SCIENTIFIC AMERICAN

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

Vol. XXIII.--No. 13. [NEW SERIES.] | NEW YORK, SEPTEMBER 24, 1870. | $3 per Annum. [IN ADVANCE.]

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.

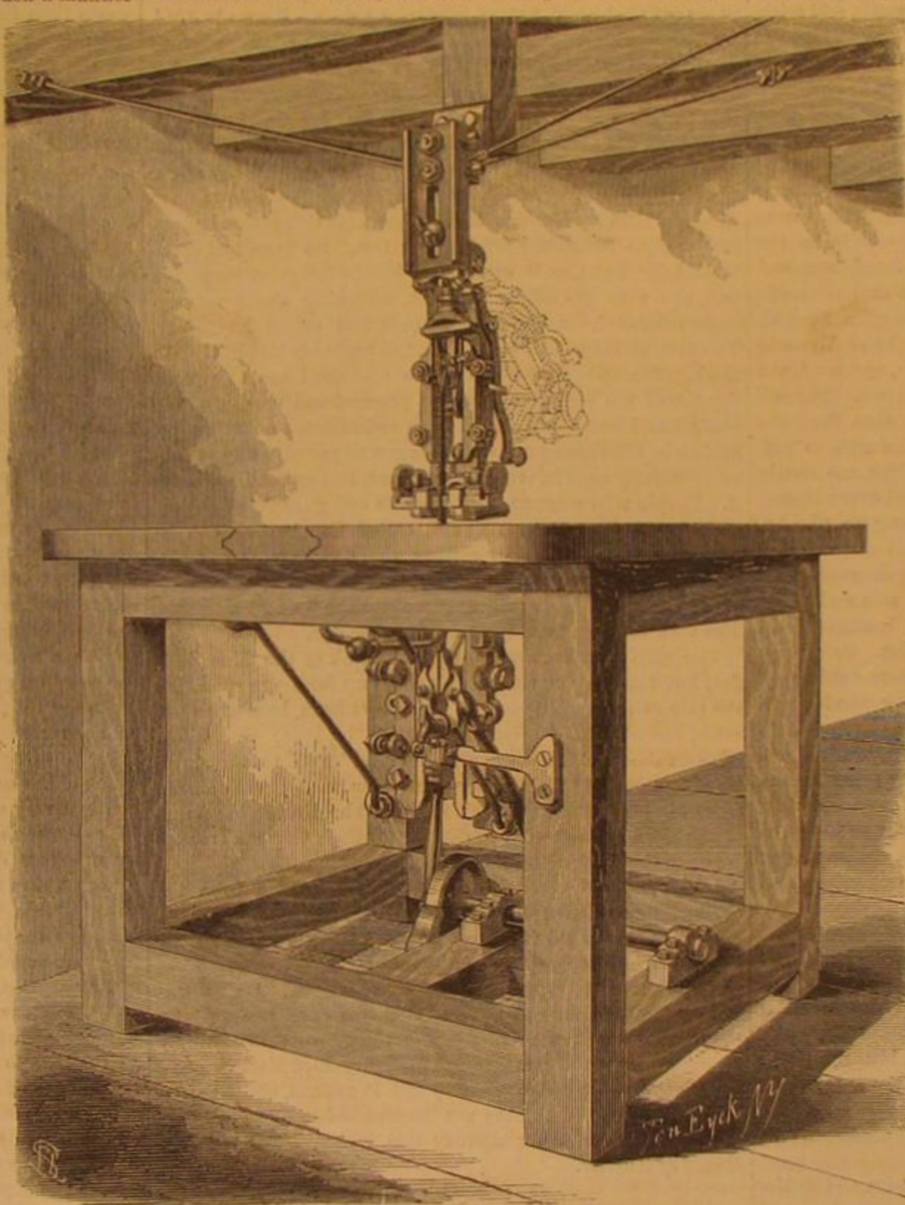
The saw is held in the lower cross-head by means of two clamping jaws operated by levers, and a conical wedging screw, which, when turned in between the levers, separates their lower ends, and forces the jaws together. When released the jaws are separated by a spring.

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.

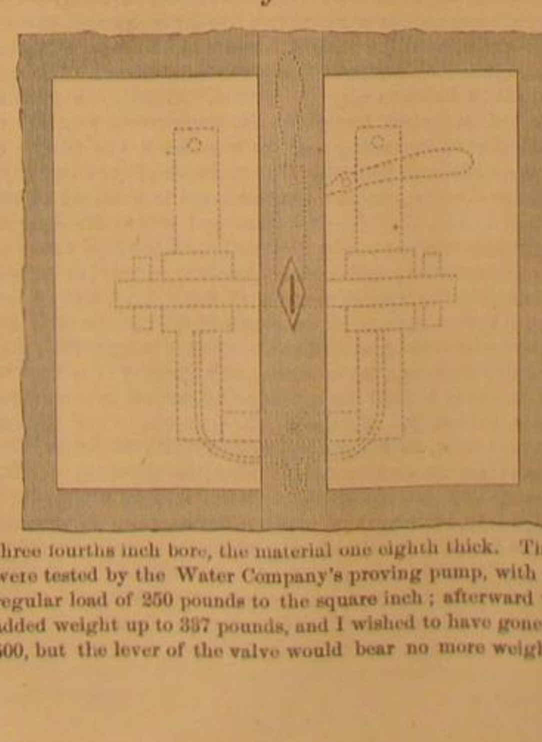
Gutta-Percha.

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	55
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 betak themselves to other countries, and seldom return to thei 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.

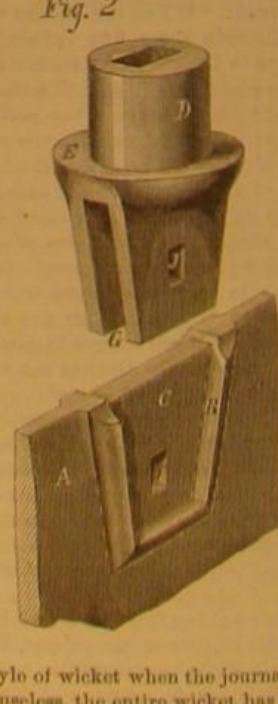
Travelers, who desire to collect a large number of birds for comparison, will find this method one of great advantage; and the specimens will be better for study than skins, inasmuch as the proportions will be better preserved. Small mammals can be kept some days for skinning by a similar process, and 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 subjected 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.

Fig. 1

Fig. 2



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 instantaneous 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, Wheat stone 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 ingenious. 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; and 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 Siemens, 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.

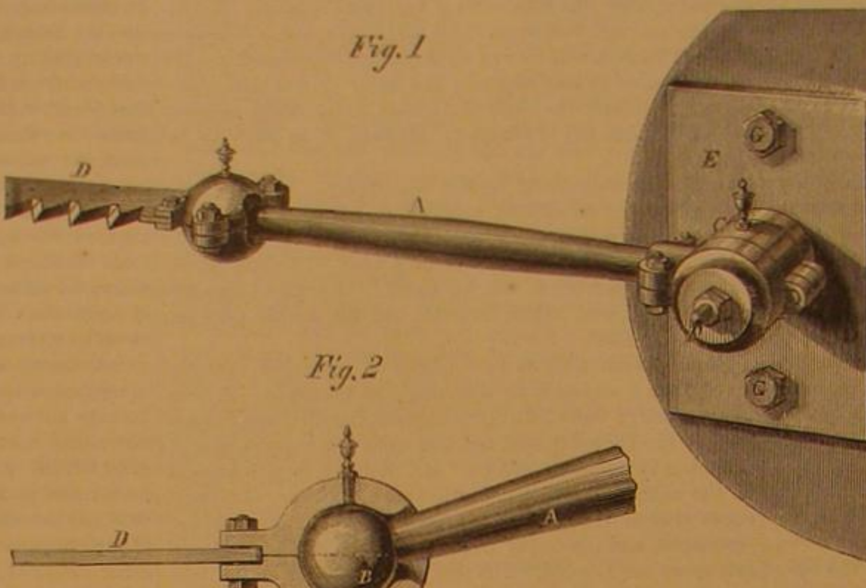
A, Figs. 1, 2, and 3, is the pitman; B, Fig. 2, represents the end of the pitman which is spherical; C, Figs. 1 and 3, is a hinged collar made concave on its interior to fit the ball on the crank end of the pitman, which it clasps as shown, being held together by screw bolts. D, Figs. 1 and 2, is the 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.

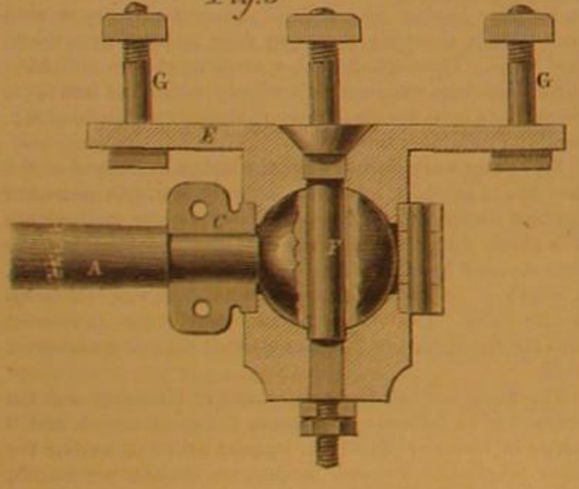
Fig. 1

Fig. 2



KEALY'S IMPROVED CRANK AND PITMAN.

Fig. 3



The incl ned 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.

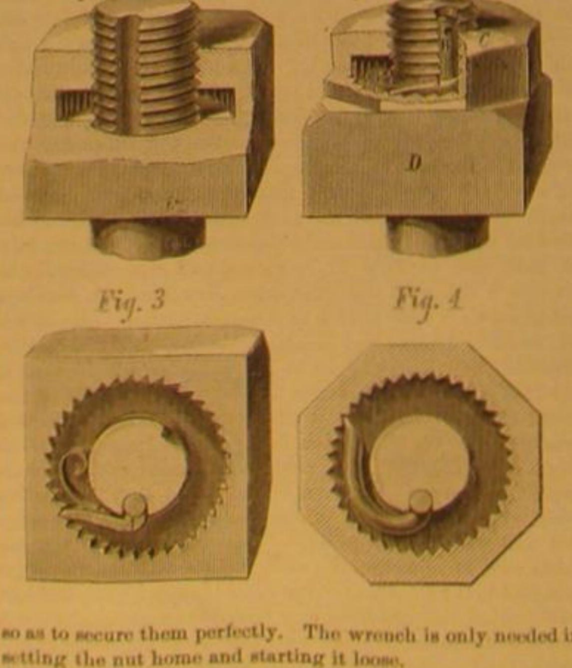
FREELAND'S LOCK NUTS.

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

Fig. 1 Fig. 2

Fig. 3 Fig. 4



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.

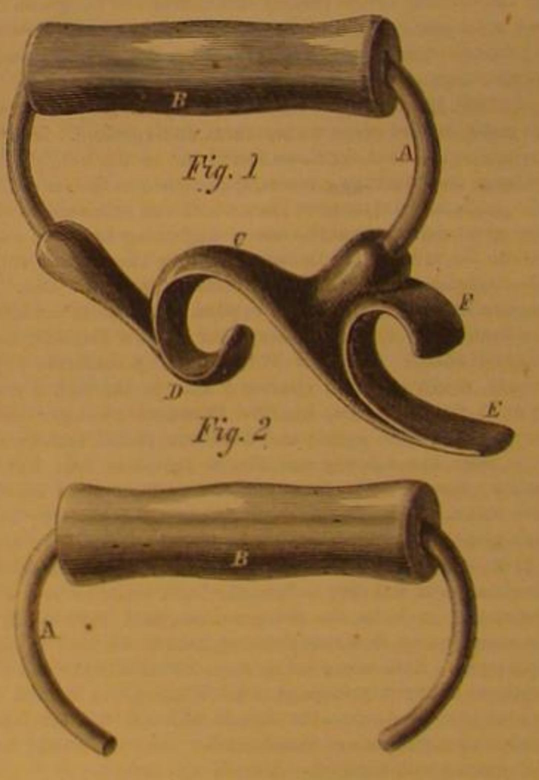
Patented, through the Scientific American Patent Agency, Feb. 22, 1870, by O. S. Freeland, of Newport, R. I., who may be addressed for railroad rights, limited territorial rights, or other information.

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.

Fig. 1

Fig. 2



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.

Scientific American,

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW (PARK BUILDING), NEW YORK.

O. D. MUNN, S. H. WALES, A. E. BEACH.

"The American News Company," Agents, 121 Nassau street, New York.
"The New York News Company," 8 Spruce street, New York.
A. Asher & Co., 20 Unter den Linden, Berlin, are Agents for the German States.
Messrs. Sampson, Low, Son & Marston, Crown Building, 188 Fleet st., Trubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

VOL. XXIII., No. 13 . . [NEW SERIES.] . . Twenty-fifth Year

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 ton 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 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 aperature 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 hydrogen 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 after 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 n 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.

2,246.—Generating Gas from Petroleum.—A. I. Ambler, Washington, D. C. Aug. 12, 1870.

2,258.—Machinery for Compressing Air.—C. Burleigh, Fitchburg, Mass. August 13, 1870.

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

2,266.—Cartridge.—F. D. Draper, Boston, Mass. August 18, 1870.

2,284.—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.

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 remaining 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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MUNN & CO.,
Patent Solicitors, No. 37 Park Row, New York

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.
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4,117.—Balance Slide Valve.—T. M. Herriott and Samuel Myers, South Pittsburgh, Pa.—Patent No. 84,278, 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. 22,759 dated Jan. 25, 1859.
4,122.—Machine for Rolling Leather.—Joel Whitney, Winchester, Mass.—Patent No. 37,991, dated March 24, 1863.
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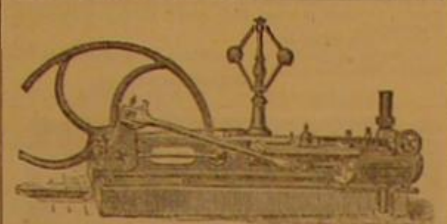

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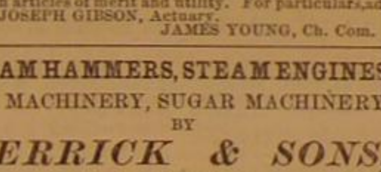

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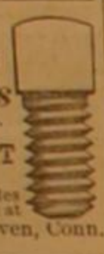

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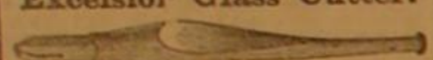

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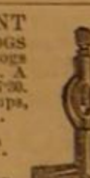

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