extension of the above patent. Day of hearing Nov. 16, 1870.

Making Steel.—John Neville, of Brooklyn, N. Y., has petitioned for the extension of the above patent. Day of hearing Nov. 23, 1870.

Machine for Forging Iron.—Silas S. Putman, Neponset, Mass., has petitioned for an extension of the above patent. Day of hearing Nov. 23, 1870.

Machine for Grinding Saws.—Edmund Andrews, Williamsport, Pa. has applied for an extension of the above patent. Day of hearing Nov. 30 1870.

Mode of Securing Springs in Upholstery.—Wendell Wright, Bloomfield, N. J., has applied for an extension of the above patent. Day of hearing Nov. 30, 1870.

Machinery for Weaving Shade Cord.—Thomas Nelson, Troy, N. Y., has applied for an extension of the above patent. Day of hearng Nov. 30, 1870.

Machinery for Grinding Paper Pulp.—Joseph Kingsland, Jr., Franklin, N. J., has petitioned for an extension of the above patent. Day of hearing Nov. 30, 1870.

Loom.—Benjamin G. Dawley. North Providence, R. I., has petitioned for an extension of the above patent. Day of hearing Dec. 7, 1870.

Advertisements.

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The frame is composed of two legs, A, and the leg, B, hooked together at the top by the long crotched and bent hook, C, and the swivel, D. E is a metal frame suspended on the hook, C, by pivot bolts. G is a square hoisting bar, arranged to slide up and down through suitable holes in the top and bottom of the frame, E. Gripe pawls, H, with square holes, through which the bar, G, passes, are suspended by rods, I, from the short arms of the levers, K, pivoted on the axis, L, and connected at their long ends to the vibrating hand lever, M, by the rods, N, one on each side of its axis, so that when one moves one way the other moves the other way. The gripe pawls, H, are also connected by small rods, O, to the spring levers, F, also pivoted on the axis, L, and connected to the bar, Q, on the leg, B, the bar, Q, being arranged to slide up and down on leg, B.

When this bar, Q, is shoved up, the spring levers press the pawls down and cause them to grip the bar as soon as the levers, K, begin to draw them up, thereby causing the bar to be raised by the alternate up-and-down movement of the pawls, and when the bar, Q, is shoved down, the springs have a lifting action on the pawls which prevent their gripping the bar, until near the end of the upward movement of the levers; so that the further upward movement will lift the bar out of the grip of the pawls below, which being thereby freed, will rise on the bar while it is lowered by the other, until near the end of its upward movement, when, as before, this one will grip and force the bar from the other at the lower position, and so on, letting the bar down.

The springs thus shift the pawls readily to cause them to raise or lower the bar, as may be required. The swinging frame gives the bar freedom to work obliquely to either side of the vertical position, and in case it requires to vibrate perpendicularly thereto the hook and leg, K, will vibrate in that direction.

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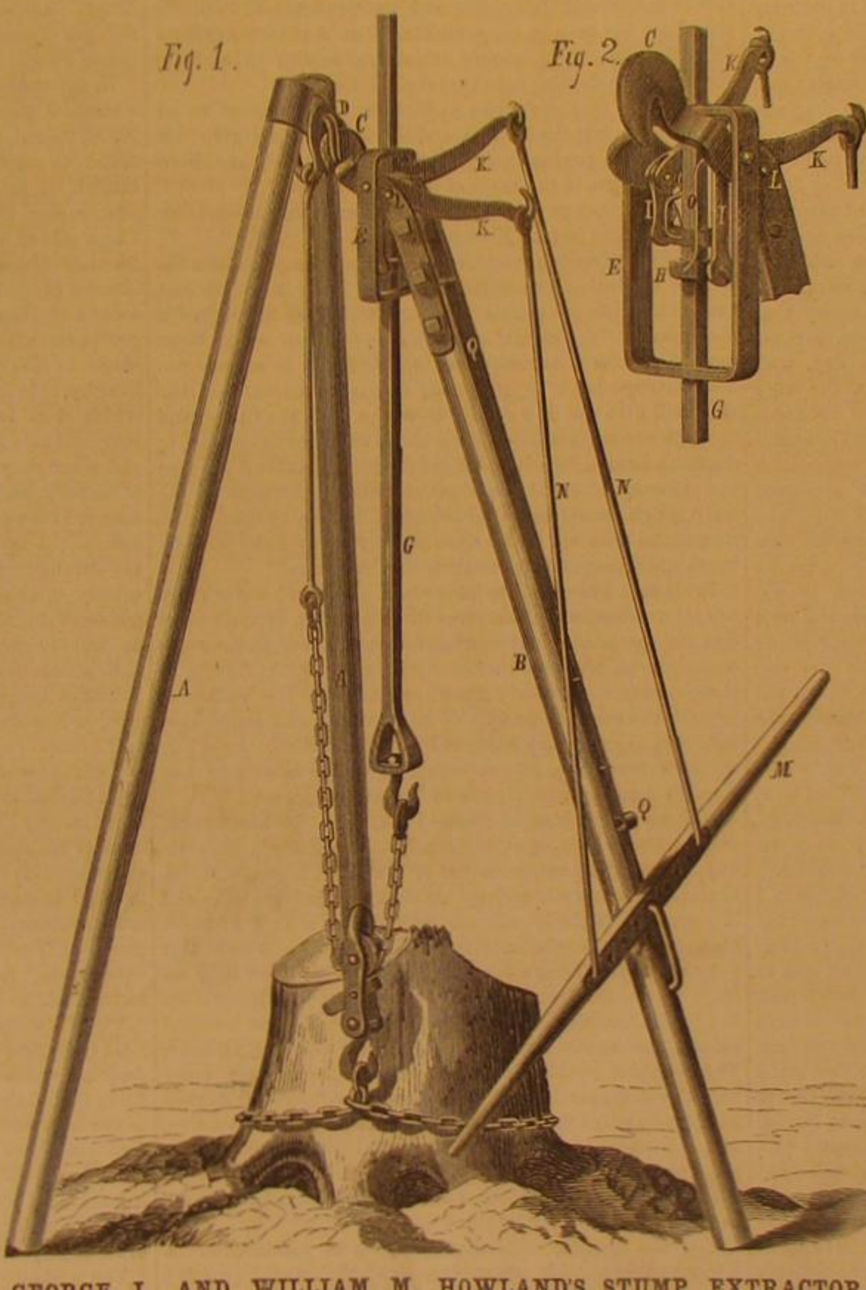

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This room, the most sensitive spot in the whole world—the cerebrum which receives and transmits intelligence from all quarters of the globe—may be looked upon as one of the most curious sights in the metropolis. Although hundreds of minds are simultaneouly conversing, some with tongues of steel, some with the clear sound of the bell, some again by means of piano-like notes, which spell the words letter by letter, although we have the clatter of all these sounds mixed with the metallic tinkle of the electric bell, hailing from distant western and northern cities—not a human voice is heard—although, stranger still, the manipulators are all women. According to the rules of the service, the swifter they talk the better; but it must be done in silence with some unseen correspondent at the extremity, it may be, of the kingdom—a necessary condition in order to insure attention and accuracy while the operators are at work.

It is certainly no unpleasant sight to see these young women doing the work of the world, proving that they are capable of thoughtful labor, and trustworthy in circumstances of great pith and moment. It is discovered at last that the sewing needle is not the only instrument they can master. They are evidently drawn from the middle rank of life; and we are informed that they make capital manipulators, the delicacy of their fingers seeming to point out to them the telegraph instrument as a suitable means of employment. . . . While the visitor is listening to the clatter of one half of the world talking to the other half, he is aware of a dull thud striking from time to time upon the ear. On inquiry, he finds this strange sound proceeds from the pneumatic tube, the new servant the electric telegraph has called to its aid; and within a glass case, against the wall, he sees trained just like so many fruit trees in an orchard house long tubes of gutta-percha, ending in an oblong-shaped mouth, covered with thick plate-glass. As he is watching, a long round pellet is projected into this reception case with the force of a spent shot—taken out by the clerk in attendance—and immediately opened. It contains a telegraphic message, sent here for transmission to some other wire.

This pneumatic tube at present is only extended to offices half a mile round, but as this half mile is in the busiest part of the city, an area in which it is difficult to get along fast by foot-passengers, porterage-work is done in seconds as compared to minutes by this fleet mechanical messenger. Eventually all the great district post-offices will be connected with the central office by pneumatic tubes, thus vastly accelerating the speed of the telegrams.

In addition to the offices within half a mile of Telegraph street, which are thus served by this aerial mercury, the head office at St. Martin's-le-Grand is provided with a tube. The great submarine cables, such as the Atlantic, the Indian, and all the marine lines wishing to use the central office as a means of forwarding messages, will have lines of tube to this room for that purpose. If the reader remembers his old pea-shooter days, he will understand their principle of action in a moment. If he blows he impels the pea, if he sucks he draws it up into his mouth. Pressure and suction are the two forces used in this pea or message-shooter of our maturer days.

The telegraph message comes in a round plug box, covered with carpet or flannel, so as just to make it fit loosely the tube. The suction and propulsive power lies in the depths of the establishment, in the shape of a steam engine.—*Edinburgh Review.*

Kid Gloves.

A correspondent of the Boston *Advertiser* says: I hope that some of your readers availed themselves of an intimation contained in a recent letter, that, owing to the disturbance to French industry, the price of kid gloves would probably advance. On the 8th ladies' gloves with one button were advanced one dollar per dozen, and on the 19th, another dollar; and so in proportion for other styles. The largest manufacturer for this country is Alexandré, who supplies one house in New York with between sixty and seventy thousand dozen pairs of kid gloves per annum. As his principal factory for cutting is in Paris, his shipments have stopped, and his house states that the resumption will depend on the contingencies of the war.

Mr. Muller, who stamps his given name of Alexandré upon the gloves, when first known to Mr. Stewart was in humble circumstances, needing capital to enlarge his industry; but his merit being discovered, the want was supplied, and an enormous establishment is the result. Mr. Muller owns an hotel in Paris for a winter residence, and possesses La Grange, with its sixty bedrooms and fifteen hundred acres of land distinguished in former years as the home of Lafayette. His hospitality corresponds with these important dwellings. He manufactures his own champagne, claret, and brandy, each of a fine quality.

On a visit to me some years ago he gave me the history of this manufacture. The opinion was then quite common that rat skins were used, which he disposed of very summarily. Besides other objections, said he, it is enough to mention that they would be much too short for the hand. In order to purchase kid skins he sends out his agents as early as February to Italy, and they follow the mountain ranges, keeping pace with the opening of spring, until they reach to the plains of the Baltic. Fields which will carry sheep are not used for the goat in flocks. The goat is driven up to nearly the snow line of mountains to feed on the tender branches of shrubs and trees, and they are tended and milked by a class which is not seen in this country.

In walking up the Alps I have found these interesting flocks. The horns of the animal supply handles for knives, its hair is used for cloth, its milk for cheese, its flesh for food—that of the young kid being excellent—and the skin is displayed on fair hands in all civilized countries. It will be years before this entire industry will be introduced into the United States. I should not be surprised if Prussia, availing herself of the opportunity which the disturbed industry of France offers, should become distinguished in this manufacture.

The compensation for sewing is too small to enlist the regular and permanent industry of women, and it is resorted to somewhat as knitting by hand is among us, at intervals in ordinary labor. The movement of the needle is guided by the notches of a steel clamp held by the sewer, who presently arrives at the experience which permits the work to be done while conversation is engaging part of the attention, and indeed while the eye is directed to a different quarter. It is owing to this facility that a sligh reward for the labor is exacted. The sewers are distributed all over France, and receive the material, cut out with precision, and put up in bundles of a dozen pairs.

In order to conduct the distribution of the gloves here with advantage, their form, color, and shade are fixed upon here. Colors which were in demand a year ago are rejected now, and others have taken their place. The closest attention to the probable variations in the public taste must be observed. You would be surprised to see the sample-book shades furnished for the purpose of preparing orders. They represent every tint which our knowledge of nature and art supplies.

No one is competent to say when this branch of industry in Paris will be fully resumed. The vicissitudes of war will not reach it to the extent of damaging the consumer, so far as the manufacture of Alexandré is concerned, for his gloves are not used at home. It may therefore be rapidly restored on the cessation of hostilities. English gloves have not advanced.

In Georgetown, Cal., the largest silver button ever produced in the United States was taken out by J. W. Watson, superintendent of the Brown Silver Mining Company. It weighs 1,141 pounds troy. The button was the result of 33 tuns of ore.

INAUGURAL ADDRESS OF THE PRESIDENT, THOMAS H. HUXLEY, LL.D., F.R.S., ETC., BEFORE THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

[Concluded from page 225].

To sum up the effect of this long chain of evidence:

It is demonstrable, that a fluid eminently fit for the development of the lowest forms of life, but which contains neither germs nor any protein compound, gives rise to living things in grea abundance, if it is exposed to ordinary air; while no such development takes place if the air with which it is in contact is mechanically freed from the solid particles which ordinarily float in it, and which may be made visible by appropriate means.

It is demonstrable that the great majority of these particles are destructible by heat, and that some of them are germs, or living particles, capable of giving rise to the same forms of life as those which appear when the fluid is exposed to unpurified air.

It is demonstrable that inoculation of the experimental fluid with a drop of liquid known to contain living particles, gives rise to the same phenomena as exposure to unpurified air.

And it is further certain that these living particles are so minute that the assumption of their suspension in ordinary air presents not the slightest difficulty. On the contrary, considering their lightness and the wide diffusion of the organisms which produce them, it is impossible to conceive that they should not be suspended in the atmosphere in myriads.

Thus, the evidence, direct and indirect, in favor of *Biogenesis* for all known forms of life, must, I think, be admitted to be of great weight.

On the other side, the sole assertions worthy of attention are, that hermetically sealed fluids, which have been exposed to great and long continued heat, have sometimes exhibited living forms of low organization when they have been opened.

The first reply that suggests itself is the probability that there must be some error about these experiments, because they are performed on an enormous scale every day, with quite contrary results. Meat, fruits, vegetables, the very materials of the most fermentable and putrescible infusions are preserved to the extent, I suppose I may say, of thousands of tuns every year, by a method which is a mere application of Spallanzani's experiment. The matters to be preserved are well boiled in a tin case provided with a small hole, and this hole is soldered up when all the air in the case has been replaced by steam. By this method they may be kept for years, without putrefying, fermenting, or getting moldy. Now this is not because oxygen is excluded, inasmuch as it is now proved that free oxygen is not necessary for either fermentation or putrefaction. It is not because the tins are exhausted of air, for *Vibriones* and *Bacteria* live, as Pasteur has shown, without air or free oxygen. It is not because the boiled meats or vegetables are not putrescible or fermentable, as those who have had the misfortune to be in a ship supplied with unskillfully closed tins well know. What is it, therefore, but the exclusion of germs? I think that Abiogenesists are bound to answer this question before they ask us to consider new experiments of precisely the same order.

And in the next place if the results of the experiments I refer to are really trustworthy, it by no means follows that Abiogenesis has taken place. The resistance of living matter to heat is known to vary within considerable limits, and to depend, to some extent, upon the chemical and physical qualities of the surrounding medium. But if, in the present state of science, the alternative is offered us, either germs can stand a greater heat than has been supposed, or the molecules of dead matter, for no valid or intelligible reason that is assigned, are able to rearrange themselves into living bodies, exactly such as can be demonstrated to be frequently produced in another way, I cannot understand how choice can be, even for a moment, doubtful.

But though I cannot express this conviction of mine too strongly, I must carefully guard myself against the supposition that I intend to suggest that no such thing as abiogenesis ever has taken place in the past, or ever will take place in the future. With organic chemistry, molecular physics, and physiology yet in their infancy, and every day making prodigious strides, I think it would be the hight of presumption for any man to say that the conditions under which matter assumes the properties we call "vital" may not, some day, be artificially brought together. All I feel justified in affirming is, that I see no reason for believing that the feat has been performed yet.

And, looking back through the prodigious vista of the past, I find no record of the commencement of life, and, therefore, I am devoid of any means of forming a definite conclusion as to the conditions of its appearance. Belief, in the scientific sense of the word, is a serious matter, and needs strong foundations. To say, therefore, in the admitted absence of evidence, that I have any belief as to the mode in which the existing forms of life have originated, would be using words in a wrong sense. But expectation is permissible where belief is not; and if it were given me to look beyond the abyss of geologically recorded time to the still more remote period when the earth was passing through physical and chemical conditions, which it can no more see again than a man can recall his infancy, I should expect to be a witness of the evolution of living protoplasm from not living matter. I should expect to see it appear under forms of great simplicity, endowed, like existing fungi, with the power of determining the formation of new protoplasm from such matters as ammonium carbonates, oxalates, and tartrates, alkaline and earthy phosphates, and water, without the aid of light. That is the expectation to which analogical reasoning leads me; but I beg you once more to recollect that I have no right to call my opinion anything but an act of philosophical faith.

So much for the history of the progress of Redi's great doctrine of Biogenesis, which appears to me, with the limitations I have expressed, to be victorious along the whole line at the present day.

As regards the second problem offered to us by Redi, whether Xenogenesis obtains, side by side with Homogenesis; whether, that is, there exist not only the ordinary living things, giving rise to offspring which run through the same cycle as themselves, but also others, producing offspring which are of a totally different character from themselves, the researches of two centuries have led to a different result. That the grubs found in galls are no product of the plants on which the galls grow, but are the result of the introduction of the eggs of insects into the substance of these plants, was made out by Vallisnieri, Reaumur, and others, before the end of the first half of the eighteenth century. The tape-worms, bladder-worms, and flukes continued to be a stronghold of the advocates of Xenogenesis for a much longer period. Indeed, it is only within the last thirty years that the splendid patience of Von Siebold, Van Beneden, Leuckart, Küchenmeister, and other helminthologists, has succeeded in tracing every such parasite, often through the strangest wanderings and metamorphoses, to an egg derived from a parent actually or potentially like itself; and the tendency of inquiries elsewhere has been in the same direction. A plant may throw off bulbs, but these, sooner or later, give rise to seeds or spores, which develop into the original form.

A polype may give rise to Medusæ, or a pluteus to an Echinoderm, but the Medusa and the Echinoderm give rise to eggs which produce polypes or plutei, and they are therefore only stages in the cycle of life of the species.

But if we turn to pathology it offers us some remarkable approximations to true Xenogenesis.

As I have already mentioned, it has been known since the time of Vallisnieri and of Reaumur that galls in plants and tumors in cattle are caused by insects which lay their eggs in those parts of the animal or vegetable frame of which these morbid structures are outgrowths. Again, it is a matter of familiar experience to everybody that mere pressure on the skin will give rise to a corn. Now the gall, the tumor, and the corn are parts of the living body, which have become, to a certain degree, independent and distinct organisms. Under the influence of certain external conditions, elements of the body which should have developed in due subordination to its general plan, set up for themselves and apply the nourishment which they receive to their own purposes.

From such innocent productions as corns and warts there are all gradations to the serious tumors which, by their mere size and the mechanical obstruction they cause, destroy the organism out of which they are developed; while, finally, in those terrible structures known as cancers the abnormal growth has acquired powers of reproduction and multiplication, and is only morphologically distinguishable from the parasitic worm, the life of which is neither more nor less closely bound up with that of the infested organism.

If there were a kind of diseased structure, the histological elements of which were capable of maintaining a separate and independent existence out of the body, it seems to me that the shadowy boundary between morbid growth and Xenogenesis would be effaced. And I am inclined to think that the progress of discovery has almost brought us to this point already. I have been favored by Mr. Simon with an early copy of the last published of the valuable "Reports on the Public Health," which, in his capacity of their medical officer, he annually presents to the lords of the Privy Council. The appendix to this report contains an introductory essay "On the Intimate Pathology of Contagion," by Dr. Burdon Sanderson, which is one of the clearest, most comprehensive, and well reasoned discussions of a great question which has come under my notice for a long time. I refer you to it for details and for the authorities for the statements I am about to make.

You are familiar with what happens in vaccination. A minute cut is made in the skin, and an infinitesimal quantity of vaccine matter is inserted into the wound. Within a certain time a vesicle appears in the place of the wound, and the fluid which distends this vesicle is vaccine matter, in quantity a hundred or a thousand fold that which was originally inserted. Now, what has taken place in the course of this operation? Has the vaccine matter by its irritative property produced a mere blister, the fluid of which has the same irritative property? Or does the vaccine matter contain living particles which have grown and multiplied where they have been planted? The observations of M. Chauveau, extended and confirmed by Dr. Sanderson himself, appear to leave no doubt upon this head. Experiments, similar in principle to those of Helmholz on fermentation and putrefaction, have proved that the active element in the vaccine lymph is non-diffusible, and consists of minute particles exceeding $\frac{1}{20000}$ of an inch in diameter, which are made visible in the lymph by the microscope. Similar experiments have proved that two of the most destructive of epizootic diseases, sheep-pox and glanders, are also dependent for their existence and their propagation upon extremely small living solid particles, to which the title of *microzymes* is applied. An animal suffering under either of these terrible diseases is a source of infection and contagion to others for precisely the same reason as a tub of fermenting beer is capable of propagating its fermentation by "infection" or "contagion" to fresh wort. In both cases it is the solid living particles which are efficient; the liquid in which they float, and at the expense of which they live, being altogether passive.

Now arises the question, are these microzymes the results of *Homogenesis* or *Xenogenesis*; are they capable, like the *Torulæ* of yeast, of arising only by the development of pre-existing germs, or may they be, like the constituents of the nut gall, the results of a modification and individualization of the tissues of the body in which they are found, resulting from the operation of certain conditions? Are they parasites in the zoological sense, or are they merely what Virchow has called "heterologous growths"? It is obvious that this question has the most profound importance, whether we look at it from a practical or from a theoretical point of view. A parasite may be stamped out by destroying its germs, but a pathological product can only be annihilated by removing the conditions which give rise to it.

It appears to me that this great problem will have to be solved for each zymotic disease separately, for analogy cuts two ways. I have dwelt upon the analogy of pathological modifications, which is in favor of the xenogenetic origin of microzymes; but I must now speak of the equally strong analogies in favor of the origin of such pestiferous particles by the ordinary process of the generation of like from like.

It is, at present, a well established fact that certain diseases, both of plants and animals, which have all the characters of contagious and infectious epidemics, are caused by minute organisms. The smut of wheat is a well known instance of such a disease, and it cannot be doubted that the grape disease and the potato disease fall under the same category. Among animals insects are wonderfully liable to the ravages of contagious and infectious diseases caused by microscopic *Fungi*.

In autumn it is not uncommon to see flies motionless upon a window pane, with a sort of magic circle in white drawn round them. On microscopic examination the magic circle is found to consist of innumerable spores, which have been thrown off in all directions by a minute fungus called *Empusa muscæ*, the spore-forming filaments of which stand out like a pile of velvet from the body of the fly. These spore-forming filaments are connected with others which fill the interior of the fly's body like so much fine wool, having eaten away and destroyed the creature's viscera. This is the full-grown condition of the *Empusa*. If traced back to its earlier stages in flies which are still active and to all appearance healthy, it is found to exist in the form of minute corpuscles which float in the blood of the fly. These multiply and lengthen into filaments, at the expense of the fly's substance; and when they have at last killed the patient, they grow out of its body, and give off spores. Healthy flies shut up with diseased ones catch this mortal disease and perish like the others. A most competent observer, M. Cohn, who studied the development of the *Empusa* in the fly very carefully, was utterly unable to discover in what manner the smallest germs of the *Empusa* got into the fly. The spores could not be made to give rise to such germs by cultivation; nor were such germs discoverable in the air or in the food of the fly. It looked exceedingly like a case of Abiogenesis, or, at any rate, of Xenogenesis; and it is only quite recently that the real course of events has been made out. It has been ascertained that when one of the spores falls upon the body of a fly it begins to germinate, and sends out a process which bores its way through the fly's skin; this, having reached the interior cavities of its body, gives off the minute floating corpuscles which are the earliest stage of the *Empusa*. The disease is "contagious," because a healthy fly coming in contact with a diseased one, from which the spore bearing filaments protrude, is pretty sure to carry off a spore or two. It is "infectious," because the spores become scattered about all sorts of matter in the neighborhood of the slain flies.

The silkworm has long been known to be subject to a very fatal contagious and infectious disease called the *Muscardine*. Audouin transmitted it by inoculation. This disease is entirely due to the development of a fungus *Botrytis Bassiana*, in the body of the caterpillar; and its contagiousness and infectiousness are accounted for in the same way as those of the fly disease. But of late years a still more serious epizootic has appeared among the silkworms; and I may mention a few facts which will give you some conception of the gravity of the injury which it has inflicted on France alone.

The production of silk has been, for conturies, an important branch of industry in Southern France, and in the year 1853 it had attained such a magnitude that the annual produce of the French sericulture was estimated to amount to a tenth of tuat of the whole world, and represented a money value of 117,000,000 of francs, or nearly five millions sterling. What may be the sum which would represent the money value of all the industries connected with the working up of the raw silk thus produced is more than I can pretend to estimate. Suffice it to say that the city of Lyons is built upon French silk, as much as Manchester was upon American cotton before the civil war.

Silkworms are liable to many diseases; and even before 1853, a peculiar epizootic, frequently accompanied by the appearance of dark spots upon the skin (whence the name of Pébrine" which it has received), had been noted for its mortality. But, in the years following 1853 this malady broke out with such extreme violence that in 1856 the silk crop was reduced to a third of the amount which it had reached in 1853; and, up till within the last year or two it has never attained half the yield of 1853. This means not only that the great number of people engaged in silk growing are some thirty millions sterling poorer than they might have been; it means not only that high prices have had to be paid for imported silkworm eggs, and that, after investing his money in them, in paying for mulberry leaves and for attendance, the cultivator has constantly seen his silkworms perish and himself plunged in ruin—but it means that the looms of Lyons have lacked employment, and that for years enforced idleness and misery have been the portion of a vast population which in former days was industrious and well to do.

In 1858 the gravity of the situation caused the French Academy of Sciences to appoint commissioners, of whom a distinguished naturalist, M. de Quatrefages, was one, to inquire into the nature of this disease, and, if possible, to devise some means of staying the plague. In reading the report, made by M. de Quatrefages, in 1859, it is exceedingly interesting to observe that his elaborate study of the Pébrine forced the conviction upon his mind that, in its mode of occurrence and propagation, the disease of the silkworm is, in every respect, comparable to the cholera among mankind. But it differs from the cholera, and, so far, is a more formidable disease in being hereditary, and in being, under some circumstances, contagious as well as infectious.

The Italian naturalist, Filippi, discovered in the blood of the silkworms affected by this strange disease a multitude of cylindrical corpuscles, each about $\frac{1}{6000}$ of an inch long. These have been carefully studied by Lebert, and named by him *Panhistophyton*; for the reason that, in subjects in which the disease is strongly developed, the corpuscles swarm in every tissue and organ of the body, and even pass into the undeveloped eggs of the female moth. But are these corpuscles causes or mere concomitants of the disease? Some naturalists took one view and some another; and it was not until the French Government, alarmed by the continued ravages of the malady, and the inefficiency of the remedies which had been suggested, despatched M. Pasteur to study it, that the question received its final settlement, at a great sacrifice, not only of the time and peace of mind of that eminent philosopher, but, I regret to have to add, of his health.

But the sacrifice has not been in vain. It is now certain that this devastating, cholera-like Pébrine is the effect of the growth and multiplication of the *Panhistophyton* in the silkworm. It is contagious and infectious, because the corpuscles of the *Panhistophyton* pass away from the bodies of the diseased caterpillars, directly or indirectly, to the alimentary canal of healthy silkworms in their neighborhood; it is hereditary, because the corpuscles enter into the eggs while they are being formed, and, consequently are carried within them when they are laid; and for this reason, also, it presents the very singular peculiarity of being inherited only on the mother's side. There is not a single one of all the apparently capricious and unaccountable phenomena presented by the Pébrine but has received its explanation from the fact that the disease is the result of the presence of the microscopic organism, *Panhistophyton*.

Such being the facts with respect to the Pébrine, what are the indications as to the method of preventing it? It is obvious that this depends upon the way in which the *Panhistophyton* is generated. If it may be generated by Abiogenesis or by Xenogenesis within the silkworm or its moth, the extirpation of the disease must depend upon the prevention of the occurrence of the conditions under which this generation takes place. But if, on the other hand, the *Panhistophyton* is an independent organism, which is no more generated by the silkworm than the mistletoe is generated by the oak or the apple-tree on which it grows, though it may need the silkworm for its development, in the same way as the mistletoe needs the tree, then the indications are totally different. The sole thing to be done is to get rid of and keep away the germs of the *Panhistophyton*. As might be imagined from the course of his previous investigations, M. Pasteur was led to believe that the latter was the right theory; and, guided by that theory, he has devised a method of extirpating the disease which has proved to be completely successful wherever it has been properly carried out.

There can be no reason, then, for doubting that, among insects, contagious and infectious diseases of great malignity are caused by minute organisms which are produced from pre-existing germs, or by Homogenesis; and there is no reason that I know of for believing that what happens in insects may not take place in the highest animals. Indeed, there is already strong evidence that some diseases of an extremely malignant and fatal character to which man is subject are as much the work of minute organisms as is the Pébrine. I refer, for this evidence, to the very striking facts adduced by Professor Lister in his various well known publications on the antiseptic method of treatment. It seems to me impossible to rise from the perusal of those publications without a strong conviction that the lamentable mortality which so frequently dogs the footsteps of the most skillful operator, and those deadly consequences of wounds and injuries which seem to haunt the very walls of great hospitals, and are, even now, destroying more men than die of bullet or bayonet, are due to the importation of minute organisms into wounds, and their increase and multiplication, and that the surgeon who saves most lives will be he who best works out the practical consequences of the hypothesis of Redi.

I commenced this address by asking you to follow me in an attempt to trace the path which has been followed by a scientific idea in its long and slow progress from the position of a probable hypothesis to that of an established law of nature. Our survey has not taken us into very attractive regions; it has lain, chiefly, in a land flowing with the abominable, and peopled with mere grubs and moldiness. And it may be imagined with what smiles and shrugs practical and serious cotemporaries of Redi and of Spallanzani may have commented on the waste of their high abilities in toiling at the solution of problems which, though curious enough in themselves, could be of no conceivable utility to mankind.

Nevertheless, you will have observed that, before we had traveled very far upon our road, there appeared, on the right hand and on the left, fields laden with a harvest of golden grain, immediately convertible into those things which the most sordidly practical of men will admit to have value—viz., money and life.

The direct loss to France caused by the Pébrine in seventeen years cannot be estimated at less than fifty millions sterling; and if we add to this what Redi's idea, in Pasteur's hands, has done for the wine grower and the vinegar maker, and try to capitalize its value, we shall find that it will go a long way towards repairing the money losses caused by the frightful and calamitous war of this autumn.

And, as to the equivalent of Redi's thought in life, how can we over-estimate the value of that knowledge of the nature of epidemic and epizootic diseases, and, consequently, of the means of checking or eradicating them, the dawn of which has assuredly commenced?

Looking back no further than ten years it is possible to select three (1863, 1864, and 1869) in which the total number of deaths from scarlet fever alone amounted to 90,000. That is the return of killed, the maimed and disabled being left out of sight. Why, it is to be hoped that the list of killed in the present bloodiest of all wars will not amount to more than this! But the facts which I have placed before you must leave the least sanguine without a doubt that the nature and the causes of this scourge will one day be as well understood as those of the Pébrine are now, and that the long-suffered massacre of our innocents will come to an end.

And thus mankind will have one more admonition that "the people perish for lack of knowledge;" and that the alleviation of the miseries and the promotion of the welfare of men must be sought, by those who will not lose their pains, in that diligent, patient, loving study of all the multitudinous aspects of nature, the results of which constitute exact knowledge or science.

It is the justification and the glory of this great meeting that it is gathered together for no other object than the advancement of the moiety of science which deals with those phenomena of nature which we call physical. May its endeavors be crowned with a full measure of success!

COSTUME AND ART.

[From The Building News.]

Costume may be usefully divided into *three* kinds or modes of clothing the "naked animal man." The first may be typified by the old Greek dress, where the evident object was to hide the figure as little as possible, *i.e.*, to so clothe and fit the human frame as not to hide or smother, but to show the form. The next other mode was the precise reverse of this, and was well typified in the magnificent costume of the ancient Mede, in whom the whole figure was clothed in flowing drapery, the object being to exhibit the splendor of the dress, and to add to the dignified presence of the wearer by its shape and folds. These two modes of dress may be said to represent the two opposite ways of clothing the human form, both equally good in their way, and obviously equally suitable for different people and avocations. It must be observed in passing that under these two heads there are a vast number of costumes and modes of dress all the world over, and in all ages, which will equally well typify the two systems; and a work of no small interest might be written on the subject if thus simply divided. The third mode we would venture to call the mode of *quaint* costume—the word quaint being used for want of a better. It may be represented by the dress of the Japanese, where the object would seem to be neither of the two above mentioned—neither to show the form of the wearer nor the grace of the dress, nor even folds of drapery, but simply to cover the body with some quaint device, almost like the strange figures on a common playing card. It is, perhaps, the very strangest costume that was ever invented by man; the patterns, the colors, and the odd cut of the several parts making up a gorgeous show, not a little strange and quaint, and unlike everything else. There are, under this head, too, a number of different costumes from different countries and in different ages; and much of the costume of the middle ages is of this type, and has come down to us in the glass painting in the windows of cathedrals and on the walls of churches. To this class of dress belongs that of the end of the last century and of the days of Hogarth, where a sort of odd quaintness redeemed it in a great measure from contempt. Indeed, as we see it in the paintings and prints of Hogarth, it is impossible not to be struck with its oddity; and the wig and great horseman's coat, long waistcoat, short breeches, and heavily buckled shoes, make up together at least an harmonious whole, and the word quaint seems to be the only one which can well characterize it.

It is from this strange idea of a human dress that our modern costume of to-day comes by regular descent; and it of right must come under the same general heading, for it certainly does not belong to the Greek idea of dress, nor to the Median robe order of costume, nor, indeed, if the truth must be told, to the quaint, but is truly a thing by itself. It is simply the very stupidest thing ever yet invented by the ingenuity or perverseness of man. It comes under neither of those two leading principles which should regulate all costume, viz., either to show the form and actions of the human frame, or to exhibit the form and folds of the dress with which it is clothed; or, to go to the third and only other way, to show mere "quaintness," as we have ventured to call it, where neither of the two first requirements of dress are aimed at. It would seem, indeed, absolutely impossible to conceive anything more ungainly and inconvenient than the present system of modern fashionable male attire—the "sustained splendor" of Mr. Disraeli—for it does not allow of the form to be seen; it is nothing in itself, there being no folds or drapery, and there is in it no sort of quaint interest to make up in any way for the loss of the two prime ideas in all dress. To confine our remarks to the ordinary fashionable male costume, we may take it for granted that the dress-up of a smart waiter at a big hotel or club may be taken as fairly typical of it. The arms and legs of the old Greek were left bare, for not living under Mr. Gladstone's rule they knew nothing of the "anthropomorphic element" in fine art: so that when they wanted to draw the human arm they were content, poor, simple, ignorant souls, to look at one, and the old Greek dress allowed of it. In our improved modern system of clothing, this it is clear cannot be done, for the climate, it will be urged, compels the covering of legs and arms. Be it so. Neither, again, does the form of the dress allow of the dress to show itself, and to become a thing of beauty *per se*, or even one of convenience; for what can possibly be more ugly or awkward than the semi-tight fitting sleeve of a common coat, or the still worse and more fashionable trousers? Quaintness will not surely be charged upon them, so that neither form, comeliness, nor oddity belongs to it or to them, and certainly not mere and simple utility. Fashion does all the work.

It would be useless to go into the merits of the world-renowned swallow-tailed coat—that pride of the smart waiter, and last hope of those who glory in being dressed. Of its convenience or beauty, no one perhaps did ever yet boast, any more than they have done or do of the tight-fitting boot or tall chimney-pot and so dearly fashionable hat. They are all things which the tyrant fashion compels everybody to wear and to be perpetually inconvenienced by. It really all seems to be typical of the art of the time of this latter part of the nineteenth century, when all real and genuine art has disappeared and given place to machinery and manufacture. It would be impossible to sink lower than we now are sunk in this country—at least, in all matters appertaining to art, whether high or low; and one means of rescuing things from this most deplorable state would be, as we take it, some improvement, or say merely change, in costume; and it would seem that the only channel through which any such change or improvement is at all likely or possible is in that of our army, and in the dress and appointments of soldiers.

The tremendous and disastrous failure of that gallant and so perpetually victorious army of France has been so sudden and unexpected that no man has had time to think anything about it, or how it has ever come to pass that so magnificent a body could have suffered and lost as they have done. May it be allowed us in this place to suggest *one* cause of it—the excessive neatness, primness, and fit of the clothes of the men; everything bran new, and of the brightest and gayest colors. The man was lost in his smart tailoring. The course of the war has been so rapid that there has been no time for any one to grow shabby enough to work, or do anything, or to think of his own personal and bodily self. In the old Italian wars of the first Napoleon, the soldier wore off the smartness of his smart attire before he found himself on the battle-field, was ready for work, and thought of himself and not of his dainty clothing—all so tight, and awkward, and inconvenient, and unfit for its stern purpose. What more important subject, then, can there be than that of art combined with utility in costume, more especially in the dress of the soldier? In it most surely there ought to be combined the two prime requisites—utility and convenience, and ease of movement with sightliness and artistic beauty, and appropriateness and harmony of colors. Cobden used to say that the French were so artistic a nation, and so clever in making the most of what other people would despise and throw away as useless, that they levied a sort of tax on the whole world in the matter of setting the fashions and showing the rest of the world how to make a dress, and then how to wear it after it was made; not, by the way, so easy a feat as one might be disposed to think; but it is to be feared that they have paid a fearful price for their artistic superiority, for what with this world-taxing smart dressing and Hyde Park generalship, the nation itself is all but well nigh lost, and their Emperor quite. It cannot be amiss, therefore, to draw attention to the art of costume, and to the best possible way in which the human body may be clothed so as not to impede its movements, and yet that this costume shall be at the same time beautiful in form and harmonious in color. In military dress these two principles are fundamental requisites, as no soldier will be, or ought to be, satisfied unless he looks like a soldier. The old Greek went out to battle with his limbs as free as possible, and with a dress allowing of the utmost ease and freedom of action and movement; and may it not be a good and useful question, in case of any radical change of costume, either in the regular army or in the volunteer force, or in the formation of any new regiment, to depart a little from the conventional and fashionable type of clothing, and aim at something better and more workable and appropriate? Humanity itself is, as things now are, absolutely blotted out by the unsightly costume it is compelled to wear; and pictorial art is impossible all the time there are no living exemplars to keep the artist's eye and hand to the work he has to do. In either of the three systems of costume-making we have named there is to be found abundance of precedent and examples to go by; and the difficulty, if any there be, will be in the number, and not in the paucity of examples. Of course it will be understood that all that has been said of a required change in military costume applies equally—nay more—to civil costume; and it is in the hope of seeing some speedy change in the dress of the soldier, now generally admitted as desirable, that these few hints on the subject of costume, and the need of beauty and harmony in it, have been written.

BRONZING COPPER URNS.—The surface, first made thoroughly clean and bright, is covered with a thick coat of rouge and water; when dry, the article is placed in a clear hollow fire (say a chamber of bricks, red hot) for a short time until the rouge has turned to the desired shade of color. Then the article is placed on a suitable stand, and polished with a soft brush and rouge powder and afterwards with soft leather. The tinning and soldering are subsequent operations.

NEW CAPITOL FOR THE STATE OF NEW YORK.

The site of the building at Albany illustrated in our present number is very commanding, being 170 ft. above the level of the Hudson, and has an area of ten acres. It is bounded on the south by State street, and on the north by Washington avenue, 100 feet in width. The land falling off rapidly to the north, south, and east, this building with its high walls, still higher pavilions, turrets, and towers, will be seen to advantage. In the exterior composition of the design, there is a general adherence to the style of the pavilions of the New Louvre, of the Hôtel de Ville of Paris, and the Maison de Commerce recently erected in the city of Lyons. The terrace which forms the grand approach to the east or principal front will form a striking feature.

The exterior is 290 feet long north and south, and 390 feet east and west. The floor immediately above the level of the plateau of the terrace will be entered through the porticos on Washington avenue and State street, and through the carriage entrance under the portico of the east front. The first or main entrance-floor will be reached by a flight of steps on the east front leading to the loggia, or hall of entrance, occupying an area of 60 feet by 74 feet, and 25 feet in hight.

Communicating directly with this hall are two grand staircases, which form the principal means of communication with the second and most important floor. On the left of this hall are a suite of rooms for the use of the Governor and his secretaries, and military staff. On the right are rooms for the Secretary of State, Attorney General, with corridor leading to the Court of Appeals.

On the second or principal floor will be placed the Senate and Assembly chambers, and the State library, all of which (in elevation) will occupy two stories, making 48 feet of hight. Rooms for the committees and other purposes will also be placed on this floor. The Senate Chamber will be 75 feet by 55 feet on the floor, with a gallery on three sides of 20 feet in width. The Assembly Chamber will be 92 feet by 75 feet on the floor, surrounded by a similar gallery, which in both chambers largely increases the areas of the upper portion. The library will occupy the whole of the east front of these two stories, and will be 283 feet long and 54 feet wide. This will be the most attractive room in the building. Its large area and lofty proportions, its view towards the north, east, and south, overlooking the city, and bringing in the valley of the Hudson and its western slopes for miles in each direction, will make it a favorite place of resort at all seasons of the year The main tower is 66 feet square, and about 320 feet in hight. In the center of the building will be an open court 137 feet by 92 feet. This court will be an attractive feature, being treated in the same manner as the exterior fronts, and will no doubt ultimately have its fountains and be surrounded with statuary. The entire structure will weigh 150,000 tuns; but the great inequalities in the hights of the various walls, and the distribution of the enormously heavy fire-proof floors, and roofs sometimes laden with deep snows, will bring very unequal weights upon the parts of the foundation adjacent to each other, and without great care they would settle unequally and crack the walls, as is so frequently seen in modern private, and even many public buildings. The stone foundation of the walls commences on concrete, and is made of large blocks of close-cut limestone of from two to six tuns weight, laid in regular courses, the first one nearly the width of the concrete, and each successive one narrowed by offsets, until the wall is contracted to the width necessary to support the superstructure, arranged so that they will afford an equal bearing on each side of the line of the centre of gravity of the walls and the weights which they are to sustain. The work has been carried on very rapidly under the direction of the Commissioners, Messrs. Hamilton, Harris, John V. L. Pruyn, O. B. Latham, James S. Thayer, Alonzo B. Cornell, William A. Rice, James Terwilliger, and John T. Hudson. The architects are Messrs. Fuller & Laver, of Albany; and Mr. W. J. McAlpine is the engineer.

The buildings are being constructed by day-work, under the immediate superintendence of Mr. J. Bridgford, a well-known builder.

CAPITOL OF THE STATE OF NEW YORK.

Log Dams.

These, in a locality where timber is plenty, are cheapest, and easiest to build. If the bottom be rock or other good foundation, begin by laying a large log across the stream, at the down-stream face of the intended dam; this you will extend from bank to bank, by laying one log at the end of another, having each piece as long and large as possible, taking care to clear away everything that will wash out from under, and where hollow places occur, put short logs across under, so as to give it a safe foundation. Then put short logs across this, six or eight feet apart, their butt ends lying upon the log and their top ends upon the ground, up stream from this; you will now place another tier upon these, above and parallel with the first one, but inclining slightly up stream; then another set of short ones, their butts upon the last tier, and top end upon the ground beside the first cross ties. These must be a little shorter than the first ties, to admit of laying a smallish log on the ends of the first ones, and up into the angle formed by the second ones; you can now lay "skids" upon these small logs, and proceed to roll up your third tier of large logs, along the faces. Care must be taken to notch them a little where they cross each other, to insure their lying safely, or block them secure with a stone or piece of wood where the small ends come.

Your next tier of ties must be notched well down at the small or up-stream end, and you must proportion your two parallel tiers of logs and these ties, so that the front or breast will rise enough faster than the rear to keep it like a portion of an arch, and have the cob-work, when finished, fit the rafters; that is, the larger tier of logs at the breast should support the rafters near the top, while the smaller tier at the rear should support them near the middle, and the lower ends of the rafters rest upon the rock or bottom. It will be seen that a breastwork, so constructed, is like a portion of an arch or circle, of which the foot of the rafter is the center, and the front of the breastwork the circumference; and the more weight is put upon it the stronger and more solid it becomes Care must be taken not to carry it too high, or steep, for the length of rafter (or radius), as in that case the force of water behind might slide it away in a body.

If logs are convenient, this may be covered with them, like rafters, touching each other, taking care to fit them well and chink the cracks. The moss on trees and old logs, in damp places, is good to chink these cracks, as it grows and increases in such a place, instead of washing out. Cedar bark, pounded soft like oakum, is also good. Such a covering requires but little graveling to make it tight, as the pressure of the water forces the packing down into the seams formed by the round logs, where it is not easy to wash it out, or displace it by any other means.

Such a dam is cheap, strong, and durable, where there is a constant supply of water; but on small streams liable to dry up in summer, and allow the logs to dry, and heat, and check, they very soon rot, and are therefore not to be recommended for such a situation.—*Practical Millwright and Miller.*

Henry Ward Beecher on Interest.

No blister draws sharper than the interest does. Of all industries none is comparable to that of interest. It works all day and night, in fair weather and foul. It has no sound in its footsteps, but travels fast. It gnaws at a man's substance with invisible teeth. It binds industry with its film, as a fly is bound in a spider's web. Debts roll a man over and over, binding hand and foot, and letting him hang upon the fatal mesh until the long-legged interest devours him. There is but one thing on a farm like it, and that is the Canada thistle, which swarms new plants every time you break its roots, whose blossoms are prolific, and every flower the father of a million seeds. Every leaf is an awl, every branch a spear, and every plant like a platoon of bayonets, and a field of them like an armed host. The whole plant is a torment and vegetable curse. And yet a farmer had better make his bed of Canada thistles than attempt to be at ease upon interest.

It is said that a good way to polish plaster of Paris castings, it is coat them with melted white wax, and then place them before a fire until the wax is absorbed; a considerable polish can then be obtained by friction.

Improved Spring Bed.

The production of a spring bed which should afford no haunt for vermin, and which should be perfectly easy and accommodating to the form, distributing the pressure equally over the entire surface, and which should at the same time be far more portable than the spring beds hitherto used, has been the object sought in the invention shown in our engraving.

It is claimed that all these objects have been attained in this device, and that it comprises all the desirable features of such beds with none of their defects. We think after a personal trial of this bed in our own residence, that these claims are fully substantiated.

The principle of construction adopted is the connection of all the springs together, so that no one can be compressed without at the same time drawing upon the others. This is accomplished by making four abrupt bends in the upper and lower convolutions of each spring, as shown, and connecting these bends by links, as indicated in the engraving.

The springs are attached at the bottom to a series of slats, as shown in the engraving, and are left entirely uncovered. In use a mattress is laid upon the springs, and when it is desired to move the bed, or pack it for transportation, the slats and springs may be rolled up together as easily as a mattress and corded together so as to be very compact.

These mattresses are on exhibition at the Fair of the American Institute. For further information address David S. Mallory, manufacturer, 385 Main street, Poughkeepsie, N.Y.

IMPROVED SPRING BED.

Manufacture of Portland Cement.

Portland cement was introduced to public notice under a patent by an Englishman nearly fifty years ago; and we have hitherto possessed a partial monopoly in its production, inasmuch as we have fortunately inexhaustible beds of the raw material from which it is made, and an abundant supply of fuel necessary for their economical manufacture. It is strange that under these conditions French engineers should have obtained the start of their professional *confreres* in this country, and that they should have been the first to demonstrate by experiments, and subsequently by the erection of magnificent harbor works on their seaboard, the valuable properties of this excellent constructive material. We may date the *extensive* employment of Portland cement in England from the commencement of the metropolitan main-drainage works. During the last fifteen years the manufacture of Portland cement has gone on steadily increasing, until at the present day we find that little short of 400,000 tuns per annum are made in the county of Kent—the center of cement manufacture—irrespective of the productions of many minor factories in different parts of the country.

The chemistry of the setting of Portland cement is by no means so well understood as it ought to be. There is no doubt, however, that, like the hydraulic lime and natural cements, it is, chemically speaking, a double silicate of lime and alumina; silicic acid is generated by the hydration of the cement, and forms insoluble salts with the lime and alumina bases. It is a curious fact that Portland cement hardens more rapidly when salt water is employed. According to Schweitzer, 1,000 grains of sea-water in the English Channel contain 27 060 grains of chloride of sodium; soluble silica has a known preference for alkaline bases, and it is not improbable, when the cement is hydrated with sea-water, that the chloride of sodium is decomposed, the silicic acid of the cement combining with the sodium and oxygen of the water, and forming thereby a silicate of soda, or a species of crude glass.

Portland cement is of two classes, which, for the sake of distinction, may be termed "Engineers'" cement and "Plasterers'" cement. The former is the more costly; it is usually described by manufacturers as "best heavy tested"; it weighs from 112lbs. to 120lbs. to the bushel, is slow setting, and of great strength: the latter is a light cement, quick setting, and of inferior strength when compared with the other. It must be understood that our remarks apply exclusively to "Engineers'" cement.

Portland cement is made from chalk and alluvial clay; the factories on the banks of the Thames use white chalk, those on the Medway gray chalk; the latter is probably preferable, inasmuch as it contains large quantities of silicious matter. Mr. Read, in his treatise on "Portland Cement," says that "the present and safest proportions, provided both chalk and clay are selected free from sand, are four parts of chalk from the Medway (gray), or three parts of Thames (white), with one of clay by measure." These materials are placed in mills of simple construction, each having a circular pan, 6ft. in diameter and 2ft. deep, in which two "edge runners," 4ft. 6in. in diameter, are kept continually going; a constant stream of water flows into the pan, and as the "edge runners" revolve, the chalk and clay are thoroughly ground, and, being thus converted into a fluid state, they filter through a band of fine brass-wire gauze fixed to the side of the pan, and flow through wooden "launders" into tanks or settling reservoirs. One washmill will feed four tanks, each of which is about 100ft. long, 40ft. broad, and 4ft. deep. When one of these has been filled in the manner just described the same process is applied to the others in succession. About three weeks after the tanks are filled the whole of the materials will be precipitated, the clear water being drained off in the mean time through a small weir in the brick side of the tank; the residuum is a plastic mixture of the consistency of "putty," and not much unlike it in color. The next process is to convey this precipitate from the tank to the "drying floors," over which it is spread in a layer about 6in. thick; each floor is 40ft. by 30ft.; it consists of an outer skin of boiler plates resting on a series of brick ovens and flues. The object of this arrangement is to render the plates sufficiently hot to effect the rapid desiccation of the water from the superincumbent layer, a process generally accomplished in about twelve hours. The materials having thus been thoroughly dried are ready for conveyance to the kilns. The "charge" consists of alternate layers of coke and raw materials, the burning generally occupying thirty-six hours. When the contents of the kiln becomes sufficiently cool, the "clinkers," or cement stones—for the mixture has now assumed that form—are drawn and removed to a floor where the larger pieces are broken, and the whole of the burnt materials are then conveyed to the hoppers of the grinding-mills, where, passing under rapidly revolving horizontal burr-stones, they are ground into an almost impalpable powder. The cement issues from the mill at a temperature of about 160°, and the now manufactured material is wheeled away, and placed in a layer from 2ft. to 3ft. thick over the floor of a cool shed; it is subsequently packed in casks or sacks for conveyance from the works. The essential conditions for the manufacture of good Portland are: 1. The chalk and clay should be thoroughly mixed in the wash mills, and the fluid materials delivered by "launders" over the *entire* area of the settling tanks. 2. The contents of the kilns ought to be burnt equally throughout. 3. The burnt materials should be ground very fine. 4. After coming from the mill the cement should be spread over the floor of a shed, and allowed to remain there for *at least* a fortnight previously to being packed into casks or sacks.

The strength of Portland cement increases as its specific gravity increases; the tensile tests are usually made with briquettes the standard size for the neck being $1\frac{1}{2}$in. by $1\frac{1}{2}$in.; and it must be understood that all experiments referred to have reference to the weight necessary to sever $2\frac{1}{4}$ square inches of neat cement.

It appears from Mr. Grant's valuable paper, read before the Institution of Civil Engineers in December, 1865, that Portland cement gains from 20 to 30 per cent in strength by setting under water; it is usual, therefore, to place the best briquettes in water, after gaging, and to allow them to remain there until they are to be tested. The following table has been compiled from a recent series of experiments; it shows the average tensile strength of Portland cement as compared with the natural cements; the test blocks were of standard size of $2\frac{1}{4}$ square inches, and placed in water as before described:

	Weight per bushel.	Breaking weight two days old.	Breaking weight four days old.	Breaking weight seven days old.
	lbs.	lbs.	lbs.	lbs.
Portland cement	119	568	914	1,024
Roman cement	76	200	240	280
Medina cement	69	280	313	313
Cement de Zumaya (Spanish)	84	306	...	409

The *Builders' Trade Circular* vouches for the accuracy of these figures.

Mr. Grant's tables show conclusively that the strength of gaged Portland cement increases with age; from his experiments it appears that the breaking weight of rest blocks, one week old, one year old, and two years old, are as 1, 1·5, and 1·62. The ultimate maximum tensile strength has not as yet been ascertained; experiments are, however, being conducted periodically with a view to determine this important point. Mr. Grant gives the average tensile strength of cement weighing 119lbs to the bushel as 777lbs., whereas we give it as 1,024lbs., the excess of the breaking weight as recorded by us may probably be accounted for by improved manufacture since Mr. Grant's experiments were made

Portland cement now forms an important item in the list of our manufactures, but even now its valuable properties are not as fully appreciated as they deserve to be.—*Eng. Mech'ic*

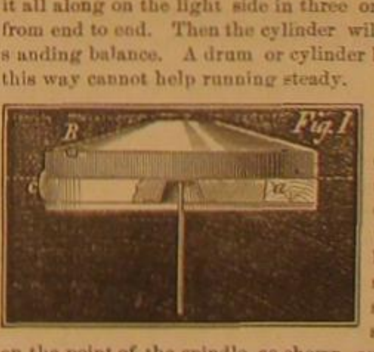
Correspondence.

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

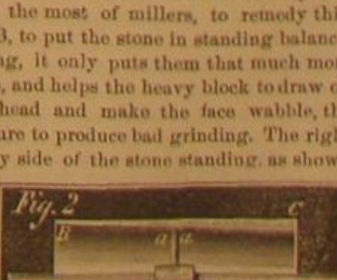
Balancing Cylinders, pulleys, and Runner Mill-stones.

MESSRS. EDITORS:—I see in the SCIENTIFIC AMERICAN of Sept. 3d, page 148, present volume, W. O. Jacobi and J. G. F., are trying to instruct C. E. M. how to balance his cylinder or shaft and pulleys. But either one of the parties does not give C. E. M. the right plan to balance a cylinder perfectly, although they both have a pretty good idea of the matter. I have had a good deal of experience in balancing machine cylinders and runner millstones.

To balance a pivot millstone true is something very nice to do, and no one that does not understand it will ever get them right unless he does it by accident. No cylinder can ever be balanced perfectly true after being once built and finished, if long. If it is a narrow or thin wheel, it can be balanced true, providing its axles and everything else are done in workmanlike manner. But a long cylinder must be built and balanced all at the same time. For instance: you want to build a cylinder two feet long, with a spindle three feet long, so as to allow bearings on each side, with two heads for staves to be fastened on to form a drum; or it may be longer or shorter, with more or less head. The first thing to be done is to turn up the spindle true just as it ought to be for the purpose intended. Then make the heads, bore, and finish them just as they ought to be. Then have your balancing bars right, and put on the first head you want to go on the spindle, exactly in its proper place, and fasten it then lay the spindle on the balancing bars and balance the head perfectly. Then put on the next head and balance as before, and so on till you get everything on. In this way every head wheel or pulley gets balanced separately. Then I will warrant you this spindle and head will run in balance at any speed. It will be both in running and standing balance. The next thing is, if you want to make a drum of this, to make all the staves just as you want them, all ready to be fastened on the heads, whether iron or wood. If they are to have any attachments like spikes as a thrasher cylinder, the spikes should all be put in, and every thing finished just as they must be. To balance these staves I have two horizontal points, like lathe centers, very fine and sharp, just strong enough to bear the weight of the staves. I then find the middle of the stave lengthwise and the middle sidewise, and insert a scribing awl, if of wood, or a center punch, if of iron. I then put them in the balancing machine, with the points in these holes; one of the points is worked like a lathe, with screw, backwards and forwards to admit the center. By this means I find the heavy and light ends of each stave, then add on to the light end till they balance endwise. I don't care whether they are all of a weight or not after they are all balanced in this way. I fasten them all on cylinder heads as they are to be; I then lay the cylinder on the balancing bars, find the heavy side for standing balance, and whatever it takes to put it in standing balance, I divide it all along on the light side in three or four different parts, from end to end. Then the cylinder will be in running and standing balance. A drum or cylinder built and balanced in this way cannot help running steady.



The pivot millstone is the hardest machine to balance of any, and next in order of difficulty is the wide-cast band pulley, with one set of arms. See the millstone in Fig. 1. If the stone was swinging on the point of the spindle, as shown, and there was a heavy block put in at *a*, the stone would hang down at that point, while standing; but if you should run the stone up to its proper speed, the heavy block at *a* will draw that side up on a line with the cock-head. A millstone left in this way will never grind well, and the most of millers, to remedy this, will put in weight at B, to put the stone in standing balance, which is entirely wrong, it only puts them that much more out of running balance, and helps the heavy block to draw on a line with the cock-head and make the face wabble, the greatest of all faults, sure to produce bad grinding. The right way is to find the heavy side of the stone standing, as shown in the engraving. If it is heavy on one side it is always between the point of cock head and the face of the stone. If the stone is built right and the irons put in the center, I always find what weight it will take to put the stone in standing balance by laying iron at B; then I fasten that much on the stone, at *c*



about half way between the cock-head and the face of the stone. This puts them in running as well as standing balance, as the standing balance will counterbalance with the heavy block at *a*.

After putting on the iron at *c*, and the stone is in standing balance, or nearly so, I raise the runner by the spindle three quarters of an inch above the bed stone, the back having been previously turned true while grinding the face of the stones together. The driving iron should drive very true at both ends, back and forth. I then run up to grinding speed. I can now see by the eye whether the stone runs true on its face or back; if it seems to run pretty true it is about right, but if it wabbles a little too much I hold a pencil from a rest near the back, and let the high place touch the pencil four or five times; if it touches all on one side I add in a little lead at the point where the pencil touched out against the band and as near the top as is safe to prevent its flying out; and I also put as much more lead on the opposite side down as near the face as it can be put, say, fasten it to the driving band, repeating this till they run true on the face. Then the miller can make good flour with common care.

Such a pulley as is shown in Fig. 2, if it should be cast or made in any other way, bored, and turned up and hung on the shaft, no man could guess where the weight must be put, even to put it in standing balance. At *a a* it might put it more out of running balance; the rim being a little thicker at C C, it would be best to put weight at B B. If the rim is the heaviest at C C, and you would put it in standing balance at *a a*, when the pulley is put in motion, the heaviest parts at C C will throw each end of the spindle up and down in their bearings, and if the spindle is not stiff it will spring and make matters worse. This is the case with all cylinders, after they are made you cannot tell where to put the balance, as materials are sometimes heavier at one place than another, even if they are all of a size. The only way is to balance them as you build them. Anything to run with a high speed ought to be thus made. PHILIP STRICKLER.

Timberville, Va.

On the Use of Tin for Fruit and Culinary Purposes.

MESSRS. EDITORS:—If it would not be regarded as saying more upon the subject than its importance demands, I should like, as a tinner of forty years' experience, to say something upon the tin fruit can and kindred subjects, not so much with a view of allaying apprehension as of stating such facts as are within my knowledge; and first I would remark that tin ware, on account of its lightness, durability, and adaptability to almost all culinary purposes, has driven almost everything else out of every well-ordered kitchen, and if there is any danger to health from its use, this danger is greater in any other article than in the fruit can, because all other articles are exposed to the corroding effects of atmospheric influence, while the fruit can, the moment it is sealed, is secure from the influence. Let me here remark that it is the opinion of some very intelligent persons that the thorough amalgamation of lead with tin, as in the manufacture of solder, neutralizes or renders inoperative the power of the lead, and this view receives considerable weight from the fact that the article so extensively used and highly prized by many of our best housekeepers, known under the name of Britannia ware, which is an alloy of tin and lead, has never been known to injure any one. How little do those housekeepers dream, while regarding with pride their well filled cupboards, that there lurks underneath the beautiful polish a poison deadly as the upas. The new article of manufacture, the tin-lined lead pipe, so confidently recommended as free from all danger, is only so in regard to liquids passing through them. In a well or cistern if the outside is not also protected it will oxidize by contact with the atmosphere, and the agitation or vibration from pumping will cause this poison to fall into the water, whence it will occasionally pass up through the pipe and cause mischief.

Many people have in their composition so much of the timid, the suspicious, and the apprehensive that they undergo an amount of imaginary suffering unknown to those of "sterner mold," and it is curious to witness the contradictory and inconsistent conduct of some of these persons. An acquaintance of mine, for instance, suffers an amount of mental laceration that is affecting to behold, from an apprehension that his store rooms produce an atmosphere unfit for breathing purposes; yet he sees nothing at all unhealthy or injurious in the foul stench of a vile cigar, and will absolutely luxuriate in a cloud of tobacco smoke that would stifle any decent being.

Tin cans for family use should be made of the best charcoal tin, the seams of the body locked rather than soldered, and the tops and bottoms well fitted and soldered on the outside. When emptied of their contents they should be thoroughly scalded and carefully dried, and the caps should be replaced upon them. They should then be put away in as dry a place as possible until they are wanted again. If these precautions are observed, their durability will greatly exceed that of most articles of tin ware now in use.

Delphi, Ind. N. SMITH.

Hub Boxes on Railway Cars.

MESSRS. EDITORS:—In your issue of August 20, 1870, I notice an article complaining of hot boxes, and the query, Can the heating of journals be remedied? Please allow me to state what I consider the principal cause on most railroads. Journals and the boxes in which they run are but too often neglected, so long as they run without any apparent trouble. In many shops a pair of wheels will be placed under a car by (often the case) a carpenter of but little railroad experience, and of no practical knowledge of how a brass should be fitted to the journal, and also without knowing for certain that the packing leathers in the back of the boxes fit the shafts and are oil tight. One thing is certain; if good Lightner boxes have good, well-fitted brasses, not Babbitt, done by a skillful machinist, with oil-tight leather washers, and if the centers of shafts in each truck in the train be packed with salt, hay, tallow, and oil, they will run on any road for months without heating, and seldom need oiling. C. STEWART.

Aspinwall.

Rock Asphalte Paving.

MESSRS. EDITORS:—Noticing in your issue of 24th ult. an article from the pen of Dr. Hayes on "Concrete" (or asphalte) paving, I forward an account of the pavement now in well-merited esteem and being largely adopted in the city of London—viz., that of the Val de Travers rock asphalte, which, having proved generally its entire success in Paris, rapidly superseding the plan of macadamizing and stone pitching there, and experimentally tried for the last eighteen months in the former city, has shown clearly its great value, and is now being substituted for the granite pitching for a large portion of Holborn and the entire Cheapside and Poultry, where in either the wear and tear of the traffic exceed that of our busiest streets.

The original asphalte, as adopted by the Continental engineers for paving purposes, was a species of bituminous rock found at Seyssel, on the Rhone, whence its distinctive name, which, however, as we all know, did not prove in every respect satisfactory.

This, however, led to further experiments, and a hard limestone rock was found in the Val de Travers, canton of Neufchatel, Switzerland, containing from twelve to thirteen per cent of bitumen equitably diffused throughout, and consequently allowing a more perfect solving and subsequent hardening process than any of the earlier asphaltes ever could command.

Besides the Val de Travers and the Seyssel there are, strictly speaking, of mines of bituminous materials known, but those of Seyssel Volant, of Auvergne, and of Maestu, near Vittoria (Spain).

The last three are not sufficiently homogeneous in their composition to succeed for paving purposes, while the Seyssel contains but six to eight per cent of bitumen, which is not a sufficient proportion to enable its particles to consolidate quickly and thoroughly under the action of heat and compression. Again, in the Pyrimont Seyssel mine, while the proportion of bitumen is extremely small, the irregularity of its bituminous impregnation, as well as the variety of its associate minerals, rendered its use difficult and unreliable; consequently its endurance was uncertain, and, unless a much more stable material could be adopted, the success of asphalte, once so generally employed by the ancients, was improbable.

Many of the recent compound imitations under the name of asphalte, but consisting of coal tar and such inferior pitch, mixed with lime, chalk, sand, or gravel, have brought into discredit the true material, and it was in the face of great prejudice that the Val de Travers could be even given a fair trial in the crowded streets of England's metropolis. In May, 1869, however, 485 square yards of the Val de Travers compressed asphalte was laid in Threadneedle street, over which passes a traffic of 2,500 vehicles daily. A year and a half afterwards no perceptible wear could be observed, while openings purposely cut in its surface and repaired within fifty minutes were barely visible, and as perfect as the original bed.

The result has been that over 1,000 of the leading firms, banks, and companies, petitioned for its extension on all the city streets, urging that its "freedom from the roar of traffic, and its cleanliness, safety, facility of construction and repair, and less cost, as compared with granite, wood, iron, or any known variety of paving, rendered the desirability of extending its use throughout the city as imperative." And the report of the street committee indorsing the Val de Travers asphalte on all these points, the change is being already effected.

The term "compressed" asphalte is used to distinguish it from those asphaltes where the material is boiled to a liquid, which this is not, being spread upon the surface in the form of a fine powder, and never liquefied.

In its use for paving the natural rock is first ground to a powder and subjected to an intense heat in a revolving boiler near the place of use, then taken and spread over the prepared surface to a depth of but two inches, and compressed with heated irons into a homogeneous mass without joints and entirely impervious to moisture.

As it cools it hardens to the original density of the rock, and for my own satisfaction I tested the fact that in less than one hour from the spreading of the powdered material the vehicles were traversing its surface without causing injury or impression.

The foundation used is Portland cement concrete, say eight inches thick, on which half an inch of thin mastic is run to economize the asphalte, which is then spread and leveled.

The advantages claimed for the Val de Travers are sevenfold:

1. It produces neither dust nor mud.
2. It is perfectly noiseless.
3. It diminishes, by a large percentage, the draft on horses.
4. It reduces the wear and tear of vehicles to one half, the annual saving in Paris being computed at over three million dollars for horses and carriages.
5. It increases the comfort and rapidity of travel.
6. Its economy and durability.
7. It is unaffected by heat or by frost.

In addition to its uses for paving it is in much demand for terraces, conservatories, slaughter houses, court-yards, breweries, fire-proof floors, docks, fortifications, powder magazines, etc.

Now, if this wonderfully valuable material can be readily shipped to England, why not to this country, or, if the increased freight, exchange, etc., render it too expensive for our use, let our numerous inventors follow out the suggestions of Dr. Hayes, which are surely based on correct grounds, and with bitumen, chemically combined with calcareous earths, devise a compact, artificial asphalte, unaffected by alternations of heat or cold, which, hardening readily, shall, by its semi-elasticity, tenacity, and cheapness of production, prove its advantages, reap a fortune for its discoverer, and earn the blessings of all unborn citizens.

New York city. GEO. E. HARDING.

Inventors who are Satisfied.

FREEPORT, ILL., Sept. 21, 1870.

MESSRS. MUNN & CO.:—I thank you for reminding me of the extension of my patents, but I cannot take the oath necessary, believing I have received a reasonable compensation on all my patents, and have sold out my reaper establishment; but I find exercise absolutely as necessary for me as food, and therefore fancy farming, or rather vinyarding, which has not as yet been very successful in this country. I find in it ample exercise and study for the mind in trying to solve the mystery. In trying all sorts of experiments, I may perhaps hit on something useful. It is a very pleasant occupation at all events. Yours, etc., P. MANNY.

RIGGSVILLE, PA., Sept. 22, 1870.

MESSRS. MUNN & CO.:—I take much pleasure in informing you that I have received my letters patent, all in good order, and I am a thousand times obliged to you for your honest, upright, and careful attention to my business. I praise the bridge that carries me safe over. I would sooner pay your fees all down, without a receipt, than to trust my business in other hands. I shall recommend your Agency and paper without your request, for I think it my duty to do so.

JAS. K. B. SOLOMON.

CHESTER, PA., Sept. 15, 1870.

MESSRS. MUNN & CO.:—Please accept my thanks for the very efficient manner in which you have transacted the business intrusted to you, namely, procuring patent for steam piston packing. If my experiments prove successful, I will require your assistance again.

Respectfully, JOHN KEESEY.

DESIGN PATENTS.

DECISION BY JUDGE BLATCHFORD.

The bearing and scope of design patents have, in a recent suit of the Gorham Manufacturing Company *vs.* George C. White, selling agent of Rogers & Bro., for the infringement of a design patent, been more clearly defined than on any previous occasion.

The letters patent in question cover the invention of a design for a spoon and fork handle, not only as far as the configuration or mere outline, or the ornamentation on the face of the same is concerned, but as a "unit," which was in this case construed to be the combination of configuration and ornamentation.

The defendant has sold spoons and forks whose handles were, in outline, more or less similar to, but in ornamentation entirely different from the design represented in complainant's patent. And although the complainants sought to prove by witnesses that the respective articles or designs resembled each other in *general* appearance, such testimony was held to be ineffective, as long as persons in the trade will not be deceived by the resemblance into taking an article of the one design for an article of the other. The letters patent in question, covering, by the claim, the design as represented, were held to protect, not the result or appearance of such design, but the *means* of producing the result or appearance, so that even if the same appearance is produced by another design, if the means used to produce it are different from the means used in the prior patented design to produce such appearance, the latter design is not an infringement of the patented one. The suit was consequently dismissed.

The chief point settled by this decision, is that design patents must be construed, as to their scope, in the same manner as mechanical patents—that is to say, if a patented design consists of a new addition to an old form, and is so claimed, the patent will cover the addition only, and not its connection with the old form; if the design, however, is patented as a *unity*, it is for a *combination* of *all of* its parts, and any other person may use any of its parts, less than the whole, and not be an infringer.

The same rule, as applied to the matter of infringements will, of necessity be and has in fact always been, a guide to the Commissioner of Patents in determining the question of interference between different designs. He examines not the effect produced by a design, but the means used for producing the same, and if the means employed to the same end differ, they entitle each applicant to a patent, provided that the stated novelty is not disproved.

A KANSAS SILK FACTORY.—According to the Detroit *Tribune*, the first velvet factory in the United States has been started by a French colony in Kansas, at the town of Franklin, eighteen miles southwest of Ottawa. The colony began operations last summer on the co-operative plan, and have already, besides their manufactory, comfortable dwellings, stores, and shops, and farms under full cultivation. The pioneer in this enterprise, M. Veleton de Boissiere, contemplates supplying his community with other looms, not only to increase the manufacture of ribbons, but also to enlarge the products of his community by including sewing silks, tassels, trimmings, and other dress materials, which are fast becoming indispensable even beyond the Mississippi.

HOW RAILROADS ARE MADE.

BY JACOB ABBOTT.

THE CHARTER.

When the grant is obtained from the Legislature, it is inscribed in a very distinct and legible manner upon parchment, and authenticated by the proper signatures and seals, and is delivered to the Company. Such a document as this is called a Charter.

THE COURSE OF THE ROAD.

The general course of the road is usually prescribed in the charter. The precise line, however, cannot be determined without much careful study and examination, and many accurate surveys. There are a great many different considerations which have to be taken into the account in deciding the question. If the only thing to be inquired into was the conformation of the land on the different possible routes, with a view to determining on which of them the track could be laid most easily, with the gentlest inclines, and the least expense for bridges, culverts, and the like, the question would be very simple. But there are many social and business considerations to be regarded—such as the position of towns in the neighborhood of the line—not only of those already existing, but of those which may be brought into existence in in consequence of the road; the points where freight of different kinds, and passengers from the surrounding country, may most exsily be concentrated; the facilities for the construction of stations; and other similar points.

Sometimes, indeed, it is found, after making a careful calculation, that it is better to go through a hill by means of a tunnel, rather than to make a circuit to avoid it. The calculation, in this case, is very complicated, involving, as it does, a great number and variety of considerations—such as the nature of the formation; whether consisting of solid rock or of beds of sand or gravel, which is to be cut through, or of loose and friable strata of any kind, requiring an arch of masonry to sustain the roof, as seen in some tunnels; the saving of fuel and of time in the subsequent working of the line by going straight, and on a level, instead of pursuing a devious course up and down inclines; and, finally, the advantage of not disturbing the public roads on the surface, or the private property which would have to be paid for,and of avoiding the necessity of building bridges or culverts which might be required on any feasible route that would avoid the hill.

In the same manner, a complicated calculation has to be made, to determine whether it is best to shorten a distance by constructing an expensive work for carrying the line across a river, a marsh, or a pond, or to avoid the obstacle by a circuit and save that money.

All these things, which have to be taken into the account in the calculations which the directors have to make, would seem to render the case complicated enough,but the difficulty and embarrassment are vastly increased by the number and variety of conflicting interests which are brought into action. These interests are, of course,much more important,and much more serious, in the pressure which they bring upon the directors in the old and more densely populated countries in Europe, where land is much more valuable, and towns more numerous, where rich estates, costly gardens, and elegantly ornamented pleasure grounds are more frequent, and more highly valued than with us. One line of towns competes with another, each wishing to have the road pass through them. One nobleman, of great landed proprietor contends against another, each wishing to keep the road away from his parks or gardens. The baron trembles for his castle, for fear that the road will cut through the grounds of it. The farmers adjoining him tremble lest the road should not come that way, and so deprive them of the opportunity of sending their produce conveniently to market; and different manufacturers, who cannot all be accommodated, severally urge the directors to run the line here, there, or in the other place, each wishing to secure facilities for himself in bringing materials to their establishments, and taking away the manufactured goods.

All these things the directors have to consider before they can decide upon the location of the line; and a very perplexing and embarrassing work they often find it.

GENERAL SURVEY.

The principal towns through which it is finally decided that the line shall pass, form usually fixed points for the track, both in respect to position and level, so that the construction of the line going from one town to another,becomes, as it were, in some respects, a distinct and independent work. Of course, the best determination of the track, were it practicable, would be in a direct line from one terminus to the other, and a uniform incline, in case of any difference of level. But this is seldom possible. The track must rise and fall, to follow gentle but extended undulations in the land, and deviate to the right or to the left, to avoid all high hills and deep valleys,and sometimes to avoid exceptionally valuable estates, the traversing of which would involve too great an expense for damages. To enable the directors to judge intelligently on these points, a careful survey of the country must often be made, and accurate maps and profiles constructed, showing not only the natural scenery,such as the course of the streams, the positions of the villages, the situations of forests,marshes, ledges of rocks, and other such characteristics, but also the differences and the exact gradations of level in every part.

TRIANGULATION.

All surveys of land for such purposes as this are made by a very curious process called triangulation. Very few persons—except those who have had their attention particularly called to the subject—have any distinct idea of the nature of this process; and yet, after all, it is very simple in principle, though very curious, and is very easily understood.

The method consists in dividing the whole territory of the country to be surveyed, into triangular areas, by means of signal posts, set up at proper intervals on the summits of hills, or on any commanding positions, and connecting these stations by imaginary lines. These lines are so drawn, however, and so connected at the points where they meet at the stations, that each side of every triangle forms, also, a side of the triangle next to it. In other words, the triangles are formed by sets of lines radiating from the same points—namely, the signal posts on the eminences above mentioned.

The reason why the triangle is employed for this purpose in preference to any other figure, is, because it is so much more easy to be measured with accuracy than any other; and the reason why it is so much more easy to be measured, is, because the work may be done chiefly by the measurement of angles; and angles may be measured much more easily and accurately, on a great scale, than lines.

DIFFERENCE OF BEARING.

The angle formed by two lines running from any station on a hill or mountain,to objects in the field of view, is simply the difference of bearing of those objects. Now, if an observer stands at a signal post on a mountain, and sees the spires of two villages at a distance across the country, he can measure the exact bearing of each of the spires from the place where he stands, and can obtain thus the difference of direction of the two lines running toward them, very easily, and with great precision, by means of extremely accurate instruments constructed for the purpose; and could do it, moreover, in a moment, without leaving the spot where he stands. On the other hand, to measure the distance of one of the spires by means of a rod or chain applied to the ground, would require him to scramble down the sides of the mountain, over rocks and precipices, and to traverse the intervening country, through forests and bogs, perhaps, and over all sorts of impediments. The work would be, in all cases, one of great difficulty; in many cases it would be impossible, and without the expenditure of great labor and expense in the mode of performing the operation, there could be no reliance whatever in the accuracy of the result.

This is the reason why it is so much easier, in surveying, to measure angles than lines.

Still, it is not possible, wholly, to dispense with the measurement of lines on the earth's surface, in surveying. There must be one line measured for every survey as a means of beginning the calculation. One line being thus measured by mechanical means,and made one of the sides of the first triangle, the other sides of the first triangle, and all the sides of all the other triangles, can be obtained by calculation from the measurement of angles alone.

THEORY OF THE CALCULATION.

A glimpse of certain mathematical properties of the triangle, on which these calculations are based, may be obtained by means of the supposition that two huntsmen, standing at a certain distance from each other, are aiming at the same mark. Each one is pointing his gun in a certain direction—that is, so that it forms a certain angle with the line we may imagine to be drawn between them. Now, it is plain that if the mark is moved from its position in any way—whether it is carried farther off or brought nearer, or moved to the right or to the left—one or both of the huntsmen would have to alter his aim.

In the same manner, if the distance between the huntsmen is increased or diminished, while the position of the mark remains unchanged, then, too, the aim must be changed.

In other words, it is plain that all the dimensions of the triangle are controlled, or, as the mathematicians express it, determined, by the length of one side, and the bearings from it of the other two sides; in other words, by one side and the adjoining angles.

PRACTICAL SOLUTION.

This principle, so obviously true, may be reduced to practice by a very simple method. We have only to draw a triangle upon paper of the same proportions and form with the one on the field, and then measure the two unknown sides by the same scale that was used in laying down the known side. For instance: suppose that the distance from one huntsman to the other was found to be sixty paces. We conclude to take for the scale a tenth of an inch to a pace, which would give sixty tenths of an inch, or six inches for the length of the corresponding line upon the paper. Then, from the two extremities of this base line, we draw two other lines at the same angles of inclination with it as were made by the lines of aim of the two guns, and then prolong these lines until they meet.

We shall now obviously have upon the paper a triangle of the same form and proportions with the one imagined in the field, and we have only to measure the two lines converging toward the mark by the same scale to which the first line was drawn—namely, one tenth of an inch to a pace, to ascertain the distance in paces from the station of each huntsman to the mark

INACCURACY.

It is plain that the principle of this operation is perfectly correct in theory, but the imperfections in the methods of measurement, as described above, would render the result quite uncertain as to accuracy. Pacing gives only a very rough approximation to the actual length of any distance on land. The terminations of the line, too, at the point where the huntsmen stand, are very indefinite; and then the huntsmen cannot be supposed to have any other than very imperfect means of estimating the bearing of their respective lines of aim, in relation to the base line between them. The drawing of the triangle on the paper to a scale, would admit of a greater accuracy than any other part of such an operation; but even this could not be performed with a degree of precision that would satisfy the ideas of a skilled mathematical surveyor.

ACCURACY.

The example given above is only intended to afford some general idea of the principle that certain parts of a triangle determine, necessarily, the other parts, so that, if the former are ascertained by measurement, the latter can be ascertained by calculation. The surveyors have the means of determining the lengths of lines measured on the earth's surface, and the magnitudes of the angles formed by the bearings of different signals from the same point, with a precision almost inconceivable. It would, however, be out of place to describe those instruments or methods here.

Then, moreover, they depend for their results, not on drawings made mechanically on paper, but on mathematical calculations made by the help of trigonometrical tables, constructed with infinite labor and study. Still, although the processes necessary to secure exactness in the results are laborious and complicated, the principle on which the work is based stands out in all its simplicity in the midst of it—namely, this, that

"If two lines converge toward each other at the ends of a third line, the length of which is known, the amount of the convergence, as measured by the angles, will determine the distance at which they will meet."—*Riverside Magazine.*

Fire-Proof Construction.

On the 11th of last month the Drake, Farwell & Thatcher block, Chicago, one of the most beautiful and costly business structures ever erected in this country, was burned to the ground. Several lives were lost, and the total amount of property destroyed is estimated to have been two and one half millions of dollars. The building was designed by and erected under the supervision of Mr. John M. Van Osdel, a most highly accomplished and skillful architect, and, while not intended to be fire-proof, it was supposed to be among the most substantial structures of its class.

In writing of its destruction at this late date we do not purpose to enter into detail, because the catastrophe was but a repetition of similar disasters which have occurred in this and other cities. In every essential particular the structure, on the morning before the fire, would not have suffered by comparison with buildings of its class in any city in America. The walls were equally heavy, and a careful examination of the ruins afforded convincing evidence that the masonry had been executed with scrupulous care. The Mansard roof, about which so much has been said contained less wood than the majority of similar roofs in New York, Philadelphia, and Chicago. According to the American idea it was a first-class building. It was as good as any building of similar size not intended to be fire-proof. And now, after all this, if it can be proved that the walls were of insufficient thickness, that the roof was of material too inflammable, that the system of anchoring joists was bad, what does it all signify? It simply signifies a condition of things which the *Builder* has from the beginning denounced. We have said, again and again, that our entire system of building needs reforming. If not, then why are we compelled to witness these fearful conflagrations? Why do we not hear of such fires in the great cities of the old world? Do we ever read of a fire like this in Paris? No: the elder civilization builds better than we; and, building better; it builds cheaper. The expense of iron girders is not a serious matter in the construction of a building which is to contain millions of dollars, worth of merchandise in its several departments, because it is not difficult to construct fire-proof floors after the French method where no wooden joists enter the walls. Our underwriters clamor for thicker walls.

We have been referred, time and again, to the recent fire on Randolph street, where the walls are standing; but those walls were built under Mr. Van Osdel's direction, and differ little, if any, from other walls. The fire went through them in twenty different places, and all that saved the adjacent building from burning was the Babcock extinguisher in the hands of the firemen and citizens, prominent among whom was Mr. Murphey, secretary of the Home Insurance Co.

It is hardly fair to charge all the evils of the present system of building on the architects, because the evil is back of them. Property owners demand a liberal percentage on their investments, and in order to secure it buildings must be erected with special view to cheapness. When the *Tribune* Company desired a building that would not burn down, there was no difficulty in finding an architect to execute its will. The greed manifested by property owners to secure the largest percentage possible on rentals, and the extreme willingness of insurance companies to make good all losses, are the saddest features of this whole building business.

Elastic and Sweet Glue.—Good common glue is dissolved in water, on the water bath, and the water evaporated down to a mass of thick consistence, to which a quantity of glycerin, equal in weight to the glue, is added, after which the heating is continued until all the water has been driven off, when the mass is poured out into molds, or on a marble slab. This mixture answers for stamps, printers' rollers, galvano-plastic copies, etc. The sweet glue, for ready use by moistening with the tongue, is made in the same way, substituting, however, the same quantity of powdered sugar for the glycerin.

Whatever be the issue of the struggle between France and Germany, Von Moltke has won his place in history. The student of European warfare can no more think of 1866 or 1870 without having in mind a picture of that small, thin, silent old man, than he could think of Silesia and forget Frederick the Great, or Austerlitz and not remember Napoleon

Improvement in Woodworth's Surface Planer.

The accompanying engraving shows a very neat and compact machine for planing wood surfaces, being a modification of the well-known and justly popular Woodworth planer. It is, in fact, a consolidated Woodworth planer with four rolls above and two below, with a narrow table under the knife, and having the rolls all geared together. The compactness of this arrangement, and the economy of space and cost secured thereby, will be apparent upon inspection of the engraving.

N, in the engraving, represents the cylinder knives on the shaft with main-pulley and feed-pulley. E is one of the front feed rolls, four inches in diameter. The other front feed roll is three inches in diameter, but is hidden by the roll, E.

The position of the back rolls, which are precisely like those in front, except that they are not fluted, is indicated by the letter W. Caps, G, contain compression rubber springs which serve to hold the rolls in place, yet to allow them to accommodate themselves to varying thickness of stuff.

L is one of the under rolls four inches in diameter. A similar one is on the back side of the machine, not shown in the engraving.

A represents the feed shaft and pulleys, D is a clutch coupling with lever for running the working parts of the machine into gear with the shaft, A. The cone pulley next the clutch lever forms a part of the clutch coupling, and runs loose on the shaft when not clutched. The feed is regulated by the cone pulley, M.

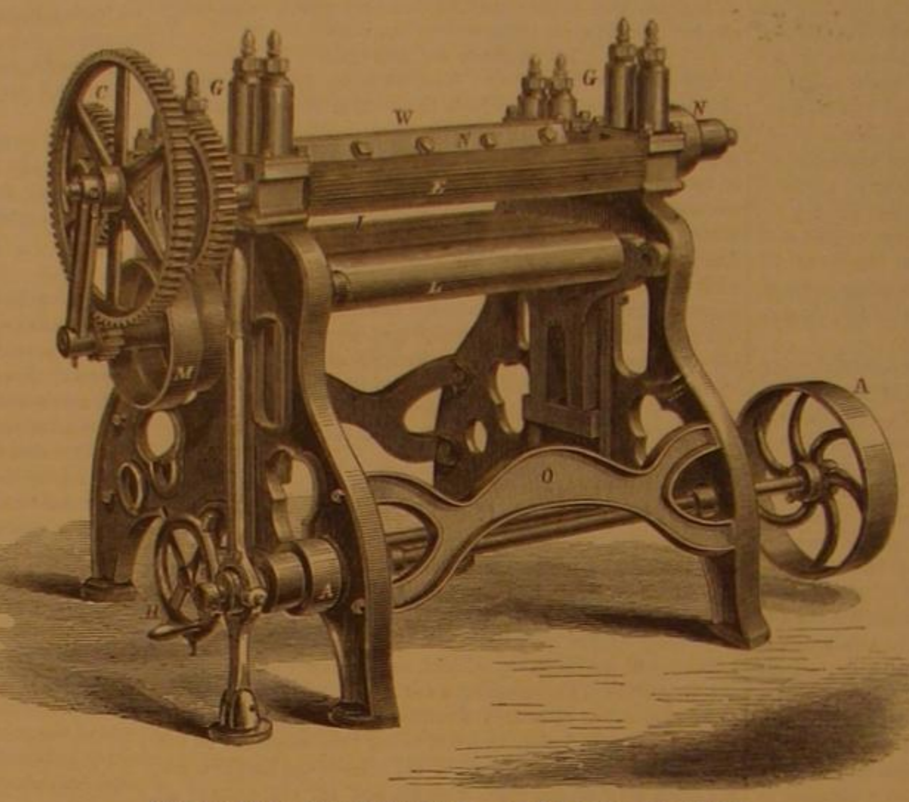
C is the gearing which drives the feed rolls.

The table, I, is raised or lowered by the hand wheel, H, which acts through bevel gearing, not shown, to turn vertical screws playing in nuts fastened to the bottom of the table.

The sides of the frame are massive and strong, and are firmly connected by the heavy brace pieces, O.

A hood, not shown in the engraving, serves to throw off shavings. It is so constructed as to rise and fall with the feed-rolls, and to completely cover the back smooth rolls, so that no shavings can get on either these rolls or on the board, to mar the latter after it has been planed. This attachment is regarded as a great improvement.

For further particulars, address the New England Machine Co., Fitchburg, Mass.



IMPROVED WOODWORTH SURFACE PLANER.

Pekin as It Is.

A correspondent of the Sacramento *Union*, writing from China, thus describes Pekin:

No long description, be assured—only this: From the observatory one sees a large portion of the town. Built of mud-brick, and gray stone, dotted with sparse foliage, of magnificent distances, curious architecture glimmering in the light, serpentine lanes and by-ways, the scene is not enchanting. In the streets, the scenes to be encountered are revolting. Sand, filth, pools of fetid water, miserable mud huts, and occasional tawdry temples; innumerable braying donkeys; such carts; dromedaries; occasional chairs; long lines of mules; dense throngs of coolies, of whom not one in twenty—aye, fifty—is half-clad in dirty rags; crawling beggars festering with disease; among the people scenes of gross indecency on the very sidewalks—a perfect disregard for what even a "Digger's" modest would revolt at; women, Tartars, small merchants, peregrinating restaurants, naked children eight or ten years of age; shops filled with earthenware of coarse manufacture; tea houses about every mile; the habitation of some high Chinese officials—one-storied, and that would make a second-rate stable in America; half-a-dozen temples, once massive and costly, but with no trace of beauty; the principal street, paved with rough blocks of granite that is worn in deep ruts and almost impassable; the emperor's palace and grounds—a dingy, barren walled inclosure, guarded by slaves; streets almost impassable with rubbish, ruts, and rocks; in brief, the most wretched, decayed, crumbling, repulsive spot we ever saw, with a semi-civilized, conceited, inhospitable, lazy, lousy populace, with no trace of anything that tells of content or happiness equal to their associates and superiors—the dogs and pigs of the Imperial capital.

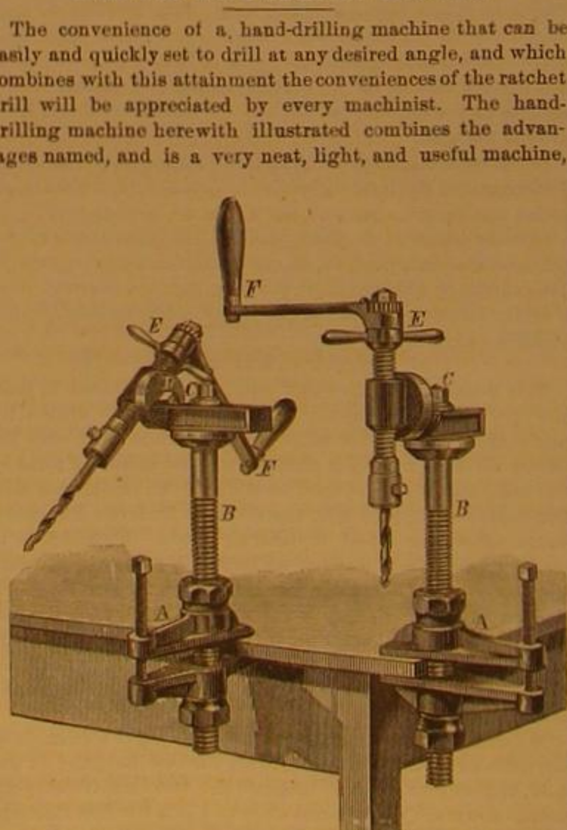
This is Pekin, with its millions of wretched inhabitants. I confess to unmitigated disgust. I abhor those enthusiastic chroniclers who have shed untruthful ink in praise of this horrible place. If proof is required to substantiate my views, I would refer to an esteemed resident of Sacramento, now a thoroughly disgusted resident of Pekin.

The Love of the Beautiful.

What are half the crimes in the world committed for? What brings into action the best virtues? The desire of possessing. Of possessing what?—not mere money, but every species of the beautiful which money can purchase. A man lies hid in a little, dirty, smoky room for twenty years of his life, and sums up as many columns of figures as would reach half round the earth, if they were laid at length; he gets rich; what does he do with his riches? He buys a large, well-proportioned house; in the arrangement of his furniture he gratifies himself with all the beauties which splendid colors, regular figures, and smooth surfaces can convey; he has the beauties of variety of association in his grounds; the cup out of which he drinks his tea is adorned with beautiful figures; the chair in which he sits is covered with smooth, shining leather; his table-cloth is of the most beautiful damask; mirrors reflect the light from every quarter of the room; pictures of the best masters feed his eyes with all the beauties of imitation. A million of human creatures are employed in this country in ministering to this feeling of the beautiful. It is only a barbarous, ignorant people that can ever be occupied by the necessities of life alone. If to eat, and to drink, and to be warm, were the only passions of our minds, we should all be what the lowest of us all are at this day. The love of the beautiful calls man to fresh exertions, and awakens him to a more noble life; and the glory of it is, that as painters imitate, and poets sing, and statuaries carve, and architects rear up the gorgeous trophies of their skill—as everything becomes beautiful, and orderly, and magnificent—the activity of the mind rises to still greater and to better objects.

IMPROVED HAND-DRILLING MACHINE.

The convenience of a hand-drilling machine that can be easily and quickly set to drill at any desired angle, and which combines with this attainment the conveniences of the ratchet drill will be appreciated by every machinist. The hand-drilling machine herewith illustrated combines the advantages named, and is a very neat, light, and useful machine, extremely simple, yet capable of a great many applications in practical use, which we need not specify, as they will at once suggest themselves to all practical men.



A clamping vise, A, serves to sustain the screw post, B, in any required position on the bench, or upon the framework or other portion of machines where it may be requisite to use the drill for special service. Strong nuts receive the screw-post, B, and acting against each other, hold the screw-post firmly after it is adjusted to the proper hight from the bench.

A horizontal arm is pivoted to the top of the screw-post, and may be turned radially about the axis of B to any desired position, and then secured by turning down the nut, C.

To the end of the horizontal arm is pivoted a plate which carries the drill and feed screw. The latter may be turned radially about the axis of the horizontal arm to any required position and secured there by turning home the nut, D. The feed-screw is actuated by the lever nut, E, in the usual manner.

A winch, F, operates a ratchet and pawl on the arbor of the drill, so that it may be revolved entirely around or through any arc of its revolution in cramped positions where entire revolutions are not practicable.

It will be seen that within certain limits, depending upon the size of the machine, there is not a point to which the drill cannot be set and made to operate with ease and facility

Patented, through the Scientific American Patent Agency, April 5, 1870, by James E. Hunter. Address, for rights, machines, or other information, James Hunter & Son, North Adams, Mass., or Kelly, Howell & Ludwig, agents, 917 Market street, Philadelphia, Pa.

A Chicago Street Locomotive.

Mr. D. J. Lake, who was the contractor for constructing the lake tunnel, has invented and constructed a peculiar road engine, which has been tried of late in our streets. It has the apparatus of a steam fire-engine attached. The following description we copy from the Chicago *Times*:

"In an ordinary locomotive, the steam from the cylinder acts upon the piston and is communicated directly to the crank of the driving wheels. In Mr. Lake's machine, when desirable, the motion can first be communicated to balance wheels. When these wheels have reached a very high rate of speed, the power can be communicated by a 'clutch' to the driving wheels. The communication can be made gradually, or as rapidly as may be thought desirable.

Any one can see the benefit of this style of communication. Suppose the vehicle in a place where it requires extra force to start it. By applying the power at once no movement is effected; but by storing it up in the balance wheels, and then communicating it to the drivers, one gets almost precisely the same benefit that he would by getting, say, a heavy wagon under rapid motion just before running it up an incline.

"He has another novelty. The machine has two sets of driving-wheels, one of which is considerably smaller than the other. By a simple use of the screw, either set can be raised, leaving the other on the ground. The power can be applied at will to either. The object of these two sets is, of course, to obtain either greater power or speed, as may be desired. In hauling heavy loads, the small wheels will be used, and in excursions, where there is no great weight to be hauled, rapidity is secured by the employment of the large drivers.

"A pump and air-chamber furnish a complete apparatus for throwing water; while a hand wheel allows the transfer of power to a thrashing machine, or any other article of the kind.

"The engine itself is a very handsome one. It weighs about three tuns, and moves without difficulty, and guides as easily as a well-trained horse."

Patented through the Scientific American Agency.

HISTORY OF CHLOROFORM.

The story of the discovery of the properties of chloroform in England is this: A Mr. Waldie, a chemist and bookseller at Linlithgow, had one day some of the liquid in a saucer, when a gentleman entered the shop with a little dog. The chloroform was placed on the ground to be out of the way, and presently the dog was discovered lying by the side of the saucer, unconscious, and apparently dead. After a time, however, while the stranger was mourning over the loss of his pet, the dog moved his limbs and gradually regained consciousness. Mr. Waldie began to think that he had made a discovery, and, after having administered chloroform to a number of cats with the same result, was confirmed in his belief. He went to Edinburgh to relate his story to some medical men, and at the suggestion of a friend, called upon Professor James Y. Simpson. After that interview Simpson tried a number of experiments, and proved beyond all question the virtues of chloroform as an anæsthetic. Professor Simpson published the results of his experiments in 1847, and gave full credit to Mr. Waldie for his share in the matter; but, as the learned physician had previously tried ether, protoxide of nitrogen, and everything in fact that was suspected to have anæsthetic properties, it is more than probable that he would soon have hit upon chloroform.

It was Dr. Simpson who first applied chloroform in childbirth, and for this he is justly celebrated. Although chloroform was discovered by an American, Guthrie, in 1831, and the editor of the *Pharmaceutical Journal* of Philadelphia, in publishing an account of it, even at that early date, anticipated for it an extensive application in medicine, it was not until the news of Dr. Simpson's experiments reached this country in the winter of 1847, that this valuable compound was introduced as an anæsthetic. The scientific properties of chloroform were first investigated by Liebig and Dumas, and they gave it its present name from its supposed chemical constitution—terchloride of formyle, which was abbreviated to chloroform.

LINEN can be glazed by adding a teaspoonful of salt and one of finely scraped white soap into a pint of starch.

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VOL. XXIII., No. 16 . . [NEW SERIES.] . . *Twenty-fifth Year.*

NEW YORK, SATURDAY, OCTOBER 15, 1870.]

Contents:

(Illustrated articles are marked with an asterisk.)

CENTRAL PARK, NEW YORK---REPORT OF THE COMMISSIONERS.

The report of the Central Park Commissioners for 1869 has but just made its appearance. We are, however, compensated for the delay by the fullness of the report. The book, which is in pamphlet form, comprises some two hundred pages of valuable statistics, and other matter, and is illustrated with a number of photographs and lithographs. The lithographs illustrate the work of Professor Hawkins, who has been, as our readers are already informed, engaged in modeling a group of fossil animals for the Museum, and the meterological instruments, improved and invented by Mr. Daniel Draper, and used in his observations, are given at length for the year in the report. The photographs are chiefly scenes and statuary in and about the Park.

From the body of the report we are enabled to extract some items of general interest.

THE MUSEUM.

As a beginning of this collection, intended to ultimately be made equal to any in the world, the Commissioners have purchased

1st. The entire collection of the late Prince Maximilian, known as the Weid Collection, comprising 4,000 mounted birds 600 mounted mammals, 2,000 fishes and reptiles.

2d. Selections from the Verreau collection at Paris, 2,800 mounted birds, 230 mounted mammals, 400 skeletons.

3d. The entire collection of American and foreign birds, about 2,500 in number, lately belonging to D. F. Elliott, Esq.

4th. A series of 250 birds of Siberia, purchased from Monseiur Vedray, in Paris.

This purchase, comprehending in all 12,770 specimens, as follows: Mounted birds, 9,550; mounted mammals, 820; fishes and reptiles, 2,000; skeletons, 400.

The details of the conditions upon which these collections are to be deposited with the Park Commissioners have not yet been entirely settled, but it is believed they will be such as to be satisfactory to all the parties concerned, and greatly to the public advantage. It is important that the conditions be carefully devised, to provide for all probable contingencies, to protect the property, to keep alive and extend the interest of the donors, and to serve as a precedent for those interested in other branches of art and science who may be disposed to make like arrangements.

Prof. B. Waterhouse Hawkins has been engaged in advancing the group of fossil animals, more fully alluded to in the last Annual Report. A very wide interest, both in this country and in Europe, has been excited among scientific men by this interesting and novel undertaking. The proceedings of the Commissioners of the Park in this matter have been alluded to, commented upon, and commended by scientific journals, both at home and abroad.

It would be difficult to insure too great care in the preservation of the wonderful remains of animal organizations of past times that are from time to time discovered in different parts of the country. There are examples of fossil remains lying in public and private collections of the country, that in the interest of science, should be utilized and placed where they can readily be got at by those especially interested in this department of inquiry. It is very difficult, except through the offer of a reward in money, to impress upon those who, in excavation, casually come upon fossil remains, the importance of handling them with care; they are often, to them, nothing but old bones, and a stroke of the pick, or a scoop of the shovel may, in an instant, irrevocably destroy or cast away a fragment that might serve to establish or refute received ideas of the past eras of our globe.

The great group of ancient animals formerly living during the secondary geological epoch on the continent of America, now being modeled and restored to the natural size and appearance of the animal as in life, by Mr. Hawkins, for the Central Park, consists of the gigantic Hadrosaurus of the exact dimensions (one twenty-six feet, and the other thirty-nine feet long), as proved by the fossils described by Dr. Joseph Leidy, in the "Smithsonian Contributions to Knowledge, No. 192"; also models of "Laelap's Aquilunguis" fossils, described by Cope, together with the aquatic "*Elasmosaurus* and *Mosasaurus*." The second division of the group will illustrate the post-tertiary period, and represents the mastodon, the mammoth, megatherium, megalonyx, glyptodon, etc., etc., thus uniting the early periods of animal life with the earliest evidence of man's existence, and so constituting a complete visual history of the American continent from the dawn of creation to the present time.

THE ZOOLOGICAL GARDENS.

The progress reported in the zoological gardens has not been great, owing to want of proper drainage, insufficient housing for animals, and delay in regulation of streets and avenues about the grounds. It will probably be a year before this feature of the Park reaches completion. The commissioners having no control over the difficulties specified are obliged to wait the movements of others. They report, however, that

Nearly two thirds of the foundation wall is, on the west line of the square, complete. The preparatory excavations of the habitations of the large group of northern carnivora represented by the genus *Ursus*, or the bears, with their allied genera, has been made at the southwest angle of the Zoological grounds. At this point are also commenced the accommodations for the polar bears, the walrus, seals, sea lions, etc., specimens of cetacious, and also for the aquatic rodents, such as capybare, beaver, etc. In these, as in all other habitations for the animals of the gardens, every arrangement that will conduce to their healthfulness, and to the facility and convenience of observing them, will be provided, and it is hoped that in the outset the knowledge of the needs of various classes of animals may be so thorough, and the skill in utilizing this knowledge for the purposes required may be so marked and successful, as to avoid much of the expensive alterations and changes in plan that have characterized, during the last half century, the experiences of most of the European gardens, and that by the time these habitations are ready for occupancy, some of the ways of approach to the gardens may be passable. Some progress has also been made in the preparation of designs and models for the houses of tropical carnivora, and each class of animals, in the order of its relative importance, will be located and properly housed and provided for.

METEOROLOGICAL OBSERVATORY.

This employs the self-registering apparatus above referred to, a portion of which was invented by Mr. Daniel Draper, and the rest improved from European instruments by the same gentleman, and by which, to use the language of the report, "the weather each day leaves, by its own action, an enduring picture of itself, complete and accurate, presenting a marked contrast to the ordinary methods of weather observation. The records of the observatory frequently sought for to determine legal controversies, are given weekly to the newspapers for publication, and are forwarded to kindred institutions."

The report is a well-written and comprehensive document, and the favored few who are able to obtain copies of it, will doubtless read it with interest throughout. The Commissioners are entitled to great praise for the vigorous and judicious manner in which they have discharged and are discharging their duties, and the additions they are constantly making to the chief attraction of our great metropolis.

WOODBURY'S PHOTO-RELIEF PROCESS.

A few years since Mr. Woodbury explained to us in Paris his famous process for obtaining pictures by copying negatives with gelatin and transferring the print to soft metal. Since that time he has made some improvements, and we give below the whole method as witnessed by ourselves, and as described in some of the photographic journals.

A film of gelatin rendered sensitive by bichromate of potash is exposed in a common printing frame to the action of the sun or electric light. Where the light acts, the gelatin is rendered insoluble, where it does not penetrate, the gelatin remains soluble. If, therefore, the film of the exposure be put into warm water, the parts acted upon by light will be dissolved out, and the other portions will remain to form a picture in relief.

This gelatin picture is laid upon a steel plate, then covered with a plate of type metal, and subjected to pressure under a small hydraulic press. The raised parts of the gelatin film are forced into the soft metal, thus giving a picture with the lights and shadows reversed.

Upon this metallic *cliché* is poured a hot mixture of gelatin with some coloring substance, a sheet of well-sized paper is then laid on, and the whole is well pressed together. As soon as the gelatin is cool, the impression is done.

In order to render the impression permanent it is immersed in a solution of alum or of tannin—it would otherwise be soluble in water.

This is the outline of the process, and we come now to speak of the details.

A glass plate is greased and covered with a hot solution of gelatin containing some pigment and bichromate of potash. After drying, the film is covered with a thick layer of paper collodion. It is then removed from the glass, and kept on a portfolio until wanted. The greasing of the glass facilitates the removal of the gelatin. The film is quite black, and as thick as pasteboard. The coloring matter is added to aid in following the development of the picture, and the collodion serves as a support to the film.

The gelatin sheet thus prepared is laid in a printing frame, with the collodion side in contact with the negative. It is then exposed either to the sun or a powerful electric light. The length of exposure is half an hour in the sunlight, and two to four hours in electric light. The sunlight is preferable because the rays are parallel and more powerful. The electro-magnetic apparatus consists of fifty horse-shoe magnets, and the helices are propelled by a steam engine of six-horse power.

Usually six printing frames are simultaneously exposed at a distance of a few feet. A large sheet of white paper serves as a reflector. The light is evolved between two carbon pencils which are connected with the magnetic-electro machine, and is so uniform, that, with a little experience, the duration of the exposure can be estimated by the appearance of the negatives. A glass plate is covered with a solution of india-rubber in benzine. The exposed sheet with the collodion side down is pressed upon it (to prevent the curling up of the film in water), and the plate is laid in warm water, and the water is renewed from time to time. The development requires considerable time, often twenty-four hours. The coloring matter dissolves in the places where the gelatin has remained soluble, and finally leaves a clear picture. The print is then taken from the water, removed from the glass plate, and dried. It forms a beautiful transparency, and is a true picture in relief, in which the deepest shades possess the original thickness of the gelatin film.

This gelatin relief is pressed into a metal plate in a similar manner to nature printing. It is laid upon a hard steel plate and covered with a sheet composed of antimony and lead $\frac{3}{4}$ of an inch thick. It is then exposed for five minutes to a pressure of half an tun to a cubic centimeter in an hydraulic press, by which a sharp impression is obtained on the soft metal without the least spreading or injury of the gelatin film.

The *cliché* is cut with a saw, and made ready for the printing press. It is carried to a room where there are a number of large revolving tables, on each one of which there are six presses. There is one workman for every table, who is provided with a pot of dark-colored gelatin kept hot in a little stove.

The *cliché* is put entirely horizontal into the press, which is simply an iron box with a metallic cover. Some of the colored gelatin is poured upon the middle of the *cliché*, the cover put on, and the table revolved until the second press is before the printer. By the time the sixth press has been reached, the picture in the first press is ready for removal. A skilled printer can take forty impressions in an hour.

The paper is rendered water-tight by lac, and is then well glazed. After each print the *cliché* is wiped off with an oily rag to remove any adhering color. The gelatin must harden in the press; the print is laid upon a table until it is entirely dry and hard. The margin of gelatin squeezed out by the press is cut off and thrown into the glue pot to be used again. The color improves by use. Finally, the prints are immersed in a solution of alum, then washed, dried, and cut ready for mounting.

Mr. Woodbury has made some further improvements by which he can use fatty inks the same as with copperplate engraving.

Electrotypes can also be taken of the *clichés*, and this is one of the most important applications of the process, as it admits of taking photographs of all manner of natural objects, of copying them in gelatin and of obtaining electrotypes for printing in the usual way. Prints in gelatin and color have the great advantage over ordinary photographs of being much more permanent—they are as unfading as any steel engraving, and are very rapid of execution.

We are glad to know that the inventor, who has been indefatigable in his efforts to perfect his process, is now beginning to reap the rewards of his labor.

THE GATLING BATTERY GUN IN ENGLAND.

The trial of the "Gatling Battery Gun" at Shoeburyness, has given the British authorities a very favorable impression of its formidable character. The small Gatling gun of forty-two one hundredths of an inch caliber was tried first. This gun has ten steel rifled barrels, and is made of any proper caliber to suit the musket cartridges used by different governments. It was fired at the high rate of about 350 shots a minute. The one-inch gun was tested next. This is the third or largest gun of the system, and is made with six, sometimes with ten, barrels, and discharges solid lead balls half a pound in weight. It also uses a canister cartridge which contains sixteen balls. It also discharges explosive balls with great effect. At this test it discharged 255 half-pound balls in one minute and eighteen seconds, and riddled the target at 1,400 yards. On the same day the small gun (No. 1) was again discharged at 1,400 yards, and made an excellent target, firing about 375 shots a minute. It was also fired at dummies representing a company front, on uneven ground, the men being disposed in irregular order. There were 136 dummies, representing men, 99 of whom would have been killed. The average hits were four in each man.

Subsequently, the small gun was again fired at various ranges from 1,200 down to 400 yards at targets and at dummies. The firing was at about the same rate and speed as before, making the same targets and producing the like destructive effect among the dummies. All on the ground seemed to agree that they had seen the operation of a weapon of unprecedented power.

Our readers will be interested in the history of this remarkable gun, from the pen of Mr. Gatling himself.

A man is entitled to the fruits of his labor, and to assert a just claim is a duty as well as a right. In the year 1861, I first conceived the idea of a machine gun, which has been ever since the great controlling idea of my life; and it certainly cannot be regarded as egotism when I express the belief that I am the originator of the first successful weapon of the kind ever invented. A brief history of this arm may establish the fact, and cannot fail to engage the attention of all who take an interest in fire-arms.

I completed my first "battery," or "machine gun," in the city of Indianapolis, State of Indiana, my place of residence, in the early part of the year 1862, and my first American patent bears date November 4th, of the same year. The gun was fired repeatedly during that year, in Indianapolis, in the presence of hundreds and thousands of persons, over two hundred times a minute, and the result published to the world.

In the autumn of 1862, I went to the city of Cincinnati, in the State of Ohio, and in the well-known establishment of Miles H. Greenwood & Co., I had six of my guns constructed; but about the time they were completed the establishment was destroyed by fire, together with the guns, patterns, and drawings, subjecting me to a very heavy pecuniary loss. Shortly afterwards, I had twelve of my batteries manufactured at another establishment in the same city. In the meantime, I continued to fire my gun, made at Indianapolis, before the citizens of Cincinnati, and in the presence of many Army Officers of rank and distinction, all of whom were highly pleased at the result of its performance. The American press of 1862 and 1863 teemed with accounts of these trials, and during all this period no notice of a similar weapon, at least none equaling or approaching the "Gatling battery," in the rapidity of its firing, appeared in any of the papers published in America or Europe.

I made no effort to keep my invention a secret, but, on the contrary, published full descriptions of the gun, with cuts and diagrams, and sent the same to all parts of the civilized world. I stated in these descriptions that my invention consisted of a "series of barrels," parallel to each other, arranged around a central shaft, and that "each of the barrels was furnished with its own appropriate lock, or firing mechanism;" I also described it as a "compound machine gun," that is, many guns in one. At the time I made these publications, that "mysterious" French mitrailleuse, of which we have since heard so much, was not invented, and, in my opinion, not even thought of. It is well known that the French and Montigny mitrailleuses are composed of a number of barrels, and have a lock or firing device for each barrel, and, for reasons submitted hereafter, I have no hesitation in saying, that this feature of a gun, formed of many barrels and many locks, is copied from my invention.

I continued to make my guns in Cincinnati during the years 1863 and 1864, and in the autumn of the latter year, I made additional improvements to my battery—in the locks and rear cam—but without, however, changing its main features, for which I secured a second patent of the United States, bearing date May 9th, 1865.

In the years 1865 and 1866, these improved guns were manufactured at Cooper's Fire Arms Manufactory, in the city of Philadelphia, but since that time they have been constructed in large numbers, at Colt's Armory, in the city of Hartford, where machinery has been fitted up at great expense, to build the guns in the highest style of perfection.

This gun is now on exhibition at the Fair of the American Institute in this city.

COMPARATIVE ACCURACY OF MERCURIAL AND ANEROID BAROMETERS.

During the progress of the recent official surveys for the ship canal across the Isthmus of Darien, the level lines were ascertained by spirit levels, and also by barometic observations. The mercurial and the aneroid barometers were employed, and their indications were, from point to point, compared with those of the spirit levels. The result showed that the aneroid barometer was very unreliable, as its indications of level were frequently in error to the extent of one hundred feet, while the average deviation of the mercurial barometer from the spirit level, did not exceed twelve feet.

Our readers are, of course, familiar with the construction of the mercurial barometer, in which a column of quicksilver, 30 inches high, counterbalances the weight of a column of the air, of the same diameter, and 100 miles, more or less, high. When we rise above the sea, the weight of the air diminishes, and at an altitude of 5,000 feet the mercury column stands at 24·77 inches, instead of 30 in. as at the sea level. The hight of hills and mountains may therefore be measured by placing the barometer at the highest point of elevation, and observing the position of the mercury.

The mercurial barometer was invented in 1643, by Torricelli, an Italian, a disciple of the famous Galileo. The term barometer is derived from Greek words signifying "weight-measurer."

The aneroid barometer is a more recent invention. It is made wholly of metal, and consists of an air-tight box, which may be described as somewhat resembling a common tin blacking-box, except that the edges of the barometer box are creased so that the flat faces may spring towards or from each other, when pressure is applied to them. One of the faces is connected with a delicate wheel mechanism and a pointer by which the slightest movement of the box face is indicated to the eye. The interior of the box is charged with hydrogen gas, and the faces are so set that at the sea level the pointer will stand at a given degree, say 30. Any variation in the pressure of the air will alter the position of the faces of the box in respect to each other, and the change will be indicated by the pointer.

The aneroid barometer has come into very extensive use, and has heretofore been considered a reliable and excellent instrument. During a voyage across the Atlantic, we once compared the relative merits of the mercurial and the aneroid barometers. The ordinary indications were the same with both instruments; but the aneroid was considered preferable by the officers of the vessel as it was more sensitive to atmospheric changes than the mercurial. The aneroid always indicated the approach of bad weather, or the change to fair, in advance of the mercurial instrument.

It may be that the aneroids used on the Darien expedition were in some manner defective.

The aneroid barometer is a very neat and compact instrument, not easily broken, readily transported, and very serviceable. It was invented about twenty-two years ago by M. Vidi, of France.

The term aneroid is from Greek words, which signify "without fluid;" no mercury being employed in the aneroid barometer.

FAIR OF THE AMERICAN INSTITUTE.

We have noticed in order certain departments of this Fair, and for the future shall select for notice from the other departments such things as may seem of interest, without regard to strict classification.

Among these we find a patent machine for "spreading" flax, hemp, etc., which takes the material from the bale, and lays its fibers all parallel, turning them out in a continuous sliver in a very expeditious and beautiful manner. The hemp or other similar material, in the condition in which it is ordinarily taken from the bale, is placed upon the feed-board, and gradually brought to feed-rollers, which convey it at the requisite speed to and upon an endless chain apron covered with heckling pins, which measurably straighten and comb its fibers. From this it passes to another endless chain, running at higher speed, the pins of which complete the heckling operation. The hemp is thus combed and drawn out by the pins of the two endless chains, while the fibers are free at one end to accommodate themselves to such action. The hemp then passes therefrom to pressing and drawing rollers, which, having performed their function, the material passes through condensing tubes in the form of a sliver. To any who delight in examining the workings of well devised machinery, the operations of this machine will prove gratifying. The machine is exhibited by John Good, of Brooklyn, E. D., N. Y.

A cotton seed hulling machine is shown by T. M. Jewell, 93 Liberty street, New York. It is designed for plantation use and can be run separately from the gin, or attached to the gin and driven by the same power. When run by itself it is driven by the power of two mules. It is claimed to remove the hull and lint entirely from the seed and to leave the kernel unbroken. At the same time the kernels are dried and cleaned by an air blast, and, it is claimed, rendered fit for shipment to any distance. Our readers who have perused the valuables article on "Cotton Seed" and "Cotton-Seed Oil," published in our last volume, will be prepared to appreciate the value of a machine that will do what is claimed for this one.

A line of power and foot punching presses shown by N. C. Stiles, Middleton, Conn., is worthy of notice. Those interested in this class of machines, and who visit the Fair, will do well to look at them.

Shaw's Patent Gunpowder Pile Driver, exhibited by the Gunpowder Pile Driver Co., 505 Minor street, Philadelphia, attracts much attention. This novel and ingenious device was fully described and illustrated on page 97, Vol. XXI., of Scientific American. For the short time this invention has been before the engineering public it has made a brilliant record.

A flax scutching machine, shown by William McBride, Somerville, N. J., is also a very ingenious device. The flax is fed in under an endless belt, the belt pressing upon the middle of the fiber, and holding it firmly while it passes and is acted upon by a series of revolving scutching blades which dress one end of the mass. Then the machine turns the other end of the flax fiber, so that it in turn passes another series of scutching blades, and finally delivers it well dressed for future operations.

FIRE-ARMS.

Under the superintendence of Col. Geo. Woodward, 304 West street, New York, this department has been made a most attractive feature of the Fair.

Col. Woodward represents nearly or all the first class manufacturers of fire-arms in the United States, and his politeness and affability, his intimate knowledge of the arms exhibited, and his readiness to explain to the curious the peculiarities of the weapons shown, render this department a rare opportunity for any who wish to post themselves on the subject of modern fire-arms. Most of the guns shown are breech-loaders, and are made in the very highest style of the art.

A prominent object in this connection is the Gatling battery gun, quite recently described and illustrated in this journal, exhibited by Chas. H. Pond, 179 Broadway, Agency, Winchester Arms Company and Gatling Gun Company. We need not here repeat any details of this remarkable arm, which as a destructive weapon is probably unexcelled by any similar piece ever constructed. The same exhibitor shows a case of the Winchester repeating arms.

The Winchester rifle differs from the Henry rifle only in the mechanism by which the cartridge is extracted. It is claimed for this gun that it can not only be fired thirty times a minute continuously as a repeater, but it can be used as a single loader without any attachment to be changed for the purpose, retaining the magazine full of cartridges to be used in any emergency, when the whole fifteen charges can be fired in fifteen seconds, or at the rate of sixty shots a minute, or in double-quick time, in seven and a half seconds, or at the rate of 120 shots per minute, or two shots per second, loading from the magazine.

The Providence Tool Co., Armory, Providence, R. I., exhibit a case of the Peabody breech-loading fire-arms. In these arms no movement of the barrel or any other parts, except those immediately connected with the breech block, is required in the performance of any of the operations. The mechanism is designed to prevent any possibility of obstruction from the effects of friction, rust, or exposure to dust, rain, and continued service. The condition of the breech block, when the guard is drawn down, is such as to form an inclined plane, sloping towards the breech of the barrel, and the groove on its upper surface corresponding precisely with the bore of the gun, facilitates the entrance of the cartridge, so that it slides directly into its proper position without the necessity of looking to see that it is properly inserted. The removal of the empty cartridge is effected by the action of an elbow lever, which throws it out the instant the guard is lowered. This lever derives its power from the action of the breech block itself, and is not dependent upon any spring and is of such strength as to seemingly prevent the possibility of breakage or derangement by any service to which it can be exposed.

Ward & Co., 57 Wall street, New York, show a case of the Ward-Burton breech-loading rifles. The Ward-Burton gun is constructed on the bolt or needle gun system, and is operated by holding the piece in the left hand below the lower band, in the position known in the manual for muzzle-loading arms as "prime," and seizing the handle of the breech with the right hand, nails uppermost. The breech is then opened by turning the handle up and withdrawing it to its full extent of motion, a cartridge taken from the pouch with the right hand and dropped bullet end to the front in the now open receiver, and the breech closed by reversing the motions required to open it. By the motion of opening the breech to reload, the empty cartridge shell will be ejected. The breech, however, may be closed during the act of raising the gun to the position of aim. A manual to load and fire by command in six motions may thus be readily devised. Practically, to load and to fire require but four motions.

S. Remington & Sons, of Ilion, N. Y., show a collection of the various arms manufactured by them. These arms are too well known to need any special description here. The exhibitors are now supplying arms to Egypt, Italy, France, Austria, and Denmark; France at present taking all the available stock. The details of the guns thus furnished to foreign governments vary in nothing except the form of the bayonets. The bayonets on the Egyptian guns are sabers, with hilt and guard; the others are triangular.

Isaiah Woodbury, 39 Broadway, New York, exhibits specimens of the "Roberts" Breech-loading Musket. This arm is constructed strictly on the lever plan, having lever strength for its entire operation. The breech plug is a lever, the extractor is a lever, and the "catch" that holds the breech plug in place for firing is a lever. These are the principal pieces that take the wear and tear of fire-arms; they are all of great strength, and so mechanically combined as to receive the recoil shock of the charges without cross strain or disposition to displacement.

The Sharp's Arms Co., of Hartford, Conn., exhibit their infantry carbines and repeating rifles. These celebrated arms are fine specimens of mechanical art, and have a reputation so widely extended that we need not dwell upon the prominent features of their construction.

M. W. Robinson, of 79 Chambers street, shows a fine group of the Wesson sporting rifle pistols, and a case of Smith & Wesson's well-known revolvers

J. W. Storrs, 252 Broadway, New York, shows specimens of the "Central Fire" breech-loading shot guns manufactured by the Wesson Fire-arms Company, Springfield, Mass. These guns are beautiful pieces of workmanship, and will be admired by all sportsmen who examine them. The same exhibitor shows specimens of J. Stevens and Co.'s breech-loading pocket rifles, each of which weighs only eleven ounces, yet shoots with great accuracy and power from thirty to one hundred yards or more; can be loaded and fired five times a minute, can be carried in a side pocket while working in the fields, ready to bring down game at short notice.

Isaiah Woodbury, 39 Broadway, New York, shows some electric batteries and battery fuses for blasting purposes, in which the spark which ignites the powder is generated by frictional electricity. We regret that we could not obtain any information in regard to the details of the internal construction of his device.

Near the collection of fire-arms in one of the alcoves may be seen the screw steering apparatus illustrated and described on page 111. It is exhibited by the manufacturers, James L. Jackson & Bros., 315 East Twenty-eighth street, New York.

We noticed, also, near the entrance to the Machinery Department, a novel and ingenious printing press, called the "Chromatic" press, which prints in three colors with a single impression, and does its work as rapidly as any platen press can print in single color. The surface of the inking cylinder is divided into three equal parts, which are supplied with adjustable sectors (or color strips) of various sizes, to correspond in width with any line or part of line of type. Each part is supplied with a color from one of the distributing rollers. The cylinder has lines struck on its surface which are numbered to correspond with lines and numbers on the chase, making simple work for the pressman to set his sectors to correspond to the lines of the type which he may wish to print in colors. Thus, having the sectors arranged, they receive their proper colors and transfer them to the type rollers, corresponding in width and position with the lines of the type to be printed. Within one minute the press may be changed from two or three colors to one, by means of throwing two polished shells or half cylinders over the color arrangements, which enables the pressman, if he desires, to use three times the amount of distribution and inking surface that he now has in any one-color job press.

Those interested in ice manufacture and ice machines will soon have the opportunity to see the celebrated Carré apparatus at work in a special room assigned to it at the rear of the building. A skating ring 24x10 feet, and laid with ice eight inches thick is promised as soon as the machine gets under way. This will be a most interesting feature of the

Fair. The machine is exhibited by M. J. Bujac, 17 Broad street, New York.

In the sewing machine alcove there is little that is new. An automatic bobbin winder, shown by Pratt, Palmer & Co., 384 Broome street, New York, is a neat device and does its work in a very complete manner. It is much noticed by the lady visitors to the Fair.

Leyburn's motive power for sewing machines also attracts much attention. This motive power, which may be attached to any of the machines, enables a rocking motion of the upper part of the body to be substituted for that of the lower extremities at the will of the operator. This motor accords entirely with suggestions editorially made in this journal June 12, 1869, and we believe it to be a good and health-saving device. Exhibited by Ed. J. Leyburn, 119 Fourth avenue, New York.

The Carpenter Sewing Machine Needle Company, 95 and 97 Liberty street, New York, exhibit the self-setting and self-threading sewing-machine needle illustrated, and described on page 164, current volume, which is attracting much attention, and eliciting much commendation from the experts who pass among these machines in search of novelties. Specimens of its work show that the needle is strong as well as convenient.

The Carpenter self-heating fluting machine is an invention of the same lady to whose genius the self-threading needle is due. The fluting rollers are heated by the conduction of heat through arbors, upon which they work, the heat being supplied by a gas jet. It is an ingenious and pretty little machine.

A neat little model of a horse-stall, described and illustrated on page 279, last volume, of the SCIENTIFIC AMERICAN, will also be found worth looking at. It is shown by William Bleakley, of Verplanck, New York.

We also noticed a railroad candle and burner invented and exhibited by Henry Ryder, of New Bedford, Mass., which seems to remove the defects existing in the lights now commonly used. The candle has two self-snuffing wicks, and the draft is very much improved. The light given by this apparatus is much superior to that usually supplied in railway cars.

WHAT A CONTRAST.

We call attention to the letter of the veteran inventor, Pells Manny of Freeport, Ill., published elsewhere, and from which it appears that Mr. Manny has not only gained a competence as the just reward of his patent ingenuity; but like the venerable Rip Van Winkle "he is thankful that he has had enough." What a beautiful picture is here presented! An inventor retiring upon his well earned honors and emoluments, to engage in the healthful and primitive occupation of a vine-dresser. In reading this complaisant note of Mr. Manny, we could not fail to notice his magnanimity in contrast with some other greedy patentees, who, having got rich out of their patents by the full enjoyment of all the protection afforded by the law, are still clamorous for more, and misdemean themselves by lobbying around the halls of Congress, coaxing members to favor their schemes of patent extension over luscious Chesapeake Bay ducks, and sparkling Jersey champaign. We can scarcely realize so much self-abnegation as Mr. Manny displays; but it is a green spot in the desert of human selfishness.

Trial of the United States Chemical Fire Engine.

This machine, which employs a solution of sulphite of soda, instead of pure water, for extinguishing fires, was publicly tested on the 4th inst., in this city on a vacant lot situated between 3rd and 4th avenues, just above 67th street. Two two-story buildings were erected, and in each were placed a large number of tar barrels. The floors and other parts of the building were drenched with gasoline in such a manner that when the buildings were fired the flames rose to a great hight, and the heat was intense. One of the structures was played upon in small streams by the sulphite of soda solution, and the other by water, pure and simple, to test the relative merits of the two systems.

The result, however, was not so satisfactory as could be desired. The frames of the buildings were too weak to sustain them after they had been slightly damaged by the flames, and each fell into a heap of ruins very shortly after the fire became general. It was evident that the sulphite of soda solution is an agent of great power in extinguishing fire, and we opine that should the experiment be repeated with buildings of stronger frames, the test would prove much more satisfactory. The sulphite of soda, when it comes in contact with the burning surfaces, is decomposed, yielding sulphurous acid gas, in which no flame can live. At the same time the effect of this gas upon the firemen, who may at times inhale it, is not so much to be dreaded as that of carbonic acid gas, which has been used in aqueous solution for the same purpose. We trust the experiment may be repeated under more favorable circumstances.

IT PAYS TO ADVERTISE.—Messrs. Wetherby, Rugg & Richardson, of Worcester, Mass., manufacturers of Woodworth's planers and wood-working machinery, in a recent letter to us say: "You will please continue our advertisement until orders to the contrary are received, and send your bill for settlement as heretofore. We cannot do without your paper as a medium between ourselves and our customers."

THE GIANT COUPLING.—It was intended to be stated in our notice of this unique and very useful invention, illustrated on page 207, that George Place & Co., 126 Chambers st., New York city, Miles Greenwood, of Cincinnati, and the Howard Iron Works, Buffalo, N. Y., were also agents for the sale of the coupling.

[Our Special Correspondence.]

LETTERS FROM THE SOUTH, ETC.

New Orleans, its Sewerage and Water-Works—Cotton, Cotton Factories, Cotton-Seed-Oil Mills—New Orleans as a Manufacturing Place and as Commercial Center—Ice Making and Pneumatic Car—Salt and Sulphur deposits—Sugar Crop—Railroads.

MOBILE, ALA., Sept. 17, 1870.

Instead of being to-day two or three hundred miles west of New Orleans, and in the limits of the Empire of Texas, I am that distance east—yellow fever panic is the cause thereof. The first idea that occurred to me on looking around New Orleans was why some shrewd person did not contrive a way of cleaning and sewering the streets. The city is as level as a floor, and all the sewerage runs in open gutters along the streets. Garbage is, however, not allowed to be thrown in the streets.

The city is supplied with water from the river, pumped up into a large reservoir, thence flowing into pipes. Being built on entirely made ground, and located in the bend of the river, a slight incline is had from one side to the other, thus keeping up a current in the side ditches.

From Memphis I came through the length of the great cotton State, Mississippi. The railroad, one of the best in the South, goes through a rather poor section, but there are along its route many thriving villages. One little place, consisting of a depot, half a dozen stores, and a few dwellings, sends off 20,000 bales of cotton per year. The exclusive growth of cotton is the curse of the State.

J. L. Power, Esq., of the Agricultural Association, hopes to infuse some new ideas and new life into the people, and if example can do anything he may succeed. It is hard to make Mississippians believe that there is any crop but cotton worth growing. There are two cotton factories in the State, one at Columbus, the other at Wesson, on the Great Northern Railroad. The last is the largest, and runs about 4,000 spindles. Steam power is used, and wood for fuel.

At Vicksburg there are three cotton-seed-oil mills, which made last year about 160,000 gallons of oil, and about 4,000 tuns of cake. The owners claim that the business is overdone; that at present the supply is greater than the demand. My opinion is that as the price goes down, new uses will be found for it. The various mills I have visited pay from $6 to $12 a tun for seed. A tun of seed yields 1,000 pounds of kernel, this 750 pounds of cake, from 35 to 40 gallons of oil, and 40 to 50 pounds of lint. This is of course a rough estimate, but nearly, and in some cases, perfectly accurate.

In New Orleans there are five mills. The largest, the "Orleans," does not hull its seed, hence it makes from a tun about 1,500 pounds of cake, not so valuable for feed. It uses 10,000 tuns of seed per year. The other four use 18,000 tuns of seed, and hull as at Vicksburg and Memphis. In Mobile there is also a mill which uses about 4,000 tuns of seed. This last is manufacturing a fertilizer from its cake and other materials, as does the Panola Company, in Memphis. It can thus be seen that this is really becoming a large and valuable manufacturing interest. As, for instance, at the average price of $10 per tun, the New Orleans' mills alone pay out $280,000 to the planter. It must be borne in mind that the planter receives this price at his gin-house or landing. I have thus particularly alluded to this manufacture, as it is already a great, and will continue to be a growing industry of the South.

New Orleans is not a great manufacturing place. There are a number of sugar refineries, and great efforts are being made to bring the grain of the West through the city. Two obstacles will ever prevent its being a great grain market: the warm climate, and the constant liability to yellow fever at the very time of the year when the grain should be moving. The river trade of the city has been injured by Memphis, and the railroads carry eastward much cotton which once went only through its harbor. There is considerable talk of the benefits to be derived from the Ship Canal to Ship Island Sound, but as yet the plans are too limited in their details to effect any good to the city. So far a depth of only 10 feet is proposed.

The only special objects of interest about New Orleans are the shell road, the cemeteries, and water-works, and I may add, just at this time, the ice machine, and the pneumatic car motor. The former is a great success; the latter, unfortunately is not yet perfect, but the owners have great hopes. The ice machine men claim that they can make ice at a cost of ½ cent per pound. They get up—or down—their cold by the decomposition of ammonia salt. It is a French machine, and very costly.

We were shown immense blocks of rock salt from the mines in Southwest Louisiana. This deposit of salt lies 16 feet under the ground, has been worked to a depth of 80 feet without any signs of failure, and from the main shaft tunnels have been driven 180 feet each way. The salt is mixed and delivered at Broshear City at $13 per tun. The soil above is a sugar plantation, and will this year produce 300 hogsheads of sugar. Farther west and south is the great sulphur deposit, which unfortunately is in the hands of the lawyers, and hence its value is not likely to be developed for years. I was told that 100,000 sacks of salt were taken from the mine in six months, that the supply is limited only by demand, and that it may be afforded at very cheap rates.

The sugar season has not yet commenced, but the crop is said to be fully 25 per cent larger than last year. Mr. Lawrence has made his steam plow a perfect success.

Three new railroads are finding their way into New Orleans; one from Mobile, the others from Selma and Meridian, thence northwards to Chattanooga. The first and last of these lines are under the control of the Alabama & Chattanooga R. R. Co., which is really the old Union Pacific R. R. Ring. They are much abused by some of the people here, but are doing the country a great deal of good. I shall allude more particularly to them in connection with Alabama.

Stirred up by this new and rival interest, Chas. Morgan is rapidly pushing his Texas Railroad, while parallel with him the Alabama & Chattanooga men will run another line.

These rival interests bring good to the people, or rather to the country, for most of the people had rather plod along in the old way. Their places will be taken by other and more energetic men in time. The climate, however, is enervating yet. I can never believe that Heaven intended all this vast area of immensely rich soil to remain an uncultivated wild. The solution of the problem has commenced, the end is not so sure. The Chinaman and the steam plow may settle it.

H. E. C.

Immigration.

The following synoptical table exhibits the total number of immigrants that arrived in the United States during the fiscal year ending June 30th, 1870, and their nationalities:

COUNTRIES.	IMMIGRANTS ARRIVED IN 1869-'70		
	Males.	Females.	Total.
Great Britain	63,369	40,316	103,685
Ireland	31,414	25,582	56,996
German States	73,027	49,621	122,648
Sweden and Norway	16,309	10,350	26,659
Denmark	2,519	1,564	4,083
Holland	663	403	1,066
Belgium	718	284	1,002
Switzerland	2,012	1,073	3,085
France	2,689	1,316	4,005
Spain and Portugal	655	256	911
Italy	2,132	759	2,891
Russia and Poland	690	440	1,130
Other countries of Europe	28	2	30
China	14,624	1,116	15,740
Africa	26	5	31
British North American Possessions	22,720	17,683	40,403
Mexico	352	101	453
South America	59	10	69
Cuba	816	357	1,173
West Indies	315	98	413
Azores	275	167	442
All other countries not stated	139	43	182
Total	235,551	151,546	387,097

Fair of the Central Agricultural and Mechanical Association, Selma, Alabama.

The Second Annual Fair of this association, will be held at Selma, Alabama, in November next, commencing on Tuesday the 8th, and continuing four days. The directors are making ample preparation for the display of all articles which may be brought for exhibition, in all the departments. The unexpected success of the First Annual Fair, and the encouragement received from every direction, induced them to double the area of the grounds of the Association, to erect large and commodious buildings, provide artesian wells and beautify the grounds to an extent that will make their location at once the most convenient and attractive place of resort in the South. The corresponding secretary is Mr. Wm. M. Byrd, Jr.

Trial of the Aveling & Porter Steam Road Roller at Orange, N. J.

This machine, purchased by Daniel Brennan, Jr., in England, for use in this country in the construction of broken stone pavements on the Telford and Macadam systems, was tested for the first time, on the 29th of September, on Main street, East Orange, N. J., in the presence of a large number of invited guests. The section of road on which the trial took place was a Macadam surface, and the test gave general satisfaction. Mr. Brennan imported the machine at an expense of $5,000. It weighs 36,000 pounds. Much interest is felt in the success of Mr. Brennan, a young man of great enterprise, and to whom has been awarded contracts for a number of miles of Macadam pavement in the young city of Orange.

Trade-Mark Decisions.

Two English decisions are recently reported.

1. *Title: acquiescence.*—When a man has learned a trade secret from his employer and practiced it after the employer's death, selling the article under the old name, he will not acquire such a right to the exclusive use of the name as a trade-mark as will be protected in a court of equity.

2. *Semble*—Where a trader acquiesces in a particular infringement of his trade-mark for a considerable period during his life, his representatives will be unable to restrain it after his death.

IN looking over the portfolios of the Patent Office we are always reminded of the want of care and skill displayed by some solicitors in the preparation of drawings accompanying their applications for patents. Poor, scratchy drawings are the rule; good ones the exception. Some solicitors seem to be anxious only to crowd in their cases. No matter about the character of the drawings. The Commissioner ought to insist upon a decided reform in this respect.

MR. PHILIP STRICKLER, of Timberville, Va., whose communication on balancing cylinders and runner millstones will be found on another page, states that he has a number of good inventions in mills and fire-arms for which he would like assistance to secure patents. He offers to make liberal terms with capitalists who would contract to take out patents for these inventions.

SURVEYS OF THE ISTHMUS OF DARIEN.—The results of the recent surveys of the Isthmus, undertaken by the United States Government, with a view to the construction of a ship canal between the Atlantic and Pacific, show that a tunnel ten miles long, and high enough to accommodate the masts of ships, would be required. The expense is regarded as too great to warrant the undertaking. Further surveys towards the south are yet to be made.

Facts for the Ladies.

We are very happy to be able to recommend Wheeler & Wilson's Sewing Machines to all persons who may be wanting an article so useful as a Sewing Machine. After an experience of ten years, we are not only able to to speak with confidence of their usefulness, but, also, of their great superiority over all other machines that we have tried in our establishment. These Sewing Machines have three advantages of great importance—rapidity of motion, adaptation to a greater variety of work and material, and little or no expense for repairs. SISTER MARY, Sister of Charity.

Providence Nunnery, Montreal.

You Cannot Do a Better Thing

For your Wife, on a washing day, than provide her a Doty Washer and Universal Wringer. It will keep aches from her back and arms, wrinkles from her forehead, and roughness from her hands. It will do the work of a hired woman, and save your linen from being scrubbed out and her temper from being chafed out.—[New York Weekly Tribune, March 22, 1870.

Many of the Largest Advertisers

In the country make all their contracts with newspapers through the Advertising Agency of Geo. P. Rowell & Co., No. 40 Park Row, New York. Their facilities for the transaction of the business are not excelled by those of any similar establishment in the world.

Answers to Correspondents.

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

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

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

W. J. B., of N. Y., writing to ascertain what will remove walnut stains from the hands, is answered by

R. S., of Vt., who states that slices of ripe pears rubbed on the hands will remove such stains. This may be correct; but, if so, the action must, we think, be due to the malic acid contained in the fruit. If this view be correct, green apples, which contain a much larger proportion of malic acid, ought, it would seem, to be still more efficient. There are various organic acids that will remove vegetable stains. Of these oxalic acid is one of the most powerful, but it is very poisonous, and requires to be used with much care. Citric acid or lemon juice, which contains a large proportion of citric acid, is also very good for removing many kinds of stains, and is safe to use. When the hands are stained no soap should be used to wash them previous to the use of acids for taking off the stains, as the alkali of the soap acts as a mordant to render the stains permanent. Where any of the acids named are used, the washing should be completed with pure water.

D. H., of Mass.—India-rubber can be dissolved in turpentine, animal oil, ether, or benzole, by introducing the solvent in the form of vapor, into a vessel containing the india-rubber in small pieces; the vessel being then exhausted of air, and kept at a required temperature by means of steam. Or, it will dissolve in these fluids by simple immersion in them, when heated, but more slowly and imperfectly. Benzole or benzine as it is commonly called, and other hydrocarbons of a similar character, dissolve it cold. Chloroform also dissolves it, but undoubtedly the best solvent for general purposes is benzole. We doubt if you will succeed in making finger cots by this process. There are secrets of experience essential to success which manufacturers jealously guard.

G. D. F., of S. C.—The paragraph to which you refer, as going the rounds of the press, stating that the Little system of transmitting telegraph messages enables 400 words per minute to be sent from Washington to New York, is correct in that statement. We have ourselves been lately investigating this system, and have now in our possession a message of about six hundred words transmitted at that rate, and distinctly legible. Your idea that this system could be substituted for short hand reporting is not correct, as the messages have to be first prepared by punctaring strips of paper on a machine for that purpose, a much slower process than short-hand writing, and the transmission is effected by an automatic machine that can only speak what is put into its mouth on the punctured paper slip.

C. E. K., of Mich.—Many learn to run locomotives by commencing wiping, and so climbing through the post of fireman finally to engineer in charge. In fact, that is the apprenticeship usually practiced we believe in England. We believe, however, that the learning of the machinist's trade in a locomotive shop is the best beginning. Certainly, all other things being equal, he who knows how to build and repair a locomotive is best qualified to run it. Besides, all men having the requisite knowledge are not qualified by courage or strength of constitution to endure the hardship of a locomotive engineer's work. Having learned the machinist's trade, you would have something to fall back upon in case of failure.

J. W., of R. I.—There is no way that we know of, and india-rubber manufacturers tell us there is *no practical way* of fastening india-rubber to metal, except by dovetailing it in, or some kindred process, while the rubber is yet soft and previous to the vulcanizing process. If, in this time of many discoveries, a cement has been found that will cause rubber to firmly cohere to metal, we shall be glad to receive the formula from any of our correspondents who may chance to know it.

E. J., of Ill., says that the water from a certain well is raised by means of three buckets, and that it is proposed to add another. The question arose whether the use of the extra bucket would add one third more, or one fourth, to the volume of water discharged. The parties, unable to agree, wish us to decide. We answer the extra bucket increases the discharge one third.

J. S., of S. C.—It will not injure your plain cylinder boiler to drill an inch hole in the end in the top remote from the boiler, and insert therein a pipe to convey steam to the lint room of your gin-house, provided the work is done in a workman-like manner.

C. M. B., of D. C.—A wire of fifty miles in length of iron might without doubt be made so small that it could be wound on a single reel of not very exaggerated dimensions. There would be no difficulty about flexibility. The size of the coil would of course depend upon the diameter of the wire.

W. B., of Ca., wants to know how japaning is done by steam heat, the construction of the ovens, etc. We have never seen japaning done by steam heat, still it is quite possible it is so performed. Can any of our correspondents throw some light on this subject.

J. S. V., of N. H.—There are no depths in the ocean to which a body originally heavier than sea water would not sink, although there is a theoretical limit where water would become so compressed as to be heavier than iron or even lead. This limit is, however, far lower than any depth of water supposed to exist in the ocean.

Wm. L. G., of D. C., wishes to know how to give small steel blades, which have been discolored by being ground, and which are not polished, a color which will remove or cover the rust, and also give a uniform shade of, say, blue or green.

S. K., of Ind.—We have not been able to get the definite information you seek in regard to the oil of brick.

Business and Personal.

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

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

Parties in need of small Grey Iron Castings please address Enterprise Manufacturing Co., Philadelphia.

Excelsior Stump Puller & Rock Lifter. T.W.Fay,Camden,N.J.

For Sale—One half the interest in McGee's Patent Self-boring Faucet. Address T. Nugent, Morristown, N. J.

Knitting Machines.—Manufacturers will address R. Samuel, Walden, N. Y.

Ireland's Hand Fan Mover.—The Patent Right of this novel and valuable invention for sale for cash, or part cash, and a royalty. Address W. A. I., 4 Irving Place, New York.

For Sale—A very valuable Patent. Large Commission to Agents in selling my new and valuable invention. Address Peter Soule, Rochester, N. Y.

Stager's Automatic Boiler Feeder. For Rights and Machines apply to J. B. Smith, 417 Broadway, Milwaukee, Wis.

Double-barrel Breech-Loading Gun Manufacturers send circulars and Prices to F. Booker, Glass Box 196, Springfield, Ohio.

A Foreman Boiler Maker wishes a Situation to take charge of a Shop. Address "Boiler Foreman," care J. Kenworthy, 480 8th ave.,N.Y.

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

Dickinson's Patent Shaped Carbon Points and adjustable holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24th, and Nov. 20, 1869. 64 Nassau st., New York.

Peck's patent drop press. Milo Peck & Co., New Haven, Ct.

Pattern Molding Letters to put on patterns of castings. Wholesale and retail, by H. W. Knight, Seneca Falls, N. Y.

Propeller Engine Cylinders, 28 inches square, for sale cheap, by Daniel W. Richards & Co., 92 Mangin st., New York.

Foundery Cranes, ten and fifteen tuns capacity, wanted. Address Box 2,348, Postoffice.

Foundery Cranes,thirty tuns capacity,for sale cheap. Address Postoffice Box 2,348.

Pictures for the Drawing Room.—Prang's "Lake George." "West Point," "Joy of Autumn," "Prairie Flowers." Just issued. Sold in all Art Stores.

Roofing Materials, House Sheathing, Roofing Felts, & Paints, full directions for applying. Mica Roofing Co.,73 Maiden Lane,New York.

Edging or Profiling Machines, having a valuable improvement in device for cutting "formers;" superior shaping, die sinking, spindle and cutter grinding machines are made by the Pratt & Whitney Company, Hartford, Conn.

A New Waltham Watch, made especially for Railroad Men and Engineers,is fully described in Howard & Co.'s Price List of Waltham Watches. Every one interested should send for a copy, which will be mailed to any address free. Address Howard & Co., 785 Broadway, N. Y.

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

See advertisement of New Work on "Soluble Glass," published by L.& J.W.Feuchtwanger,55 Cedar st.,N.Y. Price $2·20,mailed free.

Pumping Water without Labor or Cost, for railroads, hotels, houses, cheese factories, stock fields, drainage, and irrigation by our self-regulating wind-mill. Strong and well tested. Con. Windmill Co., No. College Place, New York.

Screw Wrenches.—The Best Monkey Wrenches are made by Collins & Co. All Hardware dealers have them. Ask for Collins Wrench.

Profitable Canvassing.—"Universal Sharpener," for Table Cutlery and Scissors. A correctly beveled edge can be obtained. See Adv't.

Blind Stile Mortising and Boring Machine, for Car or House Blinds, fixed or rolling slats. Martin Buck, Agent, Lebanon, N. H.

Builders—See A. J. Bicknell's advertisement on outside page.

The best selected assortment of Patent Rights in the United States for sale by E. B. Roberts & Co., 15 Wall st., New York. See advertisement headed Patentees. Sales made on Commission.

Best Boiler-tube cleaner—A. H. & M. Morse, Franklin, Mass.

"Your $50 Foot Lathes are worth $75." Good news for all. At your door. Catalogues Free. N. H. Baldwin, Laconia, N. H.

The Best Hand Shears and Punches for metal work, as well as the latest improved lathes, and other machinists tools, from entirely new patterns, are manufactured by L. W. Pond, Worcester, Mass. Office, 98 Liberty st., New York.

One 60-Horse Locomotive Boiler, used 5 mos., $1,200. Machinery from two 500-tun propellers, and two Martin boilers very low. Wm. D. Andrews & Bro., 414 Water st., New York.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Keuffel & Esser,116 Fulton st.,N.Y.,the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves.

For tinmans' tools, presses, etc., apply to Mays & Bliss, Plymouth, st., near Adams st., Brooklyn, N. Y.

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming,and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

Cold Rolled—Shafting,piston rods,pump rods,Collins pat.double compression couplings,manufactured by Jones & Laughlins,Pittsburgh,Pa.

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

It saves its Cost every sixty days—Mitchell's Combination Cooking Stove. Send for circular. R. B. Mitchell, Chicago, Ill.

Incrustations prevented by Winans' Boiler Powder (11 Wall st. New York,) 15 years in use. Beware of frauds.

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

Recent American and Foreign Patents.

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

PAINT MILL.—John W. Masury, Brooklyn, N. Y.—This invention relates to improvements in mills for grinding paint and other wet substances, and consists in providing the upper stationary stone with an annular or other hollow open or closed space for the application of cold or hot water or steam to be kept in circulation, for regulating the temperature of the stones and the substances being ground, which space is designed to be formed in the cast metal which is to be used with thin slabs of stones attached for the grinding surfaces. The invention also consists in a novel manner of suspending the upper stone on the frame for delivering the ground substance at several points around the stone, and in providing a plurality of scrapers for taking off the ground paint, so that three or more vessels may receive the ground substance at the same time, thereby enabling one person to attend to several mills, the vessels not filling so fast or needing to be changed so often; and also in a manner of suspending the upper stone for greater convenience in raising it off the bed stone.

GRAIN BINDER.—William Lottridge, Charles City, Iowa.—This invention relates to improvements in grain-binding attachments to reaping machines, and consists in a twisting attachment to the grain board of the harvester for forming a rope of straw to make the bands, the said rope being conducted over suitable guide rollers to the binding apparatus; also in an arrangement of binding jaws, twister, tucker, cutters, and the operating devices for the twister for swinging back and forth to open and close over a trough to which the gavel is delivered by a reel receiving the straw from an endless carrier, the said jaws opening to admit and disconnect the driving gear of the twister, and closing the gavel, to engage the twister with its driving gear and to bind the gavel. The invention also consists in certain improvements in the construction, arrangement, and operation of the rope carrier, tucker, discharger, cutters, and the grain holdingand delivering reel.

NURSERY FOOTSTOOL.—Levi Burnell, Milwaukee, Wis.—This invention relates to improvements in footstools, and consists in a combination with a base plate preferably mounted on short legs of an upper plate hinged to it at or near one edge, or to a piece rising a little above it, and supported at the opposite edge by springs or other elastic support, considerably higher than the hinged edge, thereby constituting a graduated springing stool on which the nurse may place her foot while holding an infant, and trot it with an easy and uniform motion, not attainable when the feet rest on the floor.

HOISTING APPARATUS.—Levi Burnell, Milwaukee, Wis.—This invention relates to improvements in apparatus for hoisting building materials for building houses, and consists in a combination of a hoisting car, a track, and a counterpoise weight, so arranged that the counterpoise weight may be raised by the weight of the attendant on the unloaded car, and then raise the loaded car, whereby the gravity of the attendant may be used to raise loads as heavy, or heavier, than he could carry, in a manner much less fatiguing than the common way of carrying up the material in hods.

REED ORGAN.—George Woods, Cambridgeport, Mass.—This invention relates to improvements in reed organs, melodeons, and other like instruments, and consists in the application to the said instruments, as now constructed, of an additional wind chest, with reeds and sounding-box, for increasing and varying the sounds, the said attachment being so arranged that the valves may be worked by the keys which work the principle valves, and they may be brought into or out of action instantly by a stop provided for the purpose.

HEAD-BLOCK FOR SAW MILLS.—Franklin W. Shelley, Muncie, Ind.—This invention relates to a new apparatus for imparting motion to the head-blocks of circular and other saw mills. The invention consists chiefly in the application of a series of friction levers, which are operated by a pair of sliding bars so as to impart the necessary intermittant forward motion to the block.

ROOFING COMPOUND.—Joseph V. Douglas, Philadelphia, Pa.—This invention has for its object to utilize the iron scales, shavings, and dust which constitute the waste of shops, founderies, rolling mills, etc., and consists in combining the same with adhesive ingredients, to produce a coating or paint for roofs.

CORRUGATED AND METALLIC STREET PAVEMENT.—George Wilkes, New York city.—This invention has for its object the application of the railway principle to common use on street or roads so that all vehicles may have the smooth tracks which are now exclusively provided for railroad cars.

BALING PRESS.—William Iler, Shreveport, La.—This invention relates to a novel construction of mechanism for working the follower of a baling press, and consists in a new arrangement of friction clutches for working the follower downwardly, and also in a new construction of clutch.

VELOCIPEDE.—John Eggert, New York city.—This invention relates to improvements in the construction of the driving, steering, and braking gear of a three or four-wheeled velocipede, and to a new manner of supporting the seat on the same.

GRATE.—Francis Glick and U. Keck, Allentown, Pa.—This invention relates to a new sectional grate, which is so constructed that it can be dumped without disturbing or wearing its supports on the fireplace.

FENCE.—James Comstock, Greenfield, Ind.—This invention relates to improvements in fences, and consists in connecting the panels, which have broad posts attached to the ends, so that the longitudinal boards only extend to the centers, and are so arranged that at the meeting ends the parts of each panel will be on opposite sides to inclose the ends of both panels between them, by braces set on the ground and notched into the posts at the upper ends to support the whole above the ground, and tie bars, jointed at one end to the braces near the bottom, and extending through the board, by the edges of the posts, between the lower boards, and secured in blocks by keys in such a way that the weight of the fence serves to bind the whole together in a measure of permanence depending upon the weight of the fence.

HAIR CURLER.—J. W. Kenny and J. H. Adams, Albany, N. Y.—This invention relates to improvements in hair-curling instruments, and consists in making the cylinder hollow and of thin metal, with a small screw thread at the open end, and providing a heating iron with a handle for screwing into the said hollow curling cylinder or tube for heating the latter rapidly and uniformly, and providing a heat that will not burn the hair, by means of water contained in the tube into which the heating iron is placed. The invention also comprises the application to the tube of a thimble or ring for applying to the tube in a manner to confine the end of the lock of hair to be curled.

DEVICE FOR SPREADING CIRCULAR SAW TEETH.—W. H. Rudolph, Clarksville, Tenn.—The object of this invention is to facilitate the operation of spreading or expanding the points of circular saw teeth, so as to give a sharp cutting edge to the tooth and relieve the saw of friction, and it consists in a metallic plate provided with projecting ears for holding the tooth to be spread, and for holding the plate on the saw.

MANUFACTURE OF ICE.—J. F. Gesner, West Farms, N. Y.—This invention relates to improvements in the manufacture of ice and the refrigeration of air and all fluids, liquids, and solid substances which it may be desirable to reduce to a low temperature. By this improvement ice is produced or refrigeration obtained by the combined frigorific effect of the evaporation and heat conduction of liquid sulphurous anhydride or binoxide of sulphur (ordinarily called sulphurous acid), chemical symbol SO_2, containing one equivalent of sulphur and two equivalents of oxygen.

HORSE POWER.—E. O. and C. B. Thompson, Thomasville, Ga.—This invention relates to improvements in horse power, and consists in an improved arrangement of the supporting frame and operating machinery calculated to provide a simple and cheap apparatus for use either on the floor or for attachment, so as to be suspended in an inverted position from the beams or frame of a gin house or other building.

CAR PUSHER.—Rufus Lane, Freeport, Ill.—This invention relates to a new improvement for propelling railroad cars on switches, etc., in places where engines for that purpose are not to be obtained. The invention consists in the use of an extension frame which has a claw for propelling the rail at one end and a pushing block at the other, and can be extended by revolving a pinion.

ELASTIC CLASP.—Antoine Scheydecker, Amsterdam, N. Y.—This invention has for its object to furnish an improved clasp for confining the ends of elastic sleeve bands and other elastic bands, which shall be so constructed as to hold the end of the bands securely, and at the same time in such a way as to prevent the clasp from coming in contact with the sleeve or other object about which the band is passed.

CORN PLANTER.—H. C. Beshler, Berrysburgh, Pa.—This invention has for its object to furnish an improved corn planter, which shall be so constructed and arranged as to drop the corn uniformly and at the proper time, and in such a way that the operator may see the kernels as they pass down the onductor spouts.

CHECK REIN CONNECTOR.—A. H. Rockwell, Harpersville, N. Y.—This invention has for its object to furnish a simple, convenient, and effective device for connecting the check rein with the main rein, which shall be so constructed as to enable the check rein to be secured to the main rein adjustably without sewing, forming holes in, or otherwise weakening the said main rein.

CAR COUPLING.—G. W. Wheat, Philipsburg, Pa.—This invention has for its object to furnish an improved car coupling which shall be simple in construction, effective in operation, will couple the cars automatically when they are run together, and may be easily and conveniently uncoupled.

ELASTIC CABLE APPARATUS.—J. E. Jones, Wiretown, N. J.—The object of this invention is to provide means for giving elasticity to chain cables on board of ships and steamboats, designed for relieving the cable in breaking the anchor from the ground, and in the surging of the vessel.

GUANO DISTRIBUTOR.—William E. Martin, Oconee, Ga.—This invention has for its object to furnish a simple, convenient, and effective machine for distributing guano, and other fine fertilizers, which shall be so constructed and arranged that it may be easily operated by hand.

ADJUSTABLE TIME TABLE.—Loyst J. Smith, New York city.—This invention relates to a new time-table for railroads, steamboats, and other purposes, and consists principally in the employment of a series of reversible and removable blocks upon which the requisite figures or characters are written, the blocks being retained by means of removable slides.

HARROW.—Andrew Lewis, Hastings, Minn.—This invention has for its object to furnish an improved harrow, which shall be flexible, so as to adapt itself to any unevenness of ground, and which may be folded together to enable it to make a turn on short corners.

PROJECTILES.—James G. Hope, Topeka, Kan.—This invention has for its object to furnish an improvement in balls and other projectiles, by means of which the ball or other projectile may be fired in curved lines with the same accuracy as in straight lines.

BOAT HULLS.—L. P. Rider, Pittsburgh, Pa.—This invention relates to a new and important improvement in mode of constructing boats or marine vessels, and consists in the application of certain construction lines for forming the bottom of the hull, by means of which the water is made to exert a lifting force on the boat, and is thrown beneath instead of to the opposite sides of the boat.

HAND GUANO-DISTRIBUTER.—Edwin R. Stedman, Sparta, Ga.—This invention relates to improvements in apparatus for sowing guano, plaster, and other like substances in the rows or drills in which the seed is planted. It consists in a small tin or other sheet metal cup, with a short socketed or other suitable handle for the reception of a longer wooden one, and having a hole at the apex of the conical bottoms, over which works a slide for regulating the discharges, said slide being held by a pin, or it may be any other fastening, engaging it at certain prearranged points by which it holds the slide at certain graduated positions for discharging the required quantities.

SNAP HOOKS.—David J. Blasir, Western, N. Y.—This invention relates to improvements in the construction of snap hooks, and mode of attach- the reins thereto, and consists in making the shank of the hook, which is broad and flat, and broader at the end than at the junction with the hooks, and providing a clasp corresponding to it for slipping on in the direction of the strain on the rein, which clasp confines the end of the rein against the side of the shank, upon rivets projecting from it, and also confines the snap springs in a way to admit of readily removing it and applying another when broken or rendered useless from any cause.

SAW SET.—Wm. A. Smith, Dresserville, N. Y.—This invention relates to an improved saw set, which is adapted for setting the teeth of crosscut saws, by driving a tool, resembling in some respects the common upsetting tool used, for spreading the teeth of saws cutting with the grain of the wood, against the points of the teeth.

STUMP PULLER.—J. M. Ferguson, Summit, Miss.—This invention relates to improvements in machines for pulling stumps, and consists in an arrangement on the top of a portable frame of a spherical nut, with a pulling screw rod working in it, the said nut being mounted in a rotating sweep to be turned for raising the screw rod, and to have a universal motion in its seat in the sweep, so that the rod may shift according to the direction of the strain on it, and the sweep being mounted on friction balls for being supported and for revolving readily. The invention also comprises an arrangement of the brace rods for the base of the frame, calculated to facilitate the adjustment of the frame around the stumps.

MACHINE FOR FINISHING WHEELS.—Jas. L. Hathaway, Norfolk Va.—This invention relates to improvements in machinery for dressing and finishing small gear and other wheels for watches and the like, and consists in a rotary cutter of peculiar construction, and a wheel support, arranged for turning the faces of the wheels, also for dressing out and finishing the teeth.

OPERATING SAFETY LATCHES.—J. Ward Fifield, Franklin, N. H.—This invention relates to a new and useful improvement in operating safety latches, whereby the latch may be moved for locking or unlocking by means of a key.

GAS MACHINE.—John L. Bartlett, Stockton, Cal.—This invention relates to a new and useful improvement in machines for generating illuminating gas by carbureting atmospheric air.

CAR COUPLING.—Loyst J. Smith, New York city.—This invention relates to a new car coupling, which is made entirely self-acting, so that it will connect two cars without the aid of an attendant.

MEDICAL COMPOUND.—H. W. Cloud, Evansville, Ind.—This invention relates to a new and useful improvement in a compound to be used as a medicine for the cure of disease, and as a tonic.

SWING LOCK FOR TRUNKS.—James Terry, Jr., Terryville, Conn.—This invention relates to a new construction of lock fastening for trunks, etc., and more particularly to a novel form of joint for a swinging lock.

COMPOSITION ROOFING.—George Shove, Yarmouth Port, Mass.—This invention relates to a new composition for roofing, or, rather, to a novel combination of materials for constructing a covering for roofs.

POTATO DIGGER.—G. M. Marks, Half Moon, Pa.—This invention relates to new and useful improvements in a machine for digging potatoes, whereby that tedious and laborious operation is performed by horse-power, and in the most expeditious manner.

TELESCOPIC PEN AND PENCIL CASES.—Charles H. Downes, Jersey city, N. J.—This invention relates to improvements in telescopic pen and pencil cases, of that class wherein the pen or pencil holders are moved out and in the sheaths, or outer cases, by means of spirally slotted tubes, and it consists in a novel arrangement of the revolving tube and its adjuncts, whereby the spindles or pencil holders may be made of greater capacity with the cases of ordinary or a given capaci

HOISTING GRAPPLE.—John A. Burgess, Plymouth, Mass.—The object of this invention is to facilitate the operation of hoisting barrels containing fish, or other material or substance, having but one head, designed more especially for use on fishing vessels, for hoisting and lowering fish (which are usually packed in open barrels), into the holds of the vessels.

WAGON BEDS.—W. H. Porter, Brazil, Ind.—This invention relates to improvements in wagon beds, platforms, or boxes, and consists in certain improvements in the construction and arrangements thereof, and of the connections of the brake, actuating levers, calculated to provide the most substantial and durable boxes or beds and brake apparatus that may be.

SAW FILING AND SETTING MACHINE.—Hiram D. Chance and Daniel Rishe, Llewellyn, Pa.—This invention relates to improvements in saw-filing and setting machines, and consists in an application to a pair of clamping jaws such as are used for clamping the saw and holding it to the bench, of a novel arrangement of file-holding and adjusting apparatus; also, of a setting lever.

FURNACE GRATE.—Abner B. Weeks, Rockland, Me.—This invention relates to improvements in grates of furnaces of steam-generating or other apparatus, which burn large quantities of fuel, and consists in a simple and convenient arrangement of the same in sections for dumping while the fires are burning, to discharge the refuse matter.

WATER METER.—John W. Groat, New York city.—This invention relates to improvements in the construction of that class of water meters in which the water is made to pass over a screw or spiral blade incased in a tube, the blade or screw being turned by the water, and the shaft thereof imparting motion to the recording apparatus. The invention consists in the construction of the case and the blade, and in the relative arrangement of the one with the other also in the construction of the tube inclosing the spiral blade.

WATER CLOSET.—S. R. Mann, East Cowes, England.—This invention relates to an improvement in water closets, and consists in an arrangement of parts connecting to the bottom or lower part of the pan or basin a siphon pipe, the long leg of which connects with the soil pipe, or with a trap which leads to the drain or sewer. The action of the closet is as follows: Before the handle is pulled the basin contains its normal quantity of water, say one third of a gallon, which, while serving for the proper reception of foul matters, at the same time seals the communication between the basin and the siphon pipe, which leads to the drain. When the handle is pulled, a quantity of water, say half a gallon, is quickly discharged into the basin, and the impulse and effect thus produced cause the water to flow up the short leg of the siphon and over its top bend, falling down its longer leg, and driving forward the air, or a portion of the air, contained therein, and in passing through or out of the bottom of the longer leg the water is checked in its flow, and the siphon is brought into or continued in action, drawing the contents of the basin forward so as to pass on into the soil pipe trap or drain, without allowing foul air to escape backwards into the basin or apartment.

BREECH-LOADER.—F. Von Martini, Lauenfeld, Switzerland.—This invention dispenses with the spiral spring at present employed for actuating the discharging mechanism in the Martini rifle, and the separate functions of the same and other springs heretofore usually employed in fire-arms of the kind above referred to are fulfilled by a single flat bent spring. This flat, bent spring is placed in the lock frame behind a direct-acting or other hammer, the upper part or band of the spring partly supports the rear part of the falling breech block, a recess in the block resting on the bend of the spring. The lower parts of the spring are used for actuating the tumbler or hammer to discharge the arm, and also as a trigger or sear spring.

THE Newark *Daily Journal* says: "We have a great idea of New Jersey as THE (or, at least, A) nursery of inventors, and though a certain New England State puts in a claim, we believe (and probably a just one), to be considered as the great mother of inventors in this hemisphere, we nevertheless cannot get rid of the notion that among the Jersey Blues what may be called the genuine spirit of invention prevails to a very uncommon degree. There is scarcely a village, indeed, of any account, so far as the mechanic arts are concerned, in this comparatively small but independent State, where two or three of its denizens are not to be met with whose ingenious experiments justly entitle them to the legitimate distinction of being (in however small a measure) the benefactors of their species; nay, whose powers of discovery, could the latter be effectually brought into practice, may have the effect of revolutionizing to advantage many a branch of mechanical business at present sinking into desuetude for the lack of such regeneration. Well, what is it, it may be asked, that could, under the circumstances, be done to bring about so great a *desideratum*? We answer that every well-wisher to the struggling inventor—every one with the means and the will—should take part in bringing such inventor, if he cannot do it himself, in immediate contact with those that can help him, and that effectually. And who are they? We answer, none other than that long-established, universally-known, deeply-experienced, and, by all odds, the most thoroughly skillful firm at present to be met with in this country, as procurers of patents—we mean, as a matter of course, Messrs. Munn & Co., of the *Scientific American*, 37 Park Row, New York city, who, if anybody can, CAN most effectually benefit any inventor deserving the name, and whose object it may be to secure a patent for his invention."

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107,849.—COOKING RANGE.—James Albee, Chelsea, assignor to Moses Pond & Co., Boston, Mass.
107,850.—FEED-WATER HEATER.—Harrison Anderson, Peoria, Ill.
107,851.—PAPER-FEEDING APPARATUS.—John T. Ashley, Brooklyn, E. D., N. Y.
107,852.—DIAPHRAGM STOPCOCK.—W. E. Banta, Springfield, Ohio.
107,853.—GAS CARBURETER.—John L. Bartlett, Stockton, assignor for one half his right to William Biven, San Joaquin county, Cal.
107,854.—PROCESS FOR SEASONING LUMBER.—H. H. Beach, Rome, N. Y.
107,855.—HANDLE FOR MILK CAN.—Alvin C. Beckwith and G. H. Graham, Oriskany, N. Y.
107,856.—GRAIN SEPARATOR.—Frederick A. Begole, Jackson, Mich.
107,857.—CORN PLANTER.—Henry C. Beshler, Berrysburg, Pa.
107,858.—ROLL FOR CRUSHING AND PULVERIZING MACHINE.—E. S. Blake, Pittsburgh, Pa.
107,859.—SNAP HOOK.—D. J. Blasir, Western, N. Y.
107,860.—GRAIN AND SEED CLEANER.—Newton M. Bowen, Knightstown, Ind.
107,861.—CIRCULAR SAW-MILL.—Wm. Bowman, Etna Green, Ind.
107,862.—COMBINED PLOW AND HARROW.—J. F. Braucher Lincoln, Ill.
107,863.—SLIDE VALVE.—George Bailey Brayton, Boston, Mass.
107,864.—MANUFACTURE OF BOOTS AND SHOES.—William N. Brookhouse, West Danvers, Mass.
107,865.—REED-SETTING MACHINE.—Joseph Browning, Philadelphia, Pa.
107,866.—MANUFACTURE OF SALT.—J. R. Buchanan, Louisville, Ky.
107,867.—CASTING VALVE CHAMBER AND SEAT.—John K Burke, Rochester, N. Y.
107,868.—HOISTING APPARATUS.—Levi Burnell, Milwaukee, Wis.
107,869.—NURSERY FOOTSTOOL.—Levi Burnell, Milwaukee, Wis.
107,870.—HOSE BRIDGE.—Walter E. Cameron, Taunton, Mass.
107,871.—WRENCH.—Daniel Campbell and William Saul, Elizabeth, N. J.
107,872.—SAW-FILING AND SETTING MACHINE.—Hiram D Chance and Daniel Rishe, Llewellyn, Pa.
107,873.—VISE.—Julius Chavanne, Porrentray, Switzerland.
107,874.—STOVE LEG.—S. E. Chubbuck (assignor to himself, Isaac Y. Chubbuck, and Stillman E. Chubbuck, Jr., copartners, Boston, Mass.
107,875.—MACHINE FOR DRILLING CARRIAGE SHACKLES.—J. B. Clark, Plantsville, Conn.
107,876.—RANGE FOR HEATING AND COOKING.—J. S. Clark, Philadelphia, Pa.
107,877.—MEDICAL COMPOUND.—H. W. Cloud, Evansville, Ind.
107,878.—MANUFACTURE OF FERTILIZERS.—John Commins, Charleston, S. C.
107,879.—FENCE.—James Comstock (assignor to himself and John W. Comstock), Greenfield, Ind.
107,880.—WATER COOLER AND REFRIGERATOR.—Levi R. Comstock, Keokuk, Iowa.
107,881.—PARLOR BEDSTEAD.—Mark Crosby, Boston, Mass.
107,882.—ROULETTE.—A. H. Crozier, Oswego, N. Y., and M. Taylor, Hartford, Conn.
107,883.—PORTABLE FENCE.—Wells Crumb, Coloma, Mich.
107,884.—STREET LAMP.—Gustavus Cuppers, New York city. Antedated September 21, 1870.
107,885.—BARREL HEAD.—Reuben De Bare, Philadelphia Pa.
107,886.—SAW MILL.—J. A. Dorr, Williamsport, Pa.
107,887.—MACHINE FOR FELTING AND HARDENING HAT BODIES.—John T. Earle, Danbury, Conn.
107,888.—VELOCIPEDE.—John Eggert, New York city.
107,889.—HEMMER FOR SEWING MACHINES.—John V. D. Eldridge, Detroit, Mich.
107,890.—WEIGHING ATTACHMENT FOR CARDING MACHINE FEEDER.—P. C. Evans, Brimscombe, England, and H. J. H. King, Glasgow, Scotland.
107,891.—STEAM PULLER.—James M. Ferguson, Summit, Miss.
107,892.—LUMBER DRYER.—Robert E. Ferguson, Chicago, Ill.
107,893.—CLOTHES WRINGER.—Robert E. Ferguson, Chicago, Ill.
107,894.—KNIFE-GRINDING MACHINE.—E. S. M. Fernald, Saco, Me.
107,895.—SAFETY LATCH.—J. W. Fifield, Franklin, N. H.
107,896.—MACHINE FOR POLISHING THE EYES OF SEWING MACHINE NEEDLES.—Thaddeus Fowler, Tottenville, N. Y., assignor to "Excelsior Needle Co.," Wolcottville, Conn.
107,897.—MOP HEAD.—O. S. Garretson and J. G. Garretson Buffalo, N. Y.
107,898.—MANUFACTURE OF ICE.—J. F. Gesner, West Farms, N. Y.
107,899.—GRATE.—Francis Glick and Uriah Keck, Allentown, Pa.
107,900.—WATER METER.—John Warner Groat, New York city.
107,901.—MACHINE FOR MAKING CLEVIS.—John S. Hall, Pittsburgh, Pa.
107,902.—ADJUSTABLE WINDOW SHADE.—E. W. Hastings, Boston, Mass.
107,903.—MACHINE FOR FINISHING WHEELS FOR WATCHES.—J. L. Hathaway, Norfolk, Va.
107,904.—PRESERVING WOOD.—Joshua R. Hayes, Washington, D. C.
107,905.—HORSE-COLLAR TOP.—Isaac Hicks (assignor to himself and J. O. Kendall), Hartford, Wis.
107,906.—STUMP EXTRACTOR.—Johnson Higgins, Friendship, N. Y.
107,907.—NECKTIE.—John G. Hitchcock, New York city.
107,908.—CORN PLANTER.—Hezekiah R. Holland, Wilmington, Va.
107,909.—PROJECTILE.—J. G. Hope, Topeka, Kansas.
107,910.—CEMENT FOR PAVING AND BUILDING.—J. E. Hover, Philadelphia, Pa.
107,911.—MACHINE FOR TENONING SPOKES.—John W. Huffman, Fremont, Ind.
107,912.—LIFE BOAT.—Robert Humble, Milwaukee, Wis.
107,913.—MACHINE FOR MAKING FANSTICK.—Edmund S. Hunt, Weymouth, Mass.
107,914.—WAGON LOCK.—S. S. Hurlbut, Cardova, Ill.
107,915.—GRAIN DRILL.—Joseph Ingels, Milton, Ind.
107,916.—MAINSPRING BARREL OF WATCH.—H. B. James, Trenton, N. J.
107,917.—SURGE RELIEVER.—J. E. Jones, Wiretown, N. J.
107,918.—MACHINE FOR TURNING OR PLANING THE INSIDE OF BELL OR OTHER CASTING.—Octavous Jones, Troy, N. Y.
107,919.—CORN SHELLER.—Elbert Jordan, Pickens County, Ala.
107,920.—HAIR CURLER.—J. W. Kenny and J. H. Adams, Albany, N. Y.
107,921.—TREADLE FOR SEWING AND OTHER MACHINERY.—G. B. Kirkham, New York city.
107,922.—COTTON OPENER.—Richard Kitson, Lowell, Mass.
107,923.—BARK MILL.—Charles Korn, Wurtsborough, N. Y.
107,924.—ROCKING OR TILTING CHAIR.—James Lamb, Hubbardston, Mass.
107,925.—MOLD-BOARD FOR PLOW.—John Lane (assignor to Hapgood & Co.), Chicago, Ill.
107,926.—CAR PUSHER.—Rufus Lane (assignor of one half his right to W. G. Moore), Freeport, Ill.
107,927.—CIGAR MACHINE.—Johan Lauritzen, Newark, N. J.
107,928.—HOT AIR ENGINE.—C. P. Leavitt, New York city.
107,929.—HAMMER STRAP.—W. J. Lewis, Pittsburg, Pa.
107,930.—RACK FOR WAGON BRAKE.—W. J. Lewis, Pittsburgh, Pa.
107,931.—BLANK FOR HAMMER-STRAP FOR WAGONS.—W. J. Lewis, Pittsburg, Pa.
107,932.—MEAT AND VEGETABLE SLICER.—P. H. Lindsey, Lockport, N. Y.
107,933.—GRAIN BINDER.—William Lottridge, Charles City, Iowa.
107,934.—WATER INDICATOR AND ALARM.—Mirabeau, New Albany, Ill.
107,935.—FLOUR BOLT.—John Mallin, Chicago, Ill.
107,936.—WATER CUT-OFF FOR CISTERNS.—J. R. Manny, Chicago, Ill.
107,937.—GUANO DISTRIBUTER.—W. E. Martin (assignor to James D. Barber), Oconee, Ga.
107,938.—SULKY PLOW.—H. W. Mason, Hagarstown, Md.
107,939.—PAINT MILL.—J. W. Masury, Brooklyn, N. Y.
107,940.—IRONING TABLE.—Henry McChesney (assignor to himself and J. W. Clark), Buffalo, N. Y.
107,941.—STAIR ROD.—W. T. Mersereau, Orange, N. J.
107,942.—MANUFACTURE OF PURIFIED CAST IRON FROM THE ORE.—J. W. Middleton, Philadelphia, Pa. Antedated September 24 1870.
107,943.—CUTTER HEAD FOR PLANER.—John More, New York city.
107,944.—FEATHER RENOVATOR.—M K Morris Council Bluffs, Iowa.

107,945.—Balanced Slide Valve.—G. F. Morse, Portland, Me.

107,946.—Expanding Tap.—Frank Murgatroyd, Cleveland, Ohio.

107,947.—Piano Lock.—John Murphy, Roslindale, assignor to O. J. Faxton, Boston, Mass.

107,948.—Damper Regulator.—J. H. Murrill (assignor to himself and L. R. Keizer), Baltimore, Md.

107,949.—Ice Cream Pail.—G. A. Nash, Niles, Mich.

107,950.—Railway Car Coupling.—Nathan Norris, Buchanan, Mich.

107,951.—Apparatus for Drawing and Measuring Oil.—Person Noyes, Lowell, Mass.

107,952.—Tie for Bags, Grain, etc.—G. W. Osborn, Parkville, Mich.

107,953.—Wire.—J. S. Parsons, Windham, assignor to himself and A. S. Winchester, South Windham, Conn.

107,954.—Cultivator.—H. N. Pease, Toledo, Ohio.

107,955.—Friction Roller for Railway Car Trucks.—Jethro Pencille, Lockport, N. Y., assignor to himself and Cornelius Hood.

107,956.—Curtain Fixture.—F. G. Peoble, New York city. Antedated September 10, 1870.

107,957.—Apparatus for Washing Ores and Minerals.—Edwin Platt, Charleston, S. C.

107,958.—Machine for Washing Ores and Other Mineral Substances.—J. B. Platt, Augusta, Ga.

107,959.—Washing Machine.—C. M. Powers and T. L. Robinson, Flushing, N. Y.

107,960.—Tree and Plant Protector.—D. R. Prindle, East Bethany, N. Y.

107,961.—Hull of Vessels.—L. P. Rider (assignor to himself, William Yagle, and A. Ward), Pittsburgh, Pa.

107,962.—Manufacture of Ice.—Moritz Rosenstein, Boston, Mass.

107,963.—Device for Spreading Circular Saw Teeth.—W. H. Rudolph, Clarksville, Tenn.

107,964.—Hand Stamp.—H. W. Safford, New York city.

107,965.—Link Connecting the Handles and Valve-Rods of Pumps.—Samuel Selden and Matthew Griswold, Erie, Pa.

107,966.—Head Block for Saw Mill.—F. W. Shelley, Muncie, Ind.

107,967.—Roofing.—George Shove, Yarmouth Port, Mass.

107,968.—Temporary Paper Binder.—F. M. Smith, Syracuse, N. Y.

107,969.—Reading Glass.—J. H. Smith, Brooklyn, E. D., N. Y.

107,970.—Adjustable Time Table.—L. J. Smith (assignor to himself and H. D. Blake), New York city.

107,971.—Car Coupling.—L. J. Smith (assignor to himself and H. D. Blake), New York city.

107,972.—Corn Harvester.—M. A. Smith, Middlefield, N. Y.

107,973.—Plow.—C. W. Snead, Milledgeville, Ga.

107,974.—Device for Attaching Steels to Corsets.—W. A. Starrett and H. E. Starrett, Lawrence, Kansas. Antedated September 24, 1870.

107,975.—Guano Distributer.—E. R. Stedman, Sparta, Ga.

107,976.—Construction of Steam Boilers and Tanks.—H. J. Stein, Hannibal, Mo.

107,977.—Steam Pump.—C. L. Stevens, Galesburg, Ill., assignor to himself, A. A. Dentan, and D. G. Dentan. Antedated september 26, 1870.

107,978.—Shaft Coupling.—Timothy F. Taft, Worcester, Mass., assignor to Aurin Wood and J. F. Light.

107,979.—Mechanism for Operating Comber Boards.—J. S. Templeton, Glasgow, Great Britain.

107,980.—Grain and Seed Drill.—G. M. Thirkittle, Belleville, Mich.

107,981.—Machine for Lasting Shoes.—C. H. Trask, Lynn, Mass.

107,982.—Dryer.—Edmund Trowbridge and Jas. M. Jones, Detroit, Mich.

107,983.—Locomotive.—J. M. Ure, Glasgow, Great Britain. Patented in England March 18, 1868.

107,984.—Rotary Bake Oven.—Joseph Vale, Beloit, Wis.

107,985.—Grinder for Harvester Cutter.—S. O. Vaughan, and P. W. Vaughan, DeKalb, Ill.

107,986.—Thrasher and Separator.—Albert A. Walker (assignor to W. C. Leyburn, and G. A. Fisk), Sparta, Wis.

107,987.—Furnace Grate.—Abner B. Weeks, Rockland, Me.

107,988.—Railway Car Coupling.—G. W. Wheat, Philipsburg, Pa.

107,989.—Corrugated Metallic Pavement.—Geo. Wilkes, New York city.

107,990.—Combined Horse-Power and Baling Press.—C. A. Wright, Rodney, Miss.

107,991.—Washing Machine.—George Wright, Savannah, Mo.

107,992.—Type Planer.—Walter Sumner Wright, Chicago, Ill.

107,993.—Electro Magnetic Safe Lock.—Charles O. Yale, New York city. Antedated September 24, 1870.

107,994.—Thrashing Machine.—Joseph Allonas, Mansfield, Ohio.

107,995.—Spring Bed.—Lewis Anderson, Chicago, Ill.

107,996.—Clothes Rack.—Herman Baumann and Urban Mueller, Canton, Ohio.

107,997.—Compound for Coloring Paper and other Fabrics.—Frederick Beck, New York city.

107,998.—Nut Lock.—Jonathan Bell, New York city.

107,999.—Feather Renovator.—Elias Bickell and Michael F. Noraconk, Milton, Pa.

108,000.—Auxiliary Table Attachment.—James Blake, Scranton, Pa.

108,001.—Radiator.—Edward Bourne, Pittsburgh, Pa.

108,002.—Subsoil Pulverizing Attachment for Plow.—L. D. Burdin, Paris, Ky.

108,003.—Knitting Machine.—W. W. Burson and John Nelson, Rockford, Ill. Antedated Sept. 30, 1870.

108,004.—Plow.—Manlove Butler, Vernon, Ind.

108,005.—Apparatus for Carbureting Air and Gas.—Henry A. Chapin, New York city.

108,006.—Life Preserver.—E. M. Crandal, Marshalltown, Iowa. Antedated September 26, 1870.

108,007.—Vegetable Cutter.—Francis Curtis, Brattleborough, Vt.

108,008.—Clothes Dryer.—W. A. Daggett, Landis township, N. J.

108,009.—Gas Retort.—Darius Davison, New York city.

108,010.—Clapboard Gage.—Abram Deyo, Rockford, Ill.

108,011.—Saw.—Henry Disston, Philadelphia, Pa.

108,012.—Brick Machine.—D. P. Dobbins and James Sangster, Buffalo, N. Y.

108,013.—Machine for Milling Carriage-Spring Heads.—William Evans, New Haven, Conn.

108,014.—Flue.—Nelson Fouche, New Orleans, La.

108,015.—Machine for Scraping Chair-Backs.—Erastus S. French, Westminster, Mass.

108,016.—Rotary Engine.—Samuel Gibson, Lancaster, assignor to himself and I. W. G. Wierman, York, Pa.

108,017.—Bolt for Barn-Doors, etc.—M. R. Green, Warwick, N. Y.

108,018.—Bed Bottom.—Benjamin Gregg, Bennington, Vt.

108,019.—Washing Machine.—Luke Hale, Hollis, N. H.

108,020.—Sewing Machine.—Thomas J. Harper, Atlanta, Ga.

108,021.—Meat Mangler.—James T. Harvey and William Dixon, Marysville, Pa.

108,022.—Revolving Fire-Cracker Pistol.—J. H. Hawes and Orville W. Brock, Monroeton, Pa., assignors to J. H. Hawes.

108,023.—Trip-Hammer and Anvil Stock.—J. C. Higgins, Skowhegan, Me.

108,024.—Snap Hook.—Asahel A. Hotchkiss, Sharon, Conn.

108,025.—Beer Faucet.—Christian Jakob, New Orleans, La.

108,026.—Molding Cutter.—Nicholas Jenkins, New York city.

108,027.—Paneling Machine.—Nicholas Jenkins, New York city. Antedated September 24, 1870.

108,028.—Toy Torpedo.—T. J. Johnson (assignor to H. P. Diehl & Co.), Cincinnati, Ohio.

108,029.—Gas Regulator.—Peter Keller, New York city.

108,030.—Composition for Destroying Worms in Fruit Trees.—Solomon Kepner, Pottstown, Pa.

108,031.—Gate.—Solomon Kepner, Pottstown, Pa.

108,032.—Plow and Planter.—Peter Kling, Springfield, Ill.

108,033.—Sewing Machine.—Albert Komp, New York city.

108,034.—Putting up Medicine.—Frederic Kraus, Cincinnati, Ohio.

108,035.—Churn.—Alexander Ladd, St. Lawrence, N. Y.

108,036.—Hominy-Mill.—John K. Leedy, Maurertown, Va.

108,037.—Cultivator.—James R. Little, Galesburg, Ill.

108,038.—Addressing Machine.—James McFatrick, Lena, Ill.

108,039.—Bustle.—Donald McInroy, Brooklyn, E. D., N. Y.

108,040.—Saw.—W. F. Milliman (assignor to Henry Disston & Son,) Philadelphia, Pa.

108,041.—Electro-photo Damaskening and Enameling.—A. G. Morvan, New York city.

108,042.—Metal Plate of Iron and Steel.—Jas. Myers, Jr., Williamsburgh, N. Y.

108,043.—Cushion, Mattress, etc.—T. H. O'Brien, Providence, R. I.

108,044.—Corn Planter and Marker.—Floyd Ogden, Fisherville, Ky., assignor to himself and J. T. Rose, Utica, Ind.

108,045.—Millstone Bush and Bearing.—Andrew Ortlip, East Vincent, Pa.

108,046.—Show Stand.—Joseph R. Palmenberg, New York city.

108,047.—Shovel Plow.—P. B. Parcell, Ashmore, Ill.

108,048.—Fruit Dryer.—Oliver P. Pence, Des Moines, Iowa.

108,049.—Fanning Mill.—Christian Peterson, Red Wing, Minn.

108,050.—Water Heater.—Jas. Raisbeck and T. A. Raisbeck, New York city.

108,051.—Seed Planter.—Blachman A. Ramsey, Trenton, Tenn.

108,052.—Shutter Fastener.—Andrew Rankin, Philadelphia, Pa.

108,053.—Wheelbarrow.—R. M. Reynolds, East Saginaw, Mich.

108,054.—Washing Machine.—Abner Riggs, Frostburg, Md.

108,055.—Composition for Covering Steam Boilers, and Other Purposes.—John Riley, Troy, N.Y., assignor to the United States and Foreign Salamander Felting Co.

108,056.—Field Roller and Furrowing Machine.—M. M. Robbins, Centerville, Ind.

108,057.—Land Roller.—I. W. Searles, Tiffin, Ohio.

108,058.—Manufacture of Iron and Steel.—Larenzo Sibert, Staunton, Va. Antedated Sept. 24, 1870.

108,059.—Saw.—John Smith (assignor to Henry Disston and Hamilton Disston), Philadelphia, Pa.

108,060.—Tanning Vat.—J. E. Smith and C. L. Smith, South Dedham, Mass.

108,061.—Earthen Teapot.—Thomas Smith, Jr., Boston, Mass.

108,062.—Shaft Coupling for Vehicle.—John Steele, Sheldon, Ill.

108,063.—Button Hook and Handkerchief Holder Combined.—G. D. Stevens, New York city.

108,064.—Lantern.—Peter Sweeney, New York city.

108,065.—Corn Planter.—Nathan Swigart, Richfield, Ohio.

108,066.—Tongs for Forging the Arms on Fifth Wheels.—Wales Terrell, Ansonia, Conn.

108,067.—Metallic Binding for Textile Fabrics.—Jas. Twamley, New York city.

108,068.—Tiles for Roofing, etc.—William Utley, Troy, N. Y.

108,069.—Harvester.—A. H. Wagner, Chicago, Ill.

108,070.—Sausage Stuffer.—Henry Whaler, Henry Metz, and Ludwig Heinzle, Freeport, Ill.

108,071.—Cap for Horse Collar.—J. F. Walsh, Hazel Green, Wis.

108,072.—Rendering Leather Impervious to Hydrocarbon Liquids.—Albin Warth, Stapleton, N. Y.

108,073.—Letter Box.—E. C. Weld (assignor to himself and T. C. Glazier), New York city.

108,074.—Sewing-Machine Table.—J. J. Wheat, Wheeling, W. Va.

108,075.—Sectional Steam Generator.—Harry Whittingham, New York city.

108,076.—Hay Knife.—Daniel H. Wile, New Pittsburgh, Ohio.

108,077.—Umbrella.—R. C. Williams, Frankfort, Ky.

108,078.—Lamp Burner.—Samuel R. Wilmot, Bridgeport, Conn.

108,079.—Journal Box.—E. D. Murfey, New York city, assignor to Manhattan Packing Manufacturing Co.

108,080.—Journal Bearing.—E. D. Murfey, New York city, assignor to Manhattan Packing Manufacturing Co.

108,081.—Journal Box.—E. D. Murfey, New York city, assignor to Manhattan Packing Manufacturing Co.

REISSUES.

4,137.—Deodorizing Apparatus for Closet.—Earth Closet Company, Hartford, Conn., assignee of Henry Moule and Henry John Girdlestone.—Patent No. 91,474, dated June 15, 1869. Division A.

4,138.—Earth Closet.—Earth Closet Co., Hartford, Conn., assignee of Henry Moulè and H. J. Girdlestone.—Patent No. 91,474, dated June 15, 1869. Division B.

4,139.—Harvester.—Rufus Dutton, Yonkers, N. Y.—Patent No. 31,709, dated March 19, 1861; reissue No. 1,762, dated Sept. 13, 1864. Division A.

4,140.—Cock.—J. P. Gallagher, St. Louis, Mo.—Patent No. 48,673, dated July 11, 1865.

4,141.—Washing Apparatus.—J. T. Grose (assignor to himself and W. E. Kinnear), Upper Sandusky, Ohio.—Patent No. 98,585, dated Jan. 4, 1870.

4,142.—Machine for Bundling Wood.—W. L. Williams and T. J. O'Connor, New York city, assignees of W. L. Williams.—Patent No. 26,147, dated Nov. 15, 1859.

4,143.—Postoffice Post-marking and Canceling Hand Stamp.—M. P. Norton (assignor to H. M. Ingalls), Troy, N.Y., Patent No. 38,175, dated April 14, 1863; reissue No. 1,748, dated Aug. 23, 1864; reissue No. 3,586, dated Aug. 3, 1869. Division A.

4,144.—Hand Canceling Stamp.—M. P. Norton, Troy, N. Y., assignor, by mesne assignments, to the "Secombe Manufacturing Co.," New York city.—Patent No. 38,175, dated April 14, 1863; reissue No. 1,748, dated August 23, 1864; reissue No. 3,586, dated August 3, 1869. Division B.

4,145.—Fruit Basket.—Lauren Carpenter, St. Joseph, Mich.—Patent No. 102,488, dated May 3, 1870.

4,146.—Table leaf Supporter.—G. L. Gerard, New Haven, Conn.—Patent No. 106,353, dated Aug. 16, 1870.

4,147.—Coal Hod.—E. A. Jeffery, New Haven, Conn.—Patent No. 52,856, dated Feb. 27, 1866.

4,148.—Manufacture of Rubber or Gutta-percha Hose.—Edward L. Perry and Charles Manheim, New York city, assignors to the Combination Rubber Company, and the Gutta-percha and Rubber Manufacturing Company.—Patent No. 92,353, dated July 6, 1869.

DESIGNS.

4,375.—Clock Front.—John H. Bellamy, Charlestown, Mass., assignor to S. D. Niles and Benjamin A. Ward of three fourths of his right.

4,376.—Stove Plate.—L. W. Harwood (assignor to Fuller, Warren & Co.,) Troy, N. Y.

4,377 to 4,379.—Iron Railing for Horse Stall.—J. L. Jackson, New York city. Three Patents.

4,380.—Lid of a Feed Cup in Bird Cage.—Otto Lindenmann, New York city.

4,381.—Medallion or Cameo.—Leopold Salomons, London, England, assignor to J. W. Chisholm and K. Chisholm, New York city.

4,382.—Spoon and Fork Handle.—B. D. Beiderhase, New York city.

4,383.—Collar Box.—A. L. Elliot, Boston, Mass.

4,384.—Box for Holding and Displaying Braids, Tapes, etc.—S. B. Fleisher, Philadelphia, Pa.

4,385.—Plate for Pitcher Stand.—H. O. Fritsch, New York city.

4,386.—Knitted Fabric.—Edward Greasly, Philadelphia, Pa.

4,387.—Coffin.—E. T. Smith and J. S. Winston, New York city.

4,388.—Dress Goods.—Matthew Townsend, Canton, Mass.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

Machine for Husking Corn.—Robert Bryson, Schenectady, N. Y., has applied for an extension of the above patent. Day of hearing Nov. 30 1870.

Mowing Machine.—Andrew M. Hall, of Falmouth, Me., has petitioned for an extension of the above patent. Day of hearing Dec. 7, 1870.

Manufacturing Calender Rolls.—John Worsley, Providence, R. I., has applied for an extension of the above patent. Day of hearng Dec. 7, 1870.

Machines for Pointing Shoe Pegs.—George Hoyt, Ashland (formerly Holderness), N. H., has petitioned for an extension of the above patent Day of hearing Dec. 7, 1870.

Advertisements.

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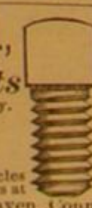

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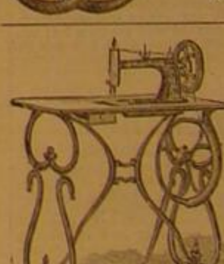

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