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Improved Sectional Tubular Boiler.

The marriage of fire and water has given birth, in these latter days, to a power immensely stronger than either, and yet more easily controlled. But, if through ignorance of its nature or carelessness of its requirements, this power is permitted to assume the leadership, its anger recognizes no curb and its strength no opposition. As a master, steam is merciless; as a servant, docile. To restrain and guide this power, under all circumstances, is the object of the nightly dreams and daily efforts of engineers, the world over, and steam boiler explosions are to be prevented, or their results shorn of their harmfulness to life and property before this power can be said to be fully under control. Therefore, the proper construction of steam boilers is a subject of personal interest to every one whose life or property may be affected by the consequences of an explosion, and in one or the other of these classes may be reckoned almost every member of a civilized community.

The chief points to be considered in a perfect boiler are safety, economy, durability, and ease of management and facility of control. Sectional boilers have for a number of years been growing gradually into favor because of their more nearly fulfilling these conditions than those of other types. They are portable, easily handled, readily removed, set up, repaired, and enlarged, are rapid generators of steam, free from danger of disastrous explosion, easily kept in order, simple in principle, and direct in operation.

Mr. John B. Root, of New York city, well known as a successful inventor and as a builder of engines and boilers, is now constructing boilers of the pattern shown in the accompanying engravings, more than one hundred of the boilers being now in use. As seen from the large (perspective) engraving, the boiler is a collection of parallel tubes of wrought iron, set on an incline of about two inches to the foot, from the front, back. The same letters refer to the same parts in each engraving. A represents the tubes, B, the heads of cast iron, square in their superficies, and into which the tubes are seated by means of screw threads on the ends of the pipes and in the heads. C is the front plate on which the lower section of heads rests, and which also supports the superincumbent weight of that end of the tubes. D is the connecting elbows forming passages between the pipes, being held in place by the nuts, E, over saddles that have a bearing on the corners of three elbows. In the Heads, B, are recesses in which are placed glands of rubber forming elastic joints to allow for expansion and contraction. F is the injection pipe for the feed water, situated at the rear of the boiler, and leading to the lower end of the lower tier of tubes. G is the steam connection of the upper tier of tubes on which is seated the safety valve, H, and from which the steam is led to the engine. K is the grate, L the front of brick work, M the floor of the ash pit, N the steam-gage pipe, O the inclined bridge wall at the back of the furnace, Q (dotted lines) is the stack for escape of the smoke, *t*, bolts connecting the side framing for the brick work, and X a steam dome, if required, on which, if used, the safety valve, *h*, and steam eduction pipe are placed. A damper, V, is placed in the flue at the rear when desired. The larger engraving represents only a portion of the boiler, some of the sections being removed.

The tubes are placed zigzag, not directly over one another, which arrangement brings their surfaces nearer together, while, at the same time, it allows space between them for cleaning when the outsides become foul, a contingency, however, which is not expected, as the arrangements of the furnace are intended to insure almost perfect combustion. The inclination of the tubes and their connection with each other by the plates or caps, D, are designed to insure continual circulation of the water—a very important point—and the heated gases of combustion, being compelled, by the arrangement of the tubes, to impinge upon or envelope all portions of their outer surfaces, are fully utilized before being discharged into the stack. The circulation of the water in the tubes keeps them free from scale, but if deemed necessary to examine them it is only required to remove the elbows, D, for the purpose. A boiler may be enlarged by adding tubes at the top and side of the boiler, as all the connecting parts are in sections.

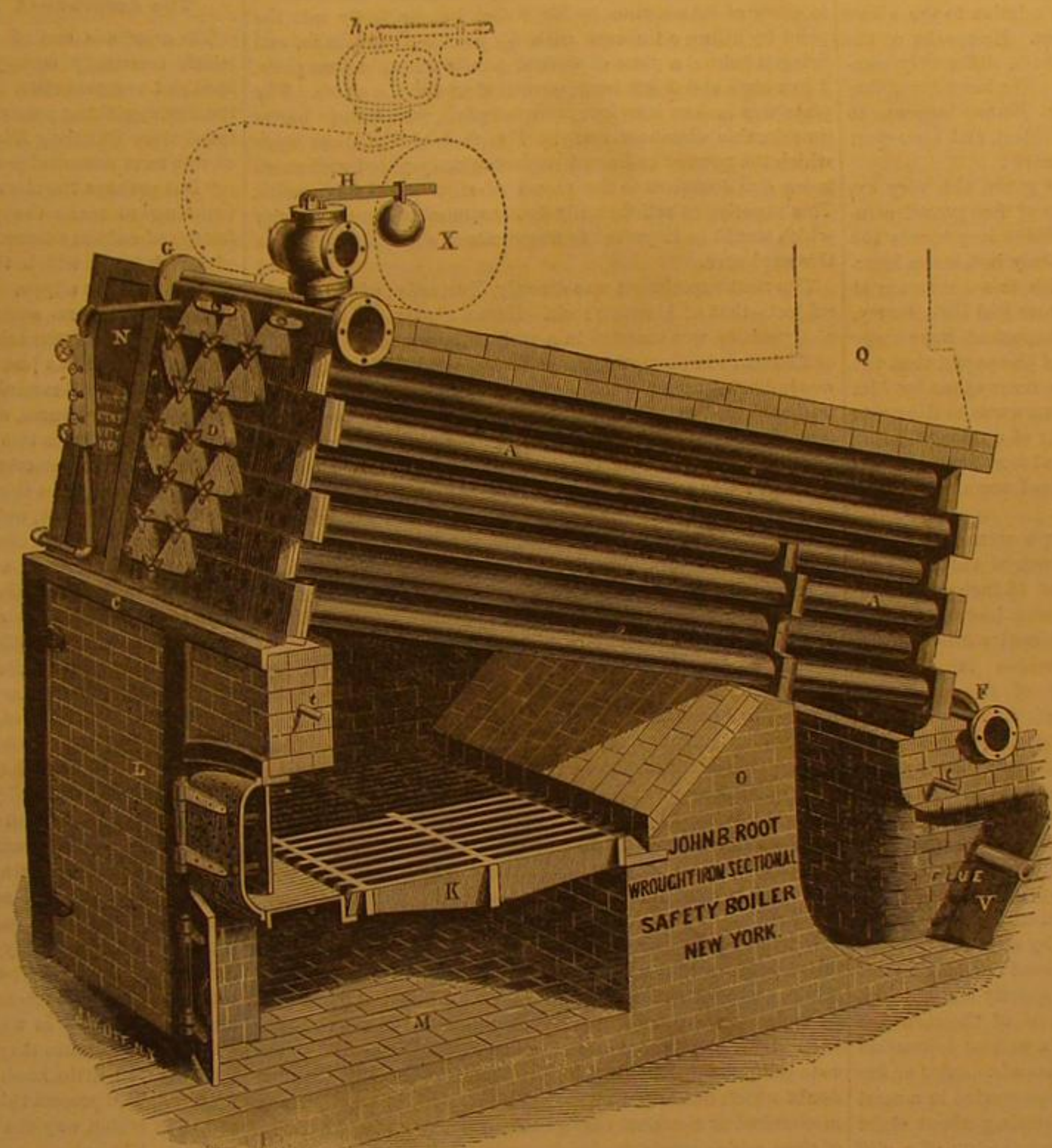
The inventor sets forth the advantages of his boiler by the following claims: First, safety; owing to the small diameter of the tubes, not over five inches, and tested to 500 lbs. to the square inch. In case of burning or cracking, no explosion can occur, but only a rupture, confined in its effects solely to the tube affected. No case of rupture has yet occurred during the two years these boilers have been in use.

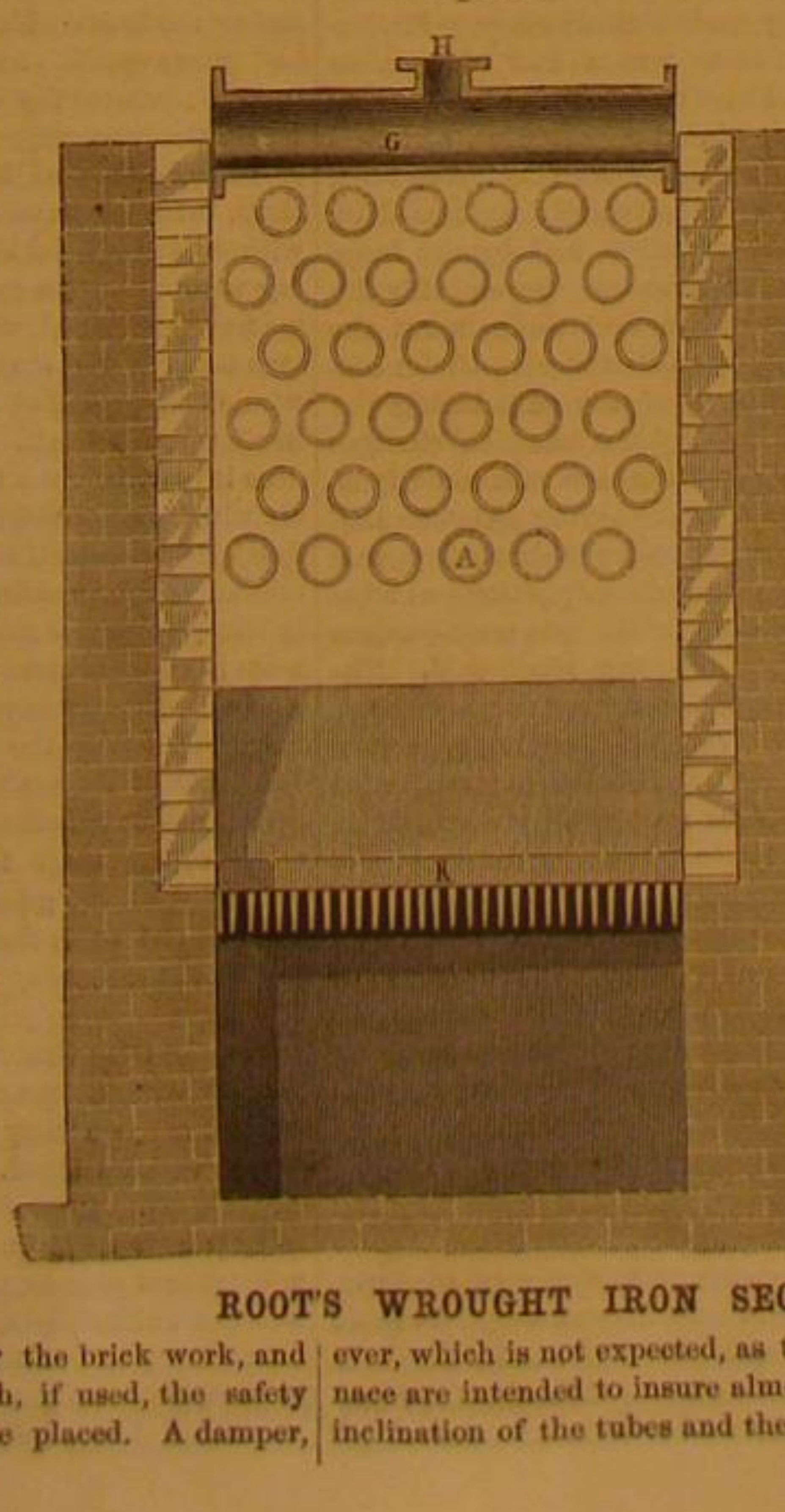
Second, economy; the inside surfaces constantly washed by rapid circulation, and the products of combustion—flame, heated gases, smoke—thrown against every portion of the heating surfaces by eddies which change the otherwise diretc course of the draft.

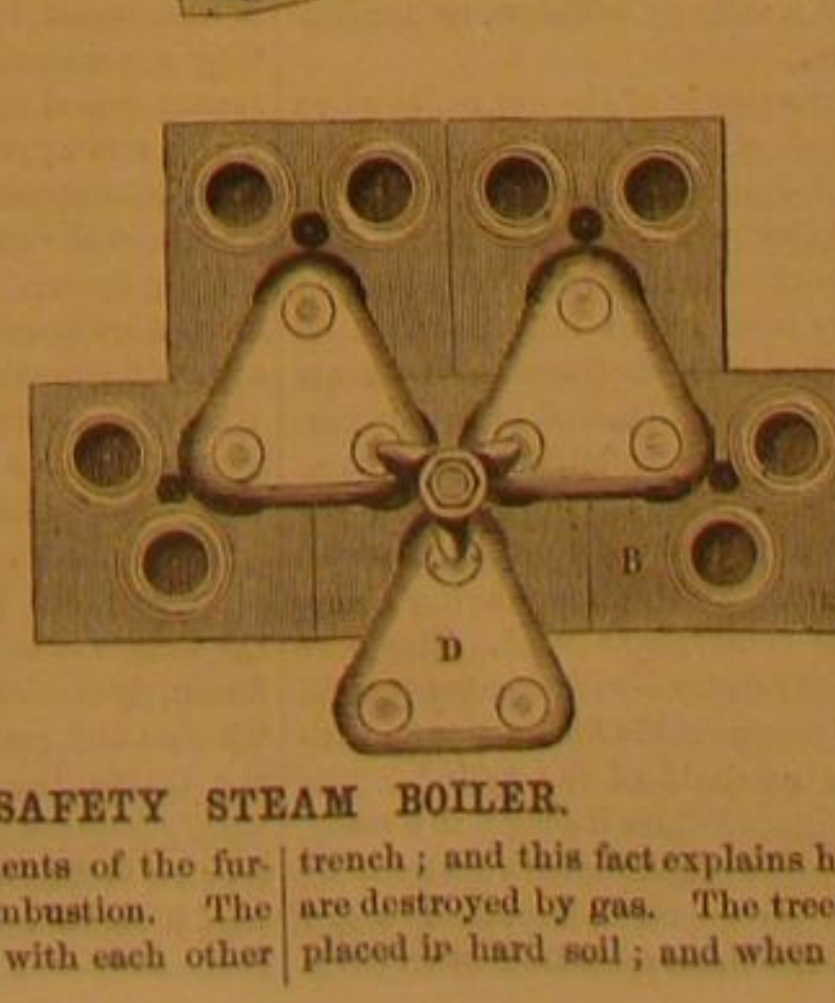
Third, durability; preventing bad results of unequal expansion and contraction by the use of elastic joints, impossible in shell boilers, which, owing to greater necessary thickness and variation of the amount of that thickness, as where joints occur, encourage unequal expansion, and suffer most from varying temperatures.

Finally, cheap and quick removal of an injured part (no weakening by patching), and facility for examination and cleaning of either inside or outside surfaces, and, also, facility of enlargement without disturbing the boiler as first erected.

Mr. Root is now putting in a 200-H. P. boiler of this pattern for one of the oldest and largest iron manufacturing concerns in Philadelphia. All communications should be addressed to John B. Root, 95 and 97 Liberty street, New York city.







ROOT'S WROUGHT IRON SECTIONAL SAFETY STEAM BOILER.

Destruction of Trees by Street Gas.

Many a city and town, says the *Boston Journal of Chemistry*, has had to deplore the loss of fine shade trees, by carbureted hydrogen gas coming in contact with their roots, and poisoning them by being absorbed. There is a strange instinct in the roots of plants or trees. As if they had eyes to see, they bend and stretch in the direction from which they can derive nutriment; and wherever they can have free and easy access to the soil and find food, there the number and thickness of the filaments are augmented. If we plant a tree in hard, unyielding soil, it will struggle most wonderfully to sustain itself, by pushing its roots through the packed earth. If, under these circumstances, a trench is dug ten, or even twenty feet from the tree, filling back the loosened earth again into it, the roots appear to be cognizant of the fact, and commence a struggle with the impacted soil, to reach the trench; and this fact explains how it is that the roots of trees are destroyed by gas. The trees upon the sides of streets are placed in hard soil; and when the trench is dug for the gas pipes, and the earth returned, the roots instinctively push for the trench as a point of relief, or where food can be more easily secured. We have seen gas pipes, after having lain for several years, perfectly covered with a network of roots proceeding from the neighboring trees. Now, if there is the slightest leak in the line of pipe, the gas moves in the direction of least resistance, and that is along the trench in which is placed the pipe; hence, the tender spongioles are presented with strange and poisonous food, the gas is absorbed, and the tree dies.

We can hardly suggest a remedy for this great evil. It may be well to compel gas companies to cover their pipes, in the vicinity of trees, with a thick coating of cement, or plank the walls of the trench, so as to prevent the tree roots from passing through. The loss of fine shade trees in cities and towns is almost irreparable, and every practical method should be adopted to prevent it.

EXPLOSIVE COMPOUNDS FOR ENGINEERING PURPOSES.

NO. V.

We resume the statements of facts in relation to the above subject contained in Mr. Nursey's paper. He speaks of the Nobel arrangement of the same substances, differently combined, under the title of "dynamite." We have heretofore published articles on dynamite, but Mr. Nursey appears to have given particular attention to the subject, and his report of experiments is very interesting. He says:

"To this new substance Mr. Nobel has given the very expressive name of 'dynamite.' It consists of fine gravel saturated with nitro-glycerin, in which condition it presents the appearance of coarse brown sugar. In July last, some interesting experiments were carried out with this substance at the Merstham Graystone Lime Works, near Red Hill, Surrey, at which the author was present. So important were these experiments as bearing on the subject of the paper, that the author will here give their details from notes taken by him at the time. The object of the experiments was to illustrate the perfectly safe and harmless character of dynamite under any other conditions except those of actual work, and to show its resistless energy when confined and fired according to the special mode proposed by Mr. Nobel.

A number of cartridges of various sizes were made up of dynamite wrapped in thin paper. To each of them was attached a fuse which burned at the rate of 18 inches per minute. On the end of the fuse, which was inserted in the cartridge, was fixed a copper cap primed with a powerful detonating compound, and to which is due the development of the explosive energy of the dynamite. A charge of half an ounce of dynamite was first exploded on an oak plank about 6 feet long, 9 inches wide, and 2 inches thick, and supported at each end. An exceedingly loud and sharp report ensued, and an examination of the plank showed that the charge had taken effect completely through the board, the under side being rent and splintered. A similar charge was then fired on a balk of fir timber placed flat on the ground. A deep indent was made in the timber, and one side was splintered off. To prove the harmlessness of the dynamite when fired by an ordinary light, Mr. Nobel cut a cartridge in two, and lighted one-half in his hand with an ordinary fuse. It burned quietly and quickly, but not rapidly out. The remaining half of the cartridge was then fired with a capped fuse, when a violent detonation resulted. The absence of all danger in case of collision or fire during transport or storage was then demonstrated in a most marked manner. A small deal box, containing about eight pounds of dynamite, was thrown down from the top of a cliff about 70 feet high, upon a hard bed of rock below. The concussion started the joints of the box, but the contents remained uninjured and unchanged. The test of fire was then applied to a box similar to the last, containing the same quantity of dynamite. A fire was kindled, upon which the box was placed, and after a few minutes the box quietly turned over on one side, a gentle puff of smoke and flame issued from it for a few seconds, and 8 pounds of one of the most violent of modern explosives were almost noiselessly dissolved into air. The charred and blackened box was removed from the embers, and on examination the joints were found to be sound and whole. The author examined this box of dynamite before it was nailed down and placed on the fire, as also the one which was thrown down the precipice after the occurence, and therefore writes from his own knowledge of the matter. Such tests ought to satisfy the most skeptical of the safety of the new blasting powder either in a railway collision, or accidental upset of a package, or a fire.

The next point was to test the power of the dynamite when under conditions of partial and also of perfect confinement. To this end, about 4 ounces of dynamite were placed upon a block of granite, measuring 3 feet by 2 feet 9 inches by 2 feet, the dynamite being only covered in with a lump of clay and a shovelful of gravel. A very loud report followed, and on examining the stone it was found to be traversed by rents and fissures, large masses being easily detached by a crowbar. The effect was certainly surprising, considering the comparatively loose and unconfined condition of the charge. In the next experiment, a cylindrical block of wrought iron, about 12½ inches high and 10½ inches in diameter, and having a one-inch hole bored through the center, was used. The bore hole was filled, but not rammed tightly—with dynamite, and fired. A report soon followed, remarkable for its penetrative loudness, and on examination one-half of the cylinder was found about 80 feet from the place where it originally stood, being then only stopped by a grass embankment. The other half was found some 50 feet in an opposite direction, lodged against a pile of broken rock, which stopped its further progress. The iron showed a clean split, which revealed an excellent quality of metal. The bore showed an extraordinary enlargement near the center, measuring nearly 1¾ inches across, while the measurements at the top and bottom of the bore were in each case 1 inch, as before firing. It would appear that power developed increased as it approached the center of its length, becoming reduced again as it neared the further end of the hole, although of course the explosion was practically instantaneous. Both ends of the bore were open to the atmosphere, there being no plugging or tamping. The strain on the metal must have been enormous to have thus compressed it around the center of the bore, and to have rent such a mass and sent its halves yards away in opposite directions.

Dynamite is of course unfitted for use, either in heavy guns or small arms, its very power being against it in this respect, as forcibly illustrated in the experiment with the cylinder. But it can be utilized in shells with great advantage. A time fuse fitted with the detonating cap would effect its explosion at the proper moment, while if the shell broke up in the gun, no harm would result, as demonstrated by previous experiments. The danger attending the use of a shell was too great to allow of its adoption by Mr. Nobel, but he fairly met the point by filling a tin case with 4½ pounds of dynamite, and firing it behind a piece of curved ⅜-inch wrought iron plate, 2 feet high and 3 feet long, measured round the curve. The plate was broken into four unequal parts, which were blown considerable distances away. The face of the plate upon which the powder had acted was completely pitted with small holes, due doubtless to the atoms of silica in the dynamite. This experiment satisfactorily demonstrated the great velocity which would be imparted to fragments of shells charged with this explosive.

The next experiment was directly illustrative of the present subject—that of blasting rock. Here a charge of 12 pounds of dynamite was inserted in a vertical bore hole 15 feet deep and 2 inches in diameter, tamped with sand. The explosion was indicated by a low subterranean thud, and a perceptible tremor of the surrounding land, even at a considerable distance from the blast. The rock showed a series of fissures which indicated that an enormous mass had been loosened, and was ready to be detached by the pick. Had the rock been of a harder and less friable nature, it would have offered a greater amount of resistance, and the whole mass would doubtless have been blown out. This was the case with some granite quarries at Stockholm, where an immense mass was detached by a charge of dynamite, and thrown down in huge blocks. On the present occasion, a further charge of 4½ pounds of dynamite was fired at the same depth as the last, with proportionate results. The method of charging in dry ground was next illustrated by filling a glass tube with a series of cartridges which were tamped with loose sand and fired. This experiment was repeated with water tamping to illustrate the mode of operation in wet ground. A striking effect was produced by firing a cartridge in a bucket of water. The detonation appeared to be stronger than under any other conditions; the bucket was shattered, and fragments were picked up several hundred feet from the spot where the charge was fired.

It will thus be seen that the most severe tests for safety failed to show that any danger was present in this material, while, on the other hand, there was no condition under which its violence was not developed when fired with a detonating fuse. So far, dynamite appears to be well calculated to supersede gunpowder for blasting purposes. The only point of doubt which has arisen in the author's mind, is whether any mechanical or chemical change might not occur in the course of time, which would render dynamite as dangerous as nitro-glycerin. The author recently made this objection to Mr. Nobel, who, however, stated that there was no fear of such an occurrence, inasmuch as he had kept dynamite in store for very lengthened periods, subject to high temperatures, and that it retained its original condition under some very trying tests. The stability of dynamite has been practically confirmed by extensive and daily use in various mines, and by the large quantities which are stored at the factories. Beyond this the most careful investigation has shown that there is not the slightest ground for apprehension on that score. Under continued exposure to the direct rays of the sun during the whole of last summer, not the slightest chemical changes could be detected, and the same was the case with some dynamite exposed for forty days to a heat varying between 150° and 200° Fah. All nitrated, or rather hyponitrated organic compounds, are liable to spontaneous decomposition—or what is understood by this hackneyed and ridiculous term—unless they are completely rid of free adhering nitric acid. The reason is that the free acid will produce a local decomposition, which sets hyponitric acid free, the latter producing a new local decomposition, and so on until sufficient heat is evolved to set fire to the compound. There is no difficulty whatever in ridding dynamite of free acid, but in the case of cotton, or any other fibrous substance, the utmost care is required, as free acid will sometimes adhere in spite of repeated washing.

Sweden consumes at present nearly as much dynamite per month as Great Britain does in a year, which only proves the want of organization which has hitherto stopped its progress in this country. In Norway, the consumption of dynamite is not very large (from about 33,000 to 40,000 pounds per year, the author is informed) but it is steadily increasing. In California, dynamite is in great favor, and is transported by rail without any restriction. In the Eastern States of the American Union, the miners still continue to use nitro-glycerin, chiefly because dynamite has not been manufactured and sold there. In England, comparatively little dynamite has been used until recently. This is owing to the difficulties of transport, and to the fact that Mr. Nobel has hitherto directed his attention to its manufacture and sale upon the Continent. There is but one depot for the whole of Great Britain, and that is situated at Carnarvon. As, however, dynamite is not carried by rail, a great many orders are not executed.

The author has referred to several catastrophes which have been caused by nitro-glycerin, but he can only find that a very few have resulted from dynamite. Since the latter material has been introduced, no accident has occurred either from its manufacture, conveyance, or storage. When the nitro-glycerin factory exploded at Stockholm last year, the dynamite stored close by was found scattered about, but not exploded. Two accidents have happened from the use of dynamite in mines. The first was caused by the tamping having been incautiously removed after a miss fire—an operation which ought not to be allowed in any case. The second was due to the folly of lighting the fuse of a charged cartridge and holding it by the hand until it exploded. These are the only accidents the author can discover. Accidents like these, through carelessness, must and will occur in mines, however safe the explosive may be to handle.

The Amoeba—A Most Remarkable Creature.

The amœba is one of those singular forms of animal life which seemingly occupy the extreme boundary between animal and vegetable life. In an article attempting to set forth the distinguishing points between animal and vegetable life, the *London Quarterly Review* gives the following description of this most remarkable of living creatures:

"But perhaps the clearest instance of the uselessness of attempting to make the possession of a stomach a distinctive feature of animal nature is shown by the history of a group of creatures, of which the well-known and common amœba may be taken as a type. In these there can be no question of definition, for in no sense whatever can they be said to possess a permanent stomach.

"The amœba has a just claim to the title of animal, for its affinities with the foraminifera are clear; and no one would deny that these creatures, with their exquisitely beautiful shells, are animals. Nor is this position shaken by the fact that the life history of the amœba can at present hardly be said to be fully made out. Yet the amœba has no stomach, possesses indeed no organs at all, unless we consider its so-called nucleus as one; and there are closely allied forms in which even this is absent. Conceive of a minute drop of transparent jelly, so small as to be invisible without the help of a microscope, a drop of jelly sprinkled and studded with a dust of opaque granules, sometimes hiding in its midst a more solid rounded body or kernel called the nucleus, and perhaps with the outer rind a little different from the internal mass. Conceive further of this amœba as of no constant shape, but like the Empusa shifting, as we look upon it, from one form into another At one moment it is like a star with straggling unequal limbs, at another club-shaped; now it is a rounded square, soon it will be the image of an hour-glass. None of these changes can be referred to currents in the water in which it lives, or to any other forces acting directly upon it from without. It seems to have within it some inner spring, an inborn power of flowing, whereby this part of it or that moves in this or that direction. And not only do its parts thus shift and change in form, but through their changes the whole body moves from place to place. As we begin to watch it, for instance, at the moment when it is in what may be called its rounded phase, a little protuberance may be seen starting out on one side. Speedily the little knob swells, lengthens, flows into a long process. The process thickens, faint streams of granules indicating in which way the currents of the unseen molecules are setting. The substance of the body surges into the process; and as the latter widens and grows thick the former shrinks and grows small. At last the whole body has flowed into the process; where the body was there is now nothing, and, where the process reached to, the whole body now is. The creature has moved, has flowed from one spot into another. Here, then, we have movement without muscles, locomotion without any special organs of locomotion. We have also feeling without nerves or organs of sense, for if a process such as we have described, while flowing out, meet with any obnoxious body, it will shrink back and stop in its work. And the whole body, terrified by some potent shock, will often gather itself up into a ball. As it moves without muscles, so also does it eat without a stomach. Meeting in its sluggish travels with some delicious morsel (and diatoms are its frequent food), it pours itself over its meal, and coalescing at all points around it, thus swallows its food by fluxion. To use a homely illustration it is much as if a piece of living mobile dough were to creep around an apple and to knead itself together into a continuous envelope in order to form an apple dumpling. Watching the food thus enveloped by the gelatinous substance of the amœba we see it grow fainter and fainter as its nutritious constituents become dissolved by the corrosive action of the same transparent but chemically active jelly; and when all the goodness has been got out of the meal the body of the eater flows away from the indigestible remains just in the same way that it flowed around the original morsel.

"We have in this creature, then, eating without a stomach, moving without muscles and without limbs, feeling without nerves, and, we may add, breathing without lungs, and nutrition without blood. The amœba is a being of no constant outline, of no fixed shape, which changes its form according to its moods and its needs, and turns its outside into its inside whenever it pleases, which is without organs, without tissues, without unlike parts, a mere speck of living matter all alike all over. And yet in the midst of this simplicity it enjoys all the tundamental powers and fulfills all the essential duties of an animal body, and is, moreover, bound by chains of close joined links with those complicated forms of animal life which are provided with special mechanisms for the most trifling of their wants.

"The dormant capabilities of this organless being are indirectly and interestingly shown by the shells which, in allied forms, are built up by the agency of similar homogeneous living matter, and which are in many cases 'structures of extraordinary complexity and most singular beauty.' Professor Huxley in his lectures most justly says:

"'That this particle of jelly is capable of combining physical forces in such a manner as to give rise to those exquisite and almost mathematically arranged structures—being itself structureless and without permanent distinction or separation of parts—is, to my mind, a fact of the profoundest significance.'"

AGE OF TREES AND SIZE OF TIMBER.

W. W. Spicer contributes to "Hardwicke's Science Gossip" an interesting article on the above subject. He says:

"The life of a plant is determined by its inner structure, by the laws of its growth, by its power of resisting external injuries, and by other circumstances, many of which are a mystery, and no doubt will ever remain so. But, bounded though it is within limits as narrow and precise as those which hedge round the life of man or the lower animals, there are cases on record of certain members of the vegetable kingdom whose existence has been prolonged for very extraordinary periods.

"The most celebrated of all old trees (and perhaps the most curious, from its belonging to the endogenous division, which does not generally boast of long-lived members) is the the Great Dragon tree, of Orotova, in Teneriffe. This monstrous specimen, which came to an untimely end in a hurricane a few months ago, was well known and carefully looked after at the conquest of the island by De Bethencourt in the year 1402. It appears to have been of the same size and appearance then as now—namely, from 70 to 80 feet high, with a hollow trunk of about 20 feet in diameter—whence, judging from the slowness of growth in this family of plants, and the little change that has taken place in four centuries and a half, it is inferred that the tree could not have been less than 5,000 years old at the time of its death. Another giant among the pigmies of modern days is the Baobab (Adansonia), an African tree, specimens of which, growing on the banks of the Senegal river, 60 to 80 feet high, and 30 feet in diameter, were estimated by Adanson to be over 5,000 years old. The Portuguese, on their voyages of discovery, were in the habit of carving their names, etc., on conspicuous trees, as a memorial of their having been the first to visit the spot. Adanson arrived at the age of the trees by comparing the depth of the indentations with the number of 'rings' in the portion of wood overgrowing them. The names themselves bore a date which showed them to have been cut three centuries prior to his visit. It has been suggested that possibly in a tropical climate these rings may not be so good a test of age as in our more temperate clime, where they are really annual. Nevertheless, allowing that the Baobab forms two rings in each year, in lieu of one, it is still deserving of 'honorable mention.' Yews have a great reputation as long-livers. The care usually taken of them in church-yards and similar places, no doubt tends greatly to their preservation. Thus a yew in the church-yard of Brabourne, in Kent, has, it is believed, reached the enormous age of 3,000 years; another at Fortingal, in Scotland, is quoted at 2,600 years, and others at Crowhurst, in Surrey, and at Fountains Abbey, are put down at 1,400 years. The yew has some near relatives in the cypress, the Taxodium, and the Wellingtonia. Of the first there is a specimen at Grenada, which was a celebrated tree before the Moors were expelled from Spain by Ferdinand and Isabella, toward the end of the fifteenth century. A *Taxodium distichum* at Oaxaca, in Mexico, which in 1829 measured 120 feet in hight by 117 in circumference, is supposed to number forty centuries. It sheltered Hernan Cortez and his little band of adventurers under its wide-spreading boughs about the year 1520. Among the gigantic Wellingtonias (or Washingtonias, as our thin-skinned cousins across the Atlantic will persist in calling them, in spite of priority of title)—among these mammoth trees of California, which reach a hight of 300 or 400 feet, individuals have been observed which must have witnessed 3,000 summers.

"Two other American trees, both Brazilian, have been noticed for their size and probably long lease of life. The first is the Bertholetia, which supplies the 'Brazil nut' of commerce, specimens of which, growing on the banks of the Amazon, have been noticed with more than 1,000 distinct rings. The other is the Hymenæa, in connection with which I transcribe the following passage from 'Lindley's Vegetable Kingdom.' The size of the timber is sometimes prodigious. The locust trees of the west have long been celebrated for their gigantic stature, and other species are the colossi of South American forests. Martius represents a scene in Brazil, where some trees of this kind occurred of such enormous dimensions that fifteen Indians with outstretched arms could only just embrace one of them. At the bottom they were 84 feet in circumference, and 60 feet where the boles became cylindrical. By counting the concentric rings of such parts as were accessible, he arrived at the conclusion that they were of the age of Homer, and 332 years old in the days of Pythagoras; one estimate indeed reduced their antiquity to 2,052 years, while another carried it up to 4,104; from which he argues that the trees cannot but date far beyond the time of our Saviour.

"My remaining examples are European. Among them is a chestnut tree growing on Mount Etna, and generally known as *Castagna di cento cavalli*, on account of the immense space which it overshadows. It is 180 feet in circumference, and cannot be less than one thousand years old. A scarcely less celebrated tree is growing at Tortworth, in Gloucestershire It was a tree 'of mark' in the days of King John. The great lime tree of Neustadt on the Kocher, in Würtemburg, which as early as 1220 caused the town to be known as *Neustadt an der grossen Linde*, is believed to be not less than 800 years old. Its stem is 38 feet in circumference. At Worms, where there has been lately such a gathering of crowned and ducal heads to do honor to the memory of the great Reformer Luther, is an elm well known in Germany as the Lutherbaum, which measures 116 feet in hight, with a stem 35 feet in circumference, and has attained an age of not less than 700 years.

"A less venerable member of the vegetable kingdom, though still one that can look back through a tolerable vista of years, is a Judas tree (*Cercis siliquastrum*), in the Botanic Garden at Montpelier; it was planted in 1598, and consequently numbers 270 years. Its trunk a short time ago measured 12 feet round. In 'Science Gossip' of last year, p. 163, was given a short account of a rose, which covers one end of the principal church at Hildesheim, in Hanover. This remarkable climber was well known as 'a monument of the past' as early as 1054. Tradition assigns its origin to the year 814, under Louis the Pious, son and successor of Charlemagne.

"Another tree with a legendary history is a 'Gospel Oak' in my own neighborhood in Hampshire, standing in Avington Park. If we are to believe the stories told of it, and common there in every one's mouth, this 'old, old tree' was spared, at the earnest intercession of certain monks residing at Win chester, solely on account of its great age, when a brother of William the Conqueror leveled the whole of the surrounding forest of Hampage, about A. D. 1076. * For some sixteen centuries, therefore, it has defied the storms of winter; but the latter have conquered at last. Ten years ago the old veteran made a final struggle to show some signs of life; and now it stands a hollow trunk, with two or three bare and withered arms, and only prevented from falling by a stout band of iron, with which it is encircled. A mere infant by the side of the Avington tree is the Great Oak of Pleischwitz, near Breslau, whose age is reckoned by Göppert at 700 years. It was blown down in 1857; its fall being due to a hollow within its huge stem, which could accommodate with ease twenty-five or thirty persons standing upright.

"Dr. A. B. Reichenbach, in his "Vollständige Naturgeschichte,' says: 'We know of limes in Lithuania with 815 annual rings, and a circumference of 82 feet; of oaks in the Polish forests in which one can count 710 perfect rings, and whose stems measured 49 feet round. There are elms whose age is known to be above 350 years, ivy 440, maples 516, larch 570, oranges 640, planes 720, cedars 800, walnut 900, limes 1,000, pines 1,200, oaks 1,400, olives 2,000.' From these numerous examples of extreme old age one may almost conclude that (provided the seed from which they spring be sound, the soil and climate favorable, and the means of nourishment abundant) the existence of many plants may be extended to an indefinite period, should they be fortunate enough to escape accidents from without."

Welding Copper.

Mr. Philip Rust, Bavarian Inspector of Salt Works, writes to *Dingler's Polytechnic Journal* as follows: "The great obstacle heretofore experienced in welding copper has been that the oxide formed is not fusible. Now, if any fusible compound of this oxide could be found, it would render such a weld possible. We find in mineralogy two copper salts of phosphoric acid—viz., libethenite and pseudo-malachite, each of which melts readily before the blow-pipe. It was therefore natural to suppose that a salt which contained free phosphoric acid, or which would yield the same at a red heat, would make the weld easy by removing the oxide as a fusible slag. The first trial was made with microcosmic salt (phosphate of soda and ammonia), and succeeded perfectly. As this salt was dear, it was found advisable to use a mixture of one part phosphate of soda and two parts boracic acid, which answered the same purpose as the original compound, with the exception that the slag formed was not quite as fusible as before. This welding powder should be strewn on the surface of the copper at a red heat; the pieces should then be heated up to a full cherry red or yellow heat, and brought immediately under the hammer, when they may be as readily welded as iron itself. For instance, it is possible to weld together a small rod of copper which has been broken; the ends should be beveled, laid on one another, seized by a pair of tongs, and placed together with the latter in the fire and heated; the welding powder should then be strewn on the ends, which, after a further heating, may be welded so soundly as to bend and stretch as if they had never been broken."

Mr. Rust states that as long as 1854, he welded strips of copper plate together and drew them into a rod; he also made a chain, the links of which had been made of pretty thick wire and welded. It is necessary to carefully observe two things in the course of the operation: 1st. The greatest care must be taken that no charcoal or other solid carbon comes into contact with the points to be welded, as, otherwise, phosphide of copper would be formed, which would cover the surface of the copper and effectually prevent a weld. In this case it is only by careful treatment in an oxidizing fire and plentiful application of the welding powder that the copper can again be welded. It is, therefore, advisable to heat the copper in in flame, as for instance a gas flame. 2d. As copper is a much softer metal than iron, it is much softer at the required heat than the latter at its welding heat, and the parts welded cannot offer any great resistance to the blows of the hammer. They must, therefore, be so shaped as to be enabled to resist such blows as well as may be, and it is also well to use a wooden hammer, which does not exercise so great a force on account of its lightness.

On the Inflaming Point of Vapors.

Various fluids occurring in the trade volatilize, as is well known, at ordinary temperatures, forming explosive mixtures with atmospheric air; others give off vapors at a somewhat higher, but still comparatively low temperature.

W. R. Hutton, of Glasgow, has recently determined the degree of heat at which the vapors of a number of liquids catch fire from a burning candle, when it is approached to the surface of the fluid at a distance of 1·5 in. or 0·5 inch. The results of these experiments are recorded in the subjoined table:

	Specific weight.	Inflaming point in degrees of Fah. At a distance of 1·5 in.	Inflaming point in degrees of Fah. At a distance of 0·5 in.
Sulphuric ether	0·747	below 53°	—
Bisulphide of carbon	1·270	" 58°	—
Petroleum benzine	0·706	" 59°	—
Benzole from coal tar, 90 per cent.	0·861	" 71°	71°
Crude paraffine oil	0·849	" 74°	72°
Crude naphtha	0·884	" 75°	74°
Whisky	0·940	" —	85°
Wood naphtha	0·849	" 87·8°	81°
Crude paraffine oil	0·871	" 89°	84·2°
Crude naphtha	0·881	" 90°	86°
Dutch gin	0·930	" —	90°
Wood spirit	0·827	" 96·8°	84·2°
Illuminating naphtha	0·859	" 100°	91°
Wine spirit	0·817	" 101°	75°
Whisky, 15 overproof	0·895	" 109°	85°
" 11 overproof	0·905	" 115°	84·2°
Kerosene	0·801	" 118°	110°
Light oil from coal tar	0·830	" 119°	109°
Spirit from resin	0·922	" 122°	105·8°
Turpentine	0·875	" 130°	119°
Sherry wine	0·993	" —	130°
Port wine	1·003	" —	130°
Refined paraffine oil	0·809	" 134°	123°
" "	0·814	" 136·2°	127°
Fusel oil	0·830	" 140°	129·2°
Oil from resin	0·987	above 212°	—
Heavy tar oil	0·950	" 212°	—

From this table it may be seen at a glance that the specific weight has, on the average, no influence on the temperature at which the generation of vapors takes place. The cause of this property may be inferred from the fact that the fluids in question consist of mixtures of various compounds, of which the lighter generally escape first. This is the case with the two kinds of crude naphtha and the illuminating naphtha, from which the benzole had been separated by distillation. The crude naphtha of the specific gravity of nearly 0·89, contained considerable portions of tarry substances and napthaline, but it nevertheless took fire at a lower degree of heat than refined naphtha, the specific weight of which did not exceed 0·86. That a liquid which contains but a small amount of a very volatile fluid, may be very dangerous, is seen, for instance, in the experiment with the light oil from coal tar. This oil inflames by the light of a candle at 119° Fah. when approached to it within a distance of one and a half inches. When compared with the great inflammability of bisulphide of carbon or benzole, the tar oil may be considered as of little danger, but it is just as dangerous when it is taken into consideration that the great inflammability of bisulphide of carbon is well known, while the tar oil is looked upon as being comparatively harmless. In the preceding case, the liquid portion, which generated inflammable gases at 119° Fah., did not amount to two per cent of the whole, and after their separation, vapors were not given off below 179·5° Fah.

Buffaloes versus Telegraph Poles.

The *Telegrapher* is responsible for the following good story: "The buffaloes found in the telegraph poles of the overland line a new source of delight on the treeless prairie—the novelty of having something to scratch against. But it was expensive scratching for the telegraph company; and there, indeed, was the rub, for the bisons shook down miles of wire daily. A bright idea struck somebody to send to St. Louis and Chicago for all the brad-awls that could be purchased, and these were driven into the poles, with a view to wound the animals and check their rubbing propensity. Never was a greater mistake. The buffaloes were delighted. For the first time they came to the scratch sure of a sensation in their thick hides that thrilled them from horn to tail. They would go fifteen miles to find a brad-awl. They fought huge battles around the poles containing them, and the victor would proudly climb the mountainous heap of rump and hump of the fallen, and scratch himself into bliss, until the brad-awl broke or pole came down. There has been no demand for brad-awls from the Kansas region since the first invoice."

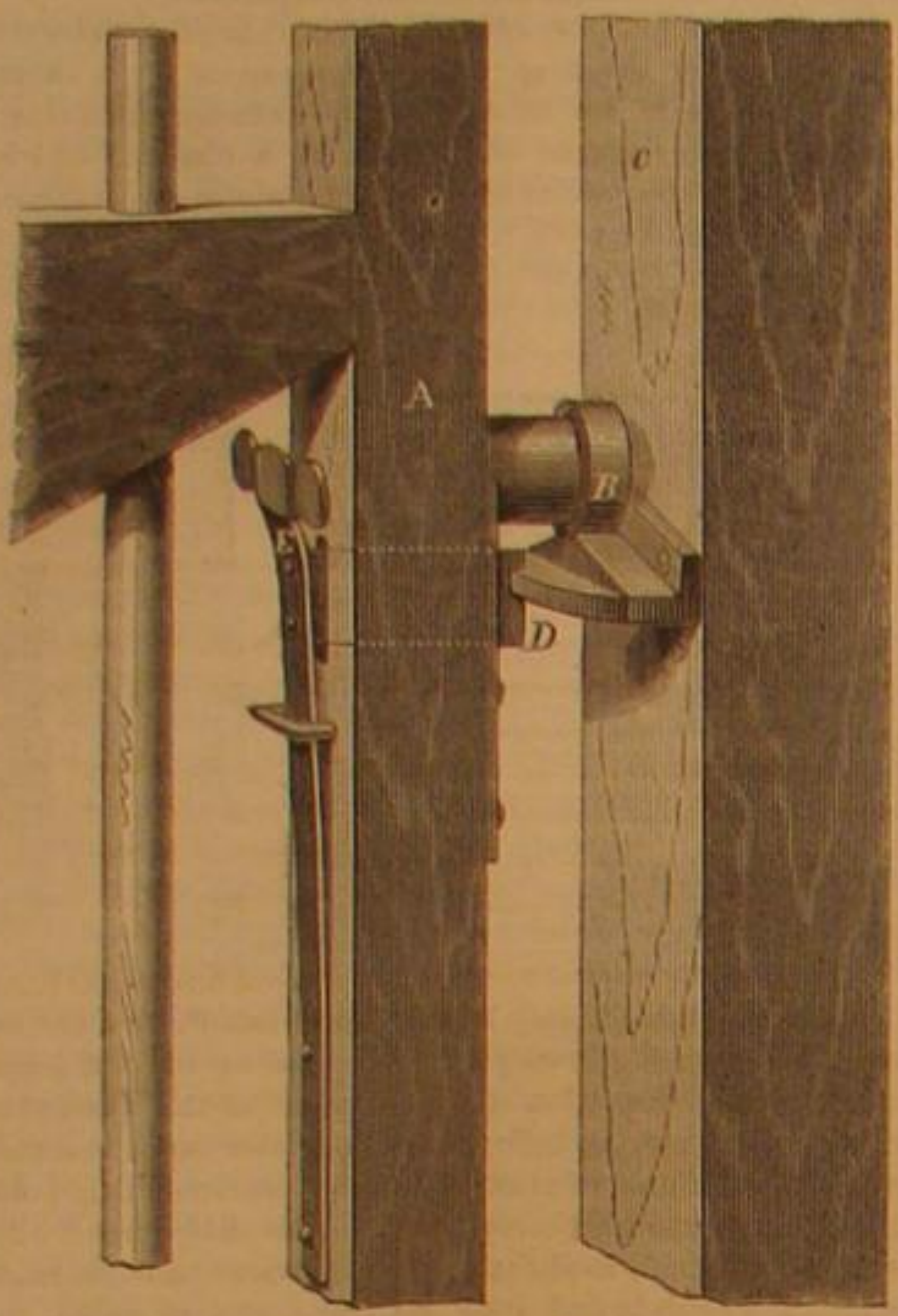
Action of Water on Lead.

Professor Parkes, F.R.S., calls attention to the fact that it has always been seen that the action or non-action of water on lead could not be entirely accounted for by the usual statements on the subject, and lately Dr. Frankland has made a curious observation, which may throw light on the matter. He found that water, which acted on lead, lost this power after passing a filter of animal charcoal. He discovered this to be owing to a minute quantity of phosphate of lime passing into the water from the charcoal; on comparing two natural waters, that of the river Kent, which acts violently on lead, and that of the river Vyrnwy, which, though very soft, has no action on lead, he found that the latter water contained an appreciable amount of phosphate of lime, while none could be detected in the Kent water. This observation, to which we have before alluded, may explain the discrepancy of evidence in respect of the action of soft water on lead.

GROWTH OF FUNGI IN CHLORIDE OF MAGNESIUM.—Mr. Slack recently noticed a quantity of flocculent matter in a strong solution of chloride of magnesium, which had been kept a long time in a dark cupboard. On examination it proved to be a gelatinous mass, in which innumerable fungoid threads were discernible. This may be added to the numerous cases of fungi growing in chemical solutions that might have been supposed unfavorable to their existence.

HENDRICKS' PATENT GATE CATCH.

The primary object of the device illustrated in the annexed engraving, is to afford a sure and sufficient support to the gate when closed, to prevent the loosening and permanent inclination of the hinge post. It also affords a ready means of opening the gate, and secures its effective latching when closed.



On the stile, or upright, A, is a slotted plate, screwed or bolted to the wood, and carrying a stud and roller, B. On the post, C, is a snug, or plate having a double incline, slightly hollowed at the apex to receive the perimeter of the roller, B. A projecting horizontal flange having inclined sides and a notch in the center is for the use of the catch, D, that is a part of the spring, E, which holds the catch in the notch. When the gate is to be opened, the spring, E, is pushed back, thus unlatching the gate and allowing it to swing in either direction. When closed, the roller, B, rests on the snug which then sustains the weight of the gate. It is not necessary that the gate should swing both ways; it may be furnished with this device adapted to suit the exigencies of any case. The device is cheap, easily attached to any swinging gate, and always reliable.

Patented through the Scientific American Patent Agency, Dec. 15, 1868, by Benjamin Hendricks, who may be addressed at Huntington, L. I.

The New Mode of Firing Gun-Cotton.

An interesting practical exhibition of the newly-discovered properties of gun-cotton when fired by concussion, instead of by the direct application of flame or heat, was afforded recently at Woolwich. The huge 36-in. Mallet mortar, weighing 52 tuns, which was placed in the marshes in 1857, and designed to fire a shell of 2,548 lbs. (empty), has, for some time past, been sinking in its great wooden bed, owing to the gradual decay of the wood. It was thought dangerous to run the risk of its falling upon any visitor by leaving it in this position. But weights of 52 tuns cannot be moved for nothing. To erect sheers and the necessary appliances for raising the mortar would have entailed an expenditure estimated at about £50. Under these circumstances, recourse was had to gun-cotton to destroy the bed, and precipitate the fall of the mortar. Four charges of 4 ozs. each, four of 6 ozs., and one of 8 ozs. (total, 48 ozs.) were placed on the wooden bed, and exploded by means of mining fuses charged with detonating composition. The material being rotten was especially unfavorable for the exertion of explosive force—for the force had, so to speak, nothing to act against. But what could be done was done. The huge bed was shattered, and particles flew in all directions. The mortar, although it altered its position, refused, however, to fall, being held, to some extent, by a thick wrought-iron screw bolt. The next experiment was made upon this bolt. A one-lb. disk of compressed gun-cotton was tied to the bolt and exploded. The explosion was thus wholly unconfined. Nevertheless the bolt was broken in two places, a result which exceeded the most sanguine anticipations. Still the huge mortar remained in its position. A third operation had, therefore, to be made. This time two 1-lb charges were disposed under the left trunnion, and the 1-lb. charge was so placed as to give the mortar a kick behind. The explosion of these charges completed the work. The monster mortar slowly and gracefully bowed forward and fell to the ground. The gun-cotton had thoroughly done its work, at a cost of 14s. 6d.—*Scientific Review.*

The Use of Zinc in the Reduction of Gold Ores.

M. D'Heureuse has been for some time experimenting in the use of zinc as a substitute for quicksilver in gold mining. According to the *Scientific Review*, he now finds that in the amalgamation process only about half the gold is extracted from the rock. Melted zinc appears to take up all the gold, allows slag and rubbish to float at its surface, requires little heat to keep it melted, and from its volatile nature can be distilled in a retort to separate the gold and re-collect the zinc itself. The mode of operating is simply to introduce gradually the gold-bearing rock, in a pulverized state, into a bath of melted zinc. This metal immediately attacks and dissolves nearly every particle of gold, while the *débris* rise to the surface of the bath, and can be skimmed off. When sulphurets are present, the rock must be previously roasted. Surely nothing can be more economical and effective than this when plenty of zinc ore is at hand.

Sugar from Pumpkins.

We condense the following from a Southern cotemporary for the benefit of our readers:

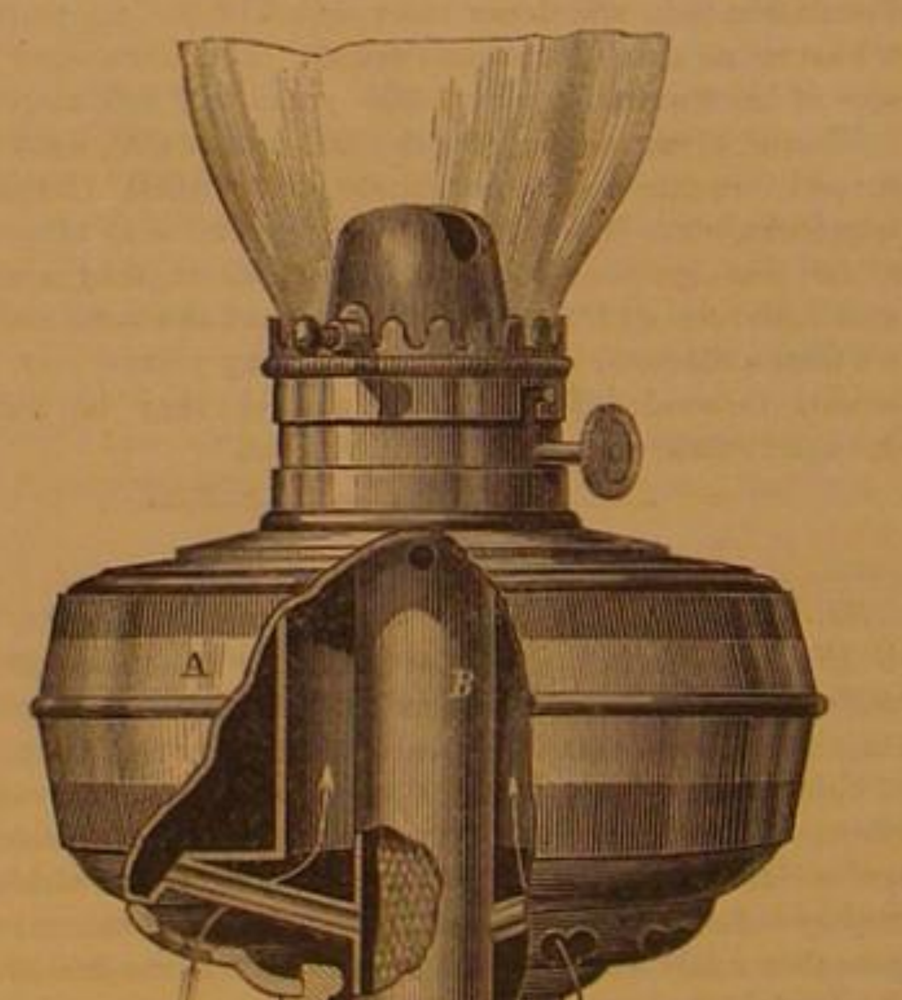
During late years, several more or less successful attempts have been made to introduce into the United States, sugar-producing plants to replace the cane. The beet root and sorghum are among the number, but one of the most valuable, which is cultivated in every cornfield in the Middle States as a side product, has been quite neglected. This plant is no other than the common pumpkin, the *Cucurbita pepo* of botanists. Its period of harvesting lasts longer than that of the beet, it is easier preserved and its refuse is just as valuable for the feeding of stock. Pumpkins weigh from 50 to 60 pounds; they furnish about 4 per cent of sugar; their contents in juice is 80 per cent. This juice indicates from 10 to 11 on Baumé's areometer.

The sugar obtained from pumpkins is of a good grain and color. Before refining, it has a slight flavor of melon. The sirup is of a very dark green color, nearly black, and tastes like cane sugar.

In Hungary, since the year 1837, several manufactories for making sugar from pumpkins have been in operation. The treatment of this fruit is perfectly identical with that of the beet root, and the machinery used for the purpose the same.

PERKINS AND HOUSE'S NON-EXPLOSIVE KEROSENE LAMP.

Any device, any plan of lamp, or any method of management that can render the form of hydrocarbon known as kerosene non-explosive, and insure safety to life and property, is certainly worthy attention and deserving of general adoption. The design of the style of lamp of which the accompanying illustration is a representation, is to provide a perfectly safe means of utilizing the light-giving qualities of kerosene. The lamp may be of any style of form or decoration desired, the essentials of the improvement not interfering with these qualities.



The globe, A, is of metal, therefore proof against breaking. It contains the oil, which is fed into a central tube, B, that holds the wick. The connection between the reservoir and the tube, B, or the wick, is made by pipes (shown where the shell of the lamp is represented as broken away), too small to permit flame to pass to ignite the oil in the globe, on the principle of the Davy and other gas safety-lamps. The air (oxygen) necessary to combustion, instead of being taken in near the flame, just below the cone, as usual, passes in, as shown by the arrows, through apertures at the bottom of the lamp, enveloping the central tube and keeping it and the oil it contains as cool as the surrounding atmosphere, thus preventing the generation of explosive gas by a higher temperature.

It is claimed that this lamp is absolutely safe, gives a superior light, and is economical in oil; results assured by the following facts: Safety by conducting the oil from the reservoir, or body of the lamp, to the wick by tubes impassable to flame; in case of overturning all the oil that can be spilled is that contained in the wick tube. By the reception of the air at the bottom of the lamp, the combustion of the oil is more perfect than in lamps in general use, according to experiments made by Prof. E. S. Snell of Amherst College, who ascertained that the amount of light obtained from this lamp is from forty to fifty per cent greater than from others using the same quantity and quality of oil. Its economy of oil is shown not only by the foregoing, but by the fact that only the amount necessary for the flame is taken up by the wick.

Patented December 11, 1866. For agencies, information, etc., address Votaw & Montgomery, at Springfield, Mass., or Cleveland, Ohio.

BEET ROOT SUGAR.

No. VI.

[TECHNOLOGY.—PART III.

DEFECATION, CONCLUDED.

The quantity of sugar contained in beet root juice varies between certain limits, the determination of which is important. Many various processes, chemical, mechanical, and optical, have been proposed for the attainment of this object, and tables have been computed and published in various works to facilitate the matter. The simplest, however, although a purely empirical method, is the direct use of Baumé's areometer (also called Baumé's hydrometer, saccharometer, or densimeter), which furnishes, by a very simple calculation, data which we found to approximate sufficiently to the truth, for all practical purposes.

The rule is as follows:

1. Float the Baumé areometer, in the saccharine solution, or beet root juice, and read off the degrees of density marked on the scale of the instrument.

2. Multiply the number of degrees thus noted by two, and subtract from the result the same product divided by ten.

The result obtained is the percentage of sugar in the liquid, very nearly.

If, for instance, the juice indicates a density of ten degrees, Baumé, we have:

$10 \times 2 - [(10 \times 2) \div 10] = 20 - 2 = 18$ per cent sugar.

If the instrument had marked only 4·8; the per cent of sugar would have been thus found:

$4{\cdot}8 \times 2 - [(4{\cdot}8 \times 2) \div 10] = 9{\cdot}6 - 0{\cdot}96 = 8{\cdot}64$ per cent of sugar.

The importance of the determination of the quantity of sugar contained in beets induces us to furnish the exact correspondence existing between each degree of Baumé's areometer and the percentage of sugar in a saccharine solution, as given in the books. It is as follows:

Degrees, Baumé.	Per cent sugar.	Degrees, Baumé.	Per cent sugar.
1	1·72	21	38·29
2	3.50	22	40·17
3	5·30	23	42·03
4	7·09	24	43·92
5	8·90	25	45·79
6	10·71	26	47·70
7	12·52	27	49·60
8	14·38	28	51·50
9	16·20	29	53·42
10	18·03	30	55·36
11	19·88	31	57·31
12	21·71	32	59.27
13	23·54	33	61·32
14	25·34	34	63·81
15	27·25	35	65·19
16	29·06	36	67·19
17	30·89	37	69·19
18	32·75	38	71·22
19	36·40	39	73·28
20	34·60	40	75·35

The lime used for defecation must be of as pure a quality as possible, and free from potash, a fact which is determined by previous chemical analysis.

To prepare it, stir it well into the water added for the purpose of slacking it, so as to convert it into a smooth, creamy mixture, to which water is then added, until the whole bulk of "milk of lime" marks a certain determined density on Baumé's areometer. This density must, when once adopted as a standard, be kept constant during the campaign. The strength of the mixture varies between 14 and 20 degrees Baumé in different establishments, but must be so regulated that the quantity of lime used shall be intermediate between one-half of one per cent and one per cent of the total weight of the beet roots worked up in the factory.

The lime ought to be slaked in considerable masses at one time to insure uniformity of composition, by successive additions of *hot* water (river or rain water if possible). When it has attained the desired consistency, it must be passed through a metallic screen sieve to remove the solid particles, small pebbles, etc., which may accidentally have been retained. It must be used freshly prepared. A good plan, where the lime is not chemically pure, is to let it rest and settle for a while after having been slaked and watered, to run off the supernatant water, and to repeat the addition of fresh water several times in succession. In this manner any contained potash (which abounds in wood-burned lime) is effectually washed out of it. We have found that heating the milk of lime to the boiling point, before admitting it into the defecating pans, accelerates its action, which it also renders more perfect.

It is known by the manufacturer that the right proportion of lime has been added during defecation, when the defecated juice is of a light, clear, transparent, amber color. If, on the contrary, this juice is of a green or greenish hue, and contains many floating opaque particles, the quantity of lime has been insufficient.

A few practical trials will soon set matters right in this respect, under the supervision of an intelligent manager, who who ought to know how to approximate his dose of lime to the quality of the juice he is working.

An excess of lime being detrimental to the economical production of sugar, considerable nicety of judgment and practical experience are required in order to determine the proportion of this substance which ought to be employed; a quantity which varies according to many circumstances, the scientific discussion of which is impossible in the pages of this journal.

THE SCUMS OF DEFECATION.

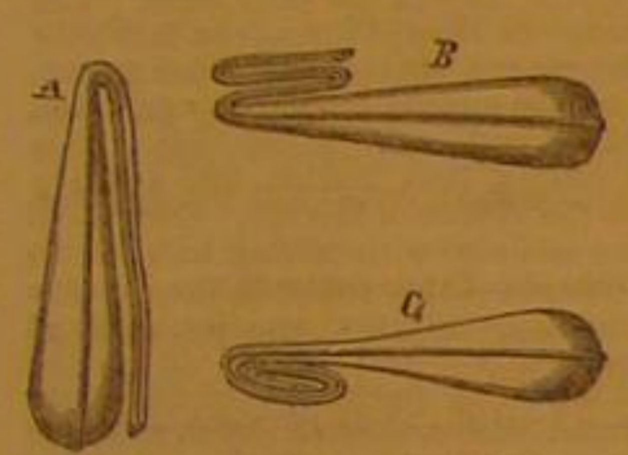
The scums formed during the process of defecation of the beet root juice being rich in saccharine matter must be made to give up as much of their valuable contents as possible. For this purpose they are collected in a special reservoir provided with a wide-mouthed faucet, through which they are filled into sacks. These sacks, made of a strong, close-woven tissue of raw flax, are laid to drip in special tanks, where about two-thirds of the included juice is run out of them in the space of a few minutes. They are then submitted to the action of powerful presses.

The liquid obtained from the presses and tanks is taken directly to a *monte-jus*, from whence it is conveyed to the carbonatation pans, while the juice from the reservoir is best passed through a small quantity of grained bone-black, covered with a loose permeable cloth, before being run into the same *monte-jus*.

Scums are worked while hot from the defecating pans, and must never be allowed to cool before they are pressed.

As the contents of the scum sacks is of a slimy, slippery nature, which would work its way out during the pressing without certain precautions, it is necessary to fold them in a different manner from what we indicated in speaking of the pulp sacks.

As soon as a sack has received its contents, a smart shake is given to it so as to collect the scum at the bottom, it is then folded through the middle, as seen in Fig. A, and laid on a table, where it is further folded, as is shown in Fig. B, after which the whole folded portion is tucked underneath, as in Fig. C. It is then ready to be placed between two sheet-iron trays, or in some cases mattings, and taken to the presses.



The "dead" scums constitute a very valuable fertilizer, rich in nitrogen and lime, and is hoarded with care until needed for use in the fields or for sale to the farmer.

The specifications for the "scum" department of a factory for working 150,000 lbs. of beet every twenty-four hours are as follows:

1. One reservoir for receiving the scums from the defecating pans, with large faucet, and a capacity of 70 cubic feet. Cost, $60.

2. Two cast-iron tables for manipulation of scum sacks. Cost, $50.

3. Two iron presses, with bronze screws. Cost, $400.

4. One *monte-jus* and its special reservoir, each of a capacity of 30 cubic feet, for scum juice. Cost, $130.

The total cost, in gold, of the "scum" department of a 500-acre factory would be $640 in gold.

CARBONATATION.

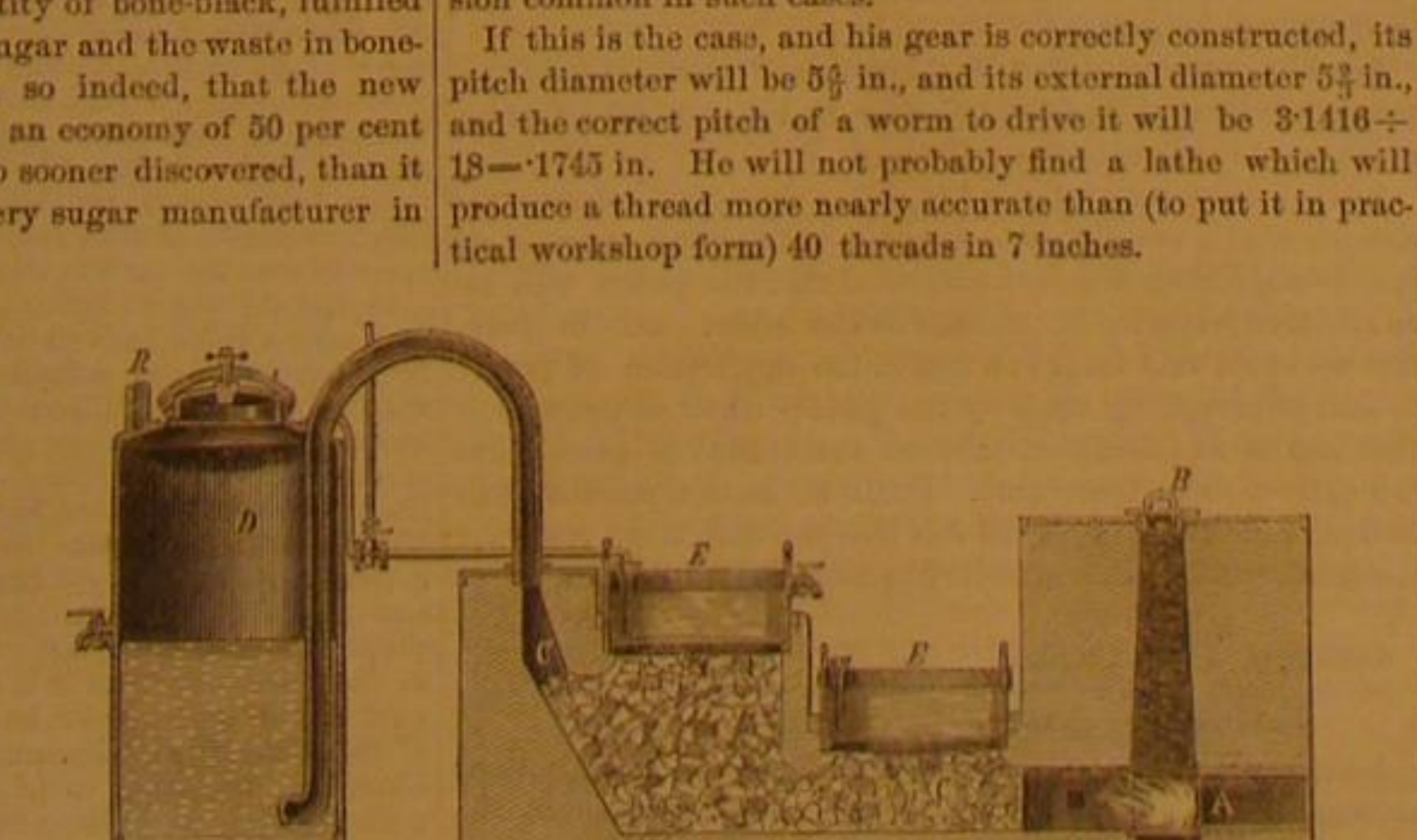
The beet root juice, after it has been freed from many obnoxious substances by the process of defecation, is still far from constituting pure "sugar and water," and still contains both organic and inorganic matter, beside a portion of the lime which has been used in the former operation. All of these are more or less detrimental to the final crystallization of the sugar and must now be got rid of.

By the old methods, passing the defecated juice through filters charged with a large quantity of bone-black, fulfilled the desired result, but the loss in sugar and the waste in bone-black were considerable; so much so indeed, that the new process of carbonatation (by which an economy of 50 per cent of bone-black was effected) was no sooner discovered, than it was adopted without delay, by every sugar manufacturer in Europe.

Carbonatation consists in the saturation of the defecated beet root juice by means of carbonic acid gas.

The cheap production of this gas is effected in many different ways, one of which we shall here describe as the simplest and easiest to put in practice.

A furnace, of which the figure annexed is a section, fulfills our purpose:



The cover, B, on the top of the furnace, is for the introduction of charcoal, which falls on the grate, A, and spreads itself in the neighboring empty space. Air is admitted through A, which, after favoring the combustion of the coal, and having been partly transformed into carbonic acid gas, penetrates into the chamber, C, which is filled with fragments of limestone. The gas is here partially cooled by coming in contact with the water pans, E E, through which a continuous stream of cold water is allowed to flow. From C the gas next passes into the receiver, D, where it is washed and purified by being passed through pure water or through water in which a small amount of soda has been dissolved. R is a pipe through which a double-acting air pump draws the gas out of the receiver, D, and forces it into the liquid to be charged. The same suction causes the necessary draft for sustaining the combustion of the charcoal at A.

During the combustion of charcoal, 6 lbs. of pure carbon, combine with 16 lbs. of oxygen to form 22 lbs. of carbonic acid gas, and each 22 lbs. of this gas are sufficient for the precipitation and elimination of 28 lbs. of the lime retained in the juice. This furnishes all necessary data for the calculation of the quantity needed in any case.

The carbonatation pans, into which the combined defecated and scum juices have been conveyed, are furnished at their bottom with a pipe pierced with three parallel rows of small holes, one-eighth of an inch in diameter, through which the carbonic acid is forced through the liquid. They are also furnished with coil pipes or double bottoms for heating by steam while the process of carbonatation is going on.

After a certain period of time, which is indicated by the cessation of "foaming," the carbonatated juice is run into large receivers, or decantators, where it is allowed to settle, after which the juice is ready for the filters, unless, as is often done, it is submitted to a double carbonatation. In many works the carbonic gas is obtained by the calcination of limestone instead of the combustion of charcoal. In places where this rock is abundant and of good quality this method has its advantages.

The deposit formed during carbonatation is a good manure, which must not be lost or wasted.

The specifications and valuations in gold for the carbonatation department of a factory for working, per diem, 150,000 lbs. of beet root, are as follows:

1. Three sheet-iron carbonatation pans, 6 feet in diameter, and 40 inches high, with copper coil pipe and full complement of valves and cocks for admitting steam, for the emptying of the pans, for introducing steam into the gas blowers in case of obstruction, etc. Cost, $660.

2. Three decantators, each of a capacity of 70 cubic feet, with three bronze cocks to each for drawing off the liquid at various hights. Cost, $240.

3. Three carbonatating pans, same as the first, for second operation. Cost, $660.

4. Three decantators, same as the first, for second operation. Cost, $240.

5. Six pipes, with stops for distribution of the juice to the carbonatation pans and decantators. Cost, $80.

6. Casing and fire box complete, for the gas furnace (exclusive of brickwork). Cost, $250.

7. Wrought-iron gas purifier, 4 feet in diameter, and 8 feet high, with continuous water supply, water level indicator, supply cocks, etc. Cost, $120.

8. Two gas pumps in cast iron, with slides attached to their frames, and with all their connections (two-foot stroke, with 1 foot 8 inches diameter of piston). Cost, 480.

9. Supplementary pipes in copper and iron, not above specified. Cost, $320.

Total, for carbonatation department of a 500-acre factory, $3,050 in gold.

Correspondence.

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

Worms and Worm Wheels.

MESSRS. EDITORS:—W. W. S., of R. I., asks you what thread he shall cut on a worm to drive a gear of 100 teeth, 18 to the inch.

You answer him in No. 13, of this volume, "If the gear teeth are 18 to the inch, the worm must be of the same pitch, 18."

I should infer, however, W. W. S.'s meaning to be, not that the pitch of the teeth of his gear is $\frac{1}{18}$ in. measured on the circumference; but that it is "18 pitch" or 18 teeth to each inch in diameter; "18 to the inch" being a form of expression common in such cases.

If this is the case, and his gear is correctly constructed, its pitch diameter will be $5\frac{5}{9}$ in., and its external diameter $5\frac{2}{3}$ in., and the correct pitch of a worm to drive it will be $3{\cdot}1416 \div 18 = {\cdot}1745$ in. He will not probably find a lathe which will produce a thread more nearly accurate than (to put it in practical workshop form) 40 threads in 7 inches.

In this connection, a few words relating to worms and worm wheels in general may, perhaps, not be deemed intrusive. Technical propriety might perhaps demand that I should say "endless screw," and "tangent wheel;" but I adopt the former terms, justified by custom, almost universal in this country.

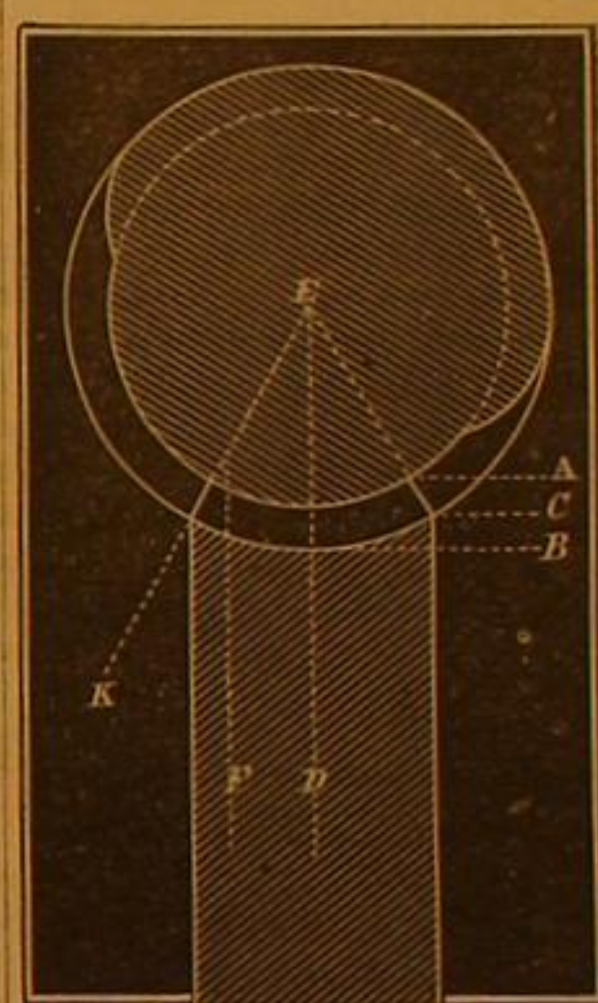
A well-constructed movement of this kind meets completely mechanical wants which could, otherwise, with difficulty be provided for. Its general proportions admit of considerable variation, but the range of proportions within which the best results are reached, is not so great as might be supposed.

It is not advisable to use the "diametral pitch" in calculating the diameter and number of teeth of the wheel, as inconvenient fractions are thereby introduced into the pitch of the worm, and the threads required cannot be accurately cut. But a simple fraction of an inch should be adopted as the pitch of the worm, and all well-equipped lathes will furnish sufficient variety between $\frac{1}{8}$ in. and 2 in. And from the given pitch the diameter and number of teeth of the wheel can be readily determined by the well-known rules, No. teeth × pitch $\div 3{\cdot}1416 =$ diameter, and Diameter $\times 3{\cdot}1416 \div$ pitch = No. teeth.

The pitch circle of the wheel, on which to calculate the foregoing, cannot be correctly located until the other principal dimensions are fixed. Of these, the diameter of the worm should never be less than three times the pitch; the best proportion being from five to eight times, avoiding undue obliquity of strain on the one hand, and unnecessary movement of the surfaces under friction on the other.

The width of face of the wheel should be one-half the diameter of the worm; no particular advantage is gained, in general, by making it greater.

Now, make the depth of the teeth $\frac{3}{4}$ the pitch, and their ends to coincide with the radius of the worm (as by the line *e k*, in the figure), and a simple, easily-constructed form thus far is obtained, entirely suitable for nineteen cases out of twenty.



Extend horizontal lines, as A and B, from the extreme upper and lower points of the tooth thus described, and bisecting A B we have C, a point in the pitch circle. No allowance need be made for clearance, unless the work is to be cast, or is of very heavy character.

The form of the teeth and its execution now remain to be considered. Most treatises on mechanical construction treat of this movement as simply a rack and pinion, which is well enough as far as it goes, but is very far from covering the subject. Not only must the tooth in its general form coincide with the helical curve described by the thread of the worm, but to each different point in the length of the tooth the thread presents itself in a different position, requiring each section of the tooth, from the one made by the central plane of revolution, to the end of the tooth, to be of constantly varying form. For example, in the figure a section of the thread by the central plane at A will evidently be different from a section made by another parallel plane at F, and the same may be said of any two points on one side the central plane.

A little consideration will show that none of the ordinary expedients for cutting teeth will give these such a form as they require; but there is a very simple means of giving them their proper form with accuracy, certainty, and economy. It consists in finishing them (after they have had most of the metal removed in the ordinary cutting engine) by means of a cutter or hob, made in the same form as the worm, and caused to revolve in contact with the wheel in the same precise relation to it that the worm is afterward to occupy. The hob should be a trifle greater in diameter than the worm, and should be grooved spirally, and rather finely; a hob of 2 inches diameter, having perhaps 8 grooves. In other respects it should be a careful counterpart of the worm. It may be mounted in the cutting engine in place of the ordinary cutter, and such arrangements made as will allow the wheel to revolve by its action easily, yet steadily. Or it may be applied by other methods; probably no average mechanic, having a lathe of any kind, would be at a loss how to execute this simple but beautiful process.

In work requiring accuracy, proper gearing is sometimes so applied as to give the wheel a positive revolution at a velocity exactly proportionate to that of the hob and its pitch. By this means a piece of work may be produced well nigh perfect.

Since the means for nicely adapting the teeth of the wheel to the thread of the worm are so ready and efficient, we shall retain great practical simplicity in the whole construction if we give that thread as simple a form as possible. And a thread whose sides are bounded in section by two straight lines making an angle with each other of 30°, having a depth, as before mentioned, of $\frac{3}{4}$ the pitch, with all its angles slightly rounded, will be found to meet almost every possible case satisfactorily, and is certainly as simple as need be.

These brief notes are very far from exhausting the subject, but seem to me to touch the principal points necessary to the proper construction of a screw and tangent wheel in any ordinary case. CALLIPERS.

Worcester, Mass.

The Wheels of all Vehicles, Dynamical Levers.

MESSRS. EDITORS:—Mr. R. Desbonne, on page 260, current volume, in criticising my theory of the economy of short-stroke engines, rests his whole argument on the fact that if 75 lbs. of power, passing one foot, will displace 70 lbs. of resistance to the extent of eight feet, it would be an actual creation of power, a subversion of all the fundamental laws of mechanics, and hence a very extraordinary discovery.

Without fully admitting his deductions to be sound, I wish to call his attention to a fact, by which corresponding results can be shown.

The average capacity or power of a horse, is 33,000 foot-pounds.

Now, giving a cart weighing 500 lbs.,and loaded with 2,000 lbs., total weight being 2,500 lbs., a horse will propel this on wheels at the rate of 176 feet per minute, or 2 miles per hour: here we have a power of 33,000 foot-pounds, moving 2,500 × 176 = 440,000 foot-pounds.

This fact which none can dispute, will, I trust, prove to Mr. Desbonne and others that my theory does not subvert the laws of mechanics, any more than the common cart wheel, and that however perfect we may deem the text-books of mechanics, an important mission has been made in not treating of leverage under the head of dynamics, as well as under the head of statics.

This wonderful economy (which is only limited by mechanical possibilities) is due to leverage alone, for, although some may urge that the mere rotundity of the wheel alone accounts for this, by overcoming the friction, yet it is easy to show,it does not; for if it did, a round wheel of 6 inches diameter, would be as good as one of 6 feet, being equally round, but this is not the case; on the contrary, the larger the wheels, the greater load the horse can carry at the same speed, which as the wheel is a lever, is proof conclusive, that the greater the leverage the greater the economy.

Thanking you for space kindly afforded—with these few remarks I beg leave to close my testimony in defence of the theory advanced, trusting that this proof positive of the economy of the dynamical lever, may serve to open new fields of thought to mathematicians and scientific explorers. F. R. P.

New York city.

Do We Measure Horse-power Correctly?

MESSRS. EDITORS:—I have observed the communication by "Mathematician," in No 13, current volume, SCIENTIFIC AMERICAN, asking "Do we measure horse-power correctly?" and in which your correspondent states:

"When we wish to find the actual horse power of a steam engine, and compute the same by multiplying area of cylinder by stroke of piston, pounds of steam, and number of strokes per minute, without other qualification, the result is erroneous; as, for instance, apply the foregoing rule to a steam engine furnishing power for a machine shop, and running at the rate of seventy-five revolutions per minute, and let the result in horse power be thirty; then disconnect, throw the belting off the power wheel, use the same amount and pressure of steam, and the number of revolutions will be doubled on account of outside resistance being removed. Now measure the horse power by the same rule, and the result will be sixty horse power, which is evidently absurd; for it is equal to saying that the engine uses most horse-power when doing least work, and least horse-power when doing most work."

Your correspondent is right in stating that the power will be represented as doubled, but not the power of the engine; as there is no power in that of itself, but in the agent which sets it in motion. If the speed of the piston be doubled, double the quantity of steam will pass through the cylinder, thus representing double the amount of active force operating on the piston. Let the volume of steam giving thirty horse-power with the engine driving its machinery, and making seventy-five revolutions per minute, be taken as 100, then with the machinery disconnected and running at double the speed, the same volume would be exhausted in half a minute, or twice the volume in one minute, requiring double the quantity of power producing agents to keep up the supply. I therefore think the accepted formula for calculating the power of an engine is correct, as it is in reality only the measurement of the force acting at any time on the piston according to its rate of motion. WM. HORSNELL.

Montreal.

Kerosene Lamps---A Good Suggestion.

MESSRS. EDITORS:—I have noticed in your paper remarks from different quarters in relation to the difficulty of putting out kerosene lamps, and all to me seem to be of no avail. One of your correspondents directs "to turn the lamp down low and blow across the top of the chimney." I have tried this too, and on my lamp I might blow there till I blow myself out before I would get the light out. Now allow me to make a suggestion which may be profitable to some person. Advise the manufacturers of lamp burners to put on an additional wheel to the burners, so that when turned it throws a damper over the blaze, instantly putting it out. It might be made to work by means of a spring, which, when pushed would press the damper flat on the light. There is room under the thimble for the working of the damper. A patent on this might be very valuable. J. S. FETZER.

Brunswick, Mo.

Contents of Cylinder in Gallons.

MESSRS. EDITORS:—On pages 182 and 215, current volume, we have two simple rules for finding the capacity of cylindrical vessels in gallons, when the dimensions are taken in inches. Another, quite as simple, is to multiply the square of the diameter by the hight, both in feet, and by $5\frac{7}{8}$, which gives a correct answer to one gallon in twenty thousand. R. F. H.

New York city.

Copying Copperplate Engravings on Stone.

MESSRS. EDITORS:—That the Coast Survey of the United States is a useful commission, probably no one will doubt. Neither does one doubt—from the great array of diagrams, figures, etc.—the industry or knowledge, in their particular sphere, of any individual member of the same. Lieut. Hall, for example, is eminently qualified to run a base line, and sight his many tri-colored staffs, at each shore indentation, and plot the same upon paper, thereby giving valuable aid to the many "who go down to the sea" in steamships, or other craft. But Lieut. Hall, in his description published in No. 17, current volume, SCIENTIFIC AMERICAN, of the transferring of a copperplate engraving to stone, evinces *less* knowledge of lithography than the already many published blunders. Copperplate engraving *may* be transferred to stone but *never* from Lieut. Hall's quoted information! He tells us to use a "paper which does not expand by wetting," which unknown paper is to be sized with a "*fatty* coating," rather than one totally free from fat. The stone, that must always be kept *cool*, is next "heated," and the culmination of this absurd statement is reached, when "the heated fat is softly brushed away, leaving only the ink (also heated black fat) lines."

One would suppose that Lieut. Hall, of the Coast Survey, had instructed the outside public of a *new* process, instead of which he has simply blinded them in a process *old* as lithography itself, and simplified this is the correct method: Coat a sheet of india paper, which expands but little with moisture, with, say, three coatings of starch, laid on smoothly with a brush, each being permitted to dry before laying on the other. Take an impression from the copperplate, having filled the engraving with a very fat ink, upon this coated side of paper. The impression is now on the interposing starch surface and not upon the paper. Lay the printed side down on a clean stone, and run through the press: the ink lines are thus forced in close contact with, and, being greasy, received by the stone. Pour water upon the back of this paper and the soaked paper softens the starch, permitting the paper's removal. We now have only a soluble starch, and fat ink lines absorbed by the stone upon the surface. Gently wash away the starch, and with the stone *moderately* moist, a printing roller charged with printing ink, may be rolled over its surface, leaving ink *only* on the parts affected by the greased ink lines from the copperplate. Lay on a clean sheet of paper and run through the press, and you have the first impression.

I have purposely omitted some details; the principle is all embodied in the above. LITH.

New York city.

Does Resistance Increase as the Square or Cube of the Velocity?

MESSRS. EDITORS.—Silliman, in his work on "Physics," says: "The resistance which a moving body meets in air or water, is an affect of the transfer of motion from the solid to the particles of fluid. For the moving body must constantly displace a part of the fluid equal to its own bulk, and the motion thus communicated is so much loss to the motive power. · · · The resistance increases as the square of the velocity; for, if the velocity is doubled, the loss of motion is quadrupled, because twice as much fluid has to be moved in the same time and it has to be moved twice as fast."

The mistake in the above is, that the two terms, *twice as much and twice as fast*, in this case, signify the same thing. In the passage from New York to Liverpool, a vessel will displace no more water if the distance be made in five days than if ten days were occupied. That the water is moved twice as fast is sufficient reason why twice as much is displaced in the same time, and the time saved is equal to the additional expense of power.

If the resistance is equal in a given distance, which I maintain, the power required to overcome it will increase in the same ratio with the increase of speed. If all the power required to do ten days' work is applied in five days, the work of ten days will be done in five. So far as the time is concerned, the vessel has gained enough to make the passage back to New York within the ten days, doubling the distance by doubling the power.

But the arguments of "Mathematician" were intended to prove that it would require but *four* and not *eight* times as much power to double the velocity.

So far I have only intended to define the actual relative resistance that a vessel has to overcome at varying degrees of speed—supposing it to be understood that the power will be as effectively applied in one case as the other. But in practice we know that there is a loss in the application of power to that of propelling boats by the paddle wheel or screw, and that loss is so indefinite, that no mathematical calculation can determine its true value. Until we have a practical test to determine the quantity of this loss, the case is not ready for the mathematician because he has no sufficient data. A. DEAN.

Otto P. O., Clark Co., Ind.

Calculating Horse Powers of Engines.

MESSRS. EDITORS:—Having seen several communications in regard to calculating the horse powers of engines in the SCIENTIFIC AMERICAN, I thought that perhaps a few words on the subject from an "old hand" might not be improper. Having been engaged for the last twenty years in building, setting-up, and running engines, I have had good opportunities for observation, and I beg leave to differ in some respects, from the rules laid down in text-books, and in the SCIENTIFIC AMERICAN (an authority for which I have a great respect, as its statements are generally sound), and I will therefore give my reasons for thus differing.

Being called upon to set up an engine, 14 by 26 inches, in a mill adjoining another, in which was an engine 8 by 12 inches, the owner desired to know the combined power of the two and the difference between them. The pressure in each was the same, the large engine making 80 revolutions and the small one 450. The answer of a scientific engineer—according to rule—was that the smaller engine had most power because of its higher rate of speed. The absurdity of this was so apparent that the answer was not satisfactory.

I give this simple rule: Four superficial inches of piston, with steam at 56 pounds per inch, develops one-horse power with a speed of piston 400 feet per minute. The proportions of an engine, I have found by experience, should be, stroke two-and-a-half the bore and speed 400 feet per minute.

S. G. SHIRLAND.

Paper-making Fifty Years Ago.

The Ashtabula *Sentinel* has been giving a series of articles on the industries of Ohio, in one of which it gives the method of making paper as it existed a half century since. It says:

When we commenced these articles we mentioned paper as one of the manufactures of the State, and then had in view, the paper molded by hand, as all paper was made, till about forty years ago. And as that way of making paper has gone into entire disuse, a description of the process may be interesting—both to those acquainted with the present process, and those who have never seen any paper made. At what time the manufacture of paper from a pulp formed of ground rags, bark, or straw, was introduced, is very uncertain as a matter of history. But for many centuries past it has been a staple article of commerce, and for the manufacture of books; during the last three or four centuries there has not been any material change in the method of making it, till the invention of the machines now in use. We shall therefore describe the manufacture of paper from rags, as we saw it about 1819. As the present mode of bleaching by chemicals, was then unknown, the dependence for white paper was white rags of linen or cotton. The white rags of the stock were then very carefully selected from the rest, and after thoroughly washing them they were placed in the engine for grinding. These engines have not been changed by the new process, and perhaps never will be, as they seem to be a kind of machine that must always be used in grinding paper stock to pulp. They are really revolving shears, that cut and beat the fiber at the same time. The engine consists of an immense tub of oval shape, ten feet long and five wide; made very heavy and strong, and fixed permanently. This is divided in the middle by a heavy partition that reaches within two feet of each end. In one side of this tub are placed a series of cutting bars, bedded into a heavy wooden concave, fastened to the bottom of the tub. Over these bars is placed a cylinder, covered also with cutting bars, set so as to come within a short distance of the cutters in the concave below, which is made to revolve with great rapidity, while it forms with the concave a series of powerful shears. In general arrangement it looks like a thrashing machine, with these bars instead of teeth. It is covered with a wooden cap to keep the pulp from being thrown out, and for safety. The speed of this cylinder is much like a circular saw. The tub is filled with water and rags and the machine is set in motion. The motion of the cylinder will establish a current by which the rags and water will be carried continuously around the tub passing through this "beating engine," as it is called, till the whole is reduced to a pulp. Thus far the process of making paper is unchanged. Under the old process, this pulp was transferred to large square vats, from which the sheets of paper were molded. At each was a man and assistant, who worked up this pulp. Two molds were furnished them, which were square sizes, not unlike a picture frame, of the size of the sheet to be made, about half an inch deep, and bottomed with fine woven wire of copper. The molder (after stirring the pulp, which had to be done frequently) then dipped the mold into it, taking up enough of the pulp to form one sheet, and shaking it, he passed it to his assistant, who slipped the other mold to him, and then turned this mold upside down upon a piece of felting cloth of the same size, leaving the newly-formed sheet of paper there, and covering it with another felt. In this manner, alternating sheets of paper and felt, the process would continue till the heap was two or three feet high. It would then be taken to a press and the water squeezed out of it. After this pressing, the sheets of paper would bear sufficient handling to separate them from the felting. They were then pressed again; after which they were taken to the dry loft and hung on poles to dry. Thus far the process of making writing and printing paper was the same. Writing and fine paper was further handled in sizing, by dipping into a vat of the size that was made of glue or tanner's scraps. After this it was dried, pressed, and picked, which consisted of scraping all knots and motes out of the sheets with a knife. Then it was hot-pressed and trimmed, and then counted into quires and packed in reams. The printing paper was neither picked nor trimmed; and in this way the old-fashioned paper can be told from the new. If the sheet has a rough edge all around it, it is hand-made. In some parts of Europe paper is still made by hand. A few years ago the Mormons, at Salt Lake City, made their own paper in this manner. The machines by which the pulp is now formed into paper, dried and cut into sheets, by one continuous process, are very expensive, as well as heavy of transportation. An inferior one will cost four or five thousand dollars.

In the old way of making paper it was very difficult to give it as nice a finish as even the commoner kinds now have. But by hot-pressing and calendering in various ways, much of the finer paper was finished in excellent style. A very large amount of the bank-note paper used in the extensive banking of the paper-money period after the war with England, was made in Ohio. We recollect particularly that the paper for the Bank of Mount Pleasant, in Jefferson county, was made at Updegraff's Paper Mill on Short Creek. Bank-note paper was also made at Steubenville and Cincinnati. At that period there were nearly, if not quite, as many paper mills in Ohio as there are now; but it is doubtful if any one of the best mills now would not turn out as much paper in a day as the whole of them did then. Certainly the present demand of either Cleveland or Toledo could not have been supplied by all the mills in Ohio in 1819; and the entire paper-making force of that time could not keep the New York *Tribune* going. Indeed they could not have made a sheet of the size now required. In hand-made paper the sheets were made of the fixed size of the molds—none of which were over 24 by 36 inches, which was called mammoth, from its unusual dimensions. Of printing paper, for books, the common size was *demy*, 16 by 22, and *medium*, 18 by 24.

Newspapers were commonly printed on *medium*, in country towns. City sheets aspired to *super-royal*, 20 by 28; and thriving establishments used *imperial*, 22 by 32. Those that went ahead of all others used the mammoth size, for which they paid extra in proportion to the size, as the molds had to be worked with a crane in making it, being too large or a man to handle without. Some extraordinary sheets were made for special purposes by the use of cranes, in molding.

Before the introduction of the power press and the paper-making machine, the demand and supply kept about even pace, as they do now; and the small quantity of paper then produced so well supplied the market, that prices do not materially differ from the present. In the art of paper making, the great mechanical agency is the beating engine for grinding the rags, which may be a thousand years old as an invention. With that and the process of molding that we have described, they jogged along down till they got into the nineteenth century, that gave birth to power-presses, stereotyping, steamboats, railroads, and telegraphs, when it became necessary to make more paper, and they had to resort to machinery for that. We might give a description of the machines now in use, for making paper; but as papermills can be seen by any one who will take the trouble to visit them, we advise those who are curious, to pursue the course we have done from childhood up—go and see any manufacturing that can be seen, and look into its details, and get intelligence by the shortest possible route.

THE PHILOSOPHY OF ALUM AND DRY PLASTER FILLING FOR FIRE-PROOF SAFES.

The use of alum and dry plaster as a filling for fire-proof safes, is based upon sound chemical and philosophical principles. The two essentials in a fire-proof safe are, that in ordinary use, it shall be perfectly dry, and that, when heated, it shall become wet. So long as it is wet the temperature in the interior of the safe can never exceed 212° Fah., the boiling point of water, at which temperature everything within it is safe, no matter how excessive the external heat may be.

In order that the first requisite (dryness in ordinary use), may be attained, the filling should contain no deliquescent salts. A train of serious evils will result from the use of such salts, as swelling of the filling, and consequent bulging of the plates; corrosion of the metal until it becomes so rotten that a pocket knife may be thrust through its walls; and dampness of the walls, producing mildew and destruction of papers and books.

Potash alum contains $\frac{216}{475}$ of its weight, of water, or nearly one-half. All of this water, with the exception of $\frac{9}{475}$ of the weight of alum, is liberated by a temperature of 356°. At ordinary temperatures it is a perfectly dry substance. It gives off water gradually as the temperature is maintained, and commences to liberate it at 140°. Some other alums contain 55 per cent. of water. A safe, having alum in lumps as an ingredient in its filling, will, when heated, be immediately filled with steam, and, as long as it remains so, must preserve its contents. The dry plaster absorbs the water as it is liberated, and holds it until the heat converts it into steam. Nothing could be more simple than this action, and its efficiency has been often corroborated by the severest tests.

Having deemed it necessary to obtain a new safe for the security of our valuable correspondence, in addition to a number already in use for our books and more valuable papers, we have been supplied with one with alum and dry plaster filling, made to order, at the manufactory of Marvin & Co., of 265 Broadway, this city, which is, in every way, so satisfactory both in elegance of design and finish, that we are constrained to bear testimony to the superior workmanship of the safes made by this firm.

The safe in question has a feature not before used, which is very convenient for filing correspondence. Two doors are provided on opposite sides of the safe, and a double row of tills, of the right capacity for folded letters, built within the walls; access being had to the files through the doors from one side or the other, without the trouble of lifting out one case to get access to another set of pigeon holes behind it. The doors are secured with Sargent's celebrated magnetic combination lock, and the whole safe is a remarkable specimen of good workmanship, both for convenience and in ornamental design. Any one desiring a double safe for their correspondence, or other purposes, will be likely to get some good hints by examining the one at our office before ordering.

ON THE TECHNICAL APPLICATIONS OF DIALYSIS.

BY PROF. CHARLES A. JOY.

A few years ago, Prof. Graham, Director of the Royal Mint in London, discovered that a certain class of substances could be more readily diffused through water than others; he found, for example, that salt, sugar, gum, and dried albumen, if placed in different vessels, and covered with water, will all of them be diffused through the water, but not in the same period of time. The salt spreads rapidly; the sugar requires twice the time, the gum four times, and the albumen twenty times longer. He found, as a rule, that substances which crystallize are diffused more rapidly than those which are amorphous. The first class are called crystalloid, and the second class colloid. When they are both in solution we can employ a thin membrane, or a piece of parchment paper, and, as it were, filter or strain the crystalloid through its pores, while the colloid remains behind. This operation is called dialysis, and the contrivance for effecting it, is known as the dialyser.

A sieve, a half barrel, a drum, a glass jar open at both ends, or even porous earthen cells, will serve for the apparatus. By tying a piece of bladder, or of parchment paper, over one end of any of the above pieces of apparatus, and floating it upon water, we have all that is required. If we pour into such a contrivance a solution of albumen and of common salt, and partially sink it into a larger vessel filled with fresh water, the common salt will very rapidly strain through the membrane into the outer water, and leave all of the albumen behind. Even silicic acid, which crystallizes in the form of quartz, can be separated from compounds in this way, provided it has been previously fused with soda. Graham has performed a series of experiments upon a large class of bodies, a recapitulation of which may suggest some practical applications of his simple device.

He discovered that tannic acid diffused through parchment paper two hundred times more slowly than common salt, and finds in this fact an explanation of the reason why it takes tannin so long to penetrate hides so as to convert them into leather. All processes for making leather rapidly will be found to be based upon the facility with which the substances employed pass through membranes, and the agents used are generally composed of crystalline salts. We are not aware of any practical application of Prof. Graham's discovery to the tanning of leather, but it is certainly worthy of the attention of persons engaged in the business.

Gum-arabic diffuses four hundred times more slowly than salt, and hence belongs to the class called colloid.

The method of dialysis can be employed for the detection of arsenic, emetic, corrosive sublimate, or any crystalline poison, in the stomach, blood, milk, or any organic compounds. The poisons will pass through the membrane into the outer vessel, and their presence can be shown by the usual tests. The same process can be made available in the case of organic poisons, such as strychnine and morphine, and it is further valuable as a method of original research in seeking for alkaloids in any new plants, and it has even been proposed as the best way for the preparation of alkaloids on a large scale. Many plants contains niter and other mineral salts, which can be separated and detected by dialysis better than in any other way.

Nitrate of silver, from photographers' waste, when put into the dialyser, passes through to an outer vessel, where it can be precipitated and saved; the albumen and other organic matter will remain in the inner vessel. For this purpose a half barrel, with parchment tied over the bottom, and immersed in a barrel of water, would be a good contrivance.

Great expectations were raised in reference to the separation of sugar from molasses, and its purification by dialysis. Several patents have been taken out for this purpose. At the Paris Exhibition of 1867, Messrs. Carmichel & Co., sugar refiners and distillers, exhibited dialysers for refining sugar, which they called *osmogenes*. Each apparatus contained fifty or sixty frames, forming partitions one-quarter of an inch in thickness, and furnished with nettings of strings to support the sheets of parchment paper destined to accomplish the work. The frames with water alternate with those for molasses or sirups. Each frame is provided with an interior opening for the hot water, and another for the sirup, so arranged that each section receives, the one the water, the other the sirup. Both liquids start from a hight of three feet, and, after descending to the bottom of the apparatus, return again, at a temperature of 160° to 170° Fahrenheit, and pass out at the top. The water is introduced and regulated according to the extent of purification required.

The inventors of this apparatus claimed for it very important results, and as it was founded upon thoroughly scientific principles, we see no reason to doubt the truth of their statements. The process is particularly valuable in the manufacture of beet sugar, and for removing potash and lime salts from sirups, but it does not appear to have been generally adopted, probably because it is not well understood.

Mr. Whitelaw took out a patent in England, in 1864, for the removal of salt and niter from salted and corned meats by means of dialysis. It is well known that the brine contains a large proportion of the nutritious constituents of the meat, and if we could remove the salt and evaporate the residue we should have all of the properties of a good soup. It so happens that the savory and valuable constituents of meat are colloids, and will not, therefore, pass through a membrane. The salt, which is added to keep the meat from decay, is crystalline, and, as we have before seen, passes very readily through parchment. Mr. Whitelaw takes advantage of these two facts, and puts the brine into porous jars or bladders, which he suspends in water, that must be renewed three or four times in twenty-four hours. After a few days, the contents of the jars will be found to be fresh and sweet, ready for use as soup, or they can be evaporated down to dryness and converted into meat biscuit. In this country, where such large quantities of corned and salted meats are consumed, the saving of the brine is a matter of much practical importance, particularly as what is thrown away is too often the most nourishing portion of the food.

FILTERING OXYGEN FROM THE AIR.

The same principle of dialysis was successfully applied by Graham to the concentration of the oxygen in the air. By passing air through shavings of india-rubber, the rubber retains a portion of the nitrogen, and the quantity of oxygen is increased to forty-one per cent., being twenty per cent more than its usual capacity. An atmosphere with forty-one per cent of oxygen will re-ignite a glowing taper, and, in general, support combustion and respiration in a very active manner. The experiment points out such a simple and cheap way of procuring oxygen from the atmosphere, that it ought to be put to a thorough trial before more money is expended in complicated and costly methods. If, by filtering the air through a membrane, or shavings, or any cheap substances, we can get rid of the nitrogen, we have made a discovery of the highest importance, and the experiments of Graham certainly seem to point out the feasibility of the plan.

Certain physiological phenomena can be very well explained by the doctrine of dialysis; for example, according to Professor Daubeney, of Oxford, gums, starch, oil, or any similar class of bodies secreted in the cells of plants, must be classed among the colloids: they have no tendency to pass through the walls of the cells where they have been elaborated, and consequently arrange themselves into groups. On the other hand, the acids and alkalies are crystalloids, and pass freely through the pores of the cells, and are frequently found on the outside, or they pass to the organs of the plant, where they undergo transformation by action of the vital force. The mucous membrance of the stomach may be compared to the parchment of the dialyser—the crystalloid elements are absorbed, while the colloid remain to be subjected to the action of the gastric juice, which elaborates them according to the laws of nutrition.

The action of different kinds of medicines can be explained according to the same law. Those which are crystalloids will diffuse rapidly through the coating of the stomach, while the amorphous medicines will remain, subject to the action of the gastric juice and the laws of digestion.

The application of dialysis in the dry way has been proposed by a French savant. He assumed that substances which fused at different temperatures could be separated by passing them through a porous vessel on the same principle. Such an application would be most valuable in metallurgy, but thus far it has not been reduced to practice. In the manufacture of paper from sea-weed, after the weeds have been boiled in caustic soda, the black liquor is thrown away. It would be well to put the waste liquor into porous cells, suspended in tanks of fresh water, to see if the crystallizable salts of iodine would not pass into the outer vessel, where they could be reclaimed.

We have thus hastily noticed some of the leading applications of dialysis. It is a process so very easy, so simple, and so cheap, that it only needs to be better understood to acquire great popularity.—*Journal of Applied Chemistry.*

Alleged Discovery of Petroleum at Wismar.

A strange rumor, says the *Grocer*, is afloat in Germany of the discovery of a petroleum spring at the seaport town of Wismar, in the Grand-Duchy of Mecklenburg-Schwerin. Our Hamburg correspondent informs us that, on March 19th, the workmen employed in digging out the earth for the new sewers in course of construction on the promenade surrounding the town, came suddenly, at a depth of five feet below the surface, upon a spring of oil, which proved to be petroleum of excellent quality, pure, and limpid. It was at first surmised that it might be caused from the leakings from the gas works at no great distance off, but the officials of that establishment declared that such was not the case. The news spread through the town like wildfire, and, in a very short time, hundreds of people rushed to the spot with bottles and pitchers, which they filled with the liquid, and Herr Beckmann, the chemist of the corporation, carried away a sample for the purpose of analyzing it. When one considers that the geological formation of that part of Germany is purely alluvial soil, or at the very oldest of diluvial origin, while the total absence of all rocks, and, on the other hand, the abundance of erratic blocks of Swedish granite of all colors and sizes, covering the surface, suggests a reference to the glacial period, it certainly does appear extraordinary that an oil spring should have been struck within five feet of the surface of the ground. As far as we have been able to ascertain, there are no artesian or other deep wells at Wismar or in the neighborhood, and, therefore, in the absence of any such borings, it is impossible to ascertain, or even approximately to hazard an opinion, as to the nature of the rocky substratum underlying the diluvial surface, though in some parts of Mecklenburg large beds of marl and gypsum have been discovered at a great depth.

Calculating Areas by Weight.

The *Engineer* contains a very novel method for computing areas by weight; an accurate square of homogeneous paper of uniform thickness being used for plotting the map of the area to be measured. The whole is accurately weighed in a delicate balance, and then the tracing of the boundary is cut out, when the weight of the piece cut out, divided by the entire weight of the square will give the ratio of the surface to be measured to that of the square, both being drawn to the same scale. Areas of the most irregular form may thus be very readily and quite accurately determined.

THE Brazil (Ind.) *Miner* says that the furnace of the Indianapolis Furnace and Mining Company, at Brazil, is the largest establishment of the kind in the United States. The furnace, or rather the double furnace of the Western Iron Company, at Knightsville, two miles east of Brazil, though not so large as the one first mentioned, has been a paying institution from the start. The cost of the first stock was nearly $100,000, and the profits of the concern paid for it inside of six months after it first commenced operations.

OVER ninety per cent of the rays issuing from most kinds of artificial lights are according to the German chemist, Landsberg, calorific or heat rays, and as such non-luminous. Sunlight has only fifty per cent of heat rays. He attributes the painful effect of artificial light upon the eyes to this large amount of heat rays. By passing artificial light through alum or mica, the heat rays are interrupted and the light is rendered much more pleasant and less injurious.

A CURIOUS experiment is said to have been recently performed in France to ascertain whether fishes can live in great depths of water. The fish were placed in vessels of water made to sustain 400 atmospheres, under which they lived and preserved their health. It is therefore concluded that fishes may penetrate to very great depths in the ocean with impunity.

During the past seven months, there have been in the United States sixty-one boiler explosions, the great majority of them involving loss of life.

Improved Brake for Velocipedes.

Messrs. Mercer & Monod, of No. 3 William street, New York city, are among the most enterprising velocipede men in the city. At their school they use machines of elegant pattern and excellent action, and adopt improvements as fast as suggested. In the accompanying engravings a new improvement is represented for the management of the brake, and for which a patent is now pending through the Scientific American Patent Agency.

Fig. 1 is a perspective view of the velocipede with the improved brake. Fig. 2 is an enlarged view of the brake and its contiguous parts. The brake shoe, A, is faced with hard sole leather, or some similar substance calculated to hug the tire closely. It is pivoted in a slot through the reach and furnished with a spring, B, that lifts it from the wheel when not forced against the wheel's perimeter by the rider. Its upper end is connected by a forked rod, C, to an arm of a bell crank lever, pivoted just in rear of the driving wheel support to the clip, which also sustains the saddle spring. The other arm of the bell crank is engaged with a strap that may be wound up on the steering bar, D, that revolves in its standards.

It is evident that by this device the rider has entire and perfect control of his vehicle by his hands, the whole muscular force of the arms being readily applied at will. In no case, however, is this force required, only a slight exertion being necessary to prevent the wheel from revolving, even going very steep grades. The adaptation of this brake in no wise weakens the vehicle in any of its parts, and it presents an elegant appearance.

Fig. 1.

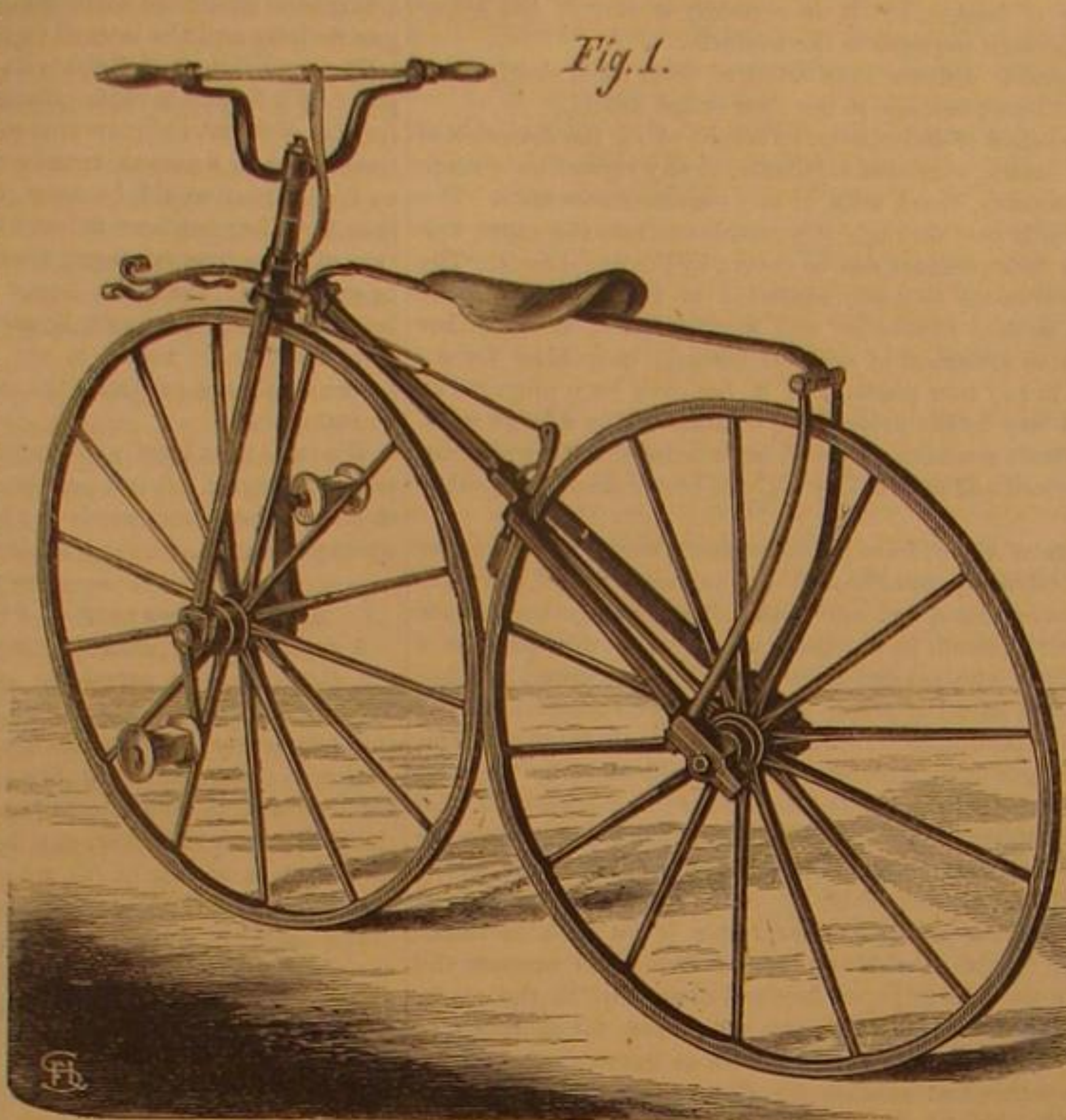


Fig. 2

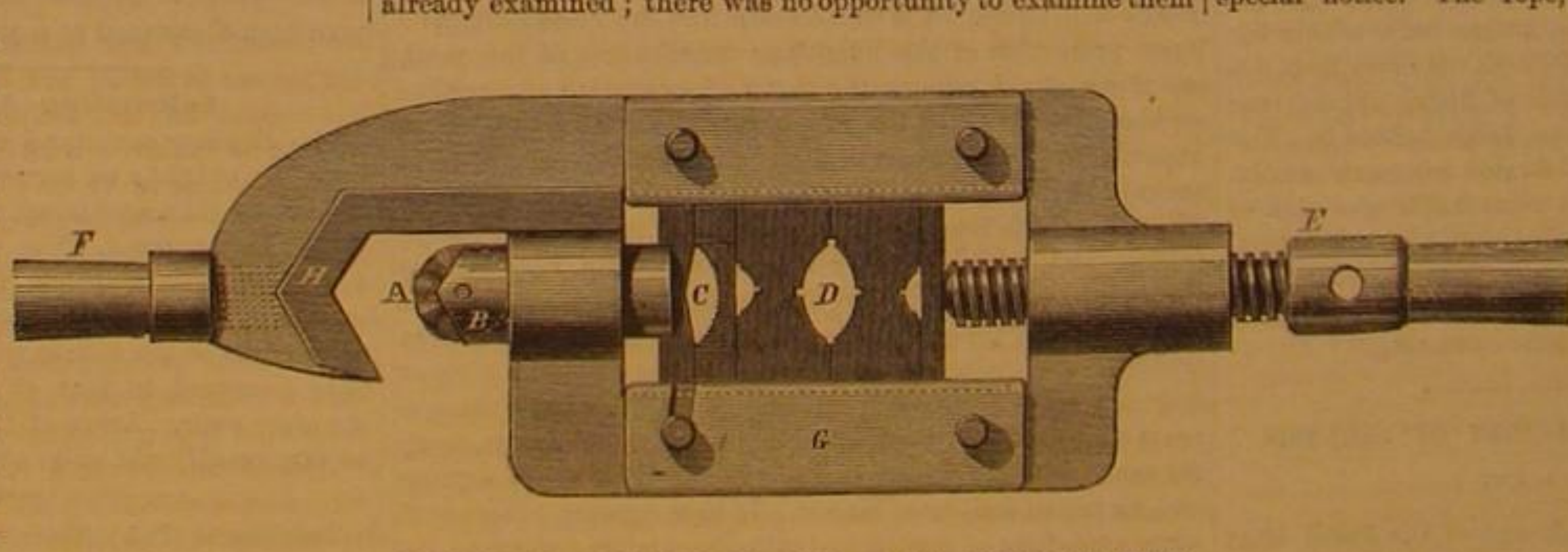
MONOD'S IMPROVED BRAKE BICYCLE.

Further information may be had of Mercer & Monod, No. 3 William street, New York city.

Himmer's Patent Gasfitters' Tool.

The implement shown in the accompanying engraving is designed for fitters of gas, steam, and water pipes of iron, to reduce the number of tools ordinarily carried about, and to provide a handy combination instrument in their stead. By it the pipe is cut, the scale or rust cleaned off, the thread cut to receive the thimble, tee, or cock, and the pipe held while being screwed up.

The stock, or frame, holds a rotary cutter, A, with its stud, B, a scraper die, C, and a set of screw-cutting dies, D. The whole are operated by the screw handle, E. The handle, F, is screwed into the opposite end of the stock, to be used only when threading the pipe. It is readily removed by means of a driver fitting a hole in the handle, as in E. For quick removal of the dies the plate, G, is pivoted near one end and slotted near the other. The stud, B, has a cross piece that steadies it, as seen. It is evident that the dies may be replaced by others instantly. When used as a cramp, or wrench, the cutter, A, is removed by pushing out the pin that forms its axle, when the apex of the stud may be set against the pipe by the screw handle, E, and it is held firmly between the stud and the jaw, H.



COMBINATION TOOL FOR GASFITTERS' USE.

In operation, when it is desired to cut off a pipe, the handle, F, is removed and the pipe inserted under the jaw for cutting off, the stud, B, and rotary cutter, A, are forced up by the screw handle, E, the frame, or stock, is rotated, and the work is readily done. To clean the end of the pipe from corrosion or scale, the pipe is inserted between the scraper die, C, and its bearing block. The thread is cut by the dies, as in an ordinary screw plate, and the implement is used as a wrench, as before shown.

Patented Sept. 29, 1868, by Jacob Himmel, who may be addressed to the care of Edward Gamm, 126 Hester street, New York city. The patentee wishes to dispose of the entire patent.

A LONG REQUIRED NEED SUPPLIED.

Shortly after the close of the exhibition of the American Institute, in the fall of 1867, we recommended that society to establish an inventor's exchange, or perpetual fair, and subsequently sketched a plan of operation. Nothing came of it, and we had begun to despair of ever seeing any such project started.

Inventors and agents have for years exhibited their models, machines, and specimens in the receiving rooms or offices of hotels, where they were temporarily stopping, or carried them about, when portable, from pillar to post, having no central and convenient place for the exhibition of their patented improvements. The inventor, proprietor, or agent showed his device and explained its operation at his hotel only on sufferance, and one hotel near our office that has heretofore been noted as a headquarters for this class of visitors has peremptorily forbidden the further use of its rooms for these purposes. This is not to be wondered at, as the annoyance was great and the profit little, if anything. The only recourse of the inventor or manufacturer was, therefore, the establishment of a New York agency by constituting some dealer in articles similar to that he manufactured a partner, in a certain sense, or a sharer in the profits. But the inconvenience and annoyance was felt more by the purchaser. If a stranger in the city, his labors and time in traveling from one point to another were very considerable; but if he did not expend both, he had little opportunity to compare articles intended for the same purpose, but built by different makers on different plans. Or if he did procure opportunities to see different machines, by visiting as many places as there were machines, he could not compare the two except as he remembered the points of those he had already examined; there was no opportunity to examine them side by side. The anxiety on the part of the resident agent to make a sale (an anxiety entirely proper), also militated against the chances of the purchaser securing either the best article or the one he really wanted. The advantages of the particular machine he was then examining were rendered so apparent by the eloquence of the salesman, and the difficulty of detecting the fault, or faults, in the machine, without close and immediate comparison with another, was so great that it is not surprising he frequently felt, after trying his new acquisition, that he had not been fairly treated.

This state of things was also injurious to the inventor or manufacturer. Most members of these classes desire, and invite comparison and competition; each feeling assured that even if in some one or two respects another's device may be better, his, on the whole is to be preferred for superior advantages. Such competition is healthy and no conscientious manufacturer objects to it, but, on the contrary, courts it. Then, if the customer is not satisfied with the article first shown, and goes to visit some other repository, he will frequently purchase what he is still less satisfied with rather than go back and acknowledge his error. Some centrally located, fairly conducted establishment, where the inventor, the patentee, the manufacturer, and the discoverer could exhibit, side by side, their products, seemed to be demanded by the interests of each and also of the purchaser. For these reasons we have repeatedly advocated the establishment of a central bureau for inventors located in New York city, the commercial metropolis of the country.

Such an establishment we visited a few days ago. It is called the "Whitlock Exposition," from the name of its projector. It is located at Nos. 35 and 37 Park Place, west of Broadway and near the City Hall Park. The building is five stories above the street and two below, the different floors devoted to different classes of articles, from roots, plants, and seeds to sewing machines and works of art. One of the floors, a hall of 50 by 80 feet, is devoted to trials of velocipedes. Offices for permanent occupancy are let to permanent agents or proprietors, while temporary exhibitors have their letters directed to the establishment, and are furnished with stationery and desks with which to conduct their correspondence. Steam power is furnished for such exhibitors as require it, and each exhibitor is entitled to an advertisement in two periodicals, conducted by the company, issued monthly and semi-monthly.

The exhibitors are charged a very moderate price for the room and power occupied and used, and permanent exhibitors a very low rent for their offices. If the company make sales (which they do without drawing invidious comparisons between competing articles of the same class), they expect the usual commission. The establishment is a perpetual exhibition, free to all who choose to visit it. Already it has become one of the features of the metropolis.

Duty to the great body of inventors, as also to the enterprising projector, impels us to this notice of the new exposition which deserves to be known. It supplies a want long felt, and its success is already assured.

A Monster Rope.

A new rope, made by the Universe Works, at Birmingham, England, is of such extraordinary dimensions as to merit special notice. The rope, which is intended for shipment abroad, is 11,000 yards long, measures, 5½ inches in circumference, and weighs over 60 tuns. These figures are enough to take one's breath away; but when we come to see how the monster is built up, there is cause for still greater surprise. The rope (made of Messrs. Webster and Horsfall's patent charcoal wire, laid round a hemp center) consists of six strands, with ten wires in each strand; each wire measures 12,160 yards; so that the entire length of the wire reaches the enormous total of 726,000 yards, or 412½ miles. To this has to be added the length of yarn used for the center—namely, twenty-seven threads, made from Petersburgh hemp, each thread measuring 15,000 yards, and giving a total length of 405,000 yards, or about 230 miles. Adding together the wire and yarn, we have a grand total of 1,131,000 yards, or 635 miles of material—all going to make up a monster wire and hemp rope a little under six miles long. Such a rope certainly has never yet been made; and we doubt whether, excepting in Birmingham, such a one could be made. As it lies in vast coils in Messrs. Wright's machine room, it looks like a miniature Atlantic cable, multiplied by five times the cable thickness. Of course such a rope will bear an enormous strain, and its capacity in this respect is increased by the perfection of the machinery employed in the manufacture, giving the strands an exactly uniform "lay," and imparting the regularity and the precise angle of "twist," which experience proves to possess the greatest resisting and holding strength.

It is said that an ingenious Frenchman, in Philadelphia, skins frogs by drawing out all their interior parts through the mouth, and then stuffs and mounts them in a variety of curious attitudes, as billiard players, velocipedists, dentists, barbers, etc.

Morgan's Trade Journal for April publishes the whole of an original article on "Tobacco Pipes," written expressly for the Scientific American and credits it, unduly, to the *Tobacco Trade Review*.

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VOL. XX., No. 18...[NEW SERIES.]....*Twenty-fourth Year.*

NEW YORK, SATURDAY, MAY 1, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

THE NEW COMMISSIONER OF PATENTS.

We are not surprised to learn that President Grant has appointed Samuel S. Fisher, Esq.,of Cincinnati, to succeed Judge Foote as Commissioner of Patents.

The *Sun*, which "shines for all," referring to this appointment, says "it was made by the President on grounds of personal friendship," wherein the *Sun* is entirely mistaken.

Mr. Fisher was selected by Secretary Cox on the ground of peculiar fitness for the position; and we happen to know that he hesitated to yield a valuable and extensive law practice to assume charge of an office which could give him but $4,500 a year. Before entering upon his duties as Commissioner of Patents, Mr. Fisher will surrender his practice, and thus remove an objection which has been raised against his appointment. As a man of honor, he would not presume to occupy a position where his judgment could not operate entirely free from considerations of personal interest.

Mr. Fisher is well known in Ohio and in the United States Courts as an able, industrious lawyer, and especially skillful in patent law causes. But our inventors, whose interests are to be so largely in his hands,will naturally be anxious to learn something more respecting his character and fitness for the position.

Mr. Fisher is comparatively a young man, being but 37 years of age. He is a native of Michigan; studied law at Philadelphia, and afterward removed to Cincinnati, where, for fifteen years, he practiced his profession with that success which always follows ability, industry,and sterling integrity.

During the war, and when one-hundred-day regiments were called out, Mr. Fisher served as Colonel of the 138th Ohio, operating in front of Petersburg, Va. He now holds the responsible position of President of the Board of Education, of Cincinnati, and is highly esteemed in that city as a Christian citizen and an efficient co-worker in all public enterprises and reforms. Mr. Fisher was appointed entirely without solicitation on his own part. He is not indebted to any outside influence for the honor conferred upon him, and enters upon his duties entirely independent of political or patent cliques. From our knowledge of the character and antecedents of the new incumbent, we do not hesitate to say, that inventors may rely upon him as a true friend; and, furthermore, that the duties of the Commissionership will be administered by himself, and without the intrusive assistance of certain parties who seem to act as though the Patent Office was under their special guardianship, and the Commissioner a mere appendage to a lobby, which has cast a shadow over the good character of that Office. Commissioner Fisher is a hard worker,and, if the business of the Patent Office flags—if there are any drones in this hive of industry—he will be apt to inquire the reason why.

We commend this appointment as one of the very best that could have been made. It assures us that the administration of the Patent Office is about to return to what it was when Mason and Holt were Commissioners.

SCIENTIFIC AND MECHANICAL ASSOCIATIONS.

The utility of well organized and well managed associations for the advancement of science and the arts is unquestionable. There are many such societies, both in this country and in Europe, which are doing incalculable good. They are models of their kind.

We believe, however, that there is room for the organization of many more associations, connected more particularly with the mechanic arts, whose influence would be almost as great and beneficial as those of a higher scientific character. Our idea of such associations is to disconnect them entirely from all consideration of the regulation of wages, hours of labor, and other questions properly confined to the trades unions; their purpose and scope being solely to elevate the standard of skill and knowledge among mechanics everywhere, and to unite them by the strong tie of just and honorable emulation.

To this end, although such societies might be to a large extent local, they should be connected so as to form one large body,comprising the mechanical genius and skill of the entire country, and recording the valuable results of general observation and experience.

We scarcely ever converse with a practical mechanic without ascertaining some fact of general interest occurring in his experience. So far as such facts are available our readers get the benefit of them, but there are large numbers of mechanics throughout the country,who are in a position to make equally useful observations, but whose knowledge, for want of proper organization, is confined to only a few of their immediate neighbors and acquaintances, while they would greatly benefit the mass of mechanics by being promptly and universally diffused. The columns devoted to correspondence in our paper, are intended to supply this need in some measure among our readers, who may be said to be members of the Scientific American Association for the Advancement of Arts and Science, but we are certain that much that is valuable fails to reach the public through our columns, from considerations of modesty, and the want of a general interest which such associations as we allude to would excite.

Many a hard-handed and hard-headed mechanic could and would impart information of general value, if he could wield the pen as deftly as he wields the implements of his trade. The diffidence he feels in appearing before the public as a writer, would not be felt in addressing an association of his fellow craftsmen, who would certainly be competent to judge whether his ideas were worthy of permanent record in their transactions. Printed copies of such transactions sent to one general central association, of which the smaller local societies should be the members, and in which they should be represented as delegates, would form the basis of a general record, the value of which could not be estimated.

Such a general annual report would be of as much practical utility to operative mechanics, as the transactions of learned associations are now to theoretical mechanics.

There seems no serious obstacle to the formation and successful operation of such associations, and their elevating effect upon their members would be immediate and salutary.

We have, in previous articles, discussed the subject of ways and means by which such organizations can supply themselves with books, lectures, and other means of individual improvement, and nothing would give us greater pleasure than to see those suggestions carried into general effect. The time is coming in the history of the world when men are to be estimated by what they can do. In that time the mechanic will find that his social position will depend not only upon his manual skill but his mental acquirements; but these will not be restricted by conventional limits. He may do or know what his natural genius best fits him for. Excellence will be the standard by which men will be estimated. Everything points to a new and better order of things in the future. It rests with mechanics themselves, whether, so far as they are concerned, the advent of the new era shall be hastened or retarded.

THE NEW EXAMINER-IN-CHIEF.

The President has appointed Rufus L. B. Clarke, Esq., of Mt. Pleasant, Iowa, to the position of Examiner-in-Chief of the Patent Office, to fill the vacancy existing in that Board. Mr. Clarke is a brother of "Grace Greenwood," and is a lawyer by profession, having been admitted to the bar by the Supreme Court of this State in 1845, and practiced his profession at Rochester, N. Y., until the fall of 1845 when he emigrated to Iowa. During his residence in Rochester he was one of the editors and proprietors of the *Evening Gazette*. At Mt. Pleasant, Iowa, Mr. Clarke, in company with George Doolittle, opened a law office and soon acquired a large practice; being offered the honorable position of law clerk in the Comptroller's office, at Washington, he removed to that city, where he has since remained in charge of special cases and questions arising in the settlement of war claims. He is said to be a gentleman of ability.

THE POSTAL TELEGRAPH BILL.

Since the assurance was first fully felt that the electric telegraph was, in fact, a means whereby messages could be cheaply, safely, and regularly transmitted with the speed of lightning itself to all parts of the civilized world, its ultimate use as an adjunct to the postal departments of this and other countries has been confidently predicted by far-sighted men.

The carrying of mails, as well as the coining of money, is a matter which all modern governments have kept under their own control. They are exceptions to the general order of business, wherein individual enterprise is allowed full scope. There are various and valid reasons why any commonwealth should retain the monopoly of these affairs, which we need not here discuss. The wisdom of such a policy has long been acknowledged by statesmen and political economists.

The analogies existing between the method of transmitting matter by the mail service, and the telegraphic system, are also obvious, and the influence is almost unavoidable, that if it be a wise policy for the governments to monopolize the one it would be wise for them to monopolize the other.

A bill for the establishment of a postal telegraph was introduced in the last Congress, and another is now under consideration, having been read twice and referred to the proper committee. While we are strongly in favor of the establishment of postal telegraphs connecting the principal cities in the United States, we are not altogether pleased with the bill under consideration.

This bill provides for the incorporation of a company to be called the "United States Postal Telegraph Company," with a capital of $400,000. This company is to build lines to connect within six months the cities of Washington and New York, Boston and Chicago, and within two years to connect St. Louis with New Orleans. It is further proposed to establish telegraphic communication with every city of five thousand inhabitants and upwards within three years from the completion of the contract.

The offices are to be located in every city at the postoffice, and also at the railroad stations. Messages are to be received at all the general and sub-offices and street letter-boxes. These messages are to be prepaid by stamps. Messages are to be delivered free, as letters are now delivered, within certain limits, and to be transmitted by mail from telegraph stations to towns too small to have a station of their own. The bill also provides for the sending of postal money orders by telegraph. The tariff is to be one cent per word for distances not exceeding five hundred miles, the smallest message to be twenty words, or if less than that number, to be paid for as twenty words.

While the increased facilities offered by this plan are very great, we are not disposed to view with favor the organization of a company to carry it out. The plan, if worthy of adoption at all, is worthy of being put in operation by the Government itself. Such a scheme might be initiated perhaps with the capital named ($400,000) but it could never be carried out without additional capital.

If Congress should see fit to sanction this scheme, it should not be done without the strongest guarantees that the spirit of the contract will be carried out, and should look to it, that, in granting such a franchise, it does not impose upon the country at large a system that places the public at the mercy of scheming capitalists.

THE TRANSITS OF VENUS IN 1874 AND 1882.

Doubtless many of our readers may think it premature to say anything about an event six years before it will transpire, but there are good reasons in this case for such an apparently ill-timed proceeding. The transits of Venus to take place in 1874 and 1882 are justly looked forward to by astronomers as the greatest astronomical events of the century in which they will occur. Why they are so considered, and the necessity for anticipating them by extensive preparations, it is the object of this article to show.

The phenomena called transits occur only with the inferior planets, that is, those whose paths of revolution around the sun lie wholly within that of the earth. A transit is nothing less than an eclipse of the sun by an inferior planet, that is, the passage of either Venus or Mercury directly between the earth and the sun, so that their disks partially obscure its face, and appear as round, dark spots upon it. Conventional usage has limited the term eclipse of the sun to the obscuration of its disk by the moon, and transit to the same effect produced by the passage of Venus and Mercury between the earth and the sun, although there is no essential difference in the nature of the phenomena.

The transits of Venus occur very seldom. The first one, we believe, of which there is any record, was observed in 1639, by the gifted young astronomer, Horrox, whose brilliant career was so suddenly terminated by death at an age when few have even begun to achieve immortality. The celebrated Dr. Halley communicated a paper to the Royal Society in 1691, with a view of calling attention to a proposed method for determining the parallax of the sun, and thereby its real distance from the earth. Since his time only two transits of Venus have occurred—viz., in 1761 and 1769. Dr. Halley expressed in his paper the belief that, in the way proposed, the sun's distance from the earth would be determined with great accuracy. The feasibility of the method at once attracted the attention of astronomers, and, upon the occurrence of the transits in 1761 and 1769, the sun's distance was computed to be 95,173,000 English miles.

The parallax of heavenly bodies is the difference in their apparent relative position, when viewed from different stations. It is usually expressed in degrees, minutes, and seconds, of angular measurement. This may be illustrated by the following simple method. Take a station at any point where a tree, or lamp-post, or stake can be brought into range with a corner of a house or any other fixed object, representing the sun. The intervening object may be considered to represent the planet Venus, and the station at which the two observed objects are in line, may represent a portion of the earth's surface. If, now, the observer take a station to the right or left of the first station, the objects will no longer appear superimposed, but separated to a distance, depending upon the distance between the two stations, the distance of the stations from the remotest object, and the distance of the stations from the intervening object. The angular difference between the apparent positions of the bodies observed, and the distance between the stations, are sufficient data for determining all the other distances, provided the angle formed by a line joining the two stations, and a line joining either station with the intervening object is also known. The problem is then reduced to the finding of one side of a triangle, another side and two angles being given, a very simple operation in plane trigonometry. In astronomical observation there are always some determinate errors, arising from refraction and other causes, which may, however, be readily corrected, and do not affect the general principle of the method as above illustrated.

In calculating the distance of the sun from the earth, the stations, from which the observations are made, can be so placed that the semidiameter of the earth becomes one side of a triangle. The parallax of the sun was thus calculated from the transits of 1761 and 1769, and found to be 8·65 seconds angular measurement, and the distance of the sun was hence determined to be 95,173,000 English miles, as given above. Subsequent calculation by Encke made the parallax to be 8·5776 seconds.

It will be seen that the correctness of these results depends upon the accuracy of the observations upon which the mathematical calculations were based. That these were not accurate, seems probable from the fact that there is every reason to believe, from the sun's parallax, as more recently determined, that the distance as originally computed is wrong by at least 4,000,000 miles.

Many hypotheses have been made as to the origin of such a grave mistake—some attributing the error to confounding a part of the planet with its penumbra, and others to mistakes in the computation, but these are of little importance. The time is approaching when the problem can be reworked, and, with the improved apparatus now possessed by astronomers, and the wonderful advances made in methods of observation, it may well be hoped that this time a reliable result will be obtained. The *Standard* (London) says of the extensive preparations now initiating for the observation of the coming transits, that "the Astronomer Royal is doing good service in preparing betimes for the great event. Though it may seem a long time to look forward to, to those who are unacquainted with the amount of preparation required for such observations, those who know the difficulty of procuring a large number of first-rate instruments, unless plenty of time is allowed, will know that there is really no time to be lost, especially if, as we should hope would be the case, all the expeditions sent out are provided with precisely similar instruments and apparatus. It is imperative upon the government to put no obstacle in the way of carrying out these observations in the most perfect manner. England must not be behind the Continent, at any rate. If any amount of failure takes place, it will not be from want of preparation on Mr. Airy's part. At the late meeting of the Royal Astronomical Society he showed that there was nothing indefinite about his ideas; he had already prepared careful maps both for observing the ingress and egress of the planet. He showed the importance of sending expeditions to several places, because, among other considerations, a thousand obstacles might interfere with the observations in any particular place. There are places which, if weather, etc., are favorable, will be admirable for all purposes, but, as in the case of Kerguelin Island, the chances are very much against a clear atmosphere. Captain Toynbee said that this island is seldom to be found on account of the fog. If practicable, no expedition will be of the importance of one sent to the South Pole, that is, as near to it as possible. At the South Pole the effect of parallax will be the greatest—that is to say, the position of Venus will vary to the greatest extent on the sun's disk. The Astronomer Royal in his maps suggests two points, one in Enderby's Land, but here the sun would be too low for it to be a certainly advantageous position—he greatly preferred a point in the Antarctic Continent, where Sir James Ross landed. As a place for observation nothing could be better. The only point is, Will the severity of the climate admit of the expedition? Captain Richards, the hydrographer to the Admiralty, spoke well upon it. He showed that if properly fitted out and provided with good huts, clothing, and food, there would be no further objection to the place than must stand in the way of any Arctic expedition. Those, however, who joined in it would have to make up their minds to one thing, namely, that they would have to spend a year upon the spot; for that it was unapproachable at anything near the time when the transit will take place. To show, however, that he did not consider this in any way fatal to the position as a station for observation, he said that he should much like to be one of the party himself. In this he was fully borne out by Captain Davis, who landed there with Sir James Ross. So that we may hope that this, at least, will be one station, and that the government will not postpone till too late the preparations to make it as favorable for the comfort of the spirited observers who will join in the expedition as for the objects of the enterprise. It may possibly be advisable to send out an exploring party previously, though Captain Davis did not seem to think that it would be necessary. The first great difficulty in all places will be to get the absolute longitude. No ordinary nautical longitude will be of the slightest value. Observations necessary can be made at many places easily accessible, as far as England is concerned, as at Alexandria, where the telegraph will be of great use; at many places, too, in the United States, where we can safely leave the work to Americans. We may especially do the same in the case of the Russians, where the exact longitude of Orsk, the extremity of the great arc of longitude extending from that place to Valencia, is known to a millionth part of a second, or in other words, to absolute certainty. The other places which are recommended to the English government are—Mauritius for one reason, and Madagascar for another. If, however, it should be thought unnecessary to fix both of these spots, then an intermediate station—viz., on the Island of Bourbon, would be preferable. If the Astronomer Royal can show that the two stations would be of considerable advantage, we hope that no financial reasons will prevent his wishes being carried out. Above all things we would urge upon the authorities the importance of making up their minds as to the instruments to be used, and in losing no time in having them put in hand. There is one more point worth noticing. How far photography can be depended on as to accuracy in helping to discover the sun's distance is not easy to answer off-hand; but certainly it is not to be doubted that much useful and interesting information may be secured by its means; and it is highly desirable that at none of the stations its use should be neglected. This part of the question is not, however, of the same pressing importance as the fixing of the stations suitable for observing the ingress and egress of the planet, and of the preparation in good time of the instruments and apparatus required."

Our readers will now be prepared to appreciate the importance of this subject, and to understand why its discussion is likely to occupy, to a large extent, the attention of the scientific press for a considerable time to come.

GALVANIZED IRON WATER PIPES.

In the opinion of some, the use of galvanized iron for water pipes, conveying water for drinking and culinary purposes, is injurious. Others take opposite ground in regard to this matter, and express themselves strongly in favor of such pipes. Our opinion upon the question has been asked by parties interested.

The use of zinc as a coating for the surface of iron pipes is not merely mechanical. Being more readily oxidizable than iron it produces an electric state in the latter metal which protects parts not covered perfectly as well as other portions of the pipe. The oxide which forms upon zinc is insoluble in pure water. Acids dissolve it readily, and when hydrated, as is the case in water pipes, solutions of the caustic fixed alkalies and solutions of ammonia will dissolve it.

Whether the oxide which forms upon the surface of galvanized iron pipes will be dissolved, depends therefore entirely on the character of the water, flowing through them. Rain water contains more or less ammonia when first precipitated. The oxide upon a galvanized iron roof would of course be dissolved to a certain extent, during a rain storm, a fact that has been noticed in connection not only with this material but with roofs of sheet zinc.

It is probably rare that water does not contain traces of free ammonia, or salts, the acid of which has a greater affinity for the oxide of zinc than the base with which it is combined. In such cases we should expect to detect traces of the zinc in water which has remained for any length of time in the pipes.

There are waters, doubtless, which could be passed through such pipes without the slightest danger of becoming charged with the poisonous oxide, and before their adoption an examination and analysis of the water should be made.

But while we have no doubt that in many cases, it would not be proper to employ galvanized iron pipes, we do not think that in a large majority of cases, the possible evils which attend their use, would be likely to prove serious. A great deal of exaggeration is to be expected upon the part of those who deal in pipes of other materials, and whose interest it is, to excite the fears of the public in regard to any wares that damage their particular trade. People are too apt to become excited by newspaper statements upon such subjects as these, and alarm themselves needlessly. If the fact exists that water flowing through galvanized iron pipes is impregnated with zinc, a simple chemical test by a competent person will readily determine it.

All metallic pipes in use are open to some objections. A great deal has been said upon the danger of using lead pipes, but the injury that has resulted from their use has undoubtedly been over-estimated. Lead poisoning is by far more subtle than zinc poisoning, and as its effects may follow without premonitory symptoms of sufficient extent to excite suspicion, we think them fully as dangerous as galvanized iron pipes under most circumstances.

A material for water pipes, cheap, durable, and capable of resisting the chemical action of all waters fit for household use is a long sought for desideratum. Until it is found we must do the best we can with such materials as we possess. Glass has been proposed and used to a considerable extent, but there are practical difficulties, which will probably prevent its ever being generally adopted.

The matter may be summed up by saying that the circumstances of any particular case can only determine whether galvanized iron pipes, are safe or otherwise. For most cases we think their use admissible.

VELOCIPEDE NOTES.

The Paris correspondent of the London *Orchestra* writes:

"I see a playful statement made by one of the Paris correspondents of the daily press—in an ultra-waggish mood, I presume—to the effect that the Customs returns here show £40,000, or a million francs, as the value of velocipedes exported to the United Kingdom in the course of a year. During some weeks past I have made bicycle statistics a particular study, and I have learned enough to convince me that the above figure must cover (with plenty to spare) the value of the total manufactures. Nine-tenths of these, to speak with moderation, are for home use; and of the exports, by far the greater number go to the United States. Every manufacturer—and manufacturers have sprung up like mushrooms—has his hands full. Any man whose productions are trustworthy, has to enter his orders, and demand a month or six weeks' delay—an elastic convention stretching indefinitely.

"Velocipedes have become a rage. Everybody talks of them. Athletes and gymnasts led the way, and now you see them in the hands of old, young, serious, and gay. *Employés de commerce* ride down to business on them in the morning, and home at night. They stable them during the day in obscure nooks of warehouses, in yards, or cupboards. They fly over the ground at race-horse speed, and their hobby horse takes no more expensive feed than the occasional *goutte* in the patent greaser. Thus they economize time and omnibus fares. The faculty have pronounced it a sanitary exercise, and lo! the obese are seen in shoals on iron horses bringing down the superfluous pound or so at eight miles an hour—and they for the most part, like their patent wheels, provide their own grease—an increasing supply that gathers in globules on their brows and streams down their glowing faces. Ergo, the bicycle supersedes Banting, for of a surety it is more congenial to the fat to do deeds of daring in the pigskin than to go off their sugar.

"The house of Michaux et Cie., of the Champs Elysees, have already one hundred and fifty workmen going as hard as they can. Now Michaux, the king of the trade, can barely produce five a day. 'What!' cries the critical reader, 'one hundred and fifty workmen to make five velocipedes in a day; a very queer speculation for Michaux' Not at all. His velocipedes sell for three hundred and fifty francs in the plainest form, to five hundred francs in polished iron, with the patent improvements. They are really models of perfection, but they cost as much as a horse.

"They very politely told me '*Nous donnons delecons gratuites à tout acquereur*,' and if I purchased an instrument of their London agent, I was welcome to my free lessons in their *manége*. They led me into a spacious riding school, I should say three or four hundred feet long by a hundred wide. It was a dazzling sight. You are in an ordinary warehouse, a door is opened, and a field of thirty hunters bursts on your view, all dashing madly to cover! There are riders of every kind—more tyros than proficients of course. One young man of twenty, or under, at once fixed my attention; a fearless fellow this that can perform more daring tricks than a Prussian rough rider. He starts it on at a desperate pace and leaps into the saddle as it flies—out again—a run and he's up again *en amazone*, working one pedal only—off again—a run and he jumps back—on to his knees—and then he's standing bolt upright, like a circus rider; and all the while his velocipede is dashing away at the rate of a London Hansom. He slackens his space to breathe awhile, and then 'again he urges on his wild career.' He dashes full at the fence, and you shrink in your boots for a brief second, thinking he has lost command of his velocipede, but he turns off at a right angle when within an inch or less of the paling. I asked the gate-keeper of the *manége* who this was. 'It is the fils Michaux,' was the reply, 'and if he would only go to the Palais de Crystal, to run in the race on Easter Monday, your compatriots wouldn't stand a chance." Thus I had to learn the doings of Sydenham from the Champ Elysees. I learned too that Michaux meant to send over a first-rate man—he was shown me—and one second only to the daring son of the house, to uphold the honor of France in the contest at the Crystal Palace. It is a plucky thing to do, and (patriotism apart) I wish them every success.

"'You see that young fellow in the gray suit,' said the gate-keeper to me in a whisper, pointing out a tall, English-looking youth of fourteen; 'that's the cousin of the Prince Imperial. The Prince has given him a velocipede fit for a gamin of eight years, and he has come to get it changed. That tall gentleman *decoré*, no beard, is Monsieur ——;' then *sotto voce* the name of a public character that rather astonished me; 'that little disdainful-looking boy is a Spaniard, the Marquis de'—(I forget what—suppose we say Carrabbas). In fact, nobles, notables, and princes were plentiful in Michaux' *manége*, and there was proof positive that the highest in the land incline to the bicycle."

One of the peculiarities of velocipedestrianism in this country is the large inventive talent displayed in framing names for it. Velocipedestrianism, velocipedestrian, velocipedist, velocipeder, velocipedism, velocipedian, velocipeddler, velocipediana, are some of the names applied to riding, riders, and items on the velocipede.

People who want to establish a velocipede rink can call it by any of the following names: Amphicyclotheatron, gymnacyclidium, velocipedrome, or bicyclocurriculum. Monocycle, bicycle, tricycle, quadricycle, are terms used to indicate the number of wheels. But we have seen one name, that in classical beauty and richness of conception, seems to us to eclipse all competitors. The machine which rejoices in this appellation is a water velocipede, and it is called "Tachypodoscaph." Greek scholars will understand this to mean "a swift foot-boat," or, as Artemus Ward would have said, "words to that effect." In view of this amazing fertility of language would it not be well for some enterprising publisher to print a velocipedictionary?

Pickering's Velocipedist says: "We have had so many inquiries in regard to the monocycle, or one-wheel velocipede, that we have determined to get up one, which shall be clear of many of the objections which are urged against those we have so far seen. We shall have it completed in time to give an engraving of it in our next number. We think that we can dispense entirely with the use of not only the steering arms, but even the cranks, although it is worked by the feet; and we consider that the same machine will be adapted for either boys or men, short or tall persons—and even ladies. It may be easily mastered (we think), and in case the rider falls, the machine will not fall on him; in fact, it will not be capable of falling on its side; and further, it will not infringe any known patent. Still further, it is not a wheelbarrow."

Mr. Benton, master mechanic of the Terre Haute & St. Louis Railroad, has invented a railroad velocipede, and has made passenger train time on the same, making about twenty miles an hour between Litchfield and St. Louis, a distance of fifty-five miles. An Ohio inventor also proposes to make a velocipede to run on one rail of a railroad, and thinks it can be propelled at a rate of a hundred miles an hour.

Professor "Ab" Brady, of Hanlon's, announces that the challenge of Fred. Hanlon will be kept open only one week longer, and it not then accepted Fred. will claim the championship.

It is stated that a velocipede clock has been invented, having numbered pins to correspond with the numbers of the velocipedes used in the schools and halls. These pins are stuck in holes drilled in the face of the clock, and prevent disagreements about time, as they indicate exactly when the time for which a machine taken has expired, and thus provide against slips of memory said to be common among velocipede learners.

Editorial Summary.

BROADWAY RAILROAD.—We had occasion a few days since to visit Albany, in reference to some matters pending before the Legislature, affecting the interests of our citizens, and we are obliged to confess that the atmosphere about the legislative halls was anything but wholesome. It was commonly believed that schemes of the most villainous character were "put up" and parceled out among members to secure their votes. The proposition of Mr. A. T. Stewart, of this city, offering to give $2,000,000 for the franchise of the "Broadway Surface Railroad," was deliberately voted down in the Senate—that body evincing a determined purpose to rush the bill through, regardless of the rights and interests of citizens and property owners. Governor Hoffman, however, has put a check upon these corrupt proceedings by vetoing certain railroad bills, and showing by able arguments that the franchises of this city are too valuable to be voted away without affording our heavily taxed citizens some remuneration. We honor the Governor for his high and statesmanlike action. The people will sustain him in the position he has taken.

YEAST FOR HOT CLIMATES.—*Morgan's Trade Journal* gives the following recipe for yeast adapted to hot climates: Boil two ounces of the best hops in four quarts of water for half an hour; strain it, and let the liquor cool down to new milk warmth. Then put in a small handful of salt and half a pound of sugar (brown); beat up one pound of the best flour with some of the liquor, and mix all well together. The third day add three pounds of potatoes boiled and mashed, and let it stand until the next day. Then strain, and it is ready for use. Stir frequently while making, and keep near a fire. Before using, stir well; it will keep two or three months in a cool place. I kept this two months in the cellar, where the thermometer ranged between 90 and 104 degrees. This yeast is very strong; half the usual quantity necessary for a baking is sufficient.

PRESCRIBING IN CHEAP PERIODICALS.—A most dangerous practice prevails of publishing in some of the cheap literature of the day various receipts for the cure of minor ailments, and it is one that is certainly upon the increase. Many of the prescriptions so given are absurd, and even dangerous; and this is not to be wondered at if we consider that the writer is often very deficient in all real knowledge of medicine, and that he is assisted by the errors of the printer, to whom the symbols of quantities are so many hieroglyphics. Our attention has been called to the following prescription, for instance: "Syr. of poppies, one ounce and a half; syr. of squills, half an ounce; of tincture of digitalis, thirty drops; a teaspoonful to be given to a child frequently." We can quite imagine a fractious baby being dosed into the effectual quietness of death by such a mixture.—*Lancet.*

CHARGED SILK.—It has recently been found that what is called charged silk, is very liable to spontaneous combustion. This article, some of our readers are aware, consists of silk, which, after having been exposed to the operations of bleaching, cleansing, etc., and losing considerable weight, is brought back to its original condition by the addition of certain astringents, such as catechu, gall nuts, and various salts, especially the sulphate of iron, by which means an increase in weight from one to two or three hundred per cent is sometimes effected. When dried, at about 212 or 225 degrees, this silk has been known to take fire spontaneously, as soon as the air had access to it. The result appeared due to the rapid absorption of moisture and an attendant oxidation.

FALSE diamonds always contain silicon. Their true character may be determined by putting them into a lead or platinum crucible with pulverized fluor spar, and pouring thereon sulphuric acid. The hydrofluoric acid generated by the reaction will corrode or wholly destroy the imitation, while a genuine diamond will be totally uninjured. The experiment should be performed in the open air or under a hood, as the fumes of the gas are highly deleterious. The operator should keep at a distance until the reaction has ceased, to avoid inhaling the poisonous gas. He should be careful also to avoid getting the hydrofluoric acid on his hands, as otherwise they may be severely injured.

CURIOUS PRODUCTION OF COLD.—Dr. Phipson has recently discovered that an intense degree of cold is produced by dissolving sulphocyanate of ammonium in water. Many salts, especially salts of ammonia, lower the temperature of water while dissolving; but, according to Dr. Phipson, no compound produces this effect in so marvelous a manner as sulphocyanate of ammonium. In one experiment, 35 grammes of this salt, dissolved rapidly in 35 cubic centimeters of water at 23 degrees Centigrade, caused the thermometer to descend in a few seconds to —10 degrees Centigrade. The moisture of the atmosphere instantly condensed itself on the outside of the glass in thin plates of ice.

HOP STEMS AS A MATERIAL FOR PAPER.—A Brussels correspondent of the *Organe de Mons*, a Belgian paper, says a gentleman from Marseilles, traveling through the country last autumn, purchased large quantities of a valueless substance which farmers were in the habit of burning in heaps to get rid of it, and has succeeded in making an excellent, strong, pliable paper, the most important qualification of which is that it costs a mere trifle. A capitalist has joined him, and a large factory is now being erected to make paper from this substance, which is nothing more or less than the old hop stems after the crop has been gathered.

NEW METHOD OF PILE DRIVING.—At a recent meeting of the Franklin Institute, a new method of driving piles was described. It substitutes gunpowder for steam in working the drop weight. A charge of powder is used to elevate the weight, and another charge throws it down again with greater force than it would acquire by falling alone. Ordinary musket charges are said to be sufficient to work a four hundred pound hammer in this way, and the strokes are made with greater rapidity than in the old method.

HON. ELISHA FOOTE retires from the office of Commissioner of Patents enjoying the respect and confidence of all who know him. He was an upright, faithful Commissioner, and had already cleared off a portion of the obloquy that attached to the office. Had he been permitted to remain we have no doubt that the character of the office under his administration would have greatly improved. Judge Foote was an honest official, and escapes from political life without a stain upon his honorable character.

DEATH TO CROTON BUGS AND ROACHES.—The *Journal of Applied Chemistry*, gives the following remedy against croton bugs and cockroaches: Boil one ounce of poke root in one pint of water until the strength is extracted; mix the decoction with molasses and spread it in plates in the kitchen or other apartments which are infested by these insects. All that have partaken of this luxury during the night will be found "organic remains" the next morning.

TO RESTORE FADED WRITING.—When writing by common ink has become faded by age so as to be nearly or quite illegible, it may be restored to its original hue by moistening it with a camel's hair pencil or feather dipped in tincture of galls, or a solution of ferro-cyanide of potassium, slightly acidulated with hydrochloric acid. Either of these washes should be very carefully applied, so that the ink may not spread.

ELDERBERRY INK.—A correspondent says: 'I write these lines with ink made of elderberries. My mode of making it is as follows: one-half gallon of juice of elderberries, as described in your paper; 1 ounce copperas, 2 drams alum, 20 drops creosote dissolved in a small quantity of alcohol. The ink kept the violet color several years, now it has a brownish appearance. It makes a fair copy.

A PITTSBURGH firm have recently made a steel roller for rolling metals at the Philadelphia mint, which, after a test of several weeks, has been pronounced superior to the Prussian. It is said to have been hardened by a new process, discovered by the manufacturers. Another roller has been ordered of the same firm for the same mint, to be used in rolling nickel.

ONE of the most forcible sayings that has ever emanated from the pen of Horace Greeley, is the following: "The darkest day in any man's earthly career is that wherein he fancies that there is some easier way of gaining a dollar than by squarely earning it."

PATENT CASES IN COURT.

THE ELLIPTICAL SUSPENDER CASE.

The United States District Court at Baltimore, Hon. Judge Giles, recently heard the evidence in the case of Chas. H. Cleveland *vs.* William P. Towles, being an action to recover from the defendant damages laid at one hundred and sixty-five thousand dollars for an alleged infringement of the patent granted to Cleveland in the manufacture of what is known as elliptical suspenders. Some six months ago the plaintiff applied to Judge Giles for an injunction restraining Towles from manufacturing or selling the article in question, which was refused; Cleveland then brought suit for the sum above named, and the case was called for a hearing in November last, but the plaintiff failing to respond, it was continued until the present term. Quite a number of witnesses were examined, and the case was argued by Wm. Henry Morris, Esq., on behalf of Towles. The plaintiff was represented by the Messrs. Brent. After hearing the testimony, Judge Giles directed that the following issues be tried by the jury: First, whether the patent granted to the complainant is for a new and useful improvement. Second, whether the patent granted to the defendant is an infringement in whole or in part upon the patent of the complainant. Third, whether the defendant has manufactured and vended suspenders in violation of the exclusive right conferred on the complainant by virtue of his patent. The case was then given to the jury, who decided all the issues in the negative, thus establishing the right of Towles to the entire use and profit of the patent under which he manufactures the elliptic suspender. The article manufactured by Towles and that of Cleveland are constructed on entirely different principles.

The Towles suspender is illustrated on page 56, Vol. XIX, SCIENTIFIC AMERICAN.

DIAMOND MILLSTONE DRESS.

Judge Olin, of the Supreme Court of the District of Columbia, has rendered a decree, declaring the letters patent of the United States, No. 73,542, granted to Samuel Golay on the 21st of January, 1868, for improvement in millstone dressing, invalid, inoperative, and void as to that part of the alleged invention set forth in the specification in the following words: "The main feature of my invention consists of a cutting tool, armed with a diamond or other hard stone, and so constructed and operating as to pick or cut grooves in millstones by a series of blows delivered in quick succession," and as claimed in the first and third claims. The proceedings in this case were instituted by a bill filed by James T. Gilmore against Samuel Golay—Henry B. Sears, assignee, and Sewell Brothers, licensees under Golay's patent—claiming that said Golay's patent should be declared null and void so far as it interferes with letters patent granted to said Gilmore on the 23d of May, 1863, about five years previous to Golay's patent.

Messrs. Riddle and Laski for complainant; Gifford and Bradley for defendants.

"THE HOOK-HEADED SPIKE CASE" DECIDED.

The hook-headed spike case, commenced in 1841 by Henry Burden, proprietor of the Troy Iron and Nail Factory, to recover damages of Corning & Winslow, proprietors of the Albany Iron Works of Troy, for the infringement of Mr. Burden's patent upon the machine for the manufacture of railroad spikes, has at length been finally adjudicated, and an award made to the complainant for his damages. The case has been twenty-eight years in the courts, during a large portion of the time, however, in the hands of the late Chancellor Walworth, of Saratoga Springs. It has become one of the *causes celebres* of the country. It was originally commenced by the late Samuel Stevens, of Albany, and upon his death, Judge Elisha Foote, ex-Commissioner of Patents, assumed charge of it for the complainant. The total amount awarded to the complainant, including about $50,000 costs, is $80,000—a very good offset to the water-power suit recently determined against Mr. Burden and in favor of Messrs. Corning & Winslow. Chancellor Walworth commenced taking proof on the 5th of April, 1854, and finished and filed his report in May, 1863. In October, 1867, Hon. Wm. D. Shipman, of New York, was appointed to review and pass upon Walworth's report. His decision, concurred in by Judge Nelson, as stated, has just been received.

MANUFACTURING, MINING, AND RAILROAD ITEM

MANUFACTURING IN RHODE ISLAND.—The Boston *Commercial Bulletin* says that the region including Woonsocket and vicinity—Cumberland, Smithfield, Blackstone, and Bellingham, has seventeen cotton mills, employing 3,500 hands, running 207,000 spindles, 4,030 looms, using 10,000,000 pounds of cotton, and making 40,000,000 yards of cloth per annum; eight woolen mills employing 2,650 hands, running 114 sets of cards and 450 looms, using 5,300,000 pounds of wool, and making 3,000,000 yards of fancy cassimere per annum Other cotton mills, which will have 55,000 spindles, are in process of construction. Just beyond the limit of three miles from Woonsocket are two more cotton mills with 30,000 spindles, and a woolen mill with 19 sets Other branches of manufacture are represented in this region by a rubber factory, which employs 150 hands and produces $500,000 worth of goods annually, machine shops, founderies, one boiler shop, one scythe shop, two manufactories of agricultural implements, one glue factory, two roof factories, one bobbin, one shuttle, one worsted mill, one tape mill, four or five sash and blind shops, contractors and builders, etc.

The mills now in operation in the White Pine silver districts are the Oases, ten stamps; Moore's, eight stamps, and the Metropolitan, fifteen stamps, at Silver Springs; the White Pine Silver Mining Company's ten stamps, and Felton's five stamps, at Hamilton. A thirty-stamp mill is being erected to crush ores from the Aurora mine. A twenty-stamp mill is being removed from Smoky Valley, and three other mills, numbering about fifty stamps, are being brought from Virginia City. But there is work for five times these one hundred and fifty stamps. The miners charge $50 a tun for reducing ores.

Senator Sprague, of Rhode Island, who is the largest cotton manufacturer in the United States, having 10,000 hands in his employ, says that the business is not profitable and the operatives are poorly paid. If there is not soon a change for the better, he predicts that the cotton factories will be suspended.

An Indiana speculator went to Chicago in the early part of the past winter and harvested 20,000 tuns of ice. During the panic among the ice dealers in the subsequent warm weather he sold his stock at $17,000 profit and went home. Since that time the price of ice has greatly declined on account of the cold weather and the gathering of a full supply.

The Wamsutta mills corporation at New Bedford, Mass., paid over $30,000 monthly internal revenue taxes in 1868.

A Fitchburg, Mass., manufacturer of bird traps, recently received a single order for 50,000.

A passenger car for the Erie Railroad, to cost $60,000, is building in Jersey city. It will be, it is said, the largest, costliest, and perhaps the most elegant car in the world.

It is said that more cotton will be planted in Texas this year than in any year since the war.

A letter from an old Nevada miner, now in Japan, says that the Japanese islands contain as rich gold and silver mines as any in the world, but the policy of the government represses their proper development.

St. Louis has forty-three miles of street railroad, ten miles of Nicolson pavement, one hundred and thirty miles of macadamized road, and over one hundred miles of sewers.

Nevada boasts of still another mining district 125 miles south of White Pine, said to be as rich as anything yet found on Treasure Hill.

The Warren Thread Company of Worcester, Mass., was inaugurated by the late Hon. Ichabod Washburn. The present capacity is 1,200 dozen spools daily which will shortly be doubled.

The work on the Missouri river bridge at, St. Louis, is progressing favorably. The engineers expect soon to commence work on the center pier.

A large cotton seed oil mill is erecting at Mobile.

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; beside, 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.*

S. S. G., of Mass.—We know of no recipe for preventing damp woods from splitting when exposed to heat. Such a discovery would be valuable.

J. M. B., of Mass.—The most fusible alloy with which we are acquainted is made of 8 parts of lead, 15 parts bismuth, 4 of tin, and 3 of cadmium. It is called "Woods metal," and is we think patented. It melts at 140 degrees Fah. and has a specific gravity of 9·4.

F. G. D., of Ill.—Two theories of the origin of the earth's magnetism have prevailed. The older, that of Hansteen, conceives the earth to be possessed of independent magnetism having its focus near the earth's center. It is now claimed that the crust of the earth and not its interior is the seat of terrestrial magnetism. To account for the pointing of the magnetic needle to the north, would be to assign a cause for the attraction, a positive pole for the negative pole of a magnet. This has never been determined.

P. R., of ——If you will refer to page 20, Vol. XIX, SCIENTIFIC AMERICAN, you will find your question in relation to apparent variation between position of crank and piston of an engine fully answered, and illustrated by a diagram.

J. P., of Ontario.—Securing belt splices by shoe pegs is not objectionable when rivets are not at hand; we have frequently practiced it with as good results as when sewed with lace leather. In "butting" or meeting belts the crossings of the lacings should be on the outside of the belt; the straight stretches on the inside next the pulley face.

W. H. P., of N. Y.—Case hardening to be quickly performed is done by the use of prussiate of potash. This is powdered and spread upon the surface of the piece of iron to be hardened, after the iron is heated to a bright red. It almost instantly fluxes or flows over the surface, and when the iron is cooled to a dull red it is plunged into cold water. Some prefer a mixture of prussiate of potash 3 parts, sal ammoniac 1 part; or prussiate 1 part, sal ammoniac 2 parts, and finely powdered bone dust (unburned) 2 parts. The application is the same in each case. Proper case hardening, when a deep coating of steel is desired, is done by packing the article to be hardened in an iron box with horn, hoof, bone dust, shreds of leather or raw hide, or either of these, and heated to a red heat, for from one to three hours, then plunged in water.

D. S., of Minn.—Common yellow brass for turning may be made of copper 2 zinc 1. For heavy work, tin, copper, and zinc are used in the proportions of tin 15, copper 100, and zinc 15, or tin 13, copper 112 zinc 1.

J. G. S., of Va.—The magnetic meridian does not correspond with the geographical meridian, except in very few places. It also is subject to variations. The magnetic needle is also subject to so many variations that an attempt to establish the true meridian by its use, would cause you considerable trouble. You can get it near enough for your purpose, by allowing the sun to shine through a vertical slit at noon when the sun is neither fast nor slow of clock, provided you can take time from a clock which is right with the sun or varies from it by a known rate. O you may get it quite accurately by describing a circle on a level surface and placing a vertical wire, seven or eight inches long, in the cente Through the top of the wire should be drilled a small hole to permit th sun to shine through. The beam of light passing through the hole will cross the circle once before noon and once in the afternoon. Watch when it crosses the circle in the morning, and mark the point of intersection. Repeat the operation in the afternoon. The points of intersection will lie at equal distances from the true meridian. Join the two points by a line, and bisect it to find its middle point. A line joining this middle point and the center of the vertical pin will lie on the meridian. It is better to draw several concentric circles and perform the same operation with each to secure accuracy. They should be so drawn that the beam will cross them between the hours of 9 and 12 in the morning. The best time to do this is about the summer solstice. It will be sufficiently accurate for your purpose, however, to do it now. Glass lamp chimneys should be annealed at the time they are manufactured. We do not think you will succeed in annealing them in a stove oven.

E. P., of Ind.—We believe there are a number of makers and dealers in india-rubber tires for velocipedes, but we cannot remember their address. Better advertise for what you wish in our "Business and Personal" column.

Business and Personal.

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

W. J. T.—We think the patent asbestos roofing manufactured by H. W. Johns, of this city, is the best substitute for tin or slate. It is cheap and easily applied.

Recent American and Foreign Patents.

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

Spring Scissors.—Albert Murdock, North Bridgewater, Mass.—This invention has for its object to construct scissors which can be constantly kept in the hand without being in the way of other work to be done, so that they may be used on sewing machines for clipping threads, and the like purposes, without requiring the machine to be stopped, and also for other purposes. The invention consists in arranging on one blade, which is provided with a ring handle, another blade without a handle and held open by a spring.

Velocipede.—W. S. Hill, Manchester, N. H.—This invention relates to a new three-wheeled velocipede, which is so constructed, that it will, when passing over uneven ground or when describing a curve, not lose its balance, but will be adjustable to retain the center of gravity in the proper position.

Saw Filer and Jointer.—C. G. Miller, Brattleborough, Vt.—This invention relates to a new apparatus for filing and jointing circular saws, and has for its object to produce an instrument, which can be adjusted to all kinds of saws in any suitable position, and for files of any suitable length.

Cotton Gin.—R. W. Stough, Griffin, Ga.—This invention relates to an improved arrangement of means for communicating a lateral movement to the cotton, as it is fed up to the saws, in order to produce a more uniform action of the saws thereon.

Harrow.—B. B. Williams, Laclede, Mo.—This invention is designed to arrange harrows so that they may be readily folded into such a shape that they may be drawn over the ground, when it is required to remove them from one place of operation to another, without the teeth being in contact with the ground.

Valves and Valve Springs, for Melodeons, Organs, etc.—A. L. Swan, Cherry Valley, N. Y.—This invention relates to improvements in valves and the springs employed for closing them, such as are used in melodeons, organs, and other similar instruments, designed to produce valves which will close more tightly, and more durable and sensitive springs.

Carriage Coupling.—Henry J. Pringle and William Pringle, Columbus, Ohio.—This invention has for its object to furnish an improved coupling for connecting the forward axle to the reach, and other parts of the carriage, which shall be simple in construction and reliable in operation.

Insect Destroyer.—Jacob Hinds, Hindsburg, N. Y.—This invention relates to a new and useful composition for destroying insects on vines, trees, and shrubbery, and which composition, when used in connection with coal tar or pine tar, is a specific against the ravages of the "wire worm."

Hand Truck for Sacking Grain and Moving the Same.—Wm. Brocklesby, Jr., Caledonia, Ohio.—The object of this invention is to provide a simple and efficient hand truck, whereby grain, or other analogous matter, may be sacked and transported to any part of a warehouse, mill, barn, or other building, with convenience and dispatch.

Well Auger.—A. A. McMahen, Oxford, Miss.—The object of this invention is to provide a simple, and effective apparatus for boring wells and deep holes for other purposes.

Household Machine.—William W. Wilson, Geneva, Wis.—The object of this invention is to produce an improved household machine, by combining, in the same machine, a washing machine and churn, and in so devising the mechanism of the same that they can be operated separately or together in a simple and effective manner.

Dumping Wagon and Car.—Thomas H. Gary, Bristol, Md.—The object of this invention is to simplify and improve the device allowed to me January 22d, 1869.

Picker.—A. H. Carroll, Baltimore, Md.—The object of this invention is to construct the picker in such a manner that it will keep the rod more constantly and uniformly lubricated than heretofore, and will not spatter the oil upon the cloth.

Broom Head.—W. C. Spellman, Baltimore, Md.—The object of this invention is to provide a new and improved mode of fastening the brush to the head.

Adjustable Breast Collar.—George W. Blaksley, Rockford, Ill.—The object of this invention is to provide for public use a breast collar so constructed as to be easier for the horse and to be adjustable in position.

Picture and Advertising Frame.—W. H. Sadler and J. M. Drysdale, Baltimore, Md.—The object of this invention is to provide for public use, a cheap, convenient, and ornamental device for holding and displaying pictures, cards, or advertisements, and so constructed that at any time one or more of the pictures, cards, etc., may be removed or introduced without disturbing the others, and without the necessity of taking the frame down from the wall, or removing its glass or back, while at all times its contents are securely held, and cannot be tampered with by any one but the proprietor.

Self-adjusting Watch Key or Holding Tool.—John S. Birch, New York city.—The nature of this invention consists in so constructing a watch key, or instrument for holding small objects, that it shall accommodate itself to the size of the object held, holding it firmly and securely. This is very important in most of the manipulations connected with watchwork and in manufacturing and repairing jewelry, and is especially important in the winding and setting of watch movements, the arbors of which are usually dissimilar in size, and yet in all cases, from the delicacy of the mechanism requiring that the key should exactly fit the arbor.

Clothes Dryer.—Louis Winterhalder and David Wilson, New York city.—This invention relates to a new clothes dryer of that class in which a series of bars are pivoted to a frame in such manner that they can be folded apart to form the dryer or together when not to be used.

Combined Washing] and Wringing Machine.—H. O. Reddish, Linden, N. Y.—This invention has for its object to furnish an improved machine, simple in construction, easily operated, and effective in operation, and which shall be so constructed and arranged that the clothes may be thoroughly washed, and, at the same time, wrung out so as to pass from the machine into the clothes bucket or other receptacle prepared to receive them ready to be hung out to dry.

Seed Planter.—I. F. Herrin, San Antonio, Texas.—This invention has for its object to furnish a simple, convenient, effective, and accurate machine, by means of which the planting may be readily done in exact check row, and which will allow the dropping device to be instantly thrown into or out of gear when desired.

Cultivator.—James B. Sexton, Pella, Iowa.—This invention has for its object to improve the construction of the parts of a cultivator, by means of which the plow beams and draft are connected with the truck so as to make the plows readily adjustable, and so as to enable the draft to be readily adjusted, according to the comparative strength of the two horses.

Hat Shaping Machine.—George W. Gallagiere and E. W. Ruby, New Milford, Conn.—This invention has for its object to furnish a simple, convenient, and effective machine for "curling" hats, which will do quickly, accurately, and well, work that has heretofore been done only by hand.

Vise.—J. D. Beck, Liberty, Pa.—This invention has for its object to furnish an improved vise, which shall be so constructed and arranged as to securely hold irregular, beveled, or plain work, and which shall, at the same time, be simple in construction and easily adjusted.

Apparatus for Forcing Liquids from Close Vessels.—J. L. Treat, New York city.—This invention has for its object to furnish a simple, convenient, and reliable apparatus, by means of which beer or other liquids may be forced out of close casks, and raised to the desired position by the pressure of atmospheric air.

Sled Brake.—Samuel W. Barber, Heath, Mass.—This invention has for its object to furnish an improved self-applying sled brake, which shall be so constructed and arranged as to be applied by the action of the team in holding back, and which shall steady the load at the same time that it relieves the horses.

Fanning Mills.—Harvey F. Siebert, Brady's Bend, Pa.—This invention has for its object to improve the construction of fanning mills so as to make them more effective and reliable in operation.

Weather Strip.—E. Mears, Battle Ground, Ind.—This invention relates to a new weather strip for doors, said strip being so arranged that it will be closed over the outer edge of the sill, and still allow the door to be opened to the inside. The invention consists in the use of a hinged weather strip, provided with a spring in such manner, that it will, by the said spring, be swung up, and out of the way of the sill whenever the door is open, but when the door is closed, the weather strip strikes against a fixed bracket or stop provided on the door frame, and is thereby folded over the outer edge of the sill to securely close the crevice formed between the door and sill.

Lock Nuts.—Almon Roff, Southport, Conn—The object of this invention is to so arrange a system of nuts on screws or bolts, that when the said nuts have been adjusted on the screws, they cannot be displaced spontaneously by jarring or other motion. The invention consists in the combination of set screws, with a right and left-hand nut, working on separate threads, or of one nut and one screw working in opposite directions for locking the nuts together when they are adjusted.

Velocipede.—John J. White, Philadelphia, Pa.—This invention relates to a new velocipede, which consists entirely of two wheels and their connecting axle, the axle supporting a frame in which the seat and driving gear are arranged so that they can be conveniently operated. The wheels can, with this arrangement, be made very large to obtain great velocity, and the whole apparatus can be made light and convenient.

Cigar Machine.—R. M. Cole, Burlington, Vt.—This invention has for its object to construct a machine for rolling cigars in which both right and left-handed wrappers can be used, in which the cigar can be seen while it is being formed, and which can be retained in motion continually, even when no tobacco is rolled in it. The invention also consists in rolling the cigar within an endless apron, which is so held between suitable forms or molds that it imparts to the cigar the requisite shape. The apron is guided over rollers, which impart continuous motion to it, and of which some can be shifted without straining and interfering with the motion of the apron.

Electric Organ Action.—Holborne L. Roosevelt, New York city.—The object of this invention is to apply electricity from a battery or other source to the operation of organs, so that the keys can be played at a suitable distance from the organ and without any difficulty. The invention consists in a novel manner of connecting the wires with the keys and pallets, by dropping them into cups that are partly filled with mercury, the wires on the keys being held away from the mercury by means of springs as long as the keys are not touched. When, however, a key is depressed, this wire is dropped in the mercury, and a current thereby established by which two coils are charged, to cause them to attract an armature.

Breech-loading Pistol.—John McGoveren, New York city.—This invention consists of an improved method of maintaining the barrel in its position in the stock, and of restoring it to the said position when displaced for loading.

Nursing Table.—Jeremiah Larkin, Unionville, S. C.—This invention relates to improvements in tables, to render them useful for sick persons, in helping themselves when unattended by nurses.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING APRIL 13, 1869.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

On each caveat	$10
On filing each application for a Patent (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$15
On an application for design (fourteen years)	$30

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

88,767.—Motive Power.—John B. Atwater, Chicago, Ill.
88,768.—Feeding Trough for Horses.—Addison D. Barrett, Cambridgeport, Mass.
88,769.—Krout-cutting Machine.—W. K. Baylor and Conrad Rapp, Batesville, Ind.
88,770.—Gate.—Jacob Behel, Rockford, Ill.
88,771.—Steam Engine Valve Gear.—Riley Bowers, Chillicothe, Ohio.
88,772.—Bed Bottom.—Charles A. Brigham, Cleveland, Ohio.
88,773.—Gate.—Lorenzo D. Brooks, Syene, Wis.
88,774.—Automatic Boiler Feeder.—Daniel L. F. Chase, Boston, Mass.
88,775.—Baling Press.—Peter K. Dederick, Greenbush, N. Y. Antedated April 8, 1869.
88,776.—Folding Chair.—Carl Dieterich, Roslindale (West Roxbury), Mass.
88,777.—Holder for Stove Lids.—Lindley M. Doudna, Washington, D. C.
88,778.—Animal Trap.—Josiah W. Ells, Pittsburgh, Pa.
88,779.—Mode of Ornamenting Candles.—Arthur Field, Upper Marsh, Lambeth, and William Bryer Nation, No. 394 Old Kent Road, England; (said Nation assigns his right to said Field).
88,780.—Tuck-creasing Attachment for Sewing Machines.—H. W. Fuller, Brooklyn, N. Y.
88,781.—Anchor.—J. Durrell Greene, Cambridge, assignor to himself and Charles H. P. Plympton, Boston, Mass.
88,782.—Portable Fence.—Frank W. Groff, Indianapolis, Ind.
88,783.—Bolt Machine.—Moore Hardaway, St. Louis, Mo.
88,784.—Lamp for Cooking Purposes.—Mary E. Hatch, Beloit, Wis.
88,785.—Earth Scraper. — John Y. Herston, Warrick county, Ind.
88,786.—Manufacture of Rails for Railroads.—Charles Hewitt, Hamilton township, N. J.
88,787.—Seeder and Cultivator.—E. W. Hewitt and Geo. Gorgam, Pecatonica, Ill.
88,788.—Casting Tweers.—Wm. M. Johnston (assignor to himself and David P. Estep), Pittsburgh, Pa.
88,789.—Carriage Jack.—A. W. Keeler and Jacob Eckert, Lafayette, N. Y.
88,790.—Corn Sheller.—Elisha Kelley, Locust Grove, Ohio.
88,791.—Combined Knob Latch and Lock.—J. B. Kelley, Brandon, Vt.
88,792.—Flour Bolt.—Ira B. Ketchum, Rochester, Minn.
88,793.—Hair Dye.—Joseph Lory, Memphis, Tenn.
88,794.—Plow.—Benjamin F. Masters, Middleport, Ill.
88,795.—Machine for Manufacturing Roofing Tile.—Charles Messenger, Cleveland, Ohio.
88,796.—Wagon Brake.—C. H. Mills, Ravenna, Ohio.
88,797.—Sled Brake.—S. A. Mitchell, Alstead Center, N. H.
88,798.—Plate for Artificial Teeth.—George Morrison Lockport, Ill.
88,799.—Metal Bird House.—John Murdock, Jersey City, N. J., assignor to John Savery's Sons, New York city.

88,800.—Composing Stick.—Francis W. Murray, Cincinnati, Ohio.

88,801.—Bog-cutter and Drag.—John W. Newton, Geneva, Wis.

88,802.—Wheelwright Machine.—James O'Connor, Jackson, Mo.

88,803.—Stilt.—Charles Page and George W. Miller, Meriden, Conn.

88,804.—Horse Hay Fork.—James A. Park (assignor to himself and William Woodhouse), Lansing, Mich.

88,805.—Furnace for Annealing Tacks, Nails, etc.—E. G. Paull (assignor to American Tool Company), Fair Haven, Mass.

88,806.—Washing Machine.—Spencer B. Peugh, Salem, Ind.

88,807.—Process and Apparatus for the Manufacture of Extract of Bark, etc.—John Pickles, Wigan, England.

88,808.—Sewing Machine.—Heinrich Pollack and Edwin Schmidt, Hamburg, Germany.

88,809.—Nail Plate Feeder.—I. R. Richardson, New Castle, Pa.

88,810.—Table Cutlery.—Charles L. Robertson, Providence, R. I.

88,811.—Comb.—Charles L. Robertson, Providence, R. I.

88,812.—Corn Planter.—Andrew Runstetler, Peoria, Ill.

88,813.—Milking Stool.—Erastus W. Scott, Wauregan, Conn.

88,814.—Blind Catch.—Wm. Frank Seavey, Portland, Me.

88,815.—Velocipede.—Samuel M. Skidmore, Brooklyn, N. Y.

88,816.—Washing Machine.—Hamilton E. Smith, New York city.

88,817.—Handle for Drawers.—John Smith, Brockport, N. Y.

88,818.—Gate.—W. Willard Sowles (assignor to himself and A. D. Wilcox), Manlius, M. Y. Antedated January 18, 1869.

88,819.—Fence.—Thomas Stanford, Noblesville, Ind.

88,820.—Fire Tongs.—F. Stith, Memphis, Tenn.

88,821.—Boring Machine.—Miles Sweet, Troy, N. Y.

88,822.—Hay Spreader.—Benjamin F. Taft (assignor to himself and David Needham), Groton Junction, Mass.

88,823.—Machine for Mixing Tea.—William Thompson, No. 85 Lower Gardiner Street, Dublin, Ireland.

88,824.—Boot and Shoe.—William H. Towers, Boston, Mass.

88,825.—Tooth Brush.—William B. Watkins, Jersey City, N. J.

88,826.—Liniment.—Wm. W. Wells, Freehold, N. J.

88,827.—Manufacture of Paper Boxes from Pulp.—Seth Wheeler and Edgar Jerome, Albany, N. Y.

88,828.—Gate.—A. D. Wilcox, Manlius, N. Y.

88,829.—Jug Top.—Homer Wright (assignor to himself, Henry H. Collins, and Benjamin F. Collins), Pittsburgh, Pa.

88,830.—Manufacture of Cheese.—J. W. Andrews and N. J. Ogden, Dryden, N. Y.

88,831.—Step Ladder.—E. R. Austin, Elmira, N. Y.

88,832.—Sled Brake.—S. W. Barber, Heath, Mass.

88,833.—Carpenters' Gage.—T. E. Barrow, Mansfield, Ohio.

88,834.—Vise.—J. D. Beck, Liberty, Pa.

88,835.—Printing Press.—Henry Betts (assignor to himself and Hart Z. Norton), Norwalk, Conn. Antedated April 3, 1869.

88,836.—Self-adjusting Watch Key.—John S. Birch, New York city.

88,837.—Die for Making Awls.—James P. Blake, Rockville, Mass.

88,038.—Breast Collar.—George W. Blakesley, Rockford, Ill.

88,839.—Knife Sharpener.—Charles A. Bogert, Bay City, Mich.

88,840.—Ring for Spinning Machines.—John Booth (assignor to Orville Peckham, trustee, and said trustee assigns to John Booth, and Fales, Jenks, and Sons) Smithfield, R. I.

88,841.—Hand Truck for Sacking Grain and Moving the Same.—William Brocklesby, Jr. Caledonia, Ohio.

88,842.—Extension Ladder.—Moses T. Burbank, Lawrence, Mass.

88,843.—Grain Fan Blast.—John Butterworth and William H. Butterworth, Trenton, N. J.

88,844.—Process and Apparatus for Extinguishing Fire by Means of Water Charged with Carbonic Acid.—Dawson Miles, Cambridge, Mass., administrator of Philippe François Carlier, deceased, and Alphonse A. C. Vignon, Paris, France.

88,845.—Picker for Looms.—A. H. Carroll, Baltimore, Md.

88,846.—Baling Press.—Nathan Chapman, Milford, Mass.

88,847.—Churn.—Nathan Chapman, Milford, Mass.

88,848.—Wrench.—John Charlton, Newark, N. J.

88,849.—Grain Conveyer for Elevators.—D. C. Chester, Ogdensburgh, N. Y.

88,850.—Cigar Machine.—R. M. Cole, Burlington, Vt.

88,851.—Plow.—Wm. S. Colwell, Allegheny City, Pa.

88,852.—Mode of Warming Railway Cars.—A. C. Crary, Utica, N. Y.

88,853.—Magazine Firearm.—Thomas Cullen, San Francisco, Cal.

88,854.—Vapor Burner.—Joseph R. de Mahy and J. P. Cross, New Orleans, La.

88,855.—Sash Holder.—D. M. Donehoo, Beaver Court House, Pa.

88,856.—Device for Holding Edge Tools while being Ground.—P. V. Dunn, Calamus, Wis. Antedated April 5, 1869.

88,857.—Mode of Hanging and Fastening Doors.—C. N. Earl, Elk River, Minn.

88,858.—Horse Rake.—Wm. Emmons, Sandwich, Ill.

88,859.—Wagon Brake.—O. F. Evans, Guilford, N. Y.

88,860.—Felt Shoe.—Reese Evans, Milltown, N. J.

88,861.—Ear Blank for Elliptic Springs.—Wm. Evans, Pittsburgh, assignor to John Evans, Philadelphia, Pa.

88,862.—Cooking Range.—Francis Falls and John P. Hayes, Philadelphia, Pa., assignors to Francis Falls. Antedated Oct. 13, 1868.

88,863.—Harvester Pitman.—J. R. Finley, Delphi, Ind.

88,864.—Smoke Stack for Locomotive Engines.—Lorenzo Fulton, Cincinnati, Ohio.

88,865.—Machine for Shaping Hats.—G. W. Gallagiere, and E. W. Ruby, New Milford, Conn.

88,866.—Fence Post.—E. S. Goodrich, Oakland, Wis.

88,867.—Stove and Furnace.—Wm. P. Hall, Piqua, Ohio.

88,868.—Cultivator.—J. R. Hand, Billingsville, Ind.

88,869.—Carving Machine.—Adolph Henkel, New York city.

88,870.—Seed Planter.—I. F. Herrin, San Antonia, Texas.

88,871.—Steam Engine.—W. C. Hicks, New York city. Antedated April 1, 1869.

88,872.—Velocipede.—W. S. Hill, Manchester, N. H.

88,873.—Compound for Destroying Insects.—Jacob Hinds, Hindsburg, N. Y.

88,874.—Adjusting Feed Rollers for Carding Engines.—Lysander Holmes, Newton, Mass.

88,875.—Bran Duster.—Stephen Hughes, Hamilton, Ohio.

88,876.—Mechanism for Transmitting Motion.—C. C. Hull, Williamsburgh, N. Y.

88,877.—Composition for Artificial Stone.—C. B. Hutchins, Ann Arbor, Mich.

88,878.—Milk Pan.—B. F. Jewett, North Bangor, N. Y.

88,879.—Treating Wood for the Manufacture of Paper Pulp.—V. E. Keegan, Boston (Southern District), Mass.

88,880.—Threshing and Separating Machine.—J. W. M. Kirkpatrick, Hamburg, Ark.

88,881.—Nursing Table.—Jeremiah Larkin, Unionville, S. C.

88,882.—Screw Threading Machine.—W. J. Lewis, Pittsburgh, Pa.

88,883.—Pastry Cutter and Crimper.—W. R. Marie, Boston, Mass., assignor to T. A. Mitchell, Washington D. C.

88,884—Attaching Hoes to their Handles.—J. A. Marine (assignor to himself and A. T. Manker), Mooresville, Ind.

88,885.—Machine for Making Sheet-Metal Screw Caps.—J. L. Mason, New York city.

88,886.—Manufacture of Sheet-Metal Screw Caps.—J. L. Mason, New York city.

88,887.—Rubber Hose, or Tubing.—T. J. Mayall, Roxbury, Mass.

88,888.—Manufacture of Rubber Hose or Tubing.—T. J. Mayall, Roxbury, Mass.

88,889.—Velocipede.—F. W. McCleave, New Bedford, Mass.

88,890.—Breech-Loading Firearm.—John McGoveren, New York city.

88,891.—Well-Auger.—A. A. McMahen, Oxford, Miss.

88,892.—Weather Strip.—E. Mears, Battle Ground, Ind.

88,893.—Saw Filing Machine.—C. G. Miller, Brattleborough, Vermont.

88,894.—Velocipede.—T. H. Mott, New York city.

88,895.—Scissors.—Albert Murdock (assignor to himself and H. E. Snow), North Bridgewater, Mass.

88,896.—Double Tree.—H. W. Palmer, Kingsville, Ohio.

88,897.—Shuttle Holder.—C. H. Parmenter (assignor to G. W. Raynes and A. S. George), Lowell, Mass. Antedated April 3, 1869.

88,898.—Railway Switch.—F. P. Perdue, Atlanta, Ga.

88,899.—Combined Mowing Machine and Hay Spreader.—J. G. Perry, Kingston, R. I.

88,900.—Apparatus for Arranging and Conveying Screw Blanks.—E. S. Pierce (assignor to National Screw Company), Hartford, Conn.

88,901.—Apparatus for Arranging and Conveying Screw Blanks.—E. S. Pierce (assignor to National Screw Company), Hartford, Conn.

88,902.—Device for Connecting the Parts of Machinery.—E. S. Pierce (assignor to National Screw Company), Hartford, Conn.

88,903.—Oil Can.—Wm. Polyblank, Cleveland, Ohio.

88,904.—Carriage Coupling.—H. J. Pringle and Wm. Pringle, Columbus, Ohio.

88,905.—Washing and Wringing Machine.—H. O. Reddish, Linden, N. Y.

88,906.—Let-off Mechanism for Looms.—Rensselaer Reynolds, Stockport, N. Y.

88,907.—Sash Stop and Lock.—Rensselaer Reynolds, Stockport, N. Y.

88,908.—Lock Nut.—Almon Roff, Southport, Conn.

88,909.—Electric Organ Action.—H. L. Roosevelt, New York city.

88,910.—Advertising Frame.—W. H. Sadler, and James M. Drysdale, Baltimore, Md.

88,911.—Table Caster.—A. B. Searles, Providence, R. I.

88,912.—Table Caster.—A. B. Searles, Providence, R. I.

88,913.—Fanning Mill.—H. F. Seibert, Brady's Bend, Pa.

88,914.—Cooking Stove.—W. G. Semple, Cincinnati, Ohio.

88,915.—Cultivator.—J. B. Sexton (assignor to himself and J. L. Andrew), Pella, Iowa.

88,916.—Potato Digger.—Isaiah Shaw, Four Corners, Md. Antedated March 15, 1869.

88,917.—Mop Head.—Emile Sirret and E. G. Sirret, Buffalo, N. Y.

88,918.—Securing Knobs to their Shanks.—T. J. Sloan, New York city.

88,919.—Securing Knobs to their Shanks.—T. J. Sloan, New York city.

88,920.—Tool for Shaving the Edges of the Soles of Boots and Shoes.—Thomas Smiley, Albia, Iowa.

88,921.—Folding Milking Seat.—Selden Snow, Somers, Conn.

88,922.—Broom Head.—W. C. Spellman, Baltimore, Md.

88,923.—Lifting Jack.—Timothy Stebins, San Francisco, Cal.

88,924.—Cotton Gin.—R. W. Stough, Griffin, Ga.

88,925.—Valve and Valve Spring for Melodeons, etc.—A. L. Swan, Cherry Valley, N. Y.

88,926.—Compound for Filling the Pores and Coating Wood.—Horace Thayer, Johnsonburg, N. Y.

88,927.—Apparatus for Raising Beer.—J. L. Treat, New York city.

88,928.—Construction of Burglar-Proof Safes.—J. Weimar, New York city.

88,929.—Steam Power Break Device.—Geo. Westinghouse, Jr., Schenectady, N. Y.

88,930.—Velocipede.—J. J. White, Philadelphia, Pa.

88,931.—Harrow.—B. B. Williams, Laclede, Mo.

88,932.—Sash Holder.—B. F. Wilson, Geddes, N. Y.

88,933.—Stop Valve for Steam and other Enginery.—B. F. Wilson, Geddes, N. Y.

88,934.—Stop Valve for Steam and other Enginery.—B. F. Wilson, Syracuse, N. Y.

88,935.—Washing Machine.—W. W. Wilson, Geneva, Wis.

88,936.—Sewing Machine.—Wm. Winter, Leeds, England.

88,937.—Clothes Dryer.—Louis Winterhalder and David Wilson, New York city.

88,938.—Drive Wheel for Harvesters.—W. A. Wood, Hoosick Falls, N. Y.

88,939.—Mode of Roasting Iron Ores.—Henry Aitken, Falkirk, Scotland.

88,940.—Guard Attachment for Cultivators.—Jas. Armstrong, Jr., Elmira, Ill.

88,941.—Mode of Purifying Iron.—Ed. Brady, Philadelphia, Pa.

88,942.—Finger Shield for Penmen.—Chas. N. Brainerd, Hartford, Conn.

88,943.—Shingle Machine.—Merrill Chase, Jr., and Horace J. Morton (assignor to themselves and F. C. Merrill), South Paris, Me.

88,944.—Device for Adjusting and Hanging Carriage Bodies.—J. D. Cole, Phelps, N. Y.

88,945.—Hay Loader.—Emmett Cooper, Theresa, N. Y.

88,946.—Base-Burning Stove.—D. B. Cox, Troy, N. Y.

88,947.—Apparatus for Exhibiting Hymns, etc.—H. V. Edmond, Norwich, Conn.

88,948.—Material for Cartridge Cases.—Alfred B. Ely, Newtown, Mass.

88,949.—Circular Saw.—J. E. Emerson, Trenton, N. J.

88,950.—Fastening for Wagon Seats.—Peter Faber and Henry Martin, Canandaigua, N. Y.

88,951.—Harvester.—Amasa Foot, Earlville, Ill., assignor to C. R. Cook, Buffalo, N. Y.

88,952.—Trace Buckle.—Kasson Frazer, Syracuse, N. Y.

88,953.—Building.—W. J. Fryer, Jr., New York city.

88,954.—Buggy and Wagon Top.—Gustav Fuchs (assignor to himself and J. E. Wehr), Milwaukee, Wis.

88,955.—Dumping Wagon.—T. H. Gary, Bristol, Md.

88,956.—Let-Off Mechanism for Carriers for Braiding Machine.—Thomas Greenhalgh (assignor to himself and A. L. Holgate), Raritan, N. J. Antedated April 5, 1869.

88,957.—Churn Dasher.—W. J. Hale, Ashley, Ill.

88,958.—Lasting Tool.—Frederick Henderson, Marietta, Ohio, assignor to himself and Isaac Atkinson.

88,959.—Bolt.—Chas. H. Hopkins (assignor, by mesne assignments, to himself and H. A. Alden), Lyndonville, Vt.

88,960.—Surface Condenser.—John Houpt, Springfield, Pa.

88,961.—Harness Saddle.—W. G. Hull, Sing Sing, N. Y.

88,962.—Wagon Brake and Tongue Support.—Abram C. Jacques, Leavenworth, Kansas.

88,963.—Amalgamator.—Solomon Johnson, San Francisco, Cal.

88,964.—Blast Heating Apparatus for Smelting Furnaces.—J. C. Kent, Phillipsburg, N. J.

88,965.—Ox Yoke.—Emmaus Knowlton, Stockbridge, and S. F. Smith, Royalton, Vt.

88,966.—Stair Rod.—Moritz Krickl (assignor to H. Uhry), New York city.

88,967.—Melodeon Attachment for Pianofortes.—La Fayette Louis, New York city.

88,968.—Lamp.—Louis Mangeon, New York city.

88,969.—Sash Stop.—W. J. Manker and A. T. Manker, Indianapolis, Ind.

88,970.—Pianoforte.—Theo. Marschall, New York city.

88,971.—Seed Sower and Planter.—E. G. Matthews, Newton, assignor to F. F. Holbrook, Dorchester, Mass.

88,972.—Sheet-Metal Lathe Machine.—Edwin May, Indianapolis, Ind.

88,973.—Salve for Cure of Foot-Rot in Sheep.—John McDowell, Buffalo township, Pa.

88,974.—Combined Knob-Latch and Lock.—John McLeod, San Francisco, Cal.

88,975.—Stencil Impress.—G. V. Metzel, Baltimore, Md.

88,976.—Inking Apparatus for Color Printing.—Thomas Moore and P. H. Day, Bloomington, Ill.

88,977.—Folding Bedstead.—John Muller, Philadelphia, Pa.

88,978.—Process of Purifying Petroleum.—C. C. Parsons, New York city.

88,979.—Truss Pad.—E. C. Penfield, Philadelphia, Pa.

88,980.—Power Hammer.—T. T. Prosser, Chicago, Ill.

88,981.—Machine for Heading Bolts.—T. T. Prosser, Chicago, Ill.

88,982.—Manufacture of Illuminating Gas.—A. C. Rand, New York city.

88,983.—Churn Lid Screen.—Edward Reynolds, Winneconne, Wis.

88,984.—Stocking Supporter.—J. A. Robbins, Boston, Mass.

88,985.—Door Spring.—Wm. Ross, Baltimore, Md.

88,986.—Base-Burning Stove.—Elihu Smith, Albany, N. Y.

88,987.—Base-burning Stove.—Elihu Smith, Albany, N. Y.

88,988.—Folding Table.—J. W. Smith, Charlestown, Mass.

88,989.—Seed Planter.—T. G. Smith, Canton, Miss.

88,990.—Method of Transmitting Motion in Car Brakes and Other Machinery.—Joseph Steger, New York city.

88,991.—Horse Hay Fork.—J. B. Sweetland, Pontiac, Mich.

88,992.—Trunk.—C. A. Taylor, Chicago, Ill.

88,993.—Stair Rod.—H. Uhry, New York city.

88,994.—Stair Rod.—H. Uhry, New York city.

88,995.—Stair Rod.—H. Uhry, New York city.

88,996.—Ring and Traveler for Spinning.—Thos. Welham, Philadelphia, Pa.

87,997.—Mechanism for Mixing Soapstone with Cotton being Carded.—T. Welham, Philadelphia, Pa.

88,998.—Gang Plow.—Geo. Wharton, Jerseyville, Ill.

88,999.—Sirup Pitcher.—J. P. Whipple, Woonsocket, R. I.

89,000.—Washing Machine.—John Young, Amsterdam, N.Y.

89,001.—Hand Corn Sheller.—Joseph C. Curryer, Thorntown, Ind.

REISSUES.

83,444.—Steam Engine Valve Device.—Dated Oct. 27, 1868; reissue 3,364.—William Baxter, Newark, N. J.

82,957.—Hollow Auger.—Dated Oct. 13, 1868; reissue 3,365.—W. A. Ives, New Haven, Conn.

58,435.—Rock Channeling Machine.—Dated Oct. 2, 1866; reissue 3,366.—E. G. Lamson, Shelburne Falls, Mass.

16,460.—Stone Channeling Machine.—Dated Jan. 27, 1857; reissue 3,367.—E. G. Lamson, Windsor, Vt., assignee of G. W. Bishop.

18,352.—Rock Channeling Machine.—Dated Oct. 6, 1857; reissue 3,368. Division A.—E. G. Lamson, Windsor, Vt., assignee of William Plumer.

18,352.—Rock Channeling Machine.—Dated Oct. 6, 1857; reissue 3,369 Division B.—E. G. Lamson, Windsor, Vt., assignee of William Plumer.

63,079.—Horse Rake.—Dated March 19, 1867; reissue 3,370.—John I. Monroe, Woburn, Mass.

19,377.—Harvester.—Dated Feb. 16, 1858; reissue 44, dated March 5, 1861; reissue 3,371. Division A.—Frederick Nishwitz, Brooklyn, N. Y.

19,377.—Harvester.—Dated Feb. 16, 1858; reissue 44, dated March 5, 1861; reissue 3,372. Division B.—Frederick Nishwitz, Brooklyn, N. Y.

36,672.—Seeding Machine.—Dated Oct. 14, 1862; reissue 3,373.—J. S. Rowell and Ira Rowell (assignees of J. S. Rowell and M. F Lowth), Beaver Dam, Wis.

60,573.—Method of Blasting with Nitroleum.—Dated Dec. 18, 1866; reissue 3,374. Division A.—Taliaferro P. Shaffner, Louisville, Ky.

60,573.—Method of Blasting with Nitroleum.—Dated Dec. 18, 1866; reissue 3,375. Division B.—Taliaferro P. Shaffner, Louisville, Ky.

63,804.—Fare Boxes for Cars, etc.—Dated April 16, 1867; reissue 3,376.—J. B. Slawson, New York city, assignee, by mesne assignments, of W. H. McLellan.

50,617.—Mode of Exploding Nitro-Glycerin.—Dated Oct. 24, 1865; reissue 3,377. Division A.—The United States Blasting-oil Co., New York city, assignees of Alfred Nobel.

50,617.—Device for Exploding Nitro-Glycerin.—Dated Oct. 24, 1865; reissue 3,378. Division B.—The United States Blasting-oil Co., New York city, assignees of Alfred Nobel.

50,617.—Mode of Manufacturing Nitro-Glycerin.—Dated Oct. 24, 1865; reissue 3,379. Division C.—The United States Blasting-oil Co., New York city, assignees of Alfred Nobel.

50,617.—Use of Nitro-Glycerin.—Dated Oct. 24, 1865; reissue 3,380. Division D.—The United States Blasting-oil Co., New York city, assignees of Alfred Nobel.

57,175.—Manufacture of Nitrine or Crystallizing Nitro-Glycerin.—Dated Aug. 14, 1866; reissue 2,538, dated April 2, 1867; reissue 3,381. Division 1.—The United States Blasting-oil Co., New York city, assignees of Alfred Nobel.

57,175.—Process of Manufacturing Nitro-Glycerin.—Dated August 14, 1866; reissue 2,538, dated April 2, 1867; reissue 3,382. Division 2.—The United States Blasting-oil Co., New York city, assignees of Alfred Nobel.

28,936.—Seed Planter.—Dated June 26, 1860; reissue 3,383.—Elijah Young, Fayetteville, Mo

DESIGNS.

3,446.—Handle of a Table Caster.—H. A. Dirkes, New York city.

3,447.—Trade Mark.—H. A. Fanshawe, New York city.

3,448.—Carriage.—John C. Ham, New York city.

3,449.—Eraser.—Wesley W. Hamilton (assignor to himself and W. G. Vermilye), New York city.

EXTENSIONS.

Machine for Making Candles.—John Stainthorp, Brooklyn N. Y.—Letters Patent No. 12,492, dated March 6, 1855.

Cut-off Valve for Steam Engines.—Noble T. Greene, of Providence, R. I.—Letters Patent No. 12,507, dated March 13, 1855.

Process of Curing Meats.—John C. Schooley, Cincinnati Ohio.—Letters Patent No. 12,530, dated March 13, 1855.

Benzole Vapor Apparatus.—Charles Cunningham, Nashua N. H.—Letters Patent No. 12,535, dated March 13, 1855.

Cultivator.—G. W. N. Yost, of Corry, Pa.—Letters Patent No. 12,571, dated March 20, 1855.

Printing Press.—Lemuel T. Wells, of St. Louis, Mo.—Letters Patent No. 12,568, dated March 20, 1855.

Illuminating Vault Covers.—Thaddeus Hyatt, of New York city.—Letters Patent No. 12,595, dated March 27, 1855.

Operating Valves in Direct-acting Steam Engines.—William H. Guild and William F. Garrison, of Brooklyn, N. Y.—Letters Patent No. 12,592, dated March 27, 1855; reissue No. 382, dated July 29, 1856.

Plow.—Thomas J. Hall, of Bryan, Texas.—Letters Patent No. 12,627, dated April 3, 1855.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

Buckles.—Stephen E. Booth, of Orange, Conn., administrator of the estate of S. S. Hartshoen, deceased, has petitioned for the extension of the above patent. Day of hearing, June 21, 1869.

Self-adjusting Wind Mill.—Addison P. Brown, of Syracuse, N. Y., has petitioned for the extension of the above patent. Day of hearing, June 21, 1869.

Looms.—S. T. Thomas, of Gilford, N. H., has applied for an extension of the above patent. Day of hearing, June 21, 1869.

Looms.—S. T. Thomas, of Gilford, N. H., has applied for an extension of the above patent. Day of hearing June 21, 1869.

Spring-bed Bottom.—Hiram Tucker, of Newton, Mass., has applied for an extension of the above patent. Day of hearing June 21, 1869.

Sand-Paper Cutting Machine.—William Adamson, of Philadelphia, Pa., has petitioned for an extension of the above patent. Day of hearing, June 21, 1869.

Method of Raising and Lowering the Cutters of Harvesters.—Jonathan F. Barrett, of North Granville, N. Y., has petitioned for the extension of the above patent. Day of hearing, June 21, 1869.

Machine for Making Bolts.—William E. Ward, of Portchester, N. Y., has petitioned for an extension of the above patent. Day of hearing, June 21, 1869.

Lanterns.—Charles Waters, of Poughkeepsie, N. Y., has petitioned for the extension of the above patent. Day of hearing June 28, 1869.

Ship's Winches.—Peter H. Jackson, of New York city, has petitioned fo the extension of the above patent. Day of hearing, July 19, 1869.

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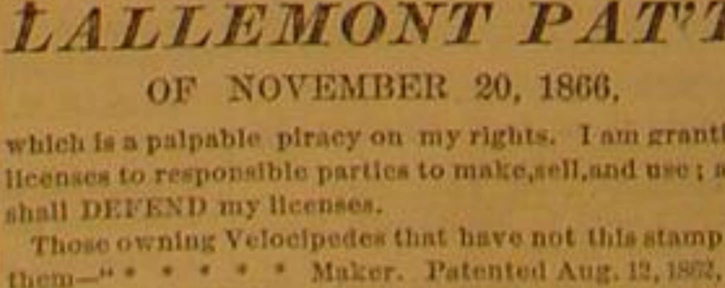

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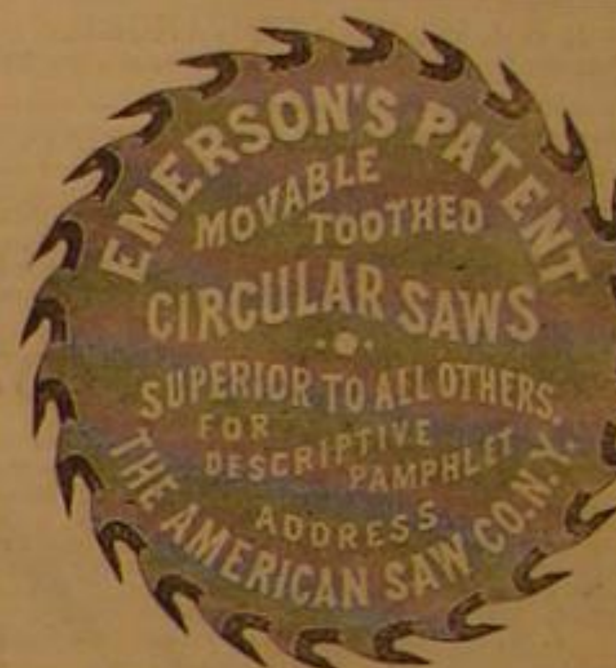

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Vol. XX.---No. 19. [NEW SERIES.] | NEW YORK, MAY 8, 1869. | $3 per Annum [IN ADVANCE.]

Improvement in Steam Hammers.

As the operations of the sword have been so carefully recorded by the historian, it would seem that the history of the hammer, one of the first implements ever used by man, and one which cannot be dispensed with to-day in beating out the tracks or roads of the world's progress, should be written.

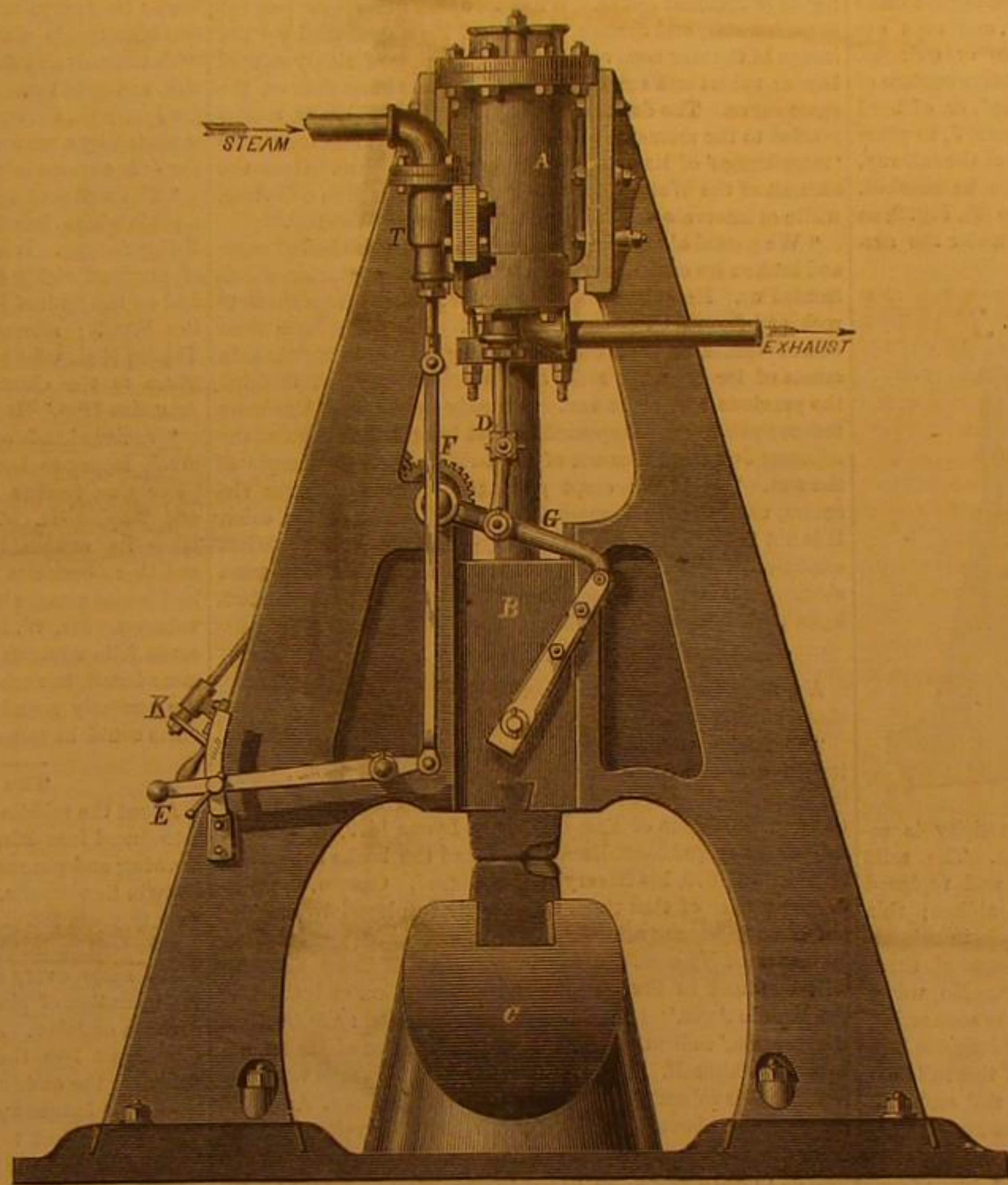
Our time and space would fail us were we to attempt any such review or record, hence we will give a brief description of the improvements claimed for the one presented in the accompanying engraving, one of the latest inventions of the hammer builders.

The form of the frame is claimed by its builder, to be the best possible shape for the objects to be accomplished, namely, firmness of support, and resistance to the blows of the hammer upon the anvil.

The frame is cast in two parts, with flanges at the upper end to clasp the cylinder, A, and with guides to control the hammer head, B. The base of the frame is mounted in the usual manner upon a bed plate which surrounds the anvil block, C, and is capable of adjustment by keys in the brackets, as shown upon the bed plate. The anvil block is formed with flanges at the bottom which extend downwards and at right angles to each other, in such a manner as to receive the ends of four large timbers, which are arranged in a pit and in the form of a pyramid. These timbers are firmly fastened together by cross bolts and the pit is filled in firmly with sand and gravel stamped. This is one of the best foundations for such anvils, as has been proved by several years of experience.

The construction of the valves and valve gear, however, constitutes the prominent novelties and features of usefulness in this hammer, and their combination and arrangement are such that the blows are completely under the control of the operator, being instantly varied in length and intensity, or fixed to work at any point within the range of the length of the cylinder. The ports are also constructed so that the action of the steam upon the valves and upon the piston prevents them from wearing away their seats and cylinders more on one side than the other.

This will be easily understood by referring to the shape of the valves, which are simply cylinders working inside of chambers on the front side of the main cylinder, A, the center of which is in line with the valve stem at D. Openings are formed in this inner cylinder to communicate with the cylinder of the throttle at T, and all of these openings for the ports are made in the extreme ends of the cylinders, so that the steam enters completely around the valves as they pass their seats.



WILLIAM A. SWEET'S STEAM HAMMER.

The throttle is operated by the lever, E, and connecting rod, F, and when the proper quantity of steam is admitted the valve is fastened by the set screw at E.

The steam valves receive motion from the connecting rod at D, and lever, G, one end of which lever is pivoted upon an eccentric shaft which receives motion by a worm gear at F, and which is operated by a crank at K, in close proximity to the throttle lever.

The other end of lever, G, is connected with the hammer head by a light bar of wood, which travels up and down with the strokes of the piston.

Motion being thus communicated to the valve stem, it is evident that by a change of the eccentric a change of the valves is easily produced, consequently the stroke of the piston may be quickly varied by simply operating the crank at K.

The piston and piston rod are forged in one piece, and the packing rings are of the simplest form, but by following the same principle of having the openings completely around the cylinder, there is so great a freedom to the exhaust that each distinct motion of the piston is clearly indicated by the escape steam as in an engine with the most approved cut-off.

As to the efficient working of such hammers, the manufacturer states that one with a cylinder of 6½ inches diameter, and a hammer of 400 pound weight, will reduce a 3-inch ingot of steel in the same time that a Sheffield "Davy Bros." hammer of 9-inch cylinder and 600 pounds weight would do the work.

One of the latest improved of these hammers can be seen in operation at the steel works of William A. Sweet & Co., Syracuse, N. Y., to whom any application may be made for further information.

Securing a Permanent Way.

Engineering talent, both in this country and in Europe, has been engaged for some years in attempts to reduce the expense of keeping railroads in repair and in saving the rolling stock from rapid deterioration. In this attempt very great attention has been paid to the style and quality of the rails themselves; steel, or a combination of steel and iron, in their composition, being mainly the point to which these efforts have been directed. The supports of the rails, however, have not, we think, received the attention their importance demands. A certain degree of elasticity, of ability to recover from the depression and shock of the weight of a passing train, seems to be a desirable quality in the road bed and rails of a railway line. We remember, in the early days of railroading in this country, that stability, unyielding resistance, was thought and believed to be the desideratum for a railway. The Boston and Lowell road, one of the best built roads in the country, had granite sleepers instead of wooden ones; and we remember well repeatedly passing on foot over a portion of the road and noting the many cases of broken sleep-

Fig. 1

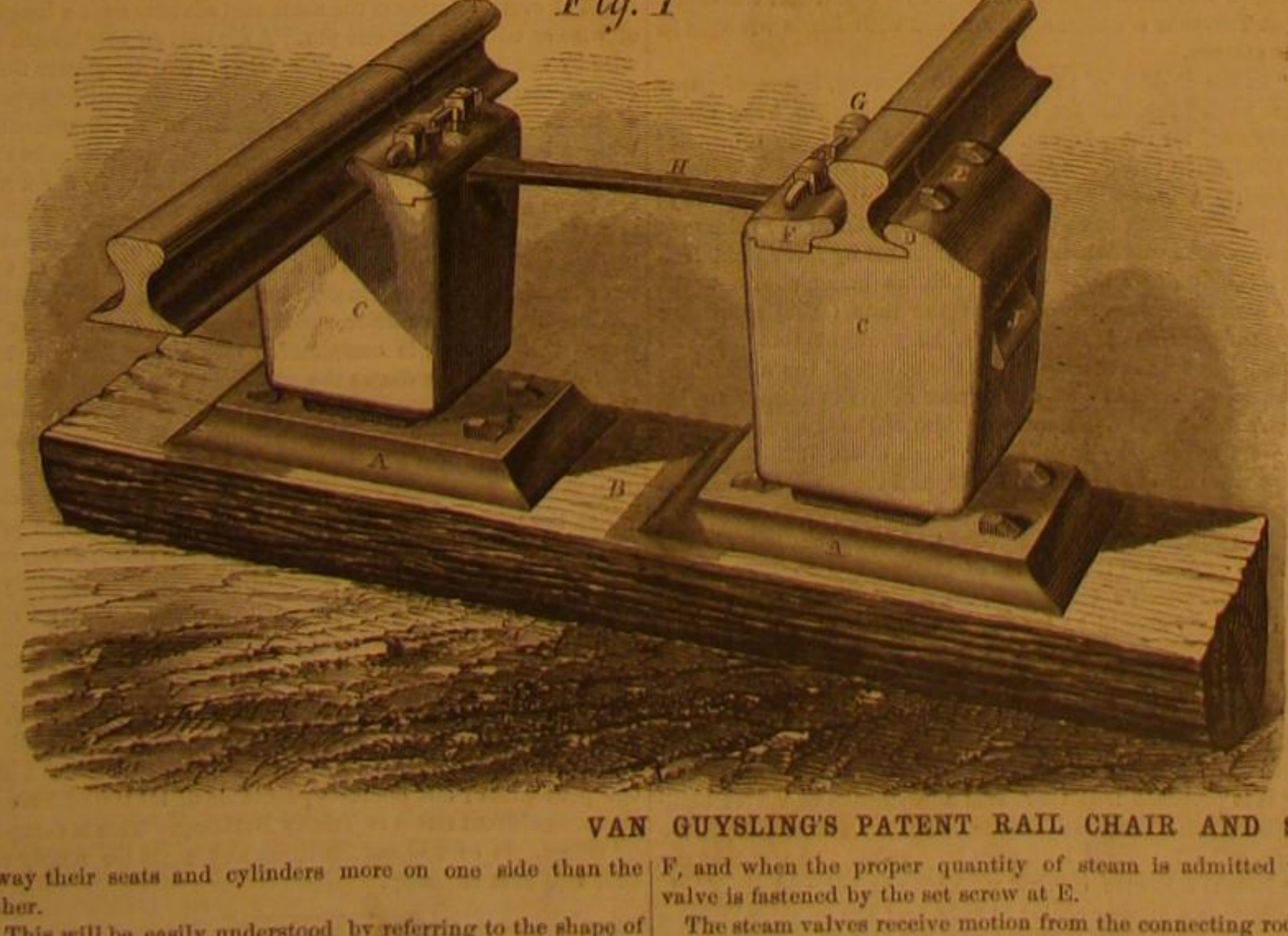
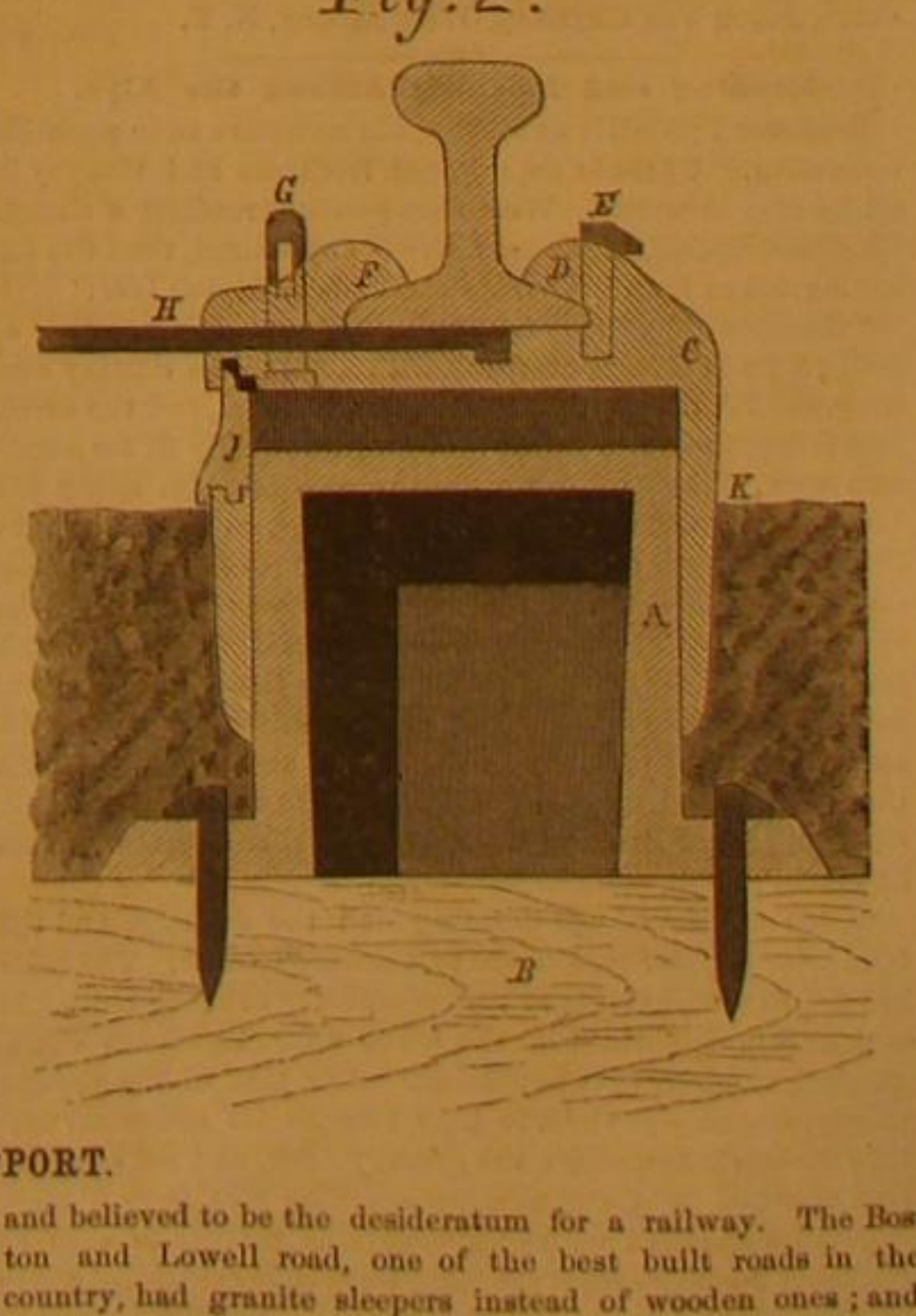


Fig. 2.



VAN GUYSLING'S PATENT RAIL CHAIR AND SUPPORT.

ers, and the continual work of placing shims of wood between the rail and sleeper, to receive, as cushions, the shock of passing trains. Some semi-elastic material seems to be absolutely necessary to the life of the roadway and the rolling stock, experience proving that a really unyielding roadway is not economical.

The device herewith represented is intended to secure a permanent way, to provide a secure means of fastening rails, give them a good support, provide for the requisite degree of elasticity, and afford a ready means of making repairs and adjusting the line of the rails. Fig. 1 is a perspective view of the device, Fig. 2 a section, and Fig. 3 an intermediate support to be placed between the joinings of the rails. A hollow standard, A, with an ample base, is spiked to the sleeper, B. This standard is an iron casting. Over it passes a box, C, having a lip, D, for receiving one edge of the rail, with keys, E, passing through the usual slots in the rails near their ends, and seated in the box, C. Another lip, F, removable at will, is held in place by means of split keys, or similar devices, passing through slotted bolts, G, seated in cored square holes in the top of the cap, C. The two standards and caps are held rigidly by the bar, H, which acts as a tie or stringer. Between the top of the standard, A, and the inner surface of the cap's top is inserted a diaphragm, I, of wood, or of hard rubber, which may be removed through the doors, J, to place a thinner or thicker gland under the rail to level the railway. Through this aperture, J, the bolts, G, may also be reached. The whole is buried in the earth to the line K, Fig. 2, so that the sleeper, B, is not less than six inches under the surface, thus assisting in its preservation.

Fig. 3

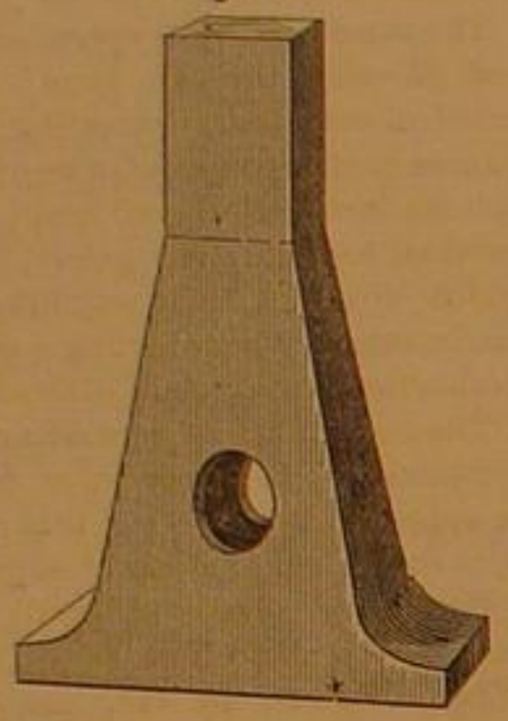


Fig. 3 is a hollow standard of cast iron intended for intermediate supports between the ends of the rail. It is furnished with cap, as is that shown in Figs. 1 and 2, which are more especially intended for the points of jointure between the ends of the rails. The inventor thinks that by covering the sleepers to the depth of six inches they will last much longer than when exposed to the weather; in wet weather there is a tendency to throw mud from under the sleepers and in dry weather the vibration of the sleepers raises a dust; both of which difficulties are obviated by this device. While sufficient elasticity is secured, the road is less liable to derangement. The rails may be taken out, and raised or lowered, and replaced without disturbing the sleepers or drawing spikes; this is a great advantage when adjusting the track in winter. The rails may be adjusted by this device a hight of three inches without interfering with the sleepers. No water can get between the chair and its support. The connecting bars are placed directly under the rail, thus affording the best means of preventing spreading. The spring of the rails under a heavy load will not cause the sleepers to roll and lift, as they now do when the rails are spiked directly to them, and they are continually following the spring and working the ballast out of place. When once settled in place these supports are expected to be permanent *in situ*. With a broad base they may be used, on a good foundation, without the support of wooden sleepers. The joint chair weighs about 100 lbs. and the intermediate about 70 lbs. The device has been approved by eminent railroad men.

Patented through the Scientific American Patent Agency, November 10, 1868. For further information address the patentee, Aaron Van Guysling, West Albany, N. Y.

Evening and Morning Among the Alps.

Professor Tyndall is as felicitous in narrative as in scientific discussion. There is an original freshness and vivacity in all he says or writes. We do not recollect reading a choicer bit of description, in the narrative of any tourist, than the following, taken from his "Odds and Ends of Alpine Life:"

"Grindelwald was my first halting place in the summer of 1867; I reached it, in company with a friend, on Sunday evening, the 7th of July. The air of the glaciers, and the excellent fare of the Adler Hotel, rendered me rapidly fit for mountain work. The first day we made an excursion along the lower glacier to the Kastenstein, crossing, in returning, the Strahleck branch of the glacier above the ice fall, and coming down by the Zasenberg. The second day was spent upon the upper glacier. The sunset covered the crest of the Eiger with indescribable glory that evening, causing the dinner table to be forsaken while it lasted. It gave definition to a vague desire which I had previously entertained, and I arranged with Christian Michel, a famous old roadster, to attempt the Eiger, engaging Peter Bauman, a strong and gallant climber, to act as second guide.

"This crimson of the morning and the evening, and the blue color of the sky, are due to a common cause. The color has not the same origin as that of ordinary coloring matter, in which certain portions of the white solar light are extinguished, the color of the substance being that of the portion which remains. A violet is blue because its molecular texture enables it to quench the green, yellow, and red constituents of white light, and to allow the blue free transmission. A geranium is red because its molecular texture is such as quenches all rays except the red. Such colors are called colors of absorption; but the hue of the sky is not of this character. The blue light of the sky is *reflected* light, and were there nothing in our atmosphere competent to reflect the solar rays, we should see no blue firmament, but should look into the darkness of infinite space. The reflection of the blue is effected by perfectly colorless particles. Smallness of size alone is requisite to insure the selection and reflection of this color. Of all the visual waves emitted by the sun, the shortest and smallest are those which correspond to the color blue. On such waves small particles have more power than upon large ones, hence the predominance of blue color in all light reflected from exceedingly small particles. The crimson glow of the Alps in the evening and in the morning, is due, on the other hand, to *transmitted* light; that is to say, to light which in its passage through great atmospheric distances, has had its blue constituents sifted out of it by repeated reflection.

"At half-past one o'clock on the morning of the 11th, we started from the Wengern Alp to attack the Eiger; no trace of cloud was visible in the heavens, which were sown broadcast with stars. Those low down twinkled with extraordinary vivacity, many of them flashing in quick succession lights of different colors. When an opera glass was pointed to such a star, and shaken, the line of light described by the image of the star resolved itself into a string of richly-colored beads; rubies and emeralds were hung thus together on the same curve. The dark intervals between the beads corresponded to the moments of extinction of the star through the 'interference' of its own rays in our atmosphere. Over the summit of the Wetterhorn the Pleiades hung like a diadem, while at intervals a solitary meteor shot across the sky.

"We passed along the Alp, and then over the balled snow and broken ice cast down from the end of a glacier which fronted us. Here the ascent began; we passed from snow to rock and from rock to snow by turns. The steep for a time was moderate, the only thing requiring caution being the thin crusts of ice upon the rocks over which water had trickled the previous day. The east gradually brightened, the stars became paler and disappeared, and at length the crown of the adjacent Jungfrau rose out of the twilight into the purple of the sun. The bloom crept gradually downwards over the snows, until the whole mountain-world partook of the color. It is not in the night nor in the day—it is not in any statical condition of the atmosphere—that the mountains look most sublime. It is during the few minutes of transition from twilight to full day through the splendors of the dawn."

Mediæval Bookbinding.

A writer, in the last number of *Chambers' Journal*, on the above subject says:

"The old stamped leather bindings of the fifteenth and sixteenth centuries are often beautifully executed, and exceedingly interesting. Jean Grolier, Viscount d'Aguisi, one of the four treasurers of France (born at Lyons 1479, died 1565), collected a magnificent library, and had the books splendidly bound. In 1675, his library was dispersed. Gascon, the celebrated binder of that time, was chiefly employed by Grolier, but the designs are said to have been composed by himself in moments of leisure. A woodcut of one of these bindings will be found in Shaw's 'Decorative Arts, Ecc. and Civil, of the Middle Ages.' It had the usual inscription: '*Io Grolierii et amicorum*,' indicating that it was for the use of his friends as well as himself. The collection of Mr. Edwards was very rich in these volumes, and large prices were realized. A colored plate of great beauty will be found in Shaw's work, of a book belonging to the same style and period, though it cannot be proved to have belonged to the Chevalier Jean Grolier. Aldus, the famous printer of Venice, printed the works of Machiavelli in 1540, in four volumes. Grolier had his copy bound in four different patterns, and one volume was sold at the Libri sale for one hundred and fifty pounds. At the same sale, two volumes, which formerly belonged to the library of Diana of Poitiers, beautifully bound, were sold for eighty and eighty-five pounds respectively. The celebrated artist, 'le petit Bernard,' is said to have been employed on them. At the Library at Treves is a manuscript studded with heads wrought in fine cameos.

"In the middle of the sixteenth century, leaves of paper were pasted together for bindings, wood having been previously used for the purpose. Mr. Thoms says the originator of binding in cloth was Mr. R. E. Lawson, of Stanhope street, Blackfriars, formerly in the employ of Mr. Charles Sully; and the first book bound in cloth was a manuscript volume of music, which was subsequently purchased by Mr. Alfred Herbert, the marine artist. On the volume being shown to the late Mr. Pickering, who was at the time (1823) printing a diamond edition of 'the classics,' he thought this material would be admirably adapted for the covers of the work. The cloth was purchased at the corner of Wilderness Row, St. John's street, and five hundred copies of the Diamond Classics were covered by Mr. Lawson with cloth. Shakespeare's plays were also issued in this form, and these works were the first books bound in cloth.

"The custom of chaining books to desks in churches is said to have originated from an act of Convocation in 1562, ordering that Nowell's Catechism, the Articles, and Bishop Jewell's Apology should be taught in universities and cathedral churches. But the custom has been traced back as far as Sir Thomas Lyttleton, who, by his will, dated 1481, ordered some of his works to be chained in different churches. St. Bernard, in 1153, in one of his sermons, actually alludes to some such custom.

"It is probable that there was no specimen of velvet binding before the fourteenth century. In the will of Lady Fitzhugh, c. 1427, several books are bequeathed: 'I wyl that my son Robert a Sautre covered with rede velvet, and my doghter Mariory a Primer cou'ed in rede, and my doghter Darcy a Sauter cou'ed in bleu, and my doghter Mal de Eure a Prim'r cou'ed in bleu.' Queen Elizabeth had a little volume of prayers bound in solid gold suspended by a chain at her side. The Countess of Wilton in her 'Art of Needlework,' says the earliest specimen of needlework binding remaining in the British Museum is Fichetus (Guil.) Rhetoricum, Libri tres (Impr. in Membranis), 4to, Paris ad Sorbonæ, 1471. It is covered with crimson satin, on which is wrought with the needle a coat of arms, a lion rampant in gold thread in a blue field, with a transverse badge in scarlet silk: the minor ornaments are all wrought in fine gold thread.

"The next in date in the same collection is a description of the Holy Land, in French, written in Henry VII.'s time. It is bound in rich maroon velvet, with the royal arms, the garter, and motto embroidered in blue; the ground crimson; and the fleurs-de-lis, leopards, and letters of the motto in gold thread. A coronet of gold thread is inwrought with pearls, the roses at the corners are in red silk and gold. In the Bodleian Library is a volume of the Epistles of St. Paul (black letter), the binding of which is embroidered by Queen Elizabeth; around the borders are Latin sentences, etc. Archbishop Parker's 'De Antiquitate Britannicæ Ecclesiæ' (1572), in the British Museum, is richly bound in green velvet, embroidered with animals and flowers, in green, crimson, lilac, and yellow silk, and gold thread. In the same collection is a Bible bound for James II., showing on the cover his initials, J. R., surmounted by a crown, and surrounded with borders of laurel, the four corners being filled with cherubim.

"The writer of this paper once saw at Broomfield, in Essex, a Bible which belonged to Charles I. (date 1527, Norton and Bell, printers). It is a folio, bound in purple velvet; the arms of England, richly embroidered in raised work on both sides, and on the fly-leaf is written: 'This Bible was King Charles the First's; afterwards it was my grandfather's, Patrick Young, Esq., who was library keeper to his Majesty; now given to the church at Broomfield by me, Sarah Attwood, Aug. 4th 1723.' It is a relic little known.

"Various kinds of insects, popularly called bookworms, do much injury to books. A mite (*Acarus eruditus*) eats the paste that fastens the paper over the edges of the binding and loosens it. The caterpillar of another little moth takes its station in damp old books, between the leaves, and there commits great ravages. The little boring wood beetle also attacks books, and will even pierce through several volumes. Mr. W. R. Tymms mentions an instance of twenty-seven folio volumes being perforated in a straight line by the same insect, in such a manner, that by passing a cord through the perfectly round hole made by it, the twenty-seven volumes could be raised at once."

The Manufacture of Pins.

About the middle of the last century, the Ryland family introduced into Birmingham the two new industries of wire drawing and pin making, which at that period were regarded as twin handicrafts. After a steady development of five and twenty years the pin trade was transferred to an ancestor of the present eminent firm of Thomas Phipson & Son. A few years since every schoolboy's manual contained a sketch of the operation of pin making as a remarkable instance of the division of labor. A single pin had to undergo the manipulation of not less than fourteen pairs of hands before it was ready for the cushion in a lady's boudoir. This forcible illustration no longer applies. Pin making like other industries, has been subject to the scientific progress and improvement of the age, and the process is now comparatively simple. An American engineer named Wright patented in 1824 a pin machine which during the revolution of a single wheel produced a perfect pin. Mr. Thomas Phipson thus describes Wright's machine, which, having undergone many improvements, is now in operation at the factory of the former, here: The principal shaft gives motion in its rotation to several sliders, levers, and wheels, which work the principal parts of the machine. A slider pushes forward pincers, which draw wire from a reel at every rotation of the shaft, and advance such a length of wire as will produce one pin. A die cuts off this length of wire by the descent of its upper "chap," and the latter then opens a carrier which takes on the wire to the pointing apparatus. Here it is received by a holder, which turns round while a bevel-edged file wheel, rapidly revolving, gives to the wire its rough point. It proceeds immediately by a second carrier to a second and finer file wheel, by which the pointing is finished. A third carrier transfers the pin to the first heading die, and by the advance of a steel punch one end of the pin wire is forced into a recess, whereby the head is partially produced. A fourth carrier removes the pin to a second die, where the heading is completed. When the heading bar retires a forked lever draws the pin from the die and drops it into a receptacle below. It is then ready to be "whitened" and "stuck." The whitening is performed in a copper vessel placed on a fire in which the pins are boiled in water along with grains of metallic tin and a little bitartrate of potash. When the boiling has continued for about one hour the pins and tin grains are removed, thoroughly washed, dried, and polished in bran. Various kinds of apparatus are employed for sticking the pins into sheets of fluted paper, and also in folding the paper for the wrappers.—*The Engineer.*

The highest store rent paid in Broadway is that of E. S. Jaffray's dry-goods store, which brings $60,000. The highest hotel rent is that of the Fifth Avenue, which rates at $100,000 per annum; but the most profitable of all the edifices on that magnificent street is Trinity Building. This is occupied by offices. It cost about $200,000, and rents for nearly one half that sum annually.

It is said that passing a red-hot iron over old putty will make it so soft that it may be readily removed.

BEET ROOT SUGAR.

No. VII.

TECHNOLOGY.—PART IV.

THE PERIER-POSSOZ METHOD OF DEFECATION AND CARBONATATION.

Some manufacturers of beet root sugar in Europe have adopted the new process of Perier-Possoz, which we shall here describe as concisely as we can possibly do it, consistently with clearness.

The milk of lime used has to be divided very finely, by being passed through a close-woven metallic sieve. It must contain 2 per cent of lime, and will then indicate 10° on Baumé's areometer.

Twenty five parts by measure (or a little more), of this solution are to be added to every 1,000 parts, by measure, of juice to be operated on, but gradually, or in eight or ten successive additions, during which the temperature of the juice is raised from 138° to 158° Fah.

At first a greenish albuminous scum is coagulated, but at a later period colorless substances are precipitated.

The "limed" juice is now submitted to the action of carbonic acid gas while it is being stirred, and while at the same time a small stream of milk of lime is allowed to continuously flow into it. This lime, as it is introduced into the juice, is rapidly dissolved in it, and precipitated, carrying along most of the coloring matters and impurities contained in the liquid.

The quantity of lime thus gradually added to the juice, varies from 2 to 8 parts in 1,000 for beets of good quality, and from 10 to 15 for beets of inferior quality.

The carbonatation is arrested at a moment when the juice contains only from 1 to 2 parts in 1,000 of unprecipitated lime. This is known by the rapid clearing of a trial sample, or, better, by mixing a small quantity of the juice to be tested with an equal volume of a solution of chloride of iron of a specific gravity of 1·0035, and of a temperature of 59° Fah., which solution will indicate about 1° on Baumé's areometer. If now a few drops of this mixture be dropped into a solution of ferro-cyanide of potassa, and *no* blue color be produced, it is a sign that the carbonatation must be further continued. If, on the contrary, a blue color is developed in the cyanide solution, then the first part of the operation is known to have been concluded satisfactorily.

The juice, after this point has been reached, is made to flow into decantators, where it is allowed to rest and settle for the space of from 15 to 20 minutes. From these it is run into a second set of defecating pans, where a new addition of lime is made, amounting to one part in one thousand of juice. This is half the quantity used during the first part of this mode of manufacture. Carbonic acid is again immediately admitted, and allowed to flow until complete saturation is effected, which is known by the same trial as above, with this simple difference, that the chloride of iron test solution must have been diluted with seven times its volume of water. As soon as the right degree of saturation has been attained, the juice is heated to the boiling point in order to drive out the excess of carbonic acid. The carbonatated juice is now run into a second set of decantators, where it is allowed to clear itself when it is ready to be conveyed to the bone-black filters for further treatment.

This process furnishes a larger amount of scums and of deposits than are obtained by the ordinary method, described by us in a previous article, and consequently the juice is of a better quality; but it is very doubtful, in our mind, whether in this country the extra expense for lime for the production of carbonic acid, for the lost time, and for the increased labor, will be compensated for by the saving in bone black effected by this Perrier-Possoz system of double defecation and of double carbonatation.

THE JELINEK PROCESS.

By this new process, defecation and carbonatation are simultaneous, and terminated in a single operation, instead of in two successive ones, as in the previous method.

The pans used are furnished with a carbonic acid coil pipe, and are deeper than the ordinary defecating pans. The juice admitted into them is comparatively cold, and must never exceed in temperature 140° Fah.

At least two per cent in weight of lime is added to the juice in the shape of milk of lime, and carbonic acid gas being admitted, the heat is gradually increased until precipitates rapidly form, and fall to the bottom. This process is based on the theory of acting on cold juice at first so as to produce a solution of saccharate of sugar, out of which the carbonic acid gas precipitates the lime as carbonate of lime, which carries along with it a certain amount of organic matter, freeing, at the same time, the sugar which recombines with a portion of lime, to be again freed by a second decomposition of the saccharate and consequent precipitation of carbonate of lime, and so on an indefinite number of times during the period of the *one* single operation.

The carbonic acid is admitted in the pans when the temperature of the juice has reached from 133° to 144° Fah.; at first in small quantities only, but it is gradually increased in quantity in such a manner that the full extent of its production is utilized by the time the temperature of the juice has attained 175° Fah.

In many manufactories where Jelinek's method has been adopted, it has been modified in various ways, both as regards the quantity of lime used, the manner of introducing it into the juice (in one or more successive additions), as also in respect to the mode of admitting the carbonic acid gas, and as to the temperature at which the saturation is effected. We cannot possibly enter here into the detailed account of these various modifications of the original "Frey and Jelinek" process, which demands a much larger amount of lime and of carbonic acid gas, and produces a much larger quantity of scums and of deposits than the common mode of proceeding. It is, however, more simple, and appears to be as effective as the Perrier-Possoz process we have described above.

THE CHEMISTRY OF BEET ROOT SUGAR, JUICE, AND MOLASSES.

The manager of a beet root sugar factory must be acquainted with at least the rudiments of the science of chemistry, without which he cannot possibly understand the why and wherefore of the operations he is directing, and, consequently, must be also ignorant of the means placed at his disposal for overcoming many of the practical difficulties he is sure to encounter during the course of a sugar "campaign." For this reason we have thought that a few words on this very important subject would not be misplaced at this point of our purely practical technological exhibition of the art of extracting sugar from beets, as it may serve to render more comprehensible to others what we have heretofore written, and what further remains for us to say.

The sugar extracted from the beet is perfectly identical with cane sugar in every respect; its specific gravity being 1·623, water being represented by 1.

Its chemical composition is: Carbon, 72 parts; hydrogen, 11 parts, and oxygen 88 parts by weight.

Sugar forms with lime, two compounds known as saccharates. The first of these is produced in presence of an excess of lime; it is soluble in cold water, but nearly insoluble in boiling water, which consequently precipitates it from its cold-water solutions. When thus obtained, saccharate of lime may be washed in hot water without loss, and afterward be again dissolved in cold water. The chemical composition of this saccharate of lime is: Lime, 3 parts; sugar, 1 part.

The second compound of lime with sugar is formed when slaked lime is added to a concentrated solution of sugar, until nothing more is dissolved, and to which 85 per cent of alcohol is added. Its chemical composition is: Lime, 1 part; sugar, 1 part.

A solution of perfectly pure sugar in pure distilled water will not enter into spontaneous fermentation. This takes place, however, when other organic matter is present, or has been carried to it by the atmosphere, especially if this matter consists of the seeds, or *spores*, of cryptogamic plants (mildews).

During the process of ordinary fermentation, sugar is transformed into *carbonic acid* gas and into *alcohol*. If, however, a neutral solution of sugar be caused to enter into fermentation at a high temperature, *lactic acid* is also formed. In most cases of fermenting saccharine solutions, 100 parts of sugar are simultaneously converted into

Alcohol, 51·612 parts.
Carbonic acid, 49·240 parts.
Lactic acid, 3·948 parts.

If a solution of sugar be rich in nitrogenized matter, beside the above, *mannite* is also produced.

The most favorable temperature for fermentation varies between 54·5° and 99·5° of the Fahrenheit scale. The more dilute the solution, and the richer it is in albuminous substances, the more rapid will be the fermentation.

Beets grown in very fertile lands being richer in nitrogenized constituents than those grown in a poor soil, are also much more liable to produce juice subject to fermentation during their conversion into sugar.

The various substances contained in the juice of the beet, other than sugar and water, and which, when possible, must be eliminated before the final termination of the processes of manufacture are as follows:

1. *A yellow extract.* This is only accidentally met with, in badly-grown beets. We have no mode of ridding ourselves of it, as it passes unaltered through all the processes of defecation, carbonatation and filtration.

2. *Silicic acid.* This substance forms with lime an insoluble silicate of lime, which is eliminated during defecation, and the subsequent action of the bone black during filtration.

3. *Chlorine* exists only in a minute quantity in good beets. Its presence is very predjudicial, as it decomposes a certain amount of sugar, and cannot be got rid of by any means at our disposal.

4. *Phosphoric acid* exists in beet root juice, combined with alkalies, which it abandons, to unite with lime, as an insoluble phosphate, which defecation disposes of.

5. *Oxalic acid*, this also forms soluble compounds with the alkalies, which are decomposed by lime, and transformed into insoluble oxalate of lime.

6. *Citric acid* forms soluble combinations with alkalies and with lime, and cannot be eliminated during the process of manufacture.

7, 8, 9. The oxides of manganese, iron, and magnesium are mostly separated during defecation as insoluble compounds.

10. *Lime.* This substance, the value of which is inestimable to beet root sugar manufacturers is also found in the natural juice of the beet. It has the beneficial effect of arresting, to a certain extent, the fermentation of the juice, by its action on the nitrogenized substances contained in it. These last, if left unmolested, transform crystallizable sugar into non-crystallizable sugar (also known as glucose, or grape sugar), and thus, largely increase the proportion of molasses.

Lime is soluble in 725 parts of cold and 1,300 parts of hot water. It forms by combination with sugar both soluble and insoluble compounds or saccharates. Lime exists in the defecated beet root juice in three states: In solution in water, in combination with sugar, and in combination with acids.

A great portion of the lime in the defecated juice is separated by the subsequent process of carbonatation, during which carbonic acid gas combines with it, forming an insoluble precipitate of carbonate of lime. After ordinary carbonatation, a portion of lime, along with some soda and potash, still remains in the juice: this quantity does not, however, exceed 0·071 per cent, and is generally less.

11. *Soda* and *potash*, which constitute from 70 to to 80 per cent of the weight of the ash of the beet root, are freed from their combinations with acids during defecation, and are thus liberated in a caustic state, which is highly prejudicial, as it decomposes sugar and colors the liquids. Many plans have been proposed for the elimination of these alkalies from the juice (the best of which appears to be the use of phosphoric acid), but none have been generally adopted by manufacturers, and to this day nearly the whole of the soda and potash in the beet root are found again in the residual molasses, from which they can often profitably be extracted by a final technical operation.

12. *The albuminous*, or nitrogenized substances in beet juice, are coagulated by the action of heat; but as coagulated albumen is soluble in alkaline solutions, and also in solutions of saccharate of lime, a portion of it remains in the juice until the alkalies and the lime have been neutralized. This takes place during carbonatation, when the lime is precipitated along with that portion of the albuminous substances which have not previously found their way into the scums of defecation.

Albuminous substances, boiled in alkaline solutions, are partially decomposed, producing ammonia, which is easily recognized by its peculiar smell.

During defecation, ammonia is always disengaged.

13. *Pectine* can only exist in the juice in a solid state, as an abnormal substance, in the shape of minute fragments of beet root or as cellular tissue.

The three successive operations of *defecation, carbonatation*, and *filtration* through bone black, are at present our only practical means of eleminating most of the extraneous substances contained in the juice of the beet. Our processes are still far from perfect, and much remains yet to be done before we shall have it in our power, to isolate all the ingredients which now find their way into the molasses, or which act detrimentally by converting a considerable portion of crystallizable into non-crystallizable sugar.

The importance of separating the various soluble foreign compounds in beet root juice from its contained sugar, may be appreciated by the fact that each per cent of these left in it, is equivalent to a loss of sugar equal to its own weight.

Beet root molasses (dripped) contains from 16 to 19 per cent of water, and from 81 to 84 per cent of solid matter. When obtained by the use of centrifugals, however, it contains considerably more aqueous matter than here stated.

Beet root molasses can be perfectly dried only when mixed with some kind of finely-divided solid matter, such as sand.

The quantity of sugar contained in beet root molasses varies from 30 to over 50 per cent of the whole, or even more. This amount of sugar consists in a mixture of crystallizable and non-crystallizable sugar in various relative proportions. If the molasses reddens blue litmus paper, it contains none but crystallizable sugar.

The quantity of mineral salts in the molasses varies from 14 to 20 per cent of its weight; that of the organic matter, other than sugar, from 10 to 20 per cent. A fair average consists of 2·5 of water, 43 of sugar, and 32·5 of extraneous matter.

The quantities by weight of potash, soda, and lime in the ash of beet root molasses amount, respectively, to 51·72, 8, and 5 per cent, which exist mostly in combination with 35 parts of carbonic acid.

The flavor of beet root molasses is so unpleasantly salt and bitter, that it is not utilized in the raw state for human consumption, but is generally either distilled into brandy or alcohol, fed to farm stock, or even, in some cases, used as a fertilizer.

An allowance of 3 to 4 lbs. of molasses per day to a fattening ox, or 1 lb. to a wether, is found to be highly conducive to rapid increase in weight. When given to dairy cows in the proportion of 4 lbs. per day along with beet root pulp and other food, it renders them very productive at a season of the year when provender is scarce and costly.

No satisfactory practical method has yet been discovered for separating, on a large scale, the molasses from its accompanying impurities, although it is known that a considerable portion of these may be removed by the tedious and expensive process of dialysis, for details of which we must refer the reader to the labors of Graham, Tilloy, Walkhoff, Stammer, and Dubrunfaut.

The quantity of mineral salts in molasses may be determined directly, if desired, by Dr. Wieler's *halometer*.

All experiments made in regard to isolating the sugar in molasses, in an insoluble form, have failed so far, in an economical point of view, but as sugar combines with barytes, stronthia, lime, and other bodies forming compounds, which are insoluble at the boiling heat of water, and which subsequently can be made to free their sugar by the action of carbonic acid gas, we have good reason for hoping that ere long this desirable result will have been attained.

It is well known, that if hydrate of barytes be mixed with sugar in solution, a solid granular saccharate is produced, which precipitates by boiling, and may be washed clean in hot water. If this saccharate of barytes be dissolved in cold water, and a current of carbonic acid gas introduced in the solution in a carbonatation pan, an insoluble carbonate of barytes is formed and precipitated, and the sugar is set free.

This process would be admissible if the barytes, which is highly poisonous, could subsequently be entirely got rid of, which, unfortunately, cannot be done in our daily practice.

Stronthia and lime have been used in the same manner as barytes, the sugar being subsequently washed with alcohol to clear it of extraneous matter. For this purpose 300 lbs. of molasses, 110 lbs. of lime, and 360 quarts of alcohol of 82 to 85 per cent are stirred together from half to one hour. The saccharate of lime formed is then pressed, and the alcohol, after being run off, is filtered and kept for use again during repetitions of the same operation.

The saccharate is dissolved in cold water, submitted to the action of carbonic acid gas, and the remaing solution filtered, boiled down, and crystallized. About 25 per cent of the sugar contained in the molasses may thus be recovered. When the price of sugar is high, this process may often be profitably practiced.

The disagreeable taste of the beet root molasses may be removed to the extent of rendering it palatable, and even very marketable, by simply boiling it carefully with a minute quantity of sulphuric acid, and neutralizing the excess of acid by means of powdered chalk, or limestone. Phosphoric acid has also been used for this purpose, as also for getting rid of the lime, in the shape of a phosphate.

The relative quantities of crystallizable and non-crystallizable sugar remaining in the molasses, are, in general, rapidly determined by the manufacturer and sugar dealer by means of optical polarization instruments, of which the best are Mitcherlich's and Bentzke-Soleil's. Full instructions for their use is furnished along with them to purchasers, for which reason we shall here dispense with a description of these valuable saccharometers.

A comparatively exact chemical method for determining the amount of non-crystallizable sugar in sirups and molasses is given by Freiling, as follows:

1. Dissolve 40 grammes of pure sulphate of copper in 160 grammes of water.
2. Put 200 grammes of tartar (*Tartarus natronatus* of druggists) into a small quantity of water, and add 750 grammes of a caustic soda solution of specific gravity 1·2.
3. Mix the two above solutions.
4. Add water until the bulk is equal to 1154·5 cubic centimeters.
5. This forms a blue standard solution, in which 10 cubic centimeters contains oxide of copper sufficient for the reduction of 0·05 gramme of uncrystallizable sugar.
5. Put 10 cubic centimeters of the above in a clean vessel, and add 40 cubic centimeters of water.
6. Heat to boiling point.
7. Add, drop by drop, a solution of the sugar or molasses containing not more than 0·5 gramme of sugar to 100 cubic centimeters of water, until complete decoloration has taken place, or all trace of a blue tint has disappeared.

A very simple calculation then furnishes, as will be seen, the quantity of non-crystallizable sugar in the sample under examination.

Let us conclude this dissertation on the chemistry of beet root sugar by remarking that strong acids, such as sulphuric or muriatic, introduced into saccharine solutions of cane or beet sugar, and heated to from 156° to 166° Fah., have the property of converting the whole of the crystallizable into non-crystallizable sugar.

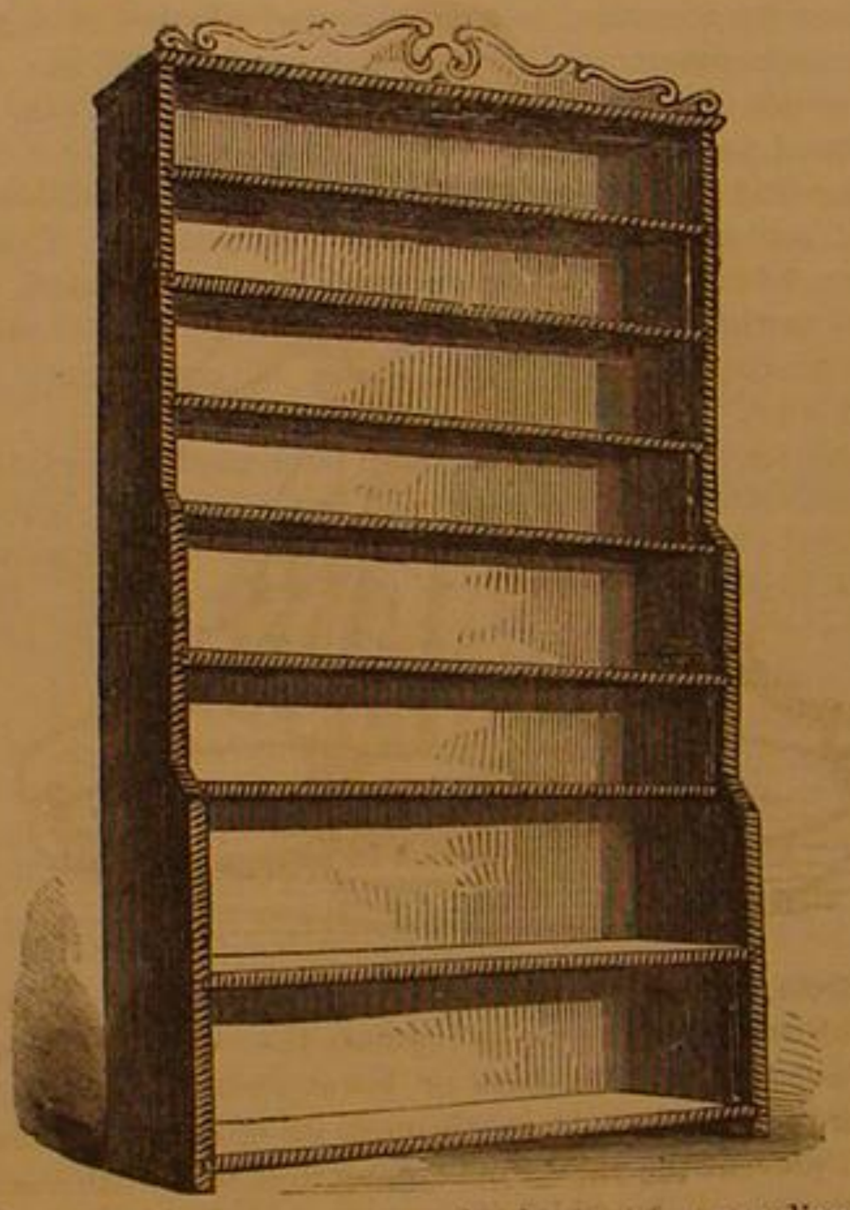
In our next article, we shall proceed with the further practical treatment of the juice of the beet root after its carbonatation has been effected.

Heat of the Stars.

The London *News*, in speaking of the heat of the stars, says: "It would scarcely be thought by most persons that the stars supply the earth with an appreciable amount of heat. Even on the darkest and clearest night, when the whole heavens seem lit up by a multitude of sparkling orbs, the idea of heat is not suggested by their splendor. It will, therefore, seem surprising to many that men of science should assign no inconsiderable portion of our terrestrial heat supply to those distant twinkling lamps. It is not many years since Professor Hopkins, of Cambridge, went even further, and expressed his belief that if the earth's atmosphere were but increased some 13,000 yards in hight, so as to have an increased power of retaining the warmth poured upon it from outer space, we might do without the sun altogether, so far as our heat supply is concerned. As a glass house collects the sun's heat and renders it available during the time that the sun is below the horizon, so he held that the additional layer of air would serve to garner the warmth of the stars in quantities sufficient for all our requirements. But until lately all these views, however plausible they might have seemed, had not been founded upon facts actually observed. It has been reserved for these days in which discoveries of the most unexpected kind are daily rewarding the labors of our physicists to see that established as a certainty which had before been founded merely upon considerations of probability. Mr. Huggins, the physicist and astronomer, has just published the results of a series of inquiries addressed to the actual measurement of the heat which we receive from the leading brilliants of the nocturnal sky. The instrument called the galvanometer, which has been made more or less familiar to many of us by the researches and lectures of Mr. Tyndall, was made use of by Mr. Huggins in these investigations. The instrument was fixed by Mr. Huggins' large refractor, so that the image of a star formed by the eight-inch object glass might fall upon the surface of the thermopile. It will give some token of the care required in researches of this sort to mention that the apparatus had to be left attached to the telescope for hours, sometimes for days, until the needle, whose motion marks the action of heat, had come to perfect rest. When the time came for making an observation, the shutter of the dome, which covers the telescope, was opened, and the telescope was turned upon a part of the sky near to some bright star, but not actually under the star. Then the needle was watched to determine whether the change of position had produced any effect. If, in four or five minutes, no signs of change were shown, the telescope was moved over the small distance necessary to bring the image of the star directly on the face of the pole. Almost always the needle began to move as soon as the image of the star fell upon it. The telescope was then moved slightly away again from the star; the needle was then seen to return to its place. In this way from twelve to twenty observations would be made upon the same star, so that no doubt might remain as to the motion of the needle being really due to the star's heat. In this way, it was found that the bright Arcturus moved the needle three degrees in about a quarter of an hour. So did Regulus, the leading brilliant of Leo, the constellation at present adorned by the splendor of ruddy Mars. Pollux gave a deflection of one and a half degrees; but, singularly enough, his twin brother, Castor, produced no effect at all upon the needle. The splendid Sirius gave deflection of only two degrees; but as this star is always low down, and so shines through a greater proportion of the denser atmospheric strata, it is not surprising that its heat should not be proportioned to its brilliancy."

HASKELL'S PORTABLE BOOKCASE.

"Three removes are as bad as a fire," says Poor Richard, and in no sense are the cost and annoyance of a removal more severely felt than in the unavoidable injury to furniture, and the difficulty of adapting the old articles of furniture to the requirements of the new abode. Peculiarly is this the case with regard to the depository for books. If the victim is of a literary turn, and therefore has accumulated a store of books, he knows the advantage of having a bookcase familiar to his touch as well as his sight, from which he may select a volume without the time and annoyance demanded by undirected search. So a bookcase in which every volume may be found at will is a valuable article of furniture, and if it has the advantage of portability its value is greatly enhanced.



The engraving represents a bookcase of a peculiar style, patented by Ezra Haskell, of Dover, N. H. It may be built of any size, and of any kind of wood. One in our office is of black walnut, eight feet by four, surmounted with an ornamental scroll and holding eight shelves, sufficient to accommodate 250 volumes, of the sizes usually found in a miscellaneous library. Each shelf is hinged to a board forming the back, to allow it to be folded together when the shelf is taken from the upright sides. These sides are grooved to receive the ends of the shelves, which have a projecting iron that engages in a saw scarf in the upper side of the groove, by which contrivance the parts of the case are held firmly together. The sides of the case are hinged at the middle of their length so they can be folded when the case is to be removed. The whole case may be contained in a box 14 by 16 inches and 4 feet long. No tools, screws, nails, etc., are required in taking down or putting up, and when in place the case is an elegant as well as compact piece of furniture. Rights to manufacture or the bookcase may be had of Howard Gannett, 40 Winter st., Boston, Mass.

FREE TRADE AND PROTECTION.

Free trade in its unlimited sense, such free trade as is preached by the most vociferous of its advocates, means dependence upon foreign sources for everything that can be produced abroad cheaper that it can be made at home. It means death to the manufacturing and mechanical interests of the country, and the conversion of the enterprising mechanics, who now add so much to the industrial wealth of the nation, into agriculturists. It means a glut in the market of all agricultural products, and consequent low prices and discouragement to those engaged in agriculture. It means exposure to sudden deprivation of those necessaries of life for which we rely upon foreign sources, at any time our foreign relations become disturbed, consequent and large advance in their price, and distress resulting from diminished supply.

Protection, on the contrary, does not imply prohibition, as it opponents, many of them, unfairly claim. It means only the proper adjustment of tariffs so that we can compete with foreign producers in all those industries, which may, with moderate encouragement, thrive here, and for which we possess equal natural advantages with foreign competitors. It means protection to labor against forced competition with the cheap labor of Europe. It means opportunity for those whose natural genius leads them into other fields of industry than agriculture, to develop that genius and thus add to the mental wealth of the country as well as to its material resources.

All cannot be successful farmers or merchants, and any policy which tends to confine the abilities of men to any one channel, however broad that channel may be, is a bad policy.

We hear a great deal about the distinction between a revenue tariff and a protective tariff, as though these were and ought to be considered separately; we do not believe in this distinction. We hold that the best revenue tariff will be the one that protects the industries of a commonwealth—the sources from which all revenue must come, notwithstanding the sophistry by which it is attempted to disguise this important and fundamental truth.

No more fatal error has ever found adherents in the political history of our country than the doctrine of "free trade." When mankind become one nation, one brotherhood; when all produce equally, not alone for self but for the good of the whole; when ignorance, and greed, and lust of power no longer exist; when the millennium has come, free trade will be the thing. Meanwhile we seem to live in an epoch some thousands of years too early for that blissful consummation.

The truth of the above proposition is found not only in logical conclusions from well-established premises, but in the history of the United States for the last half century. The tariff of 1833 produced its legitimate results in the ruin of 1837, and the country recovered only under the protective tariff of 1842. The subsequent adoption of a free trade policy in 1846, brought us to the very verge of disaster in 1849, which was staved off for a few years by the gold production of California. But 1857 brought the climax of distress upon the country, and there are many young men who can remember that bitter lesson. To use the words of Henry C. Carey—"Once again do we find the country driven to protection, and the public credit by its means so well established as to enable the treasury with little difficulty to obtain the means of carrying on a war whose annual cost was more than the total public expenditures of half a century, including the war with Great Britain 1812. Thrice thus, with the tariffs of 1828, 1842, and 1860, has protection redeemed the country from almost ruin. Thrice thus, under the revenue tariffs of 1817, 1834, and 1849, has it been sunk so low that none could be found 'so poor as to do it reverence.' Such having been our experience through half a century, it might have been supposed that the question would be regarded now as settled, yet do we find among us men in office and out of office, secretaries and senators, owners of ships and railroads, farmers, and laborers, denouncing the system under which, at every period of its existence, and more especially in that of the recent war, they had so largely prospered—thereby proving how accurate has been the description of them by an eminent foreigner as 'the people who soonest forget yesterday.'"

These are well known and often asserted facts, yet blind to their teachings, the preachers of free trade are urging their views upon the public, and enlisting in their behalf even the services of eminent divines and college professors, in order to win by clap-trap a certain class who are led by distinguished names and high-sounding titles. Such men, distinguished for their want of financial ability almost as much as for their great acquirements in letters and theology, are the men who are to instruct the country upon political economy

None are more likely to be deceived by their special pleading than farmers, and no class would be more seriously injured by the adoption of a free trade policy. Far removed from commercial centers, and not conversant with the details of trade, it seems difficult for them to comprehend how cheapening iron and cotton goods should not be beneficial to them. They do not see the connection between the prices of manufactured goods, and the prices of their products, and the value of land. The best way to convince them is to point them to the indisputable fact that when such goods have hitherto advanced in price under the genial influence of protection, their ability to purchase has always advanced in a greater ratio from the consequent increase in the value of farm products. We trust farmers will not permit themselves to be deceived in this matter. Let them judge of the present and the future by the past, which sheds a clear and unmistakable light upon this subject, and in the history of which stand yoked together, invariably, protection and prosperity, free trade and disaster.

The Manufacture of Mustard.

In the preparation of mustard, the seed is first crushed between iron rollers, and then pounded in smooth iron mortars, each about one foot in diameter. These mortars are arranged in a single row, near the walls of some of the rooms, and the crushed seed is pounded in them by large iron bulbs, which are worked by machinery. Each bulb is attached to a long wooden rod, which is raised a few inches by an arm projecting from a rotating shaft, and then falls by its own weight. Several scores of these automatic pestles and mortars soon reduce the crushed seed to the condition of flour and bran, of a dark, dirty color, in consequence of the non-seperation of the seed. The flour and bran are then seperated from each other by means of silk sieves. Eight of these sieves are placed loosely inside a large square horizontal frame of wood, suspended by chains at each of its four corners. Violent eccentric motion is given to the wooden frame, by means of an iron rod passing down its centre, and the sieves have an additional motion of their own in consequence of their being loosely fitted in the frame. In one room alone there are nine of these frames at work, carrying altogether seventy-two sieves of various degrees of fineness. The finer the sieve, the more does the mustard improve in color, and the husk is thrown aside to be made into manure cake for the land; two kinds of seed are thus treated, the brown and the white; the former being much more pungent than the latter, and the two descriptions being mixed to suit the public taste.

PRACTICAL SUGGESTIONS ON TANNING LEATHER.

BY C. GILPIN.

(Continued from page 289.)

UNIFORM TEMPERATURE OF LIQUORS AND DISINTEGRATION OF BARK.

It is generally conceded that the process of tanning is much more rapid during the summer months than through the colder seasons of the year. In other words, the tannin penetrates the hide much more readily during the months of May, June, July, August, and September, than during the other seven months of the year. Those who have given this subject any attention, have doubtless observed that during the summer months the liquor ranged from 70° to 80° Fahrenheit, and fell as low as 35° and 40° during the colder seasons in this climate, and perhaps lower in more northerly latitudes. What the difference in time required, to tan out a stock handled regularly in the liquors of the temperatures named, might be, I regret that I have no exact means of presenting to the trade, at this time, but shall endeavor to possess the information at no distant day, when I will make it public. One fact all are aware of, that it takes considerable less bark to maintain the liquors up to a certain degree of strength in cold than it does in warm weather; the tanning principle not being so rapidly absorbed by the hide, less bark is ground during the winter months.

I can well recollect when it was the custom among tanners to lay away their stock in very heavy layers during the month of October, after sending off all that was ready for market, and letting it lie until the frost was entirely out of the ground, when it would be drawn, and, as a consequence, was found to be but little advanced during that period.

It may be asked upon what principle can this be accounted for, and what is proposed as a remedy. The causes appear obvious, upon the well-settled principle that all matter animate, as well as inanimate, is influenced by the elements, heat and cold, throughout all nature, to a greater or less degree, contracting and expanding the most solid metals, as well as the most delicate animal and vegetable formations; hence, when the liquors are below the expanding temperature, the hide contracts and the pores necessarily become more or less closed, and, when at that point, cause the hide to expand and the pores to open, just in proportion as the temperature is raised, until the whole mass may be disintegrated and a chemical change produced, which alters the entire organic structure of the material operated upon; thus it is clear that when the temperature of the liquors is allowed to fall below the expanding degree, the capillaries, by contraction, present an obstacle to the free passage of the tannin, and it cannot be taken up so rapidly; hence a much longer time is required to accomplish the object.

Having endeavored to define the cause, we will suggest a remedy, which will be to introduce, into every department of the yard, a regular temperature of liquor; and the facility with which the liquors can always be kept at a certain temperature, is the best reason why the manufacturer should lose no time in adopting it, particularly when, as a general thing, they have the facilities for supplying themselves with all the heat that may be necessary for this purpose; and, as a further auxiliary, all the operations of the tannery should be housed in good comfortable buildings, with steam pipes running through them, that would keep them at summer heat, or as warm as experience found necessary, then the junk through which all the liquor passes, should, by means of steam pipes, have sufficient heat thrown into it to insure the desired temperature throughout the entire yard at all times.

Thus, the liquor, passing from the vats to the junk, thence upon the leaches, with the entire establishment kept at a mild temperature, would, it is believed, accomplish all that is deemed necessary to overcome the loss sustained by the inaction produced by cold and freezing weather upon the operations of tanning.

The expense of putting in pipes for the purpose of generating heat sufficient to warm the building, should be no obstacle, when we consider the cost as compared with the advantages gained. Mr. James Calley, of Pittsburgh, informed me that the cost of putting in twelve hundred feet of three-quarter pipe, was two hundred dollars; this included all expenses; and from information received through well-informed sources, it is believed that the whole cost of fitting up a first-class tannery, with the necessary apparatus in the way of pipes, to accomplish our object, would not exceed twelve to fifteen hundred dollars, while the actual amount saved in time and labor in handling the stock, would, it is believed, fully equal one-half of the cost annually, to say nothing of making the workmen more comfortable, and thereby saving time that is always lost in warming feet and hands, in cold, frosty weather, which is the necessary consequence in all yards exposed to the frosts of winter, particularly in northern latitudes.

In communicating with the manufacturers upon the subject of having the bark thoroughly disintegrated before leaching, they pronounced, with one accord, that this was a great desideratum, if not the greatest want, in the operations of tanning. Now, that we have a system of leaching upon the upward hydraulic pressure, by which the liquid can be forced through any density that bark might acquire by being ground never so fine; believing, as most of them do, that under the present imperfect systems of preparing the bark, a considerable portion of the tanning principle is not, and cannot be extracted, under the methods of leaching in general use, without the application of steam and boiling, or very hot liquids, which, it has been repeatedly shown, are generators of impurities, that have an injurious influence upon the leather, what we want is a machine that will thoroughly separate the bark, and discharge it into the leach in the form of saw-dust or shreds, allowing no part of it to escape without being brought to this condition. The best prepared bark that ever came under my notice, was prepared with stones arranged upon the plan of mill stones. It was thoroughly pulverized, or, perhaps, I might more properly say, ground into shreds. Under this method of grinding, no lumps or thick pieces could escape, as is the case now with the most approved mills in use. It would appear, from the past history of the world, in all ages and in all professions, that human nature has been averse to changing old methods for new ones, and the most useful as well as the most profitable improvements, have, too frequently, lingered longer in the murky and almost impenetrable atmosphere of prejudice, and those inveterate old fogies, custom and habit, than the advancement and interests of the great industrial pursuits of life would seem to demand. Yet, however much we dislike change in our systems of doing business, it is among the inevitable consequences, that necessity moves more individuals to adopt improvements than a desire to promote and encourage progress.

PALLISSARD'S WALKING SUPPORT FOR INFANTS.

The device herewith represented is intended to aid infants learning to walk, to prevent them from getting into danger and receiving hurts, and to relieve the mother, nurse, or attendant, from constant care and anxiety. Around the infant's body is secured a cushioned ring made to open on a hinge and properly fastened. It may have straps, if necessary, passing under the child's thighs for support. It is connected to a

lower circle, or ring, of metal by four ornamental bars having adjustable screws at the top to regulate the hight and adapt it to the occupant. The base or lower circle is of such a diameter that it will not pass through an ordinary doorway, and will prevent the child from coming in contact with chairs, tables, stoves, etc., by which it may receive injury. The base is supported on easily-working casters that allow the contrivance to turn or move in any direction over the floor, as the child may incline its body or direct its feet. Its great diameter precludes the possibility of overturning. A little shelf may be affixed to the supporting ring, on which articles of food, or toys, may be placed for the amusement of the infantile occupant.

Patented through the Scientific American Patent Agency, June 12, 1866, by P. Pallissard, who may be addressed at Kankakee City, Ill.

A NEW PROCESS FOR DETERMINING THE COMPARATIVE VALUE OF WHITE LEAD.

BY PROF. C. F. CHANDLER.

To determine the comparative value of different samples of white lead, it has generally been considered necessary to submit them to chemical analysis; an operation which can only be performed by a skillful chemist, and which, if carefully executed, requires much time, and involves, consequently, considerable expense.

It is therefore extremely important that a simple test should be devised, one so easy of execution that it may be applied by all persons interested in paints. Such a test was recently suggested to me by a person who has had many years of experience in the white lead industry, and who desired me to submit his plan to a careful examination to test its reliability. This I have done, and the results are so satisfactory that I desire to place them before your readers, that those interested in the purchase and use of white lead may avail themselves of the test.

PROPERTIES OF WHITE LEAD.

The great value of white lead as a pigment depends upon its opacity, or as painters express it, its "body," or "covering power." Pure white lead differs in opacity to a limited extent, according to the process by which it is made; that prepared by the Dutch method having the greatest covering power. The commercial varieties of white lead differ, however, to a far greater extent, owing to the extensive adulteration which is now practiced; sulphate of baryta, or barytes, a very heavy mineral, much cheaper than white lead, being the chief adulterant employed. The objection to the barytes is its transparency or want of body; it is not opaque, and consequently it does not cover well. A much larger quantity of the adulterated paint is required to produce the desired effect.

There is another objection to barytes, it has no affinity for the oil, and, consequently, when the adulterated paint is applied to surfaces which are exposed to the weather, as on the outside of houses, the oil quickly disappears, leaving the pigment loosely attached, and ready to be washed off by the rain.

Such paint rubs off readily upon our clothes when we come in contact with it.

White lead is a compound of carbonate and hydrated oxide of lead, which unites with the oil to some extent, producing a hard surface, which resists for a much longer time the action of the elements. Oxide of zinc has a similar property.

From these statements the importance of a simple test of the quality of white lead will be readily seen.

THE TEST.

The value of white lead depends upon its opacity; the more opaque it is, the more completely will it conceal a dark color. The test consists, therefore, in mixing a definite quantity of a dark pigment with a definite quantity of the white lead, spreading the mixture on a suitable surface, and noting the tint produced. In my experiments 100 grains of the pigment white lead, ground in oil, as it comes from the mill, were mixed with one-half grain of Eddy's best lampblack, and four drops of boiled linseed oil. These substances were thoroughly incorporated, and then spread upon sheets of window glass, 6 by 12 inches, with a steel spatula. A few of my experiments will best illustrate the test. Pure carbonate of lead and pure sulphate of baryta, both ground in oil, were employed; one-half grain of Eddy's dry lampblack, and four drops of boiled linseed oil, were mixed with—

	White lead.	Barytes.	Color produced.
1st	100 grains	0 grains	light drab.
2d	95 "	5 "	slightly darker drab.
3d	90 "	10 "	" " "
4th	66⅔ "	33⅓ "	" " "
5th	50 "	50 "	" " "
6th	33⅓ "	66⅔ "	" " "
7th	0 "	100 "	black.

The specimens were submitted to six different persons successively, and all agreed in pronouncing them as above recorded. Five per cent may therefore be considered the limit of the accuracy of this test.

OXIDE OF ZINC.

As oxide of zinc is often mixed with the white lead, experiments were made to determine the effect of this pigment upon the tints. The best American zinc white was employed. One-half grain of lampblack, and four drops of boiled linseed oil were mixed with—

	White lead.	Oxide of zinc.	Barytes.	Gave color.
1st	33·33	33·33	33·33	light bluish drab.
2d	50	25	25	darker bluish drab.
3d	50	12·50	37·50	still darker bluish drab.
4th	50	6·25	43·75	" " " "

The tint of the mixtures containing oxide of zinc was quite different from that obtained without the addition of this substance; while with white lead alone, or white lead and barytes, the color was a pure drab; the presence of six and a quarter per cent of oxide of zinc was sufficient to communicate a very decided bluish tint. I think as little as two per cent of oxide of zinc would make itself apparent in this way. This difference in tint makes it a little difficult to decide between two samples of adulterated white lead when one does, and the other does not contain oxide of zinc, as between tints so different in character, it is not easy to decide which is the darkest. In doubtful cases, however, this difficulty may be overcome by adding to both samples the same weighed quantity of oxide of zinc, say ten grains to each.

The colors communicated by the lampblack will then be of the same bluish tint, differing merely in intensity.

The only practical objection to this method of testing will arise from the difficulty of weighing half a grain of lampblack with sufficient exactness.

In my experiments, a chemical balance, which shows the thousandth part of a grain, was employed. The practical painter, however, will have no difficulty in applying this test with sufficient accuracy, if he will weigh out in ordinary scales, say 100 ounces (6¼ lbs.) of each sample to be compared, adding to each half an ounce of dry lampblack and an equal quantity to each sample of boiled linseed oil. After mixing the lead, black, and oil together, *very thoroughly*, spread each sample on glass, wood, or other smooth surface, as nearly alike as possible, when the difference in depth of color, produced by the black, will determine the comparative value or body of each sample.

The sample *most discolored* will have the *least body*, and that *least discolored* the *most body*.

Another very simple test for determining the comparative value of *any white paint* ground in oil, was suggested by the same person—the correctness of which I have fully demonstrated—namely, weigh out, say 100 grains of each paint to be compared, add three drops of linseed oil to each, and spread them with a steel spatula on sheets of glass, 6 by 12 inches, as nearly as possible in the same manner. Place the samples thus prepared between yourself and the light, and you will have no difficulty in deciding which is most opaque. The sample which has obsured the light the most, or appears the darkest when held between yourself and the light, must have the greatest body or covering capacity.

CONCLUSION.

After having made a great number of experiments with these tests, I am satisfied that when they are applied with ordinary intelligence, they will not fail to determine the comparative value of the different grades of white pigments. I would advise every person who makes use of these tests to begin by preparing a series of standard plates for comparison, selecting samples of paint obtained from the most reliable makers.

The East River Bridge.

The Government Commission, appointed to examine into the feasibility of the East River Bridge, has accomplished its task,and has approved all the calculations of Mr. Roebling, the engineer, regarding it. Authority will doubtless be given to begin the work on the return of the Commissioners from a visit to the suspension bridges at Cincinnati, Pittsburgh, and Buffalo, when they will present their report.

The first operations, says the *Evening Post*, will be upon the Brooklyn side, near the Fulton Ferry, where excavations will be made, ninety-seven feet, down to the rock upon which the foundations of the abutment towers will be laid. Digging on the New York side will immediately follow, near Pier 29, East River. Rock is there found at one hundred and seven feet, and is of the gneiss description generally found on Manhattan island.

The new bridge will be a striking and graceful feature of the surrounding scenery. Its proportions will be colossal. The entire length will be 5,862 feet, or about a mile and one-ninth, these figures may vary slightly when the termini become finally settled. The New York terminus will either be on Chatham street, opposite the Register's office, or in Chatham Square. The terminus in Brooklyn will be near the junction of Main and Fulton streets. The structure will thus overtop many houses which are situated upon the slope toward the river on each side. It will be suspended in three openings, two of which will be on land, and one, of 1,600 feet, over the water. The floor will be both fire and water-proof, and will serve as a roof to the houses and stores beneath. Its width will be 80 feet within the railings, equal to Broadway,and will be divided into five spaces,marked by six lines of iron trusses, independently of a sidewalk of six feet on each side.

As the new bridge will weigh 3,483 tuns, being far more than twice as heavy and wide as any other structure of the kind in existence, the jar upon it will be scarcely perceptible, and the most violent winds will be powerless against it. Its weight, in the daytime, will be perpetually augmented by more or less cars, carts, animals, and human beings. The maximum weight of these,if covering the entire surface,would be 1,270 tuns, but an average of about 400 tuns may be calculated on. Two passengers train of cars, upon steel rails, will run backward,and forward over the bridge alternately. They will be attached to an endless wire rope, propelled by a stationary engine on the Brooklyn side. Their speed may be at twenty or thirty miles an hour without injury to the structure. The hight of the bridge, above high tide, will be one hundred and thirty feet, and vessels, the upper masts of which exceed that measurement, will be required to lower them on passing, which can be easily done. Prominent features of the work will be the towers on each side of the river. Their length at the base will be one hundred and thirty-four feet, and extreme width fifty-six feet. Their hight to the roof will be two hundred and sixty-eight feet, at which point the length will be reduced to one hundred and twenty feet, and the width to forty feet.

The charter of the company does not provide for the opening of new streets in the neighborhood of the bridge, nor for other improvements. It is suggested by the architect that one or more blocks between William and Rose, or between Rose and Vandewater streets, should be turned into market halls. A market, he also thinks, might be built in James street, next to the anchorage in Brooklyn.

The estimated cost of the bridge is to be $6,675,357, without the purchase of real estate on either side. It will, perhaps, be nearer $7,000,000. Of this, $5,000,000 have been raised—$3,000,000 by the Brooklyn Common Council, $1,500,000 by that of New York, and $500,000 by private subscription. When the work will have become far advanced,through the expenditure of the $5,000,000 it will be easy to issue bonds for the remaining sum needed.

The Union Ferry Company are now transporting forty million persons annually across the East River. The travel by horse-railroad cars in this city is over one hundred millions a year. It is thought that the certain communication, in all weathers, from Brooklyn, afforded by the bridge, will cause a vast influx of residents to Long Island, in preference to New Jersey, and that in 1880 the amount of passengers to and from Brooklyn will approach one hundred millions a year. The traffic upon the bridge will in no wise injure the shore travel of the ferry boats. It will simply prevent an increase of their number,and an additional obstruction to the shipping of the river.

The Earliest American Engraver.

Mr. Nathaniel Hurd was undoubtedly the first American engraver. Mr. Hurd was born in Boston, Mass., on the 13th of February, 1730. In Buckingham's *New England Magazine* appeared a series of articles on "Early American Artists and Mechanics," the first number of which (Vol. 3, July, 1832) was devoted to an account of Mr. Hurd, accompanied with a portrait. This writer says: "Among our seal cutters and die engravers and engravers on copper was Nathaniel Hurd. His grandfather came from England and settled in Charlestown. He died in that town in 1749, aged 70. His son Jacob married the only daughter of John Mason, of Kingston, in the Island of Jamaica, and died in the year 1758. He was the father of Nathaniel Hurd, who is the prominent subject of this memoir."

Hurd was a real genius. To a superior mode of execution he added a Hogarthian talent of character and humor. Among other things of his, he engraved a descriptive representation of a certain swindler and forger of bills, named Hudson, a foreigner, standing in the pillory. In the crowd of spectators he introduced the likenesses of some well-known characters, which excited much good-natured mirth.

The following is an entertaining account of this print:

"In the year 1672 there appeared in Boston a curious character, who called himself Doctor Hudson. He gave out that he was a Dutchman, that he was possessed of a large fortune, and that he was traveling for his amusement. He was dressed very gayly, tried to push himself into genteel company, and, though rather expensive in his appearance, he showed but little money and displayed no resources. He was well watched. After some time, a fellow was detected in putting off a note purporting to be from the Treasurer of the Province, which proved a counterfeit. His name was Howe; he confessed he was a partner in villiany with Doctor Hudson, and that they had been privately engaged in making up a number of the province notes, which were in high credit in this and the neighboring provinces, and sold readily at an advanced price. The doctor was also taken into custody. They were tried and convicted; Hudson was ordered to the pillory, and Howe to the whipping post. The execution of their sentence was accompanied by the collection of an immense crowd, and immoderate exultation.

"Hurd immediately put out a caricature print of the exhibition, which excited much attention. Hudson was represented in the pillory, and at a short distance was Howe, stripping, near the whipping post. The devil is represented flying towards the doctor, exclaiming, 'This is the man for me.' In front of the print is the representation of a medallion, on which is a profile of Hudson, dressed in a bag-wig, with a sword under his arm (as he generally appeared before his detection) partly drawn from the scabbard, with the words 'Dutch Tuck,' on the exposed part of the blade. Round the edge is 'The true profile of the notorious Doctor Seth Hudson, 1762.'

"In an obituary notice of Mr. Amos Doolittle, of New Haven, Conn., published in *Silliman's Journal of Science and Arts* (Vol. XXII., page 183), April, 1832, it is claimed that he was "the first person who engraved on copper in this country.' This notice states that his first attempt was a print of the Battle of Lexington, after a drawing by Earl, in 1775, which was only two years prior to the death of Mr. Hurd, as will be seen by the above date, eleven years subsequent to the likeness of Dr. Sewall. Paul Revere also engraved on copper some time before the earliest date claimed for Mr. Doolittle. There is a copy of a print engraved by Paul Revere in the Redwood Library, Newport, R. I., representing the massacre of citizens in Boston, on the 5th of March, 1770, which was issued the same year.

"In the art of line engraving Mr. Hurd was his own instructor, and had he lived to a more advanced age would doubtless have distinguished himself yet more in an art, in the exercise of which it is evident he took great delight, and for which it is equally manifest he possessed both taste and talent. He died 17th December, 1777, and was buried in the old 'Granary Burial Ground' in Boston."

Hydrogen as an Illuminating Gas.

In every process, chemical or mechanical, says the *Mechanics' Magazine*, a certain amount of loss or waste of either material or power must take place. The results obtained by a chemical process never coincide exactly with the theoretical formula, nor, mechanically, can the work done, ever equal the power applied. An ignorance, or, what is worse, a culpable neglect of these fundamental principles, has led scientific fanatics to spend their time, money, and ultimately their lives, in a fruitless search after the impossible. The loss accruing to ordinary gas, from the very commencement of its manufacture, to the moment that it flows from the burners, as a source of illumination, is occasioned by both chemical and mechanical unavoidable imperfections. The latter is caused by leakage, owing chiefly to defective joints, unsound pipes, and the carelessness of those who are concerned in its manufacture and distribution. The former is due to chemical action solely, and could scarcely be prevented, which is not the case with the other sources of loss. About fourteen per cent may be taken as the average loss incurred in the manufacture and burning of ordinary gas, or that which represents the actual discrepancy between the theoretical and practical results. The composition of ordinary gas consists mainly of carbureted hydrogen gases, and as hydrogen itself possessses no power whatever of illumination or brilliancy, it is not, at first sight quite obvious what advantage results from its presence. Any one who has dabbled in elementary chemistry is aware that hydrogen gas, when tolerably pure, burns with a pale blue flame, emitting little or no light, but endowed with a very high temperature. At the same time, by causing its high temperature to act upon other bodies, such as platinum and lime, it develops a flame of great beauty and brilliancy. To a similar cause is due the illuminating properties of ordinary gas. The action of the high temperature of the burning hydrogen upon infinitesimal particles of carbon renders them incandescent, and imparts to the gas its powers of illumination. Hydrogen, therefore, destitute of brilliancy when pure, becomes possessed of that property when in mechanical combination with carbon; in other words, when it is carbureted. If it were possible to bestow upon hydrogen illuminating properties without carbureting it, as in the ordinary manufacture, the whole process would be rendered much simpler and more economical. It has been asserted that it would be found a great advantage to employ a much larger proportion of hydrogen in the ordinary gas than what at present prevails; in fact, to constitute it rather a hydrogen gas than that of which it is now composed. A very large proportion of hydrogen is lost in the manufacturing process, which might easily be preserved and utilized, resulting in the production of a gas of a superior quality The same may be stated with respect to other volatile and illuminating ingredients, including the paraffine and benzine, which for the most part are left in the bye products. Were hydrogen more carefully sought for and preserved in the manufacture of gas, the volume would be considerably increased, in addition to a greater purity being imparted to the product. It is notorious that the ordinary gas, in many of the smaller towns, is so impure, and possessed of so small an illuminating power, that many persons refuse to have it laid on their premises. A gas composed mainly of hydrogen would be free from most of the noxious aud disagreeable properties unquestionably possessed by the present great source of public illumination, but until it can be demonstrated that a better gas can be supplied at the same rate, we shall, as usual in such matters, stick to the old plan of manufacture.

Animalization of Vegetable Fabrics.

In the older theories of dyeing, it was held tha the animal tissues of wool and silk absorbed and retained colors more readily than the vegetable tissues of cotton and linen, by virtue of some peculiar animal substauce they contained. As a a consequence of this theory, attempts were made to communicate some animal principles to vegetable fabrics, with a view to improving their powers of receiving colors. The use of cow dung in dyeing madder goods; the use of sheep's dung and bullocks' blood, and urine in turkey-red dyeing, were explained, upon the supposition that they animalized the fabric in some way or other. The present view of animalization is, that it is not possible to animalize a fabric in any other way than by actually depositing upon it the animal matter in question, and that any increased facility for taking colors thus communicated, is effected by the animal matter itself held on the fabric, and not by any new property of the fabric itself. Thus, if a piece of calico is steeped in a solution of albumen, dried, and then steamed or plunged into boiling water, the albumen is fastened upon the cloth, and such cloth is then capable of receiving colors from picric acid, sulphate of indigo, magenta, archil, and other coloring matters, which previously had no affinity for the cloth. But it is impossible to look upon the albumen in any other light than as a kind of mordant acting as an intermediary between the color and the calico, differing, however, from ordinary mordants in some essential particulars. Beside albumen, the animal matters called casine and lactarine, possess similar properties, and have been tried on a large scale, but without any marked success, as mordants or bases for some of the colors, which are not attracted by the ordinary metallic mordants. The increased affinity for colors given to calico by oil, could not correctly, under any view, be called animalization, since the oils are all vegetable oils; but in fact there appears to be a considerable analogy between this case of mordanting and that by coagulable animal matters.—*Dictionary of Dyeing and Calico Printing.*

A Colony of Insane People.

Prof. Griesinger, in his work on "Mental Pathology and Therapeutics" says: "A colony of the insane has been formed in the remarkable Belgian village of Gheel, in which, for several hundred years past, lunatics have lived together with the inhabitants, and even resided in their families. In former times people frequently resorted thither to supplicate the aid of Dymphne, the patron saint of the insane, although people are seldom in the habit now of consulting her oracle. Out of a population of about 9,000, it has from 900 to 1,000 inhabitants who are insane. The lunatics enjoy an amount of pleasure and freedom which never could be permitted them in an asylum. All who are capable of it share in the mechanical or agricultural employments of the sane. The treatment in the main, is very mild, and restraint is never made use of without previously consulting a physician. Suicide is rare and the general physical health so good that in 1838 two of the patients reached upwards of 100 years of age. Owing to the peculiar situation of Gheel, escape by the patients is difficult. With all its advantages, it has undoubted drawbacks But the experiment at Gheel has proved that the greater number of the insane do not require the confinement of an asylum; that many of them can safely be trusted with more liberty than those institutions allow; and that association in family life is very beneficial to many insane patients.

Planters, Manufacturers, and Mechanics' Association of the State of Mississippi.

The above association is a branch of the National Manufactures' association. We are indebted to Mr. Chas. H. Hale of Wesson, Miss., for a copy of the proceedings of this society from Oct. 10, 1868, to Jan. 20, 1869. It contains several able addresses, and other interesting matter, and shows that the people of Mississippi are getting into harness and pulling together intelligently for the advancement of the industrial interests of that State.

A State Fair will be held at Jackson on the fourth Tuesday in October, and as we presume many Northern manufacturers will be interested, we call attention to it. We are not precisely informed who may be addressed in regard to it, but presume letters addressed to the treasurer of the above association (Joshua Green, Esq.), at Jackson, will be proper.

VENTILATION.—The Massachusetts Medical Society offer a prize of fifty dollers for the best dissertation, worthy of prize, which shall describe, in plain language, briefly, "A effective and ready method of ventilating sick-rooms—or that can be put in operation at once, at the moment needed with least difficulty and expense, in houses of ordinary construction." The committee of award consists of five well-known physicians; namely, Morill Wyman, George H. Lyman, Henry G. Clark, Edward H. Clarke, and William Read.

Correspondence.

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

Cheap Gas.

MESSRS. EDITORS:—I send you for publication a few words in reply to an article which appeared in your valuable paper, the SCIENTIFIC AMERICAN, for April 10th, Vol. XX., No. 15.

The article signed "X. Y. Z.," upon the subject, "Cheap Gas," I think is intended to discourage those who hope to secure for New York cheap gas and that of a better quality than has yet been delivered to the consumer. "X. Y. Z." says: "It has often been said, but never proved, that a mode of cheapening gas would be to diminish its cost by saving the amount of freight on the coal used in its manufacture, and that this could be done by making it at the mouth of the mines, and transmitting it, ready prepared, from thence to the center of consumption, which would be a saving of at least $3,000,000 annually."

"But," says "X. Y. Z.," "something stands in the way, which is, that it will take a pressure of 491·74 pounds per square inch to pass through a pipe fifty inches in diameter 195,750 cubic feet of gas per hour." In making this estimate "X. Y. Z." uses a formula based upon a certain result produced in some known case, and he therefore infers that a certain other result ought to follow under other given conditions.

The pipe will be straight and free from any influence tending to check the flow of gas, except from friction, which is proportional, first to the area of rubbing surface, and second to the specific gravity of the gas. The friction of gas upon the pipe is independent of the pressure to which the gas is subjected. That is, the friction of gas along a pipe under a pressure of one hundred pounds per square inch is no greater than if it were only one pound, while it varies with the velocity, the ratio of which "X. Y. Z." does not appear to understand. That gas under a given pressure, moving at a given velocity at the sides of the pipe, will move much faster in the center of the pipe, and with no friction except that of the particles among themselves, must be obvious to the most careless observer; this ratio increases in proportion to the sectional area of the pipe. That fifteen inches water pressure is all that is required to pass in two pipes, of fifty inches diameter each, all the gas necessary to supply New York city and its immediate surroundings, I am prepared to demonstrate to any party of gentlemen who will undertake the enterprise. Instead of a loss of fifty per cent in leakage, there will not be five per cent. I see no reason why there should be any, inasmuch as each and every joint can be driven from both sides, if driven joints were used. A pipe properly laid and lined with suitable material would be perfectly tight and smooth.

When the writer was in New York two years ago the estimate then made for this enterprise, with coal lands sufficient for one hundred years' supply, retort houses, laying of pipes, gas holders, exhausters, and all complete for use, was $32,500,000, which is ample.

When this pipe is laid gas can be sold in New York for $1·50 per 1,000 feet, until which New York must pay present prices for poor gas.

I have made the study of this particular enterprise a specialty for years past, and now am prepared to say that not one obstacle exists to prevent the successful accomplishment of the enterprise, and should "X. Y. Z.," or any other person, wish to meet me before a party of gentlemen ready to undertake a work of this kind, I am ready to convince the most skeptical that it is not a wild scheme but perfectly feasible and practicable, and one that must soon be put in operation.

Wenona, Mich. P. W. K.

Piles Driven by Gunpowder.

MESSRS. EDITORS:—I take the liberty of correcting a little paragraph that appeared in your issue of May 1st, relative to Thomas Shaw's method of driving piles by explosive charges. Instead of the ram being elevated by one charge and driven down by another, but one cartridge is used, as follows: The frame used is an ordinary arrangement, except at the top, where it is provided with a ratchet and pawl to hold the ram up until ready for use. When piles are to be driven, a cast-iron cap is put on the head of the pile, having a small cavity in the upper surface. The cartridge is put in this, and the ram allowed to fall on it by liberating the pawl from the ratchet teeth. A short nipple on the end of the ram strikes the cartridge and explodes it—the result being to force the pile violently down into the earth, and blow the ram back to its highest elevation; the objects attained being to raise the weight by the same force that does the work. By repeated experiments the results obtained by the use of the explosive charge over the ordinary dead fall of the ram alone are as *eight to one*. One man can manage the machine with great ease, supplying the cartridges and letting the ram fall. So quickly does the ram ascend that it is impossible to follow its motion with the eye, and the noise of the "explosion," so-called, is scarcely perceptible, or at any rate not distinguishable from any ordinary mechanical operation. We hope soon to present you with an illustration of it.

EGBERT P. WATSON.

Shipment of Unginned Cotton.

MESSRS. EDITORS.—In No. 4, Vol. XX., new series of your valuable paper, I see the idea suggested by S. D. Morgan, of Nashville, Tenn., of shipping cotton unginned, and believing with him that there would be great advantages, as well to the producer as to the manufacturer, in doing so, I hereby give you a few facts.

In my own State 1,700 pounds of seed cotton will make a bale of 500 pounds of ginned cotton, including the toll to the ginner, which is one-tenth or one-twelfth—1,700 pounds of seed cotton may be compressed in about two bales of the usual sizes of ginned cotton. The producer will save 170 pounds of seed cotton, now worth about 4 cents per pound, $6·80; less baling and ties for one bale, $2·50; balance in favor of producer, $4·30.

The benefit for the manufacturer will be, first, the greater facility in removing all trash with proper machinery before ginning; second, the better ginning of the cotton and the saving of one set of machinery and a great deal of labor; third, all the cotton seed and the oil contained therein.

I am satisfied that this plan would result to the advantages of both the manufacturer and producer. There is a large amount of cotton seed now shipped to Liverpool on account of the oil contained in the seed. The oil cake is fed to cattle. Why not ship the fiber with the seed at once? The cotton fiber during the time of transportation will improve in strength, when adhering to the seed; and there cannot be any doubt, that wherever steamboat or railroad facilities exist, it would be better to ship cotton as fast as gathered in the field with the seed, instead of storing in open pens, where the seed as well as the fiber, is injured by exposure to the weather, now frequently the case with us. H. MILLER.

Belleville, Texas.

Toothache.

MESSRS. EDITORS.—If any of your readers suffer from toothache, or neuralgic affections, arising from teeth in any stage of decay, they may experience relief instantaneous and permanent (at least so far as indicated by the experience of the writer hitherto), by saturating a small bit of clean cotton wool, with a strong solution of ammonia, and applying it immediately to the affected tooth. The pleasing contrast instantaneously produced in some cases causes a fit of laughter, although a moment previous extreme suffering and anguish prevailed.

I have used the remedy for over one year, and have obtained sufficient proof of valuable result to warrant publication. ENTERPRISE.

Cincinnati, Ohio.

Zinc for Roofing.

MESSRS. EDITORS:—I understand that some of the Eastern railroads are making use of zinc as a roofing material for their cars, and that in some portions of the oil regions it is also used for tanks.

Will you allow me to inquire of those of your readers who have had some experience in using it, as above stated, in what way it has been used and with what success?

La Salle, Ill. W. F. KEELER.

Question about Milling.

MESSRS. EDITORS:—I would like some practical miller, who has made experiments and can give a true explanation, to answer the following.

Will a 30-inch burr millstone grind ten bushels of wheat or corn in one hour with less power than a 48-inch stone? If there is any difference in the amount of power expended which stone has the preference N. H. ELLIS.

Croton, N. Y.

Blowing a Wineglass.

I spent hours in the workroom of Murano, at Venice, fascinated, despite the blinding heat, by the fairy forms and rainbow hues evolved before my eyes; by the intense, grave, silent enthusiasm of the workmen, which extends itself even to the small children admitted to watch the proceedings; by the imposibility of quitting the scene of labor until the piece in hand could be secured from failure by completion. On my first visit the head workman was requested by Salviati to make me any article I might fancy; I chose a wine-glass with a deep bowl, initial stem, and broad ruby-tinted foot. The man dipped his hollow iron rod into a pot of molten white glass, caught up a lump, rolled it on an iron slab, popped it into the furnace, blew through his rod, tossed it aloft, and a hollow ball appeared. His assistant handed him a rod of metal, in which a green serpent seemed coiled in a white cage; this he caught, and, quick as lightning, formed two initials, touching the bowl with the tip of the M, to which it adhered. Than his assistant offered more white glass, which was joined to the bottom of the M, spun round, opened with nippers, and so the foot was formed. Again into the furnace, and then the shears opened and hollowed the deep and slender bowl. Then the assistant handed a scrap of ruby molten glass, of which the master caught a hair as it were, wound it around the rim of the bowl and of the foot. Once more into an upper oven, where it must remain until the morrow to cool, and then I drew a long breath of relief; for—knowing that if the metal be too hot or too cold, if too much or too little be taken on the rod, the weight and color will be faulty; that too quick or too slow an action on the part of the assistant, in presenting or withdrawing his rod, may spoil the whole—one cannot watch such processes without intense excitement. This excitement the workmen share in their own silent fashion; and when any rare experiment is going on, all gather around the master in breathless anxiety, while no sound comes from the parted lips save in the form of a hint or caution.

Bureau of Printing and Engraving.

Under the new administration of Geo. B. McArtree this important bureau at Washington has already grown into real value and importance, as now the greater portion of the government money will be printed there.

The new arrangements entirely preclude fraud. The checks and balances are plain and comprehensive, and cannot be misunderstood. The superintendents and assistants make out daily duplicate reports of all work in their respective divisions. One goes to the chief of the bureau and the other to the chief of division in the secretary's office. The copper-plate printing division of this bureau is being refitted and the various divisions reorganized.

As it is proposed to issue a new description of paper money, the paper for the purpose is now being manufactured. A paper maker and clerk representing the Government has charge of the mill, and the contractors can work only under their supervision.

Part of the legal tender notes will be printed out of this city and the remainder here. It is now intended to print all of the fractional currency notes here.

The same plan has been adopted in regard to whiskey and other stamps made for the use of the Bureau of Internal Revenue. In the Secretary's bureau a counting room for the blank paper is in operation, while a similar one will be in use in the printing bureau, and the same, with the money after it is made, except that the counter check room is in the Treasure's bureau.

The hydrostatic presses, about ninety in number, will be abolished, and in their stead roller presses will be used with greater economy; no steam is required and the greater safety of the building from explosions is thus obtained.

The employés, men and women, of the bureau, in the various divisions, have been furloughed until the 15th of May. During this interval all the machinery will be put in perfect repair and everything prepared for a fresh start.

It is proposed to call in the fractional currency. No more of any of the series will be printed. The style of the legal tenders or greenbacks will be entirely different from those now in circulation, and as they supply the place of the old the latter will be withdrawn. A set of books will also be kept, in which all the transactions of the bureau will be recorded, and no difficulty will be experienced in the way of making the proper investigations at any time. The old machinery not required will be disposed of, and all useless dies and plates destroyed.

Editorial Summary.

BRITISH IRON-CLADS.—Laird, the notorious ship-builder at Birkenhead, opposite Liverpool, has just launched a turret iron-clad steamer of 4,272 tuns, twin screws, strong ram, and two large turrets, armed with rifled 600-pounders. This model ship has been built by the Lairds on Captain Cole's plans, in the most thorough and costly manner, to test the principle, and is intended to be the finest and most formidable war vessel in the world. Why the British Government is spending such large sums on its navy just now is not very apparent. It may be the Suez Canal; it may be to give Mr Laird the opportunity to atone for his fault in sending out the *Alabama*. Certainly, all things considered, employing him to build a large part of the British Navy is an act of singular magnanimity on the part of the government.

IMPROVEMENTS IN STEAM VALVES.—A new self-adjusting plug cock or valve is at present being introduced, the *Mining Journal* says, which, it is claimed, is superior to those at present in use, both for economy and efficiency. By the employment of an outer shell, forming a heated chamber round the working shell of the valve, expansion and contraction are equalized; while by the use of two inlets and two outlets, the travel of the plug is reduced to one-half, thereby diminishing the friction and the wear and tear. The plug is kept in its position by a spiral spring packing in the center of the cover inclosing the loose spindle. It is claimed that in first cost these valves are cheaper than any others in use, will last double the time, and will not get out of order.

SOURCE OF PATENT OFFICE REVENUE.—The sum of one hundred and fourteen thousand, seven hundred and fifty-six dollars was paid into the patent fund from the New York office of Munn & Co., for the year ending April 13, 1869. This sum does not include several thousand dollars paid in through our branch office at Washington. The professional business of the Scientific American Patent Agency is the most extensive in the world, and keeps pace with the progress of invention. The above figures scarcely need to be commented upon. They point unmistakably to the fact that inventors know where their interests are most faithfully served.

FIFTY MILES AN HOUR.—The great Runcorn Viaduct, carried on ninety-eight arches, completes at last the fast railway line between London and Liverpool, and the whole distance, 200 miles, can now be run in four hours. A saving of time is effected by not stopping for water, which is scooped up from between the rails, when running at full speed, an operation so easy that it might be universally adopted. It is only to have a long trough, let down a scoop, and the water will rush up a tube and fill the tank.

DE-BRANNING WHEAT.—In answer to the inquiry of H. G., of Maine, in our issue of 10th April, S. Bents, of Maryland, writes that the above process is in successful operation in Liverpool, Eng., and that arrangements are making with parties for its general introduction in this country. He also sends us a specimen of the de-branned wheat, which is a nice article. He does not, however, give any details relating to the process.

A. T. STEWART'S property on Broadway alone is worth about five millions. W. B. Astor's real estate on Broadway is worth about three millions. The Lorillard estate has eight millions invested in that thoroughfare.

Improved Tuck Creaser for Sewing Machines.

The device shown in the accompanying engravings is intended to be applied to the well-known Wheeler & Wilson sewing machine, but may be adapted to other machines. It is a device for forming the tucks necessary in making the plaits on men's shirt bosoms, and for similar work belonging to the intricacies of feminine habiliments. We profess but little practical acquaintance with tucks, gores, biases, gathers, plaitings, etc, and, therefore, leave these mysteries to those more competent—the feminine portion of the community. But it appears to be certain, that the little device represented in the accompanying engravings is valuable, judging from a merely mechanical point of view, and our lady readers will appreciate the improvement, it being an invention of one of their own sex.

Fig. 1 is a perspective view of the arrangement, and Fig. 2 a vertical section of the drum, holding the pivot of the creaser arm, and a coiled spring with its attachments.

The creaser proper is a needle-like bar, A, with a V-shaped crease in its lower end that fits on a ridge, B. The cloth passes over this ridge, being guided by the gage, C, and held up to the edge of the plate, D, by the serrated guide or pressure pad, E, held to the cloth by an adjustable spring, F, and guiding the goods by the inclination of its serrations. The creaser, A, is operated by the needle bar of the machine, which reciprocates the lever to which the creaser bar is attached, by connecting with it at the point, G, covered with elastic rubber.

Fig. 1

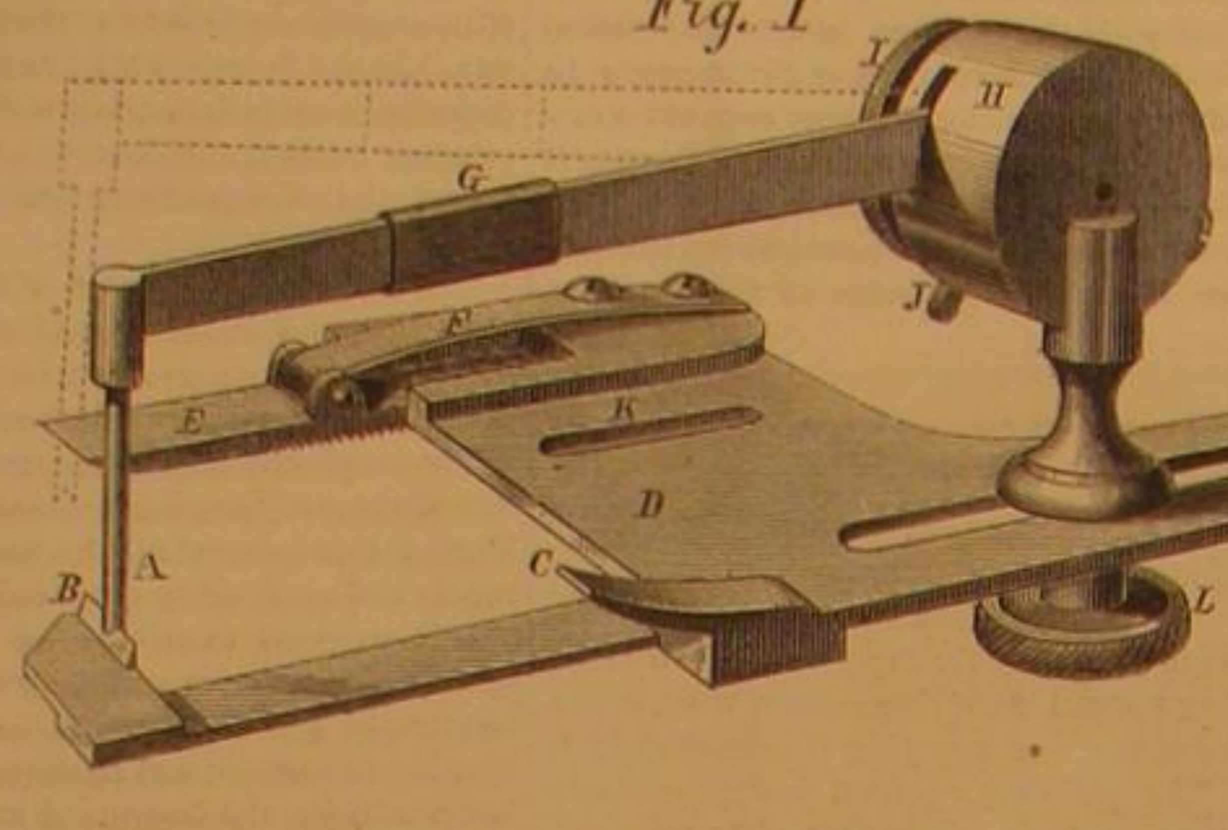
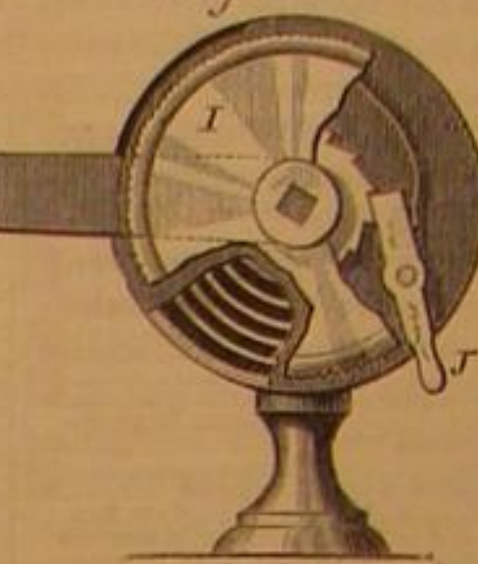


Fig. 2



IMPROVED TUCK-CREASING ATTACHMENT AND GUIDE.

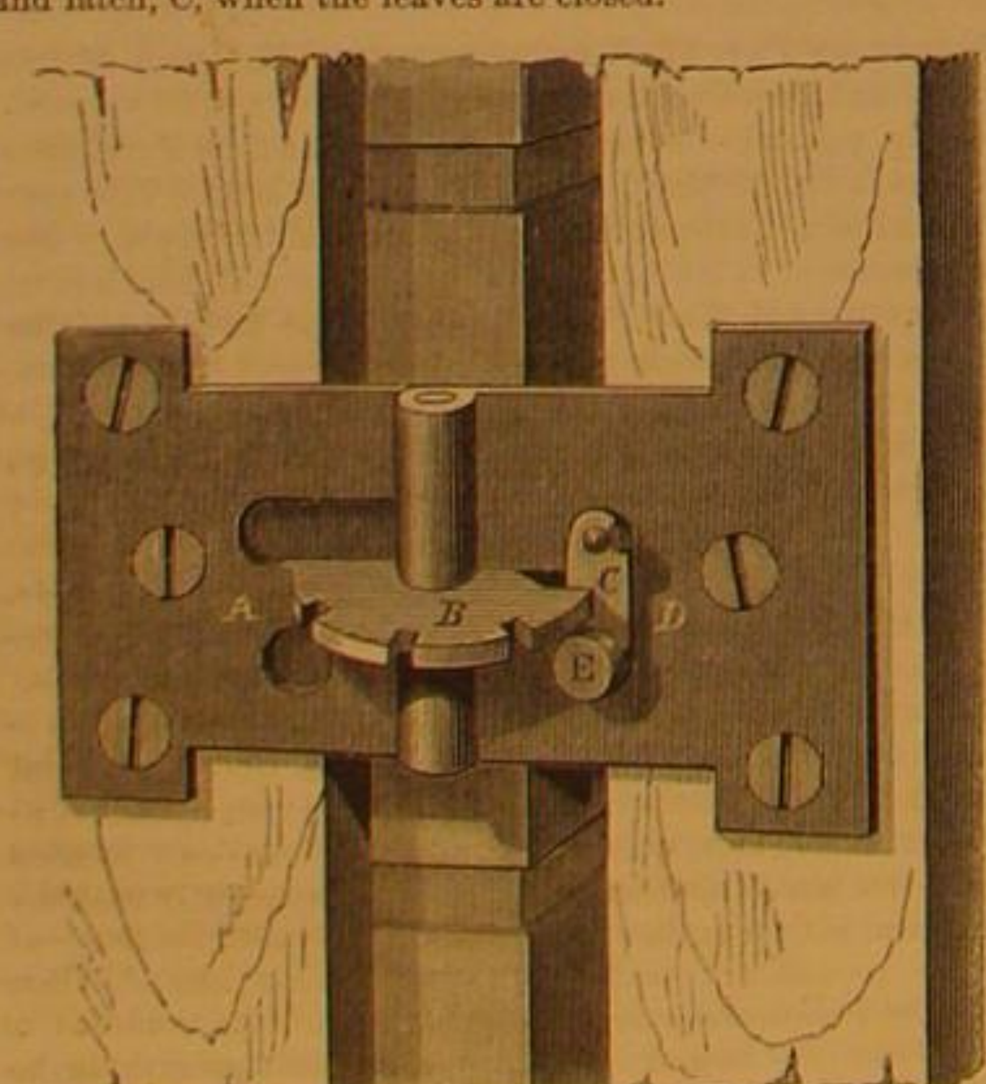
The power exerted by the creaser on the goods, between it and the edge, B, is adjusted to the thickness of the goods by means of a coiled spring, ratchet, and pawl, in the drum, H. This adjustment is effected by means of a knurled button, I, and the pawl, J, in combination with the ratchet that forms a portion of the lever, G. This arrangement is seen plainly in Fig. 2.

The device is attached to the bed plate of the sewing machine by a screw passing through the slot, K. The width of the tuck or plait is regulated by the thumb-nut, L. By this device, the labor of laying plaits and tucks is much lessened, as the work is guided without the aid of the operator, and as the pressure of the creaser may be regulated at will, there is no difficulty in starting the machine or in changing from one quality or thickness of goods to another.

Patented through the Scientific American Patent Agency, January 12, 1869, by Mrs. Anna P. Rogers, who may be addressed, in reference to the device, at Quincy, Ill., care Rogers & Malone.

IMPROVED HINGE AND DOOR STAY.

The object of this device is to produce a hinge for doors, window shutters and blinds, and chests, trunks, and boxes that will set door, blind, or lid, at any angle desired, and hold it in that position. It is an ordinary butt hinge, with single joint, having cast on one of the leaves, A, a semicircular flange, B, notched on its edge to receive the pivoted latch, C, that is pivoted to the other leaf, D. On this leaf is cast a snug, E, that receives and holds the end of the latch, C, when down. The opposite leaf, A, has recesses for receiving the snug, E, and latch, C, when the leaves are closed.



In operation, the door, or other valve, whether door, blind, shutter, or chest lid, is opened to the extent desired, and held in any position required by the catching of the latch, C, into one of the notches of the flange, B. It is evident that the door will be held firmly in this position.

When it is not required that any stop should be put to the movement of the door, the latch, C, is turned up, its free end resting on the flange, and the door may be swung as any other which is furnished with ordinary hinges. Of course there is a slot cast in the leaf, D, to permit the partial rotation of the semicircular flange, B. Adaptations of this device can be readily made for doors, swinging windows, blinds, inside or out, trunks, chests, boxes, etc.

From an examination of the model and the hinge (large size), we are inclined to consider the device a really valuable one, and hinges of this form specially adapted to all the purposes for which they are intended.

Patented Jan. 12, 1869, by M. Umstadter, who may be addressed at Norfolk, Va.

Perpetual Motion.

A correspondent, writing from Ohio, wishes us to use our influence to induce some learned society or wealthy devotee of science to offer a premium for the invention of a perpetual motion. This done, he thinks the invention will be forthcoming ere the end of the year. He speaks mysteriously of a perpetual motion that is almost, but not quite, ready to commence its endless labors. Now we have known something less than a thousand just such machines, but they never got quite ready. Under these circumstances, J. W. will please excuse us. We would rather not recommend any societies or devotees to offer any prizes. There is so much immortal genius lying around loose, that such a stimulant might be dangerous.

IMPROVEMENT IN THREE-WHEELED VELOCIPEDES.

The velocipede represented in the engravings is quite a curiosity; it seems to combine the safety of the three-wheeled

Fig. 1.

machine with the manageableness of the bicycle. Its peculiarities are in the construction of the rear axle, or axles, and the method of making connection between the feet of the driver and the driving wheel. The first permits short corners and small curves to be turned readily, and the latter the application of greater power for ascending inclines, or traveling over rough roads, than can be exerted on the ordinary machines. A brief description will suffice to show these points.

Fig. 2.

The rear axle, instead of being, as in the ordinary tricycle, a single shaft, is in two parts, the inner ends of each formed into toothed segments that engage with a small gear in a box to which the axles and the rear end of the reach are pivoted. The end of the reach is also a toothed segment engaging with the small gear. It will be seen that the inclination of the rider's body, when the vehicle describes a curve, will partly rotate the gear, and consequently elevate the inner end of one axle while it correspondingly depresses the other, thus inclining the wheels toward the center of the circle, of which the curve described is a portion. Ease and facility for turning short corners is thus assured, while the perfect balance of the rider is preserved.

This portion of the improvement is best seen in Fig. 2. In Fig. 1, the device for increasing the power of the vehicle in rising grades is shown. It is simply an adaptation of the plan of gearing used on engine lathes for increasing power and diminishing velocity. The upper or shifting gear stud, or axis, is secured in a slot in the upright support, and may be thrown into gear as required. When out of gear, the velocipede is driven, as others, by the direct application of the rider's feet. No detailed description is necessary to make this portion easily comprehended. It would seem also that this device might be advantageously applied to ordinary wagons with good effect. The method of adaptation will readily suggest itself to the intelligent mechanic from the foregoing description and accompanying illustrations.

Patent pending through the Scientific American Patent Agency. For additional details, address the inventor, N. C. Stiles, Middletown, Conn.

A Long-Tailed Comet.

James Fisk, Jr., of this city, was once a dashing peddler in New Hampshire, afterwards a dry goods merchant in Boston, and, if we mistake not, he was instrumental in galvanizing into life the "Goulding carding machine patent," which had been dead for a quarter of a century—an operation which, unassisted by anything else, would stamp Fisk as a genius of the highest order. His fame, however, does not by any means rest upon this performance, extraordinary though it be; he also plays the part of one of those brilliant long-tailed comets which go blazing away through space to the astonishment of everybody. He is in turn a peddler, a merchant, a Wall-street broker, a railway director, a financier, an operatic and theatrical manager—so shrewd and audacious withal, that everybody is wondering what Fisk is going to do next, and in order to gratify this laudable curiosity, Fisk adds to his other titles that of "Managing Director, Narragansett Steamship Company," and proposes to run two elegant steamboats from New York to Newport and Fall River. But to run them like other people would not be characteristic of Fisk. There must be a sensation on board. The comet's tail must blaze about the decks. The steam calliope will not do—that has played out. Fisk wants, therefore, to contract for two orchestras, ten pieces each, first-class musicians, and promises to give seven months' steady employment, living included. This steamboat company did not pay last year. Fisk makes everything pay.

Gold Beating.

The art of gold beating, says the *London Builder*, is a very ancient one. There seems great probability, that, like some other arts, it has been known and practiced and forgotten. Homer refers to it; Pliny, more practical, states that gold can be beaten, one ounce making 550 leaves, each four fingers square—about four times the thickness of the gold now used. This is most probably such gold as was used in the decoration of the Temple—"It was covered with plates of burnished gold." The Peruvians had thin plates nailed together. It is possible that if decorations of this character were used in these parts, their insecurity would so trouble some folks that they would have no rest till they were effectually "nailed." The Thebans have in their wall histories some gold characters done with leaf said to be as thin as the gold of the present day. Coming down with a jump from the long past to the present age, we find our country celebrated for its gold-leaf. Italy used to excel us, but Italy has been in a long sleep, and is only just awakened. It is one of the last things our overgrown offspring undertook to make for herself. Until very recently she imported all the gold-leaf she required from this country. The gold-beater's skin made here is still the admiration of the world (of gold beaters). This skin is gut skin, stretched and dried on frames, after which each surface is very carefully leveled, a labor intrusted to the delicate hands of young girls. A mold (as the number of square pieces of skin beaten at one time in the gold-beating process is called) is an expensive article, costing from £9 to £10, and when useless for gold beating is still of some value. Fifty or sixty years back a workman made 2,000 leaves of gold from 18 or 19 dwts. of gold; now, by better skin and skill, he is enabled to produce the same number from 14 or 15 dwts., showing a considerable reduction in the cost of produce, and, as may be expected, a deterioration in the quality of the article. One grain of gold beaten between this skin can be extended to some 75 square inches of surface, the thickness of which will be 1-367650th part of an inch. These figures represent what may be done. What is done for the purposes of trade is somewhat less—namely, 56½ square inches per grain, 1-290000th of an inch in thickness. To give an idea of its thinness, it would take 120 to make the thickness of common printing paper, 367,650 sheets of which would make a column half as high as the Monument.

Lookout Mountain, near Chattanooga, contains a cave that is said to have been explored for a distance of eight miles.

Some California papers pronounce the White Pine mining district as being, with few exceptions, all "Wildcat."

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Contents:

(Illustrated articles are marked with an asterisk.)

VIS INERTIA.

All are familiar with one of the many definitions given in the works on physics, of the term "Vis Inertia"—a want of power in a body to move itself when at rest or to come to rest when in motion. As however no human eye has ever seen a body or matter in a state of absolute rest, and as we know nothing of matter in that state, it is perhaps to be doubted whether we are justified in predicating anything of it in that condition. In fact it is quite possible that matter does not anywhere in the universe exist in a state of rest; and it seems quite consistent with the facts already established in physics, to consider motion as an essential condition of the existence of matter, that is so far as any knowledge of it is obtainable through the medium of our senses.

All the ideas we can get of matter are inseparably connected with motions of atoms, molecules, or masses. Let these motions at once and wholly cease in any aggregation of matter, and we have not the slightest ground to suppose that its existence would be determinable by us. We could walk through it without experiencing any resistance; it would no longer have color, form, weight, or any of those characteristics by which we are able to recognize material objects.

But while we know nothing of the state called rest, we see around us everything in motion and refusing absolutely to move less, without increase of motion in some other matter. Nay, the amount of motion lost in any body must be exactly compensated for by the motion of other matter. Nature will not permit a loss from the sum total of motion of even an infinitesimal amount. Her books always balance. We see then that of matter at rest we know nothing, and consequently, can predicate nothing. In moving matter we see the most positive tendency of motion to continue. Note this is not a negative proposition. Motion is as positive a property of matter as gravity.

Now, if "vis inertia" means anything, it is negative in its signification. It means that a body *cannot*, of itself, change its state, whether that state be one of motion or rest. Now, we might go on to any length and predicate negative qualities of matter without giving or attaining a single idea in regard to it. To say that vinegar is not sweet, would give no idea of vinegar to any one who had no knowledge of it. It is only when we assert some positive quality that ideas are conveyed. If we say vinegar is sour, then we express a quality of vinegar, and a definite idea is conveyed by our language. When we say, as does Bartlett, in his "Philosophy of Mechanics," that *matter is inert* in relation to the state of motion and rest, we are either hiding a negative meaning in a positive form of expression, or stating a false proposition.

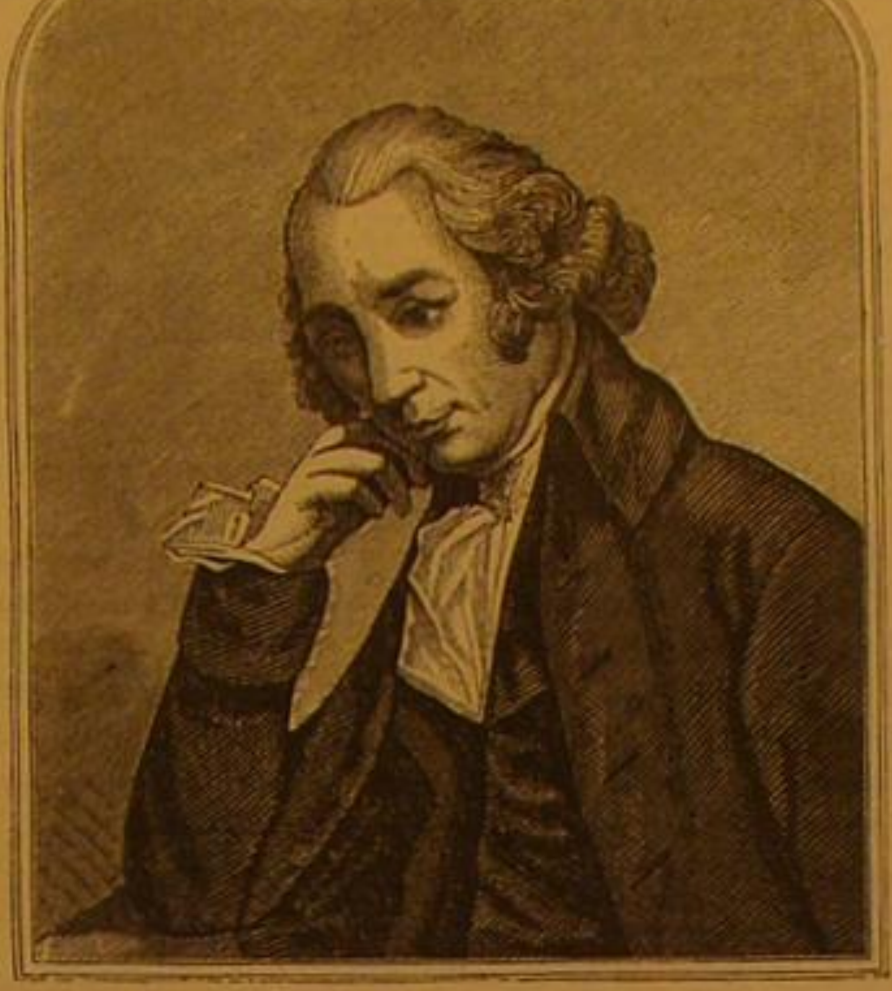
Many modern writers have seen this and have dodged the issue in their definition of inertia, in so far as they have confined it to the tendency which bodies have to maintain such motion as they possess.

Now we submit—and we believe the greater number of those who write and think upon this and cognate subjects will coincide with us in the opinion—that if it be desired to indicate the tendency of motion to continue, no more inappropriate term could have been selected to indicate this property than inertia.

The use of terms which in their primary signification mean one thing, to indicate something which is not only different but diametrically opposite, is not, to say the least, logical; and the different views of the real meaning of the term in question, have not only given rise to differences in opinion but also to grave error. The term is the offspring of obsolete notions of force, and the attempts to make it do duty in the vocabulary of modern science should be abandoned. Certainly it would not be difficult to agree upon a substitute that should aptly characterize the tendency of motion to continue, and shake ourselves clear of ideas pertaining to a purely hypothetical state of matter—rest.

CENTENARY OF THE STEAM ENGINE---JAMES WATT.

For the purpose of perpetuating the fame of revered patriots and renowned warriors, almost every nation has been accustomed to hold anniversary ceremonies. In more recent times such occasions have been laudably instituted to pay respect to great poets, such as Shakespeare, Schiller, and Burns—those mighty bards who have made the chords of the human heart vibrate with every emotion. But there is another class of great men whose achievements have been as beneficial to society as those of heroes, poets, and statesmen, and yet, so far as we recollect, no suitable anniversary ceremonies have ever been held to do honor to their memory. We refer to inventors of improvements in mechanism—those men who by their genius, skill, and perseverance have made the forces of nature,



the docile servants of man. We therefore embrace the present opportunity of paying a tribute of respect to the memory of one whom we regard as the representative man in his domain of invention. We mean James Watt, the great improver of the steam engine—that wonderful motor which has not inaptly been called "the iron apostle of civilization." This is not his natal day, but it is the centenary of the occasion when his first improvement was made manifest to the world by descriptive enrollment in the London Patent office.

A century ago, there was not a single steam engine in the strict sense of the term, in the wide world. The windmill, the water wheel, and the horse-gin were the common extraneous powers employed by man to assist him in executing severe toil. Excepting in the case of animal labor, these powers could only be used in few situations. Look now at the triumphal career of steam power. Since 1769, it has become the chief ruler over the manufacturing and commercial world, as it is applied everywhere, on land and water, for innumerable purposes. It operates mechanism in mines on the lofty Cordilleras, as well as in mines in the valley of the Mississippi. It moves vessels on the rivers of every continent—on the Nile, the Ganges, the Thames, and the Hudson, and, scorning the fickle winds, it has made the Atlantic ocean a great ferry between the old and new world. And in its latest and most princely adaptation—the locomotive—it moves long trains of elegant carriages over the Alps, and the Alleghanies; and on the railroads of the United States alone, no less than fifteen thousand of such engines are at present employed. From the cradle to the grave, it has become the faithful servant of man, operating the mechanism which prepares his daily bread, and the loom which weaves his swaddling bands, his wedding garment, and his funeral shroud. There is no individual now living who does not share in the benefits which James Watt has conferred upon society.

The town of Greenock, in Scotland, is the native place of James Watt; the 19th of January, 1736, was the day of his birth. From infancy his health was feeble, but he early gave evidence of possessing superior mental gifts. Not being able to attend the parish school, his father, who was an educated man, gave him instruction at the fireside, and the pupil was not an inattentive scholar. His very amusements were of a useful and recondite character. Drawing, geometry, and the construction of machines were his delight. Having been provided with a box of tools, he made various machines before he was twelve years of age, and among the number was one with which, at that early date, he astonished the household and the boys in the neighborhood by giving them shocks of electricity. As he advanced toward manhood, his thirst for solid information and his power of acquiring a knowledge of the severer sciences seem to have been wonderful. His love of practical mechanics, however, was dominant, and his predilection led him to London at the age of nineteen years, for the purpose of perfecting himself in the art of making philosophical instruments, there not being a single establishment, at that period, in all Scotland, where he could be instructed in the business.

It is stated that after a year's residence in the British metropolis, he returned to his native land with such a high reputation for mechanical skill that he was at once employed to repair and set up the astronomical instruments for the new "Macfarlane Observatory," connected with the college of Glasgow. Being a stranger and not a burghess of the city, the old trades guilds would not allow him to do business on his own account within the bounds of the corporation. But the faculty of the college—always distinguished for encouraging practical mechanics—got over the difficulty by providing the young mechanic with a shop within the gates of that famous institute.

Here he pursued his calling unmolested by the trades societies, and he fitted up the instruments in the observatory to the entire satisfaction of his patrons. The learned authorities had also the good sense to retain him afterward as their mechanic, to superintend, make, and repair all the machines and instruments required in exposition of the subjects taught in the classes. It was while engaged in repairing one of the working models belonging to the class of natural philosophy, that he made the discovery, and invented the improvement, which has immortalized his name in connection with the steam engine.

A small working model of what was called "Newcomen's combined steam and atmospheric engine," was placed under his charge for repairs, as it did not work satisfactorily. It represented practically all that was then known of steam applied to operate mechanism, and consisted of a boiler 9 inches in diameter; a vertical cylinder 2 inches in diameter and 6 inches in length. The cylinder was open at the top, but fitted with a piston to which was attached a chain connected with a walking beam, secured on a pin to a post upon which it vibrated; the other end of the beam was connected with the plunger of a pump. Steam was admitted from the boiler under the piston, and when the latter was elevated to the end of the stroke, the steam was shut off and a jet of cold water from an elevated reservoir was injected into the cylinder, condensing the steam and forming a vacuum under the piston, which descended by the pressure of the atmosphere upon its outer surface. When the piston had made its descent, the condensed water was allowed to flow out of the cylinder, steam was again admitted and condensed, and the piston elevated and depressed, as before described, thus giving a vibratory motion to the beam and working the pump. It was single acting—not a pure steam engine—crude of construction, and only about a dozen of such were in use in Great Britain for pumping in some of the English mines. Its waste of fuel was so great, that some of the mines where it had been employed were about to be abandoned as unprofitable investments. The great waste of steam in heating the cylinder, which was the condenser, up to 212 deg. after each stroke of the piston, at once arrested Watt's attention and engaged his thoughts; and it is related that, while taking a walk on the banks of the river Clyde, on the morning of the 28th of April, 1765 (this date rests upon memory, no record having been made at the time by the inventor), the thought beamed into his reflective mind, like a ray from the celestial regions, that steam being an elastic fluid, if he placed a second cylinder on Newcomen's engine, connected with the steam cylinder by a pipe, and allowed the jet of cold water to play upon it, the steam from the working cylinder would flow into it, at the end of the stroke, and be condensed forming a vacuum under the piston. If this could be effected, he reasoned, the working cylinder would be maintained at a uniform temperature and a great saving of fuel secured. Within twenty-four hours after this thought flashed into his mind, he had made a rude model and tested the invention by an experiment with such satisfaction to himself that his mind was filled with rapture. From this we trace the invention of the separate condenser—that improvement in the steam engine, which at once saved two-thirds of the fuel formerly required and rendered the steam engine the King of motors.

We have been somewhat minute in describing this invention because it was the first grand improvement in steam engineering by which, in these latter days, commerce and the manufacturing arts have been revolutionized, man supplied with almost unlimited productive power, and the name of Watt become to practical mechanics what Newton's is to philosophy.

At the time of this invention, James Watt was twenty-nine years of age, and during nine of these years he had been mechanician to the college in Glasgow. During the regular hours of labor he attended faithfully to his trade—his regular business—but his spare hours were devoted to the highest and noblest ends—acquiring solid and useful information. And so superior were his abilities and powers of acquisition, it is related that he became a philosopher and scholar as well as a skillful mechanic. He was acquainted with chemistry, anatomy, architecture, civil engineering, and the science of music; and he acquired the Latin, French, Italian, and German languages for the purpose of finding out what knowledge in science and the arts was contained in these tongues. His parlor was the rendezvous for all the students remarkable for scientific predilections, and the celebrated Dr. Robison—afterward professor of natural philosophy—said of him: "Whenever any puzzle came in the way of any of us, we went to Mr. Watt. He needed only to be prompted: everything became to him the beginning of a new and serious study, and we knew he would not quit it until he had either discovered its insignificance, or had made something of it. No matter in what line—language, antiquity, natural history, nay poetry, criticism, and works of taste; as to anything in the line of engineering, whether civil or military, he was at home and a ready instructor. Hardly any projects, such as canals, deepening rivers, surveys, or the like were undertaken in the neighborhood without consulting him." Such is the testimony of a very distinguished man to the character, skill, and acquirements of our representative mechanic.

The mind of Watt seems to have perceived the importance of his invention almost before his first rude model was completed. His purse, however, was light, but his faith was strong. He therefore borrowed sufficient funds to make further experiments, and a good working model to show the advantages of his improvement. But beyond this he could not proceed, not even to secure a patent, without further assistance in the way of capital, and the difficulty was to find it. His native country was then poor to a proverb, except in religious freedom, education, and philosophy, and these could not build a steam engine. After many discouragements, a friend to the invention was found in an English gentleman—Dr. Roebuck—who agreed to furnish one thousand pounds (five thousand dollars in gold) to introduce the invention in consideration of owning two-thirds of the patent.

This instrument was obtained in January 1769, but not enrolled until the 29th of April following—just one century ago! It contained a very clear description of his condensing engine, also of a high pressure steam engine, and how it could be applied to various purposes. At this stage, however, its introduction was arrested by financial difficulties in Dr. Roebuck's business, and for the following five years, James Watt could not find a person in all Great Britain who had the capital, courage, and enterprise to become his partner, and furnish the funds to build engines. At last, through the friendship and zeal of Dr. Small—once the tutor of Thomas Jefferson—an engine with a cylinder 18 inches in diameter, was put up in Birmingham; and Mr. Matthew Boulton, a wealthy manufacturer, was so pleased with it, that he purchased the interest of Dr. Roebuck, and at once the manufacture of the engines was commenced with energy. A special act of Parliament extending the patent for twenty-five years was obtained. Watt took up his abode in Birmingham, to superintend the business. Soon the fame of the invention spread far and wide, orders for the new engines poured in rapidly, old mines that had been abandoned were reopened, many new mines were commenced, and a new era in practical mechanics was introduced. Generous and fair was the conduct of Boulton and Watt toward those who desired their engines for mines. They took the old engines of Newcomen as a standard, and simply required the payment, as a royalty, of one-third the value of the fuel saved by the new engines. James Watt was now afforded the leisure and means to devote all his attention to improve his engine. Very soon, he made it double acting—a complete steam engine—and added improvement to improvement so rapidly and successfully that under his care he rendered the low-pressure condensing engine nearly as perfect as it is at the present day. The struggle was long and arduous, but deserved success ultimately crowned the efforts of the great inventor. He had the satisfaction of applying it himself to almost every purpose, for which it is now employed, and we in the New World feel gratified that he planned and built in 1805 the engine of the *Clermont*, our first successful steamboat.

Other heads and hands developed the locomotive, but he seemed to have beheld it in mental vision moving down the avenue of time, for he described in his patent, how steam could be applied to drive carriages on roads. Language is incapable of conveying adequate ideas descriptive of the benefits which have been conferred upon man by the steam engine. Day and night, on land and sea, on steamship and locomotive; in factory, foundery, mill, and workshop, the grandeur of the invention is proclaimed throughout the whole civilized world.

In the United States steam power is employed equal to the labor of 130,000,000 of men, and in Great Britain, equal to 400,000,000. It gives speed to the iron steed surpassing that of the fleetest Arab, and it moves the press which daily prints the records of our morals and the transactions of our lives. Perhaps the city of Glasgow, where Watt invented his engine, affords the best illustration to be found anywhere respecting what steam power has done for some communities. In 1755, its population was only 22,000, to-day it is 500,000 Then no man could be found in it, possessing sufficient wealth and enterprise to invest one thousand pounds in Watt's engine, now it is the engineering metropolis of the world, furnishing nearly all the great iron steamships for the merchant navies of every nation in Europe.

In the old college where the invention had its birth the inventors first model is still reverently preserved in the museum, standing beside a noble bust of its inventor. But as a fitting climax to its history, illustrating the conquering and progressive power of steam, a new structure of grandeur and more imposing dimensions, to take its place, is about to be erected in another part of the city, and the venerable old building, the cradle of modern steam engineering, will soon be occupied as a great railway depot, a rendezvous of the highest type of the steam engine.

As James Watt advanced in years, wealth and honors flowed in upon him. He was elected a member of the Institute of France, and men of the highest attainments in science and art sought and cherished his friendship. He must have been a lovable man personally. All the records of him afford abundant evidence of his wonderful gifts, his gentle and unassuming manner, and his generous and truthful nature, and that he was admired and warmly beloved by everyone who knew him intimately. We have chiefly dwelt upon his life and character as connected with the invention of the steam engine, but that was not his only invention. The power indicator, the steam hammer, and several other machines in common use, were also the fruits of his genius; and in the science of chemistry, he was the discoverer of the composition of water. Take him for all in all, he stands out on the page of history, a unique and wonderful man. Old age stole gently upon him, and although his constitution was delicate, he attained the advanced age of fourscore and three years. In the early autumn he felt the approach of the messenger summoning him away to "The better land." In calmly contemplating the solemn event "he expressed his gratitude to the Giver of all Good, who had prospered the work of his hands and blessed him with length of days, riches, and honor;" and the great inventor calmly fell asleep, to wake no more on earth, on the 19th day of August 1819. All that remained of his earthly tabernacle was carried to the parish church of Handsworth, and there interred beside his departed associate Matthew Boulton. His funeral was attended by a large concourse of distinguished persons and his faithful workmen who exhibited sincere sorrow at his departure from among them forever.

The news of his death produced a profound sensation throughout the kingdom, and men of all ranks and degree held meetings and passed resolutions of respect to his memory. Monuments have been erected to him in various towns and cities, and a colossal statue by the celebrated Chantrey has been placed in Westminster Abbey bearing the following unequaled lapidary inscription, by the late Lord Brougham.

Not To Perpetuate A Name
Which Must Endure While The Peaceful Arts Flourish,
But To Show
That Mankind Have Learnt To Honor Those
Who Best Deserve Their Gratitude,
The King,
His Ministers, And Many Of The Nobles
And Commons Of The Realm,
Raised This Monument To
JAMES WATT,
Who, Directing The Force Of An Original Genius
Early Exercised In Philosophic Research,
To The Improvement Of The Steam Engine,
Enlarged The Resources Of His Country,
Increased The Power Of Man,
And Rose To An Eminent Place
Among The Most Illustrious Followers Of Science,
And The Real Benefactors Of The World.
BORN AT GREENOCK, MDCCXXXVI.
DIED AT HEATHFIELD, IN STAFFORDSHIRE, MDCCCXIX.

HABITS OF MECHANICS.

That "habit is second nature" is not only true, but it is evident to the observant that this second or acquired nature is frequently stronger and more influential than the first or original nature. This is equally correct whether predicated of bad and injurious habits, or of good and beneficial ones. No one who has arrived at maturity but knows from his own experience the strength of habits—habits acquired, perhaps, imperceptibly and remaining unnoticed by himself until matured, and then but for an effort of memory their possessor would find it difficult to determine that they were mere accretions and not innate qualities. The importance of forming, or rather acquiring correct habits, is thus very forcibly made apparent. It forms the text for many a homily by teachers of morality; we prefer to use the fact in a different but perhaps not less important, although restricted, sense.

Let us apply it briefly to the mechanic, not as a man, an individual, a member of the community only, but mainly as a workman. It is evident that if slovenly and careless habits are once acquired it must require an effort to get rid of them; and this effort is much greater than that necessary to acquire others. Every observing mind must acknowledge this proposition, evidences of the truth of which may be found in his own experience as well as in his own observation. It is harder to overcome the pressure of habits already acquired and formed than to form others. From this it follows that the contraction of bad or improper habits is to be avoided. One of the duties of masters or employers to their apprentices and workmen should be the inculcation of correct habits in the shop, not by arbitrary rules, alone, or verbal direction, but by example. Here many fail. A master, employer, or foreman, in escorting a visitor through his establishment or department, frequently disarranges the work or the tools of the workman, and expects him to rectify these errors. So in examining a job in progress, he will delay the work and disgust the workman by his inattention to the details of "Heaven's first law," according to Pope. In such a case no rules or directions can overcome the influence of such carelessness.

Order should be the general rule of workshops and workmen; not merely order in the subdivision of the work and the arrangement of the men in gangs, but extended to the minutiæ of care of tools. Each workman should know the proper place of every tool he handles, when not in actual use, and should promptly return it to its place when done with. This presupposes a place for every tool; the providing of which should be the business of the "boss" or proprietor, or whoever has immediate control. It should be a habit of the mechanic to put a tool, he has used, in order for the next user, not to leave its repair for him who next needs it, whose time may be too valuable to waste in preparing the tool for his work. Of course, this rule is subject to modifications according to the nature of the work performed in the establishment, the number of workmen, etc.; but the rule should be imperative that the tool, when wanted, should be in working order. Some may think such a requirement entails useless labor, but from our own experience we are certain that time is really saved by a rigid enforcement of the rule.

"Sloppy" workmen, and disordered shops are an abomination; too many of them exist; none are necessary. Work men who leave a tool where they last used it, or throw it carelessly under a bench are unfit for their business. However skillful and experienced, their skill and experience will not outweigh the annoyance and cost in time by their careless habits.

A habit of promptness is hardly less necessary to make a successful workman than a habit of order. The tardiness of one man, delaying his appearance in his place at the proper moment, may hinder a dozen others and disarrange the order of a whole department. We have known of a case where a neglect of the practice of punctuality involved a cost to the proprietors of more than two hundred dollars, and secured the dismissal of the offender.

Not less is it necessary to cultivate a habit of using each tool for its special and intended purpose, and no other. The use of a screw wrench as a hammer is to be reprehended. By the way, nothing is more common than the use of *any* implement that happens to be in the hand at the time, as a hammer. The file, chisel, wrench, even the screwdriver, we have seen employed for striking a blow for which the hammer alone was fitted. And even the hammer is made to take the place of the wrench. Who has not seen the hasty and impatient workman attempt to tighten a nut by hammering at its corners instead of procuring a wrench? The result would be, generally, a battered nut, and possibly a sprung if not a cracked bolt.

These foolish, unnecessary, and injurious habits need not be formed, but being formed they should be abandoned as soon as possible, and sensible, reasonable, useful habits substituted. There is neither reason nor palliation for such carelessness. Our mechanics generally are men of education; they think for themselves, and are capable of estimating the force of the suggestions herewith presented.

EMPLOYERS AND EMPLOYED.

Much of the success which attends the management of any business, where help in a subordinate capacity is required, depends upon tact, by which subordinates are made to perform their duties willingly. Many establishments are filled with time-servers, who do their work grudgingly and shirk the moment the eye of their superintendent is off them. Other establishments exhibit, on the contrary, the more beautiful spectacle of cheerful workers, with faces good humoredly beaming, and whose blows fall harder and more constantly from very lightheartedness. They feel on good terms with their employers, their superintendents, and their fellow workmen, and thus feeling they must be more efficient than a corps of sulky sour-tempered men whose heart is not in their work, and whose superiors are regarded as their natural enemies.

These facts being admitted it is evident, that the superintendent, who, without coming short in other respects, keeps his men in good humor, is better than one who can only keep up a show of subordination by a harshness of manner which begets a reciprocal feeling in the heart of his inferiors. Such subordination is subordination under protest, a subordination which leads to secret combinations and mutterings, and is only one step from revolt.

It has been justly remarked that the most perfect subordination is that in which the rights of subordinates are recognized; in which every man has his rights, and knows that any violation of them can be promptly and surely redressed.

A good deal might be said on the rights of subordinates, but we shall only touch upon the subject at this time. In the first place every subordinate ought to have the right to defend himself from charges made against him by fellow workmen. How often is it the case that from petty malice a workman is made the subject of invidious charges, which injure his reputation for skill or his character for honesty. A workman in this trying position should feel that he has an impartial judge in his superior who will protect him from unjust accusation.

A subordinate has the natural right to expect kindness so long as his conduct merits it. Our sensibilities have often been shocked by the language we have heard employed by superintendents of large establishments towards inferiors. Swearing at workmen is a far too common vice. Were we to employ a man as a superintendent of a workshop, we should tell him at the outset that swearing at workmen could not be allowed. Any employé feels a sense of degradation from such treatment which injures his self respect and tends to make him vicious and unreliable.

The right of an employé to be treated justly and the right to be treated kindly can never be violated without loss to both employer and employed. The former loses in the amount and quality of the service performed, the latter loses a cheerful happy temper and the ennobling desire to perform his work in the best manner possible, both as a matter of principle and out of good will to his employer. Good will is worth money. It is an excellent thing to invest in. Its profits cannot be estimated as so much per cent of capital, for its first cost is nothing.

Having pointed out two rights, to which all employés are entitled, we shall point out one which many suppose belongs to them, but to which, on the contrary, they have not the slightest claim. This is the fancied right to expect or demand explanations from their superiors, why they are required to perform their work in the manner directed. Any principal of an establishment, when condemning the work of an employé, or directing him how to perform it, will voluntarily explain the matter, if he deems such explanation necessary, as instruction to guide in future work or conduct. It is his interest to do this because he gets better service by doing it. If he withholds it, however, that is his business, and his subordinate would be justly subjected to reprimand should he ask in regard to what concerns him not. If he needs instruction that is another matter; but men in active business have too much on their hands to argue with help upon the propriety of any course they may have decided upon. An arguing foreman is every bit as unfit for his place as the swearing, browbeating one. He should be a man of decision, and as decision in action is the result only of knowledge, skill, and courage, these qualities will entitle him to respect, if his other qualifications are such as to insure the good will of those under his charge.

The choice of a good foreman is one of the most important essentials to success in many kinds of business, and the difference between a good and a bad one is hard to estimate in dollars and cents. He that can be firm with kindness, and just without harshness, has the elements of good leadership. These qualities, joined with knowledge and skill, make a combination of qualities somewhat rare, but when found, sure to be prized and rewarded.

THE RELATIVE MERITS OF NEW IRON AND OF SCRAP IRON AS MATERIALS FOR THE SHAFTS OF OCEAN STEAMERS.

In number 22, Vol. XX., of the SCIENTIFIC AMERICAN, we discussed the method, hitherto in vogue, of forging shafts for sea-going steamers, from mixed scrap iron. We most decidedly disapproved the method, maintaining that a perfectly homogeneous shaft of such materials, even if its achievement were possible, must necessarily be a highly improbable result, of a plan opposed, not only to scientific principles, but to common sense.

Since writing the article alluded to, we have seen no reason to alter the opinions we then entertained and expressed with reference to this subject; and we now have the pleasure to state that those opinions are not only winning adherents, but that their truth is actually being tested, practically, by the Pacific Mail Steamship Company. This company have recently had a shaft forged for them at the Franklin Forge, corner of Twenty-fifth street and Third avenue, New York, of the Collins Iron Company's Lake Superior charcoal pig iron. This shaft is intended for the steamer *Japan*, San Francisco and China, and is, in the rough, 39 feet 7 inches long, weighing 80,000 lbs. The body of the shaft will be, when finished, 26 inches in diameter, and the diameter of collars 31½ inches. The forging of this shaft required a working force of 38 men, and consumed 15 days of ten hours each.

The iron from which this shaft was forged, was puddled by Tugnot, Thompson & Co., of the above works, expressly for the purpose, and twice hammered before the shaft was forged. None of the iron used has had less than three heats after the billets were prepared.

We were present on two occasions during the forging, and our opinion as to the great superiority of shafts made of such iron over those of scrap-iron, has been greatly strengthened by our observations. Mr. Tugnot, of the above works, under whose supervision the whole work has been performed, is one of the most experienced iron masters and forgers in this country, and the work throughout is of the most perfect character.

The steam hammer used weighs nine tuns, and under its ponderous strokes, the heated billets seemed as plastic and cohesive as wax.

Such a shaft must, necessarily, cost more than one made of scrap-iron, but its greater strength and consequent security, will more than compensate for its increased cost. The iron from which it is made is of a very superior quality, a larger quantity of charcoal being used in its manufacture than is ordinarily employed. It is made of half hematite and half specular ore, a mixture of which gives an iron of remarkable tensile strength. A chain link of this iron, made of 1¼-inch bar, was once tested by D. B. Martin, formerly Engineer-in-Chief to the Secretary of the United States Navy, and broke only at the enormous tension of 169,120 lbs. We have also seen a specimen of this iron which had only been subjected to two heats, and which was tested by Paulding and Kendall, of the West Point foundery, which, after breaking at a tension of 63,376 lbs. per square inch, was found, upon examination, to be defective. These facts speak sufficiently for the excellence of this iron, and we are glad that the importance of using shafts made of the very best material is beginning to be appreciated by capitalists. A steamer with a broken shaft is almost as helpless as a ham-strung horse; it may, if it has good luck, finally crawl into port, after a delay which has cost more than two shafts would, or it may encounter bad weather and go to the bottom. Where so much is depending, considerations of first cost should weigh little in the scale against security, and it does weigh little to the engineer who knows his business. Unfortunately, however, these facts are too often overlooked by the men who invest their money, and who, not acquainted with the nature and quality of different kinds of iron, are too apt to consider them pretty much on a par. Nothing could be more unwise than such a conclusion, and the difference between a shaft made of inferior iron and one of the best quality, is so great in its contingent results that, within reasonable limits, cost should not be considered.

We hope the precedent established by the Pacific Mail Steamship Company, will prove the beginning of a wiser practice than has hitherto prevailed in reference to this subject.

THE RECENT AURORAL DISPLAY.

On the evening of the 15th of April remarkable auroral display took place, which, according to the newspaper reports, extended over nearly the whole of the Eastern, Western, and Middle States, and was also visible in some parts of the Southern States. At this point the display was a fine one, but was probably exceeded in many other localities. Accounts from portions of Ohio indicate that the maximum brilliancy was observed in that section. A correspondent writes us from Piqua, Miami Co., in that State, that at 10 o'clock, the beauty of the display was at its hight, and that its splendor was never equaled in the memory of the oldest inhabitant.

On the night of the occurrence we chanced to be in a suburban district away from gaslights and buildings, and in other respects favorably situated to observe the phenomenon. Our attention was first called to it about forty-five minutes past seven o'clock, at which time, although the new moon was shining brightly, the heavens were gorgeously lighted up. Mars was almost exactly in the zenith. Around this planet there seemed a small unilluminated space, inclosed by a ring of pale light. From this ring extended radial bars of light in all directions like spokes of a huge wheel, to the horizon. As these bars of light neared the horizon, they increased in width and brilliancy in some parts of the heavens, giving the most beautiful prismatic colors, of which violet was the most conspicuous. The moon looked like the nucleus of a huge comet, with a tail extending westward, and reaching quite below the horizon. The entire sky was covered with a maze of tremulous light, beautiful beyond description, but it soon diminished in splendor, and although visible much later, did not again appear as bright as in the earlier part of the evening.

The aurora borealis is not confined to the Northern hemisphere, or to any zone. It has been seen within 14° of the equator, although its most frequent and brilliant displays occur nearer the poles. It is without doubt electrical in its character, and bears an important relation to terrestrial magnetism. This is more particularly evidenced by its effects upon telegraphic wires and instruments. During the last display, as on frequent previous occasions, telegraphic wires were disconnected from the batteries and messages transmitted without their help. Some have assigned to this phenomenon a cosmical cause, like that of meteoric showers; but the analogies all seem to point to electricity as the prime agent in auroral displays, although the fact has never been positively demonstrated.

There also exist, no doubt, peculiar atmospheric conditions necessary to the occurrence of an aurora, but the precise nature of these conditions is not yet understood. They occur at all seasons; one of the most brilliant we ever saw occurred in midsummer. There has never been discovered any relation between the relative positions of the earth and moon, and the occurrence of auroras, although some have thought it probable such relations exist.

Professor Olmstead thought he had discovered secular periods in the occurrence of auroral displays, but we consider this as hardly warranted by the facts. He fixed the commencement of such a period as being August 27, 1827; the length of the period being twenty years with intervals of from sixty to sixty-five years.

The observations of auroras have not been so frequent in the Southern Hemisphere as in the Northern, and it is quite probable that the whiteness of the light and absence of color, described by navigators as being characteristic of Southern auroras, may rest upon insufficient evidence.

The subject is one fruitful of speculation, and calculated to excite the most intense interest in the minds of investigators. The application of the spectroscope to such investigations seems obviously promising.

Tree Mining.

From the new work by Prof. Cook on the Geology of New Jersey, recently noticed in the SCIENTIFIC AMERICAN, we condense the following account of Tree Mining in New Jersey. In most of the marsh, known as the "Jersey Flats," near the upland, which is shallow, fallen timber is found buried; and the stumps of trees are still standing with their roots in the solid ground where they grew. The timber found in this condition is of oak, gum, magnolia, cedar, pine, and other species, such as are now the natural growth of the country. Where they are of pine, cedar, or other durable wood, their broken and weather-worn trunks are seen projecting above the marsh which has overrun the place of their growth. On the land-side of the beaches, along the sea-shore, large numbers of leafless and dead red cedars may be seen standing in the marsh, the indestructibility of the wood keeping the trees erect, although the marsh has, in some instances, gathered around them to the depth of several feet.

The remains of trees are not equally abundant in all localities, owing partly, perhaps, to differences of exposure, but more to the difference in durability of the various species of wood. In many places where oak, gum, and other deciduous trees were known to stand formerly, there are no traces of them now; they have entirely rotted away. On the contrary, the pine and the red and white cedar are almost indestructible. Pine stumps are found several feet under the marsh, where they have been for an unknown period, and which retain the characteristic smell and appearance of the wood almost as perfectly as the fresh-cut specimens. At several places in southern New Jersey, an enormous amount of white cedar timber is found buried in the salt marshes, sound and fit for use, and a considerable business is carried on in mining this timber and splitting it into shingles for market. In some places it is found so near the surface that fragments of the roots and branches are seen projecting above the marsh, while in other cases the whole is covered with smooth meadow-sods, and there is no indication of what is beneath till it is sounded by thrusting a rod down into the mud.

The tree of which these swamps are composed, is the white cedar, the *Cupressus thyoides* of the botanists. It is an evergreen, which thrives best in wet ground, and in favorable situations forms dense swamps. It is most commonly found on the head-waters of streams.

Timber which is buried in the swamp undergoes scarcely any change; trees which are found several feet under the surface, and which must have lain there for hundreds of years, are as sound as ever they were; and it would seem as if most of the timber which had ever grown in these swamps was still preserved in them. Trunks of trees are found buried at all depths beneath the surface, quite down to the gravel; and so thick, that in many places a number of trials will have to be made before a sounding-rod can be thrust down without striking against them. Tree after tree, from two hundred to one thousand years old, may be found lying crossed one under the other in every imaginable direction. Some of them are partly decayed, as if they had died and remained standing for a long time, and then been broken down. Others have been blown down, and their upturned roots are still to be seen. Some which have been blown down, have continued to grow for a long time afterwards, as is known by the heart being very much above the center, and by the wood on the under side being hard and boxy. These trunks are found lying in every direction, as if they had fallen at different times, as trees would in a forest now.

The cedar logs which are buried in the swamps are mined, or raised, and split into shingles; and this singular branch of industry furnishes profitable occupation to a considerable number of men.

In conducting this latter business, a great deal of skill and experience is requisite. As many of the trees were partly decayed and worthless when they fell, it becomes important to judge of the value of the timber before much labor is wasted upon it. With an iron rod the shingler sounds the swamp until he finds what he judges to be a good log; he tries its length and size with this rod; with a sharp cutting spade he digs through the roots and down to it; he next manages to get a chip from it, by the smell of which he can tell whether it was a windfall or a breakdown; that is, whether it was blown down or broken off. The former are the best, as they were probably sound when they fell. If he judges it worth taking, he cuts out the matted roots and earth from over it, and saws it off at the ends. This latter operation is easily performed, as the mud is very soft, and without any grit. By means of levers he then loosens it, when it at once rises and floats in the water, which is always very near the level of the swamp. The log is then cut into shingle lengths, and split into shingles. The logs are sometimes, though rarely, worked for thirty feet.

It is very interesting to see one of these logs raised. It comes up with as much buoyancy as a freshly fallen cedar; not being water-logged at all. The bark on the under side looks fresh, as if it had lain but a few days; and what is remarkable, the under side of the log is always the lightest; the workmen observe that when the logs floats in the water it always turns over, the side which was down coming uppermost. The buoyancy of the timber remaining, it is probable the lower logs rise in the mud when the roots over them are cut loose, and the logs which laid upon them are removed.

These logs are found not only in the swamp, but also out in the salt-marsh, beyond the living timber. Such marsh has, however, a cedar swamp bottom, which has been overrun by the tide. The heaviest part of the business in making the shingles is done in the neighborhood of Dennisville.

By sounding with an iron rod, these logs can be felt under the surface at all depths, from one to ten feet, and some have said for even more than that. At Dennisville a well was dug in the marsh eleven feet in depth. The mud near the surface was the common blue mud of the marshes; at a small depth the peaty cedar swamp-earth was reached, and in it cedar timbers, logs, and stumps, were found for several feet, and near the bottom the sweet gum (*Liquidambar styracifolia*) and the spoon-wood or magnolia (*Magnolia glauca*) were found. The well reached hard bottom. The white cedar grows on peat, and its roots run near the surface, so that it might be supposed the mud had settled with them, were it not for the fact that, when cedar grows where the mud is shallow, so that its roots reach hard bottom, its wood is unfit for timber, the grain or fibers being so interlocked that it will not split freely. Such is found to be the case in the buried timber; the bottom layer, as it is called, is worthless. From this the inference is conclusive that the hard ground was above tide-level when these trees grew. Large stumps are frequently found standing directly on other large logs, and with their roots growing all around them, and then other logs still under these, so that one soon becomes perplexed in trying to count back to the time when the lower ones were growing. Dr. Beesley, of Dennisville, some years since communicated to the newspapers an article on the age of the cedar swamps, which was copied by Mr. Lyell in his Travels in the United States Second Visit, Vol. I., p. 34; in which Dr. B. says that he "counted 1,080 rings of annual growth between the center and outside of a large stump six feet in diameter, and under it lay a prostrate tree, which had fallen and been buried before the tree to which the stump belonged first sprouted. This lower trunk was five hundred years old, so that upward of fifteen centuries were thus determined, beyond the shadow of a doubt, as the age of one small portion of a bog, the depth of which is, as yet, unknown."

TO OUR CORRESPONDENTS.—We repeat what we have often published in our columns, that no notice will be taken of letters not signed by the writers. The correspondence of this office amounts to several hundred letters daily, and we have a right to know the names of parties who write to us for information, and also what claim they have upon our attention. All letters (except anonymous) are carefully read, and when the subject of the inquiry is one that we deem useful and important, we endeavor to answer it; but it sometimes happens that the information sought for is beyond our immediate reach, or is considered too frivolous to merit time and attention. In all such cases, we are necessarily obliged to decline answers, but, as a general rule, letters addressed to this office are either noticed in the SCIENTIFIC AMERICAN, or answers are sent by mail. Our correspondents seldom complain of inattention to their inquiries; but we urge upon them to be clear and concise in stating their points.

NEW PUBLICATIONS.

Kemlo's Watch Repairers' Hand-Book: Being a Complete Guide to the Young Beginner in taking apart, putting together, and thoroughly cleaning the English Lever and other Foreign Watches, and all American Watches. By F. Kemlo, Practical Watchmaker. With Illustrations. Boston: A. Williams & Co., 100 Washington street.

This work contains information of practical importance to every one engaged in repairing watches. It is express, clear, concise, and comprehensive. While of special interest to the craft, it is also a valuable work for owners of watches. We need not instruct our readers that the man who understands a machine is the only one who can take proper care of it. The book before us is eminently adapted to give even the amateur a good understanding of the mechanism of the watch.

The Velocipede: Its History, Varieties, and Practice. With Illustrations. New York: Hurd & Houghton.

A pleasantly-written, convenient, and entertaining little pamphlet, which will be sought for by enthusiasts in this sport.

Business and Personal.

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

The original oil paintings, by Jerome Thompson, "Home, Sweet Home," "The Old Oaken Bucket," "Paddle Your Own Canoe," and "The Captive Child," will be sold without limit, at auction, on Friday, April 30, at 8 o'clock, at Fifth Avenue Art Galleries, cor. Fifth Ave. and 14th st., by John H. Draper & Co., Auctioneers, Hanover Square.

Henry Baughman, care Wm. C. Jessup & Co., Augusta, Ga., wishes to obtain a sand belt for smoothing spokes.

Map Engravers—Address Box 29, Greensboro', Ala.

A Machinist and Draftsman desires a situation as Draftsman. Address Paul Whitney, Frankfort House, cor. Frankfort and William sts., New York city.

Wanted—Parties to manufacture a new patent braider foot for sewing machines. Address D. Coon, Postoffice Draw 52, Ogdensburg, N.Y.

Rossing Machine.—Manufacturers of machines for rossing bark off saw logs, send circulars to J. R. Hoffman & Bros., Fort Wayne, Ind.

Blue Rapids—The best mill power in Northern Kansas, with 287 acres of land, for sale, near a railroad. Address R. S. Craft, Holton, Kansas.

"Grindstones—How to Hang and Use them Properly." Send for descriptive pamphlet. J. E. Mitchell, 310 York Ave., Philadelphia.

For sale at a bargain—a complete barrel factory, nearly new. Address Hartmann, Laist & Co., Cincinnati, Ohio.

Rubber Tire for velocipedes and light carriages upon a new principle, obviating all objections. H. G. Tyer, India-rubber Manufacturer, Andover, Mass., and 86 Pearl st., Boston.

Foreman Wanted—A young man that has had some experience as Foreman in a machine shop, competent to superintend the construction of large machinery, apply to Murray, Moore & Co., Portsmouth, Ohio.

Reckart's Patent Hub Lathe—A matchless sweep. For descriptive circular, giving full particulars, address J. M. Scribner, Ag't, Middleburgh, N. Y.

Wanted—Steady employ for portable saw mill, 3 to 5 years' contract, by the thousand. Address Box 8, Albion, Erie Co., Pa.

Sieve-hoop makers address Reimer & Holdsworth, 57 Fulton street, New York city.

Wanted—A situation by a first-class Electro Gold and Silver Plater. Address H., Box 178, Waterbury, Conn.

Riehle Bros., the Modern Scale Makers, successors to Banks, Dinmore & Co., 9 and Melon sts., Philadelphia. Circulars describing their recent Patents, & containing testamentary letters, sent free on application.

"Engineer."—You will save much oil and have none of the difficulty you speak of, if you put on one of "Broughton's" Lubricators, for which address H. Moore, 41 Center st.

Peck's patent drop press. For circulars, address the sole manufacturers, Milo Peck & Co., New Haven, Ct.

J. D. Borin, Scottsboro, Ala., wants a first-rate Brick Machine.

Pickering's Velocipede, 144 Greene st., New York.

A. B. Fisher, practical millwright, 9 Ross st., Brooklyn, E.D., N.Y.

$1 per year.—Inventors and Manufacturer's Gazette. The cheapest, best, and most popular journal of the kind published. Send stamp for specimen copy. Saltiel & Co., Publishers, P. O. box 448, or 37 Park Row, New York.

Machine for bending fellies—Patent for sale—the whole, or State Rights. Address DeLyon & Werner, Canton, Miss.

Diamond carbon, formed into wedge or other shapes for pointing and edging tools or cutters for drilling and working stone, etc. Send stamp for circular. John Dickinson, 64 Nassau st., New York.

The new method for lighting street lamps! For illustrated circular, with letter from President Manhattan Gas Light Co., and Sup't of Lamps N. Y. City. Address J. W. Bartlett, Patentee, 569 Broadway, N. Y.

The Tanite Emery Wheel.—For circulars of this superior wheel, address "Tanite Co.," Stroudsburgh, Pa.

The manufacture and introduction of sheet and cast metal small wares is made a specialty by J. H. White, Newark, N. J.

The Magic Comb will color gray hair a permanent black or brown. Sent by mail for $1·25. Address Wm. Patton, Treasurer Magic Comb Co., Springfield, Mass.

For coppered iron castings address J. H. White, Newark, N. J.

W. J. T.—We think the patent asbestos roofing manufactured by H. W. Johns, of this city, is the best substitute for tin or slate. It is cheap and easily applied.

Tempered steel spiral springs. John Chatillon, 91 and 93 Cliff st., New York.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Machinists, boiler makers, tinners, and workers of sheet metals read advertisement of Parker's Power Presses.

Mill-stone dressing diamond machine, simple, effective, durable. Also, Glazier's diamonds. John Dickinson, 64 Nassau st., New York.

Winans' boiler powder, N. Y., removes and prevents incrustations without injury or foaming; 12 years in use. Beware of imitations.

The paper that meets the eye of all the leading manufacturers throughout the United States—The Boston Bulletin. $4 00 a year.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

Knitting Machine.—John Pepper, of Gilford, N. H., has petitioned for the extension of the above patent. Day of hearing, June 28, 1869.

Machine for Mortising Window Blinds.—Joseph A. Peabody, of Philadelphia, Pa., has petitioned for the extension of the above patent. Day of hearing, June 28, 1869.

Bridle Rein.—Kingston Goddard, of Richmond county, N. Y., has applied for an extension of the above patent. Day of hearing, July 5, 1869.

Refrigerator.—William Moultrie, of New York city, has applied for an extension of the above patent. Day of hearing July 5, 1869.

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; beside, as sometimes happens, we may prefer to address correspondents by mail.

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

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

C. B., of Ohio.—The dampness of the wall of which you write us, will be hard to remedy entirely under the circumstances. A brick wall in contact with damp shaded soil will always be damp. You can help matters, however, by digging down below the brick on the outside and painting over the wall with pitch, such as is used on ships' bottoms. On the inside put up studs, and lath and plaster a wall, leaving a space between it and the brick. The studs may be of inch boards, as the only object is to get a wall not in contact with the damp brick.

E. H. R., of Ill.—You are not the first who has considered the *vis formatrix*, of a crystal the same, except in degree, as that of plants and animals. Prof's Owen and Huxley entertain nearly the same view, but when you ask what is the cause of this power, you go farther than those vigorous intellects deem it possible for philosophical inquiry to receive an answer. That is a subject for faith, not for physical research.

W. A., of Ind.—The velocity of a 36-inch burr stone to do best work ought to be about 150 per minute. To grind ten bushels of corn per hour will require, according to Nicholson's "Operative Mechanic," about three horse power.

M. E. O. C., of Wis.—The pressure in a boiler per square inch when it blows off, is found by multiplying the weight into the long arm of the safety valve lever, and dividing the product by the product of the short arm into the area of the valve in square inches, or a proportion may be used. In the special case you mention, where the long arm is 30 inches the short arm 3 inches, the area of the valve 5 square inches and the weight 125 lbs., the proportion would be 3 : 30 :: 125 : 1250, the entire pressure sustained by the valve, which divided by 5 inches, the area of the valve, gives the pressure per square inch in the boiler.

F. U., of Ill.—"Will coal soot cause water to harden in a cistern?" Ans. In general it will not. If however, the soot precipitated on the roof comes from a zinc smelting furnace it might contain oxides which would effect the water. The probable cause is the use of cement containing soluble compounds of lime. All new plastered cisterns render water more or less hard for a time.

G. J. B., of Vt.—Water engines are a very old device; you will find them described in Ewbank's Hydraulics, and in various other works.—Spencer's Water meter is a small double cylinder engine operated by water instead of steam, with slide valves and eccentrics. The objection to these machines arise from the inelasticity of water, and the liability of parts working under water to wear, etc.

H. K., of Mich.—Try the alum and plaster for stopping holes in burr stones without the glue, the latter does harm rather than good. If the holes are large use some fragments of burr stone as part of the filling.

E. W. L. C., of Ohio.—Shellac dissolved in alcohol is a good cement o make paper labels adhere to tin. The varnish should be tolerably thick.

T. H. G., of N. Y. inquires, "Can any of your numerous readers inform me, why it is, that, although many patents have been obtained for aerial machines, we hear nothing of their practical results?" The reason is simply that all aerial machines up to this time have been practically worthless.

"Jersey Farmer" can obtain such information about sawmills as he wants, by putting an advertisement in the Scientific American.

C. S. H., of Pa.—You ask "What constitutes a day's work for a draftsman?" There is no rule in reference to it that we know of, but draftsmen in our office work about eight hours—That is as long as they ought to bend over the board.

F. W. Woodward, of Winnsboro, S. C., states that there is an excellent quarry of oil and white stone near him and wishes to correspond with manufacturers.

S. F. H., of Mass., wishes to know "If the earth in proportion to its size is not as smooth and finely polished as a cambric needle?" We answer that in our judgment it is, but if our correspondent has any doubt about it we advise him to submit the question to an experimental test, and inform us of the result. It is a subject that deserves to be investigated.

N. H. S., of N. Y.—Calcium was obtained by Matthiessen by the electrolytic decomposition of a mixture consisting of two equivalents of chloride of calcium and one equivalent of chloride of strontium. The mass may be fused in a Hessian crucible, in the center of which is placed a porous tube filled with the same mixture, and into this an iron wire passed through the stem of a tobacco pipe is inserted. This wire is connected with the platinode of a battery, the zincode of which consists of a plate of iron bent into a cylindrical form, and immersed in the melted mass exterior to the porous tube. The calcium is reduced and preserved from oxidation by so regulating the heat that a film of solidified salt shall form upon the surface of the mixture in the porous cell. Lies Bodart obtained it more easily by fusing iodide of calcium with an equivalent quantity of sodium. See Miller's Inorganic Chemistry, page 407.

S. U. B., of Mich.—There is no difficulty in superheating steam in pipes to 300° Fah., but it is doubtful if the temperature of a room for kiln drying can be kept, by that means, to that temperature. Much of the heat is lost by radiation. Direct heat from a properly constructed furnace is better than steam heat for kiln drying purposes.

N. F. P., of N. J.—We do not hold ourselves responsible for the statements of advertisers in our columns, under whatever head they may choose to address our readers. The "Business and Personal," is an advertising column; we do not feel at liberty to express an opinion as to the value of the devices therein mentioned, or on the character of the advertisers. Our opinion of the Whitlock Exposition is freely expressed on page 280, current volume, in an editorial article.

C. W. I., of Iowa, asks if there is any practical rule for the position of a water wheel in a "draft tube;" whether there is any point in such "tube" at which a wheel will give a greater percentage of power than at any other. We hardly know what this correspondent means. He may suppose that more force may be gained by conducting the power (head of water) through a tube, to the wheel, at a distance from the source, than in receiving it direct from the source, or fall; but it is evident that the closer the wheel to the force—the less friction and consequent waste—the more power will be delivered.

J. E. C., of Mass.—Malleable cast iron is simply ordinary cast iron subjected to a red heat for hours, or days, according to the size of the articles, they being packed in iron scales or pulverized specular iron ore, the object being to combine the oxygen of the oxide with the carbon of the iron. A visit to any malleable iron concern will show the *modus operandi* better than we can describe it in a column.

Recent American and Foreign Patents.

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

Improvement in Matches.—Our readers will recollect an article recently published in the Scientific American, headed, "Wanted—A Pipe Light." The endless match, patented by Wm. H. Rogers, seems calculated to meet this want as well as to take a prominent place among competitors for domestic use. This match is self-igniting, and combustible throughout its whole length; when lighted it can be extinguished and re-lighted as well as before, and so on until it is entirely consumed. The match, when in use, is taken from the case and slipped into a metallic tube, so arranged that the match can be thrust out as wanted; when used, it is put out by a small extinguisher, which is slipped over the end of the tube. It is a very convenient and safe arrangement. The flame is very persistent, and is not easily blown out. For smokers and travelers the new match is specially adapted. The composition for these matches was patented through the Scientific American Patent Agency October 27, 1868, and the tube, or safe, October 13, 1868. The agents for New York city are J. H. Tennant & Co., 221 Pearl street.

Hoop Adjuster for Fore-and-Aft Sails.—F. B. Dunton, Center Lincolnville, Me.—The object of this invention is to provide the means for causing the mast hoops of fore-and-aft sails to work more perfectly than was hitherto the case.

One-Wheeled Velocipede.—Henry S. Cohn, New York city.—This invention relates to a new one-wheeled velocipede, which is arranged with spokes diverging laterally from the tire, so that sufficient space is formed within the wheel and between the spokes for arranging the drivers' support, or seat, on the axle, and for operating the vehicle by applying power to the said axle in a suitable manner.

Gang Plows.—Thomas J. Hall, Byran, Texas.—This invention relates to a gang plow, which is so arranged that the beams can be swung side-ways and up and down at will, and so that they can be permanently secured in any desired position.

Miter Box.—Robert Burchell and Robert T. Burchell, Trenton, N. J.—The object of this invention is to provide an improved apparatus for guiding hand-saws in the operation of mitering strips of wood, as molding and the like.

Blotting Pad and Hand Rest.—Peter Gorsline, Elizabeth, N. J.—This invention relates to a new apparatus, which is to be attached to the hand of a writer, and which will form a convenient hand rest, and act as a blotter. The invention consists in the combination, with a place for holding them, of a strap and blotting pad.

Core Compound.—John I. Vinton, Altoona, Pa.—This invention relates to a new and useful improvement in material for making cores in iron and brass founding, and for all purposes for which cores are used in forming metal castings.

Window Cornice.—O. L. Gardner, New York city.—This invention relates to a new and useful improvement in cornices for supporting window curtains in dwellings and other buildings, the improvement having reference to a mirror frame, for which letters patent were granted to the present inventor, dated September 10, 1867.

Vises.—F. H. Furniss, Waterloo, N. Y.—This invention relates to improvements in vises, he object of which is to provide for more permanently holding those vises which are arranged to be adjusted to any angle relatively to the bench.

Washing Machine.—W. B. Gardner, Almond, N. Y.—This invention relates to improvements in washing machines such as have a grooved roller, and a reciprocating curved and grooved board acting in conjunction therewith; and it consists in the application to the said grooved roller of a brake arranged to arrest the motion thereof when required to subject some part of the clothes to a greater amount of rubbing than other parts.

Steam Pump.—John McCloskey, New York city.—This invention relates to improvements in steam pumps, designed more especially for employment in buildings in connection with ranges, for elevating water where it is not attainable from reservoirs; but is also applicable for general use as a steam pump. It consists in the adaptation of one cylinder and two pistons for both the steam and water engine and in the valve mechanism.

Plow.—G. M. Atherton, Friendsville, Ill.—This invention has for its object to furnish an improved plow, designed especially for plowing stumpy and rooty ground, but which shall, at the same time, be so constructed as to be adjusted for ordinary plowing.

Combined Bolt and Lock.—Darwin V. Miller, Weedsport, N. Y.—This invention has for its object to furnish an improved bolt and lock, which may be used either with or without a key, and which shall be simple in construction, easily operated, and, at the same time, burglar proof.

Rotary Oiling Pump.—Alexander Shafer, Wellsville, N. Y.—This invention has for its object to furnish an improved device for introducing oil into the steam chest or cylinder of a steam engine, which shall be so constructed that the oil may be introduced in any desired quantity and at any desired time.

Clothes Frame.—William A. Daggett, South Vineland, N. J.—This invention has for its object to furnish a simple, convenient, strong, and durable clothes frame, which shall be so constructed and arranged that when extended it may furnish a large drying surface, and when closed it may be shut up into small compass.

Heater.—J. S. Van Buren, Norwich, Conn.—This invention has for its object to furnish an improved heater, which shall be so constructed as to utilize a much larger proportion of the heat developed by the combustion of the fuel than is possible with the stoves and heaters constructed in the ordinary manner.

Heater.—John H. Goodfellow, Troy, N. Y.—This invention has for its object to furnish an improved base-burning heater, simple in construction, and effective in operation, utilizing almost entirely the heat in the products of combustion before they escape into the chimneys.

Attaching Horses to Carriages.—C. McElroy, New Baltimore Mich.—This invention has for its object to furnish an improvement in the manner of attaching horses to carriages, by means of which the horse can be easily and quickly attached and instantly detached when required, which shall be safe and reliable, and, at the same time, will dispense with the use of the ordinary traces and whiffletrees.

Table Attachment for Bedsteads.—Mrs. E. D. W. Hatch, Chicago, Ill. The invention has for its object to furnish a simple and convenient table for attachment to bedsteads, lounges, etc., designed especially for invalid use, which shall be so constructed and arranged that it may be adjusted hight or positions as the convenience of those using it may require.

Stove Shield.—Edward C. Stoddard and John R. Hoyt, Woodbury, Conn.—This invention relates to a new attachment to stove pipes, which has for its object to prevent the overheating by the pipes of wooden mantelpieces, or other combustible devices near which the pipe may be arranged. The invention consists in the use of sheet metal, or other plate or shield, suspended at the side from the stovepipe, so that an air space is formed between the pipe and shield.

Nozzle for Sheet-metal Cans.—Charles Pratt, New York city.—This invention has for its object to produce an improved seal for the nozzles of sheet-metal cans, such as are used for the transportation of a certain branch of burning oils, which, when removed from the nozzle, will leave evidence of its having been used.

COMBINED CULTIVATOR AND PLANTER.—Benjamin Anyan, Fitchville' Ohio.—This invention has for its object to furnish a simple, convenient, and effective machine, which shall be so constructed and arranged that it may be easily and quickly adjusted for use as a cultivator or planter, doing its work thoroughly and well in either capacity.

POTATO PEELER.—Wm. Zeiger, Elmore, Ohio.—This invention relates to a new machine for peeling potatoes and other fruit; and it consists in the application of revolving graters, and of a stationary removable grater, to operate in the desired manner for paring apples, potatoes, etc.

GLASS-BLOWING APPARATUS.—Benj. F. Cloud, Philadelphia, Pa.—This invention relates to improvements in apparatus for glass blowing, whereby the blast may be supplied by power, and regulated in the application with facility.

CREAM SAVER.—P. F. Lewis, Columbus, Pa.—This invention consists of an attachment suspended from the underside of the cover, and arranged to take the cream from the handle and deliver it back within the churn.

VELOCIPEDE.—Joseph Irving, New York city.—This invention consists in producing a brake, arranged to act on the front wheel, to be operated from the guiding lever, and capable of turning with the wheel as the latter is changed in its course for steering, and also in producing a leg rest capable of turning with the said front wheel.

MACHINE FOR PULLING BEANS.—S. R. Niles, Rawsonville, Mich.—This invention relates to improvements in bean-pulling machines, designed to provide a simple and effective machine, of cheap construction, with an improved arrangement of adjustable truck device, capable of being readily adjusted to permit the machine to be worked, or to hold it out of the working position and support it while moving to or from the field, or along the road.

TENON.—Jackson Barnes, Burlington, Vt.—This invention relates to improvements in devices for securing parts of framing together, whether of wood or other substance, especially such articles as are required to be taken apart, as bedsteads; and it consists in a metallic tenon (preferably of circular form) secured to one part in a manner to allow it to rotate, and capable of hooking behind a pin passing through the mortice in the other part.

WOOD-BORING MACHINE.—B. F. Mohr, Mifflinburg, Pa.—This invention relates to improvements in machinery for boring wood, and consists in an improved method of clamping the wood to be bored to the feeding carriage; also, an improved arrangement of the carriage and its feeding devices, whereby it is fed past the auger and up to it; and also, in an improved arrangement of the auger support for adjusting and detaching the auger.

BOILER FOR COOKING AND OTHER PURPOSES.—Fenn Wilcox, Newark, N. J.—This invention relates to improvements in vessels used for boiling vegetables, clothes, etc., the object of which is to provide a means for preventing the water of condensation from escaping into the fire, and thereby extinguishing it; and it consists of a boiling apparatus, arranged to convey the steam into the stove or furnace.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING APRIL 20, 1869.

Reported Officially for the Scientific American.

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89,002.—GOLD-LEAF CONDENSER.—John F. Adams, Worcester, Mass.
89,003.—RAILWAY-CARRIAGE WHEEL.—John P. Allen, Manchester, Mass.
89,004.—LAWN MOWER.—Jos. Arbeiter, East Hartford, Conn.
89,005.—MANUFACTURE OF GLASS WARE.—J. S. Atterbury and T. B. Atterbury, Pittsburgh, Pa.
89,006.—SAW SHARPENER.—Austin Bartlett, Chester, Mass.
89,007.—LASTING BOOT AND SHOE.—Isaac N. Beals, North Bridgewater, Mass.
89,008.—CORN MARKER.—Jacob H. Beam, Woodside, Ill.
89,009.—SHOE LAST.—H. R. Bean (assignor to himself and S. N. Aldrich), Marlborough, Mass.
89,010.—ICE CHEST FOR SODA APPARATUS AND REFRIGERATORS.—E. Bigelow, Springfield, Mass.
89,011.—LOOM.—E. B. Bigelow, Boston, Mass.
89,012.—STOPPING MECHANISM FOR POWER LOOMS.—E. B. Bigelow, Boston, Mass.
89,013.—BOX OPENER.—Robert Blake, Scranton, Pa.
89,014.—RAILWAY-CAR BRAKE.—J. T. Blois, Jonesville, Mich.
89,015.—STEERING APPARATUS.—A. T. Boon, Galesburg, Ill. Antedated April 5, 1869.
89,016.—SLED BRAKE.—A. J. Braley, Berlin, Vt.
89,017.—SPINNING FRAME.—H. Beaumont Briggs, Clarksburg, assignor to James Hunter and James E. Hunter, Adams, Mass., for one-half of said invention.
89,018.—FASTENING FOR STAYS OF CORSETS.—J. W. Brooks, Boston, Mass.
89,019.—FILE HOLDER.—A. P. Brown, Worcester, Mass. Antedated April 10, 1869.
89,020.—PUMP VALVE.—J. H. Brown (assignor to himself and J. B. Harris), Pittsgrove, N. J.
89,021.—DEVICE FOR STEERING SLEDS.—George Buchanan, Washington, Pa.
89,022.—PRESS FOR BALING HAY AND COTTON.—E. Buel, Silver Creek, N. Y.
89,023.—PUMP VALVE.—H. C. Bulkley and Amos Shepard (assignors to the Union Manufacturing Company), New Britain, Conn.
89,024.—GONG BELL.—Legrand S. Carpenter, East Hampton, Conn.
89,025.—RING FOR SPINNING FRAME.—William T. Carroll, Medway, Mass.
89,026.—MECHANICAL MOVEMENT.—H. J. Case, Auburn, N.Y.
89,027.—RAILROAD-CAR STOVE.—Levi R. Comstock, Keokuk, Iowa.
89,028.—FLUTING MACHINE.—C. F. Corbett, Boston, Mass.
89,029.—HORSE RAKE.—Edward Crandal, Northville, Mich.
89,030.—CATARRHAL SYRINGE.—J. W. Culbertson, Richmond, Ind.
89,031.—SHELF, COAT RACK, AND CLOTHES FRAME.—John Danner, Canton, Ohio.
89,032.—THILL COUPLING.—James Dempsey (assignor to himself and Nathan Levy), Geneva, N. Y.
89,033.—SAD-IRON HEATER.—Arnold Doll, Cleveland, Ohio.
89,034.—SAFETY POCKET.—Josiah Foster, Sandwich, Mass.
89,035.—COPYING PRESS.—G. C. Gage, Waterford, N.Y. Antedated April 9, 1869.
89,036.—VOLTAIC BATTERY.—A. C. Garratt, Boston, Mass.
89,037.—SNAP FOR BRACELETS, ETC.—G. S. Grant (assignor to A. O. Baker), Providence, R. I.
89,038.—LUBRICATING SLEEVE FOR LOOSE PULLEYS.—O. E. Greene, Lawrence, Mass.
89,039.—MEDICINE FOR PURIFYING THE BLOOD.—Richard Guinn, Baltimore, Md.
89,040.—SEWING MACHINE.—W. S. Guinness (assignor to himself and A. G. Seaman), London, England.
89,041.—MOP WRINGER.—William Hall, North Adams, Mass.
89,042.—SAW SHARPENING DEVICE.—Jamison H. Harrison, Boston, Mass.
89,043.—SHUTTLE BINDER FOR LOOMS.—Myron E. Haskell, Lowell, Mass.
89,044.—STOVE TONGS.—Nehemiah L. Hatch, Cape Elizabeth, Me.
89,045.—TABLE-LEAF SUPPORT.—John Hilts, Detroit, Mich.
89,046.—CHURN.—S. B. Holden, Woburn, assignor to himself and L. L. Holden, Boston, Mass.
89,047.—VELOCIPEDE.—J. A. House and W. B. Snyder, Bridgeport, Conn.
89,048.—MACHINE FOR FINISHING CLOTH.—Daniel Hussey, Nashua, N. H.
89,049.—MATERIAL FOR JOURNALS AND BEARINGS, AND FOR LUBRICATING.—A. B. Jones, Wilmington, N. C.
89,050.—TURBINE WATER WHEEL.—John Jordan, East Windsor, assignor to himself and C. N. Harlow, West Cummington, Mass. Antedated April 15, 1869.
89,051.—STILL FOR TURPENTINE AND OTHER SUBSTANCES.—Robert W. Lamb (assignor to himself and A. Paul Repiton, Jr.,) Wilmington, N. C.
89,052.—LADIES' WORK TABLE.—William St. George Little, Boston, Mass.
89,053.—MODE OF RENDERING BRICK, STONE, CLAY, PLASTER, ETC., WATER REPELLENT.—Robert O. Lowrey, Salem, N. Y. Antedated March 23, 1869.
89,054.—MODE OF RENDERING FIBROUS FABRICS WATER REPELLENT.—Robert O. Lowrey, Salem, N. Y. Antedated March 23, 1869.
89,055.—MANUFACTURE OF WATER-PROOF AND WATER REPELLENT.—R. O. Lowrey, Salem, N. Y. Antedated March 23, 1869.
89,056.—WATER-PROOF COMPOUND.—R. O. Lowrey, Salem, N. Y. Antedated March 23, 1869.
89,057.—HARNESS BUCKLE.—A. C. Luther, Canton, Ohio.
89,058.—FOLDING PERAMBULATOR.—Charles Lyne, Padstow, England. Antedated April 6, 1869.
89,059.—ATTACHING HANDLES TO CUTLERY.—Samuel Mason and Edward Binns, Beaver Falls, Pa.
89,060.—PUMP PISTON.—S. G. Mason, Rochester, N. Y. Antedated April 15, 1869.
89,061.—CAR COUPLING.—Alpine McLean, Boston, Mass.
89,062.—MACHINE FOR PUNCHING, SHEARING, AND STRAIGHTENING FISH BARS.—William Morehouse, Buffalo, N. Y.
89,063.—WATER WHEEL.—Isaac Morse, Henniker, assignor to himself and C. H. Thorndike, Weare, N. H.
89,064.—SEWING MACHINE.—Wm. Muir, Montreal, Canada.
89,065.—POWER LOOM FOR WEAVING INGRAIN CARPETS.—Andrew Murray (assignor to Lowell Manufacturing Company), Lowell, Mass.
89,066.—JAM NUT.—B. W. Nichols (assignor to himself and W. R. Raynolds, Jr.,) Canton, Ohio.
89,067.—BEEHIVE.—Ole Osmundson, Mission, Ill.
89,068.—EAVES-TROUGH SUSPENDER.—T. F. Palm (assignor to himself and L. J. Bliven), Toledo, Ohio.
89,069.—VELOCIPEDE.—G. T. Parry, Philadelphia, Pa.
89,070.—RAILWAY RAIL.—Denison C. Pierce, Clayton, N. Y.
89,071.—STOP-VALVE FOR STEAM AND OTHER ENGINERY.—Robert Pilling, Waterford, N. Y.
89,072.—SEEDING MACHINE.—Archibald Putnam, Owego, N.Y.
89,073.—SUBMARINE PUMP DREDGE.—David Quinn, Chicago, Illinois.
89,074.—MANUFACTURE OF WHITE LEAD.—Tryon Reakirt, Philadelphia, Pa.
89,075.—CHIMNEY.—W. G. Reed, Chelsea, Mass.
89,076.—COMPOSITION FOR MAKING CHILLED CASTINGS.—J. Reichenbach (assignor to himself, John Heath, and W. R. Fitzsimons), Allegheny City, Pa.
89,077.—BAG HOLDER AND TRUCK COMBINED.—H. A. Reid, Beaver Dam, Wis.
89,078.—AUTOMATIC FEED CRIB FOR STABLE STALLS, ETC.—E. B. Rich, South Boston, Mass.
89,079.—RAILROAD CHAIR.—T. C. Robinson, Boston, Mass., assignor to himself and G. H. Sanborn.
89,080.—ROTARY PUMP.—Geo. W. Rogers, Philadelphia, Pa. Antedated April 8, 1869.
89,081.—AUTOMATIC SEED SEPARATOR.—Mark M. Rowell, Brandon, Wis.
89,082.—HARVESTER.—Alonzo Saltsman and C. H. Charlesworth, Avoca, and R. F. Osgood, Rochester, N. Y.; said Osgood assigns his right to said Saltsman and Charlesworth.
89,083.—COTTON GIN.—C. G. Sargent, Westford, Mass.
89,084.—MUSIC RACK.—Arthur Shaffer, Dubuque, Iowa.
89,085.—GATHERING ATTACHMENT FOR SEWING MACHINE.—Carle Scharffe (assignor to W. Wilson), Cleveland, Ohio.
89,086.—STREET CAR.—Philander Shaw, Boston, Mass.
89,087.—BOILER FEEDER.—Joseph Shirk and Isaac W. Martin, East Earl township, Pa.
89,088.—CARTRIDGE.—Dexter Smith and J. W. Storrs (assignors to the Wesson Fire Arms Company), Springfield, Mass.
89,089.—CAR COUPLING.—J. F. Spaulding, Rutland, Vt.
89,090.—GAS HOLDER.—C. A. Stebbins, Springfield, Mass.
89,091.—DEVICE FOR MEASURING, LAYING OUT, AND CUTTING GARMENTS.—G. P. Sweezy, Riverhead, N. Y.
89,092.—SAFETY SWITCH.—C. A. S. Temple, Greenwood village, assignor to himself and S. E. Temple, Boston, Mass.
89,093.—SEWING MACHINE.—Alex. Tittman, Indianapolis, Ind., assignor to himself, W. H. Turner, and D. Henderson.
89,094.—MODE OF TREATING PAPER AND OTHER FABRICS, TO RENDER THEM WATERPROOF.—C. Toppan, Wakefield, Mass.
89,095.—WATER REPELLENT MATERIAL.—Charles Toppan, Wakefield, Mass.
89,096.—HORSESHOE.—J. H. Tyler, Martin, N. C.
89,097.—AUGER.—Calvin Wardwell, Painesville, Ohio.
89,098.—CHURN.—G. W. Warren, Alma, N. Y.
89,099.—POTATO DIGGER.—Hiram Webster and Cyrus Powers, East Pembroke, N. Y.
89,100.—ELASTIC COMPOSITION TO IMITATE IVORY AND SIMILAR MATERIALS.—Wm. M. Welling, New York city. Antedated April 9, 1869.
89,101.—DOOR HOLDER.—J. S. White, Prescott, Wis. Antedated Feb. 1, 1869.
89,102.—VELOCIPEDE.—T. E. M. White, New Bedford, Mass.
89,103.—STEAM ENGINE VALVE GEARING.—Amos Whittemore, Cambridgeport, Mass.
89,104.—MECHANISM FOR OPERATING SEWING MACHINES.—Amos Whittemore, Cambridgeport, Mass.
89,105.—INSOLE FOR BOOTS AND SHOES.—Wm. Williams, Rochester, N. Y.
89,106.—FILTERING FEED-WATER HEATER FOR STEAM GENERATORS.—B. F. Wilson, Geddes, N. Y.
89,107.—CARPET STRETCHER.—Thomas Wilson and J. W. Appleyard, Chicago, Ill.
89,108.—SIZE MARK FOR HATS.—L. C. Woehning, New York, assignor to P. L. Ruthenburg, Brooklyn, N. Y.
89,109.—PENCIL SHARPENER.—S. S. Woodcock, Somerville, Mass.
89,110.—BUCKLE.—C. E. Woodman, Boston, Mass.
89,111.—DEVICE FOR MOVING HEAVY BODIES.—J. A. Woodworth, Hickory Corners, Mich.
89,112.—LATHING MACHINE.—Wilson S. Wright, Ithaca, N.Y.
89,113.—COMBINED CULTIVATOR AND PLANTER.—Benj. Anyan, Fitchville, Ohio.
89,114.—JACKET, OR CASE FOR TEAPOTS.—Alfred Arnold, Tenafly, N. J.
89,115.—PLOW.—G. M. Atherton, Friendsville, Ill.
89,116.—BEDSTEAD FASTENING.—Jackson Barnes, Burlington, Vt.
89,117.—HYDRANT.—Frederick Bauschtliker (assignor to himself and Fred. Gentner), Washington, D. C.
89,118.—HOOK FOR SUPPORTING CARRIAGE POLES.—Samuel S. Bent, Portchester, N. Y.
89,119.—SPRING BEDSTEAD.—Jacob Bohmer, St. Louis, Mo.
89,120.—SHAFT SUPPORT.—R. O. Brackett and D. W. Brackett, Vineland, N. J.
89,121.—COMPOSITION FOR PREVENTING THE INCRUSTATION OF STEAM BOILERS.—Samuel Brock, New Orleans, La.
89,122.—MACHINE FOR COMPOUNDING AND APPLYING ROOFING COMPOSITIONS TO FELT, PAPER, AND OTHER FABRICS.—B. S. Brown (assignor to himself and L. B. Joy), Buffalo, N. Y.
89,123.—HYDRANT.—J. G. Bryan, Philadelphia, Pa.
89,124.—MITER BOX.—Robert Burchell and R. T. Burchell, Trenton, N. J.
89,125.—CHURN DASHER.—Jonathan Carl (assignor to himself and J. A. Carl), Grenada, Miss.
89,126.—CURTAIN FIXTURE.—A. M. Cheney, Charlotte, Mich. Antedated Oct. 29, 1868.
89,127.—GLASS-BLOWING APPARATUS.—B. F. Cloud, Philadelphia, Pa.
89,128.—VELOCIPEDE.—H. S. Cohu, New York city.
89,129.—BEEHIVE.—J. H. Crandell, Upper Marlborough, Md
89,130.—VISE.—D. C. Cumings, Fulton, N. Y.
89,131.—CLOTHES FRAME.—W. A. Daggett, South Vineland N. J.
89,132.—MANUFACTURE OF CORDED-EDGE PAPER GOODS.—A. T. Denison, Poland, Me.
89,133.—EGG CARRIER.—George Dorn and John Shibley, Albany, N. Y.
89,134.—TUBULAR PUMP FOR DEEP WELLS.—C. H. Duncan, Pithole City, Pa.
89,135.—MAST HOOP.—F. B. Dunton, Center Lincolnville, Me.
89,136.—BAND DRAWER.—B. W. Field, Ferrisburg, Vt.
89,137.—CULTIVATOR TOOTH.—E. L. Freeman, Williamstown, N. Y.
89,138.—VISE.—F. H. Furniss, Waterloo, N. Y.
89,139.—ADJUSTABLE CORNICE FOR WINDOW CURTAINS.—O. L. Gardner, New York city.
89,140.—WASHING MACHINE.—W. B. Gardner, Almond, N.Y
89,141.—BASE-BURNING STOVE.—John H. Goodfellow, Troy, N. Y.
89,142.—BLOTTING PAD.—Peter Gorsline, Elizabeth, N. J.
89,143.—WATER COCK.—Joseph Gregg, Manchester, N. H.
89,144.—GANG PLOW.—T. J. Hall, Byran, Texas.
89,145.—RAILWAY CAR COUPLING.—George Harris, Ipswich, Mass.
89,146.—TABLE ATTACHMENT FOR BEDSTEADS.—E. D. W Hatch, Chicago, Ill.
89,147.—SASH HOLDER.—E. W. Haven, Brandon, Vt.
89,148.—BURIAL CASKET.—Cornelius S. Hurlbut, Springfield Mass.
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89,150.—SHUTTER WORKER.—S. E. Jewett (assignor to himself, and Osgood G. Boynton), Haverhill, Mass.
89,151.—SLOWLY CLOSING VALVE.—John Keane, New York city., assignor to himself and G. H. Brown. Antedated April 15, 1869.
89,152.—GARMENT SUPPORTER.—J. L. Kendall, Foxborough, Mass.
89,153.—AUTOMATIC WEIGHING MACHINE.—J. G. Lettelier and F. White, Bloomington, Ill.
89,154.—AUTOMATIC WEIGHING MACHINE.—J. G. Lettelier and F. White, Bloomington, Ill.
89,155.—CHURN.—P. F. Lewis, Columbus, Pa.
89,156.—STEAM ENGINERY FOR SURFACE CONDENSERS.—W. A. Lighthall, New York city.
89,157.—CHEESE VAT.—R. M. Livingston, Menteno, Ill.
89,158.—STEAM PUMP.—John McCloskey, New York city.
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89,161.—DOOR LOCK.—D. V. Miller (assignor to himself and James Keirnan), Weedsport, N. Y.
89,162.—IRONING BOARD.—J. C. Miller, Lancaster, Ohio.
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89,167.—NOZZLE FOR CANS.—Chas. Pratt, New York city.
89,168.—WHIP.—A. C. Rand, Westfield, Mass.
89,169.—HORSE RAKE.—G. M. Richardson and C. C. Richardson, Dana, Mass.
89,170.—TWISTING TUBE FOR SPINNING MACHINES.—Charles Roberts, Lake Village, N. H.
89,171.—SAFETY HAT AND COAT RACK.—F. W. Roth, Washington D. C. Antedated April 17, 1869.
89,172.—MANUFACTURE OF LUMBER.—E. B. Rowe (assignor to the South Branch Planing Mill Company), Chicago, Ill.
89,173.—MEDICINE CHEST.—Enno Sauder, St. Louis, Mo.
89,174.—EGG CARRIER.—Alex. Selkirk, Albany, N. Y.
89,175.—LUBRICATOR.—Alex. Shater (assignor to L. Sweet, and Company), Wellsville, N. Y.
89,176.—MANUFACTURE OF FEATHER DUSTERS.—C. F. Shourds, New York city.
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89,196.—HARNESS SADDLE.—Valentine Borst, New York city.
89,197.—DOOR LATCH.—E. W. Brettell, Elizabeth, N. J. Antedated April 9, 1869.
89,198.—COMPOSITION FOR COATING PAPER, FOR MANUFACTURE OF NECK-TIES, CRAVATS, AND OTHER ARTICLES OF WEARING APPAREL.—M. W. Brown, New York city.
89,199.—DRAIN TILE MACHINE.—Robert G. Carlisle, San Francisco, Cal., assignor to A. C. Robinson, W. J. X. Robinson, and J. H Addison; and said J. H. Addison assignor to J. H. Wise.
89,200.—CIGAR MACHINE.—G. B. Clarke, New York city.
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89,235.—Velocipede.—Arthur O'Neill, Hyde Park, Mass.
89,236.—Harvester Cutter.—John H. Owen, Louston township, Ill.
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89,244.—Inking Apparatus for Printing Presses.—Israel L. G. Rice, Cambridge, Mass.
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89,249.—Steam Generator.—John Sheffield, Buffalo, N. Y.
89,250.—Cracker Machine.—Theodore Sloat, Brooklyn, (E. D.), N. Y.
89,251.—Washing Machine.—Abram C. Stannard, Milton, Wis.
89,252.—Table.—Nathan Stockwel, Windsor, N. Y.
89,253.—Dental Plate.—Leander R. Streeter, Chelsea, assignor to himself and A. B. Ely (Trustees), Newton, Mass.
89,254.—Process of Treating Pyroxyle, Pyroxyline, and the Like Substance for Forming Useful and Ornamental Articles.—Leander R. Streeter, Chelsea, assignor to himself and A. B. Ely (Trustees), Newton, Mass.
89,255.—Machine for Disintegrating Wood for Paper Stock.—James Stutt, Fermanagh county, Ireland.
89,256.—Needle-threader for Sewing Machines.—W. C. A. Thielepape, San Antonio, Texas.
89,257.—Horse Rake.—Moses N. Ward, Linneus, assignor to Frederick H. Coombs, Bangor, Me. Antedated October 20 1868.
89,258.—Steam Generator.—Elijah Weston, Buffalo, N. Y.
89,259.—Ice Cream Freezer.—David Wiggins, Greenport, N. Y.
89,260.—Base-burning Stove.—R. B. Willis, Rochester, N. Y.
89,261.—Locomotive Engine Furnace.—D. W. Wyman, New York city.
89,262.—Sad-iron Cleaner.—A. R. Fuller, Burlington, Vt.
89,263.—Machine for Cleaning Bricks.—James Lyon, Norfolk, Va.
89,264.—Rock-channeling Machine.—E. G. Lamson, Windsor, Vt.
89,265.—Stone-channeling Machine.—E. G. Lamson, Windsor, Vt.
89,266.—Extension Table.—John M. Blaisdell, Sanbornton, N. H.

REISSUES.

83,445.—Steam Generator.—Dated October 27, 1868; reissue 3,384.—Wm. Baxter, Newark, N. J.
77,161.—Spring Chair.—Dated April 28, 1868; reissue 3,385.—A. Milton Blake, Canton, Ohio.
36,394.—Machine for Sewing Boots and Shoes.—Dated September 9, 1862; reissue 1,363, dated December 16, 1862; reissue 3,386.—Francis W. Carruth, Boston, and Everett P. Richardson, Lawrence, Mass., assignees, by mesne assignments, of Henry Dunham, Jr.
50,462.—Sewed Boot and Shoe.—Dated October 17, 1865; reissue 3,387.—Francis W. Carruth, Boston, and Everett P. Richardson, Lawrence, Mass., assignees of Henry Dunham, Jr.
18,730.—Corn Planter.—Dated December 1, 1857; reissue 3,388.—Jarvis Case, La Fayette, Ind.
54,374.—Harvester.—Dated May 1, 1866; reissue 3,389.—C. R. Cook, Buffalo, N. Y., assignee of Hiram R. Lavey.
26,808.—Manufacture of Sewed Boots and Shoes.—Dated January 10, 1860; reissue 3,390.—W. N. Ely, Stratford, Conn., assignee, by mesne assignments, of Francis D. Ballou.
15,354.—Mowing Machine.—Dated July 15, 1856; reissue 3,391.—Division A.—Eldridge M. Fowler, Bay City, Mich., assignee of John W. Thompson.
17,243.—Blind Fastening.—Dated May 5, 1857; reissue 3,392.—Randolph Hayden and James C. Ferree (assignees of Horace Vansands), Middletown, Conn.
17,205.—Harvester.—Dated May 5, 1857; reissue 548, dated May 4, 1858; reissue 3,393.—Division A.—James I. Hendryx, Cooperstown, N. Y., assignee, by mesne assignments, of Charles Crook.
17,205.—Harvester.—Dated May 5, 1857; reissue 548, dated May 4, 1858; reissue 3,394.—Division B.—James I. Hendryx, Cooperstown, N. Y., assignee, by mesne assignments, of Charles Crook.
84,669.—Suspender.—Dated December 1, 1868; antedated June 1, 1868; reissue 3,395.—Samuel Warren Henion, Selma, Ala.
53,682.—Harvester.—Dated April 10, 1866; reissue 3,396.—E. G. Passmore, Philadelphia, Pa.
86,316.—Wooden Packing for Piston Rods and Other Enginery.—Dated January 26, 1869; reissue 3,397.—Charles N. Petersen, Chicago, Ill.
26,616.—Harvester.—Dated December 27, 1859; reissue 3,398.—Oscar F. Smith, Williamsport, Pa., assignee of Samuel N. Purse.
82,371.—Pump.—Dated September 22, 1868; reissue 3,399.—Samuel Woodruff and H. B. Beach, Hartford, Conn.

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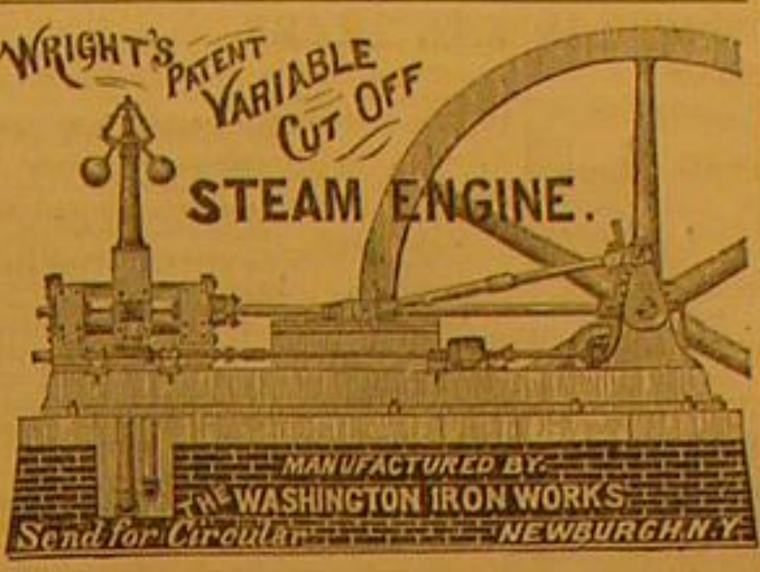

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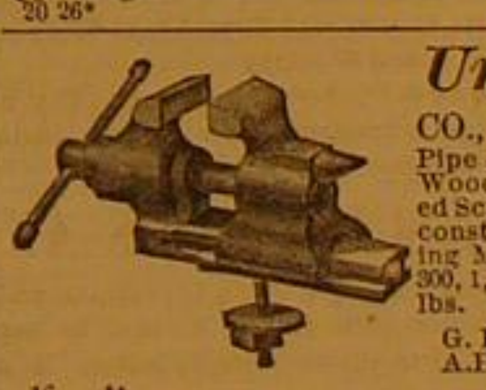

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LAFLER'S NEW IRON CLAD HAS MORE advantages combined in one machine than any other ever invented. It makes common brick of very superior quality. By a slight change, press brick are made without repressing. With Lafler's Patent Mold, beautiful stock brick are made. This machine was awarded first premium at the N. Y. State Fair, 1865, 1867, 1868. For descriptive circular address J. A. LAFLER & CO., Albion, Orleans county, N. Y. 5 tf eow

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SCIENTIFIC AMERICAN

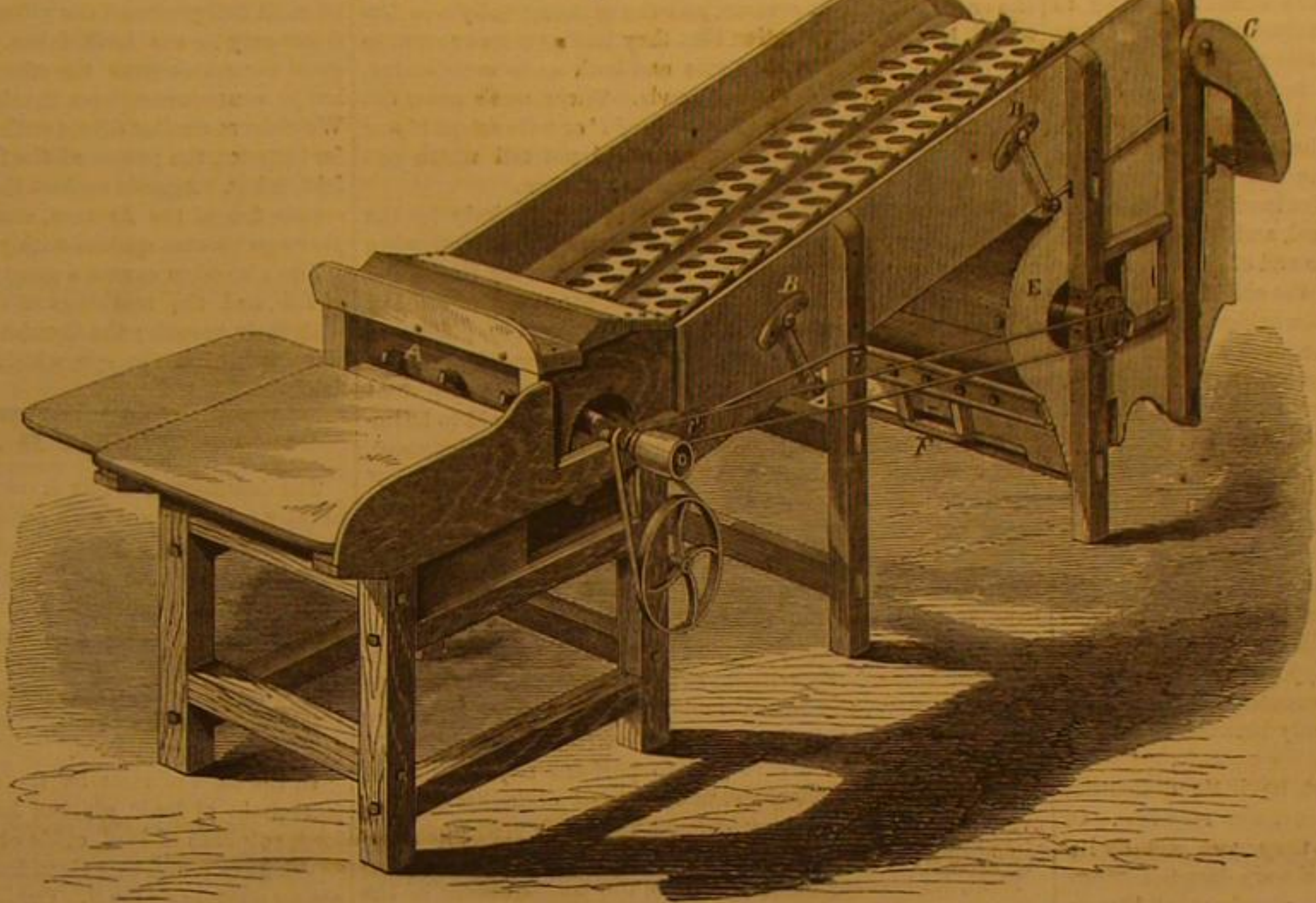
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XX.—No. 20. [NEW SERIES.] | NEW YORK, MAY 15, 1869. | $3 per Annum [IN ADVANCE.]

Improvement in Machine for Thrashing and Winnowing.

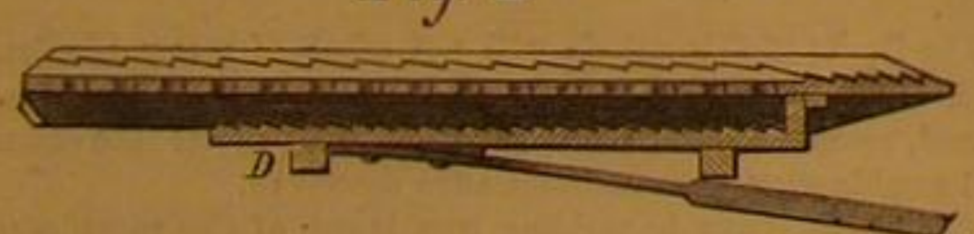
The combined machine herewith illustrated is intended for thrashing and winnowing wheat and other grains, and delivering the berries, or kernels, in a fit state for market, free from chaff, sand, and other impurities. It is driven by water, steam, horse, or other convenient power. The grain, as cut, is fed into the breaker or thrasher, A, as usual, the construction of this portion not being essentially different from that of ordinary thrashers. The straw and grain is then deposited, by the action of the rapidly-revolving thrasher-drum on the inclined perforated apron, which is double, as seen in the section, Fig. 2, and receives a rapid vibratory motion by the interposition of belts, the lower end being at the same time raised and lowered in consequence of the double apron being suspended from fixed points, B, on the sides of the machine. The serrated bars on the perforated incline receive the straw and by means of its rapid vibrating and lifting motion, the apron delivers the straw through the chute, C. The kernels and dust, with other impurities, not carried off with the straw, fall through the apertures in the upper floor of the incline on to the corrugated floor, D, Fig. 2, by which they are carried up and dropped from the upper end on to an incline, which carries them down to a series of vibrating sieves, the grain and debris being subjected to the action of a rapidly-revolving fan, E, that drives off the dust and light and imperfect kernels, the solid grains being discharged at F, ready for the market. A perforated slide, just over the delivery, F, may be used to regulate the supply of air to the fan to induce a stronger draft.

Fig. 1



SEIP & SCHMEYER'S COMBINED THRASHER AND FANNING MILL.

Fig. 2



A patent for these improvements is now pending through the Scientific American Patent Agency. Further information may be obtained by addressing Seip & Schmeyer, Macungie, Lehigh county, Pa.

HOW ENGINEERING DIFFICULTIES ARE OVERCOME.

At a meeting of the Institution of Naval Architects, recently held in London, Mr. Scott Russell delivered a very interesting discourse on "Railway Communication across Lakes, Straits, and Arms of the Sea." He said that, as they had very often to cross the English Channel, it was a great act of international cruelty to keep up such a wretched communication between Calais and Dover, as the great British nation and the great French nation now combined to keep up.

It was now more than three years since that eminent engineer, Mr. Fowler, became engineer to an association for putting a railway between Dover and Calais; and he (Mr. Scott Russell) was the naval architect for the steamships that were to make this communication. All the surveys had been made, all the plans had been prepared, and all the preliminary legal steps had been taken for bringing the scheme before the Houses of Parliament. But it was an unlucky period. Railway companies were quarreling with and ruining each other, and a scheme which merely interested the traveling public could not at that time command successful attention in the legislature or in the community. He might state that the plans had been fully matured. They had provided plans of the works by which railway trains would descend the pier at Dover, go into the vessel, cross over to Calais, and go from Calais right on to Paris, and *vice versa*; so that a passenger from London would, by a night train, take his seat or his bed in a railway carriage at London Bridge, and would open his eyes in the railway station at Paris, unconscious that he had crossed over the sea. That was a conclusion which he dared say people would gladly see realized; but he could not hold out any prospect of its being speedily realized, because we were such a patient people that it was likely for the next ten or twenty years we should be content to make passage as we had always done.

Curiously enough, about a year after this he was invited to look at the inland sea which separates Switzerland from Germany. What the Germans call the Bodensee, and what we call the Lake of Constance, was a great inland fresh-water sea, sixty or seventy miles long, and eight to twelve miles broad. The railways of Germany came close down to the German side of the lake, and the railways of Switzerland came down to the opposite side of the lake: and there the communication between the two countries was as completely interrupted as our communication with the Continent was blocked by the Straits of Dover. The reason why they did not carry the railway round the lake was obvious: the lake ran up into the precipitous Alps, and was continued over to the Italian side, so that no railway could find its way through. The Alps, with the Bodensee, formed an impassable barrier between Switzerland and Germany on one hand, and between Germany and the middle and south of France on the other. This was an enormous evil.

A large proportion of the supply of France with corn came last year from Hungary by railway and across the sea. Every sack of corn had to be unladen from the wagons, to be shipped, to be taken across, to be unshipped, to be reladen on the wagons. The cost of this transhipment, independent of the delay and blocking of the way, was greater than the carriage of the corn for the hundred miles by railway. It so happened that he had built the first fast vessel on that lake twenty years ago. It was a good, honest ship, and, as good, honest work always brought its own reward, he was called upon to solve the much more difficult problem of effecting communication between the railways on the two sides of the lake. The problem they set him was, "What we want is that you will make us the nearest thing you can to a railway, in order that we may let our trains, with their locomotive engines and everything, go across the lake as if it were a railway." Well, that was not difficult to do. The only difficulty was to do it well, cheaply, and in such a manner as to suit the peculiar circumstances of the case. The peculiar circumstances of the case were these: That at the entrance of the harbors the channels were shallow, not more than six feet deep. That was a difficulty. The next difficulty was that the harbors were so small that there was barely room for such a vessel as would carry a train to get into the harbor and turn round.

More than that, the entrances to the harbor were extremely narrow, so that in all these points, the case was a far more difficult one than the case between Dover and Calais. It might be said that he had not the great Atlantic waves to deal with. That was true; but there was something else—there was the terrific mountain hurricane, that came down so suddenly that it raised a nasty, short, sharp sea, and he need not tell them that a nasty, short, sharp sea, with a tremendous wind, was very often more troublesome to deal with, especially in shallow water, than a gentle swell would be. Another difficulty was a change of level of water, amounting to twelve feet from one extreme to the other. It was true this level did not change every day as at Dover, but it did change periodically, and therefore it was necessary to have a similar provision.

Having stated the peculiar circumstances of the case, he would shortly describe the manner in which those circumstances were met, and he would also state the results, because it would show that the difficulties between Dover and Calais could be met in a similar way. If he was asked the comparative difficulty of the two problems, he could not say that one problem was more difficult than the other. He had solved the Dover and Calais problem three years ago in plans, but he found that he had an enormous deal to learn and contrive before he could solve this particular problem in Switzerland. He proceeded to show how this problem was solved.

In the first place, he said to himself, "If they want me to continue the railway across the sea, I had better take a slice of the railway station, put a train and an engine into it, and send it over to the other side, and a train will then go on." He therefore took a section of a railway station 22 feet wide, and put upon that two lines of rail on one side and two lines of rail on the other side, leaving these two lines of rail to receive two railway trains. He had then to let in a locomotive engine, and so he had to make the roof of his railway station as high as a railway bridge, or a little higher than the top of the engine chimney.

The next thing was to float this bit of a railway station. Of course that was very easily done. He had only to put a construction below it in the nature of a ship, and, as there was only 6 feet of water, he had to take care that his vessel only drew 6 feet of water. The midships was 4 feet more out of the water when laden, so that below the railway platform there was a depth of 10 feet only. But this was not enough. Having got to propel the vessel, he had to place an engine room and boiler on each side, each 9 feet wide, making, with the 22 feet of railway, a total width of 40 feet. The boat had next to be fitted with paddles, which occupy a space of 10 feet on each side. So that, altogether, the structure was 60 feet beam. And when he stated that the harbors were from 80 feet to 100 feet wide at the entrance, and that he had to enter these harbors in hurricanes in shallow water, at a low velocity, with scarcely any steerage power, it would be seen that the task was not very easy.

Perhaps he ought to say a word about the engines. At the beginning there were a few particulars that bothered him. He wanted to get the paddle-shaft all through, but he could not. If he put it below it was too low; if he put it above it was too high; so he gave it up altogether, and simply put upon the shaft of each paddle wheel a couple of oscillating engines—one before the axle and one behind the axle. So he had a pair of engines to each wheel, perfectly independent of one another. A nautical friend would say to him, "You will get into precious difficulties with them." He knew he should. He knew very well that in a heavy wind, when one paddle wheel was deeper than the other, one engine would be flying away, and the other would be working very slowly. To counteract that he took a little indicator from the right engine room into the left engine room, and another indicator from the left engine room into the right engine room; and he made these indicators go round in the face of the engineer, so that he could not help looking at them when he was starting, or reversing, or moderating his engine. By this means engineer A was always looking at indicator B, and engineer B was always looking at indicator A; and in three days they had acquired such skill in handling the engines that engine A and engine B never advanced half a turn upon each other.

These were the difficulties he had on the cross section

There were also difficulties on the longitudinal section. On the line of rails he had to put his wagons, eight wagons on each line. German wagon were desperately long; but, having two lines of rails, he was enabled to carry nineteen wagons in all. The incovenience which he was obliged to submit to he had already mentioned, that arising from the shallowness of the water. He could not have deeper water than six feet, and he could not raise his vessel more than four feet above the water on account of the hight of the piers in the harbors. Therefore he was limited to ten feet deep. But he need not say that ten feet deep was much too shallow for a good strong vessel to stand this sort of work. Then came in the advantage of his railway station. What he did was to make the top of his railway station the top of an iron girder, and the sides of the railway station the sides of a ship; so that the ship, instead of being ten feet deep, was twenty-five feet deep from top to bottom, and the strength of the ship was at the top. This at once enabled him to get an enormously strong ship with a moderately light draft of water, and to have two decks, one above the other, the upper deck being the deck for strength, and also the most convenient deck for navigation, as well as the most preferable for passengers. There was also room for four first-class carriages outside this deck, two at each end. Here, then, was a solution of that difficulty.

The next difficulty was owing to the varying hight of the water and the varying immersions of the vessel according to its loading. He had to provide for a variation of twelve feet of water, six feet one way and six feet the other way. He managed it in this simple way: He made a railway bridge of steel 60 feet long, one end supported on the land and the other end was in the air. How did he get it into the air? Very easily. He merely put up on one side of this railway bridge a huge pillar of cast iron on the land. On the top of this pillar he put a great cast iron wheel, and round the wheel he put a chain cable. He attached one end of the chain cable to the bridge, and to the other end of the chain cable he attached a big weight half as heavy as the bridge. On the opposite side of the railway bridge he had another pillar, another wheel, another weight half as heavy as the bridge. Thus balanced, the railway bridge would remain in the air wherever you pleased to put it. But it was not content to stay there when the weight of the train was upon it; therefore it was necessary to keep it there by some other means, and so the chain was continued from the bottom of the weight round the wheel to a crane. When there was no weight on the bridge, if you gave a turn or two to the crane, the bridge got to the proper level; then they made fast to the crane, and the railway train went over the bridge. That was all; there was no merit in the contrivance. On the opposite shore there was another bridge hanging in the air, counterpoised by similar weights. The vessel oscillated only between those two points.

But it would be said that there must be little difficulties when the water was very high and when it was very low. Of course there were little difficulties, but they were met by little expedients. When the water was very low the bridge came a good deal over on the point of the boat and overlapped. There was a line of rail which ran down to each of the rails on the boat, and he need hardly tell a good engineer that as the boat "waggled" from one side to the other, he must make the bridge limp, so that it could "waggle" also, so that the train did not run off the rails. The bridge was made by a very good mechanical engineer, and for the life of him he could not get him to make any of his joints slack, so as to make the structure "wiggle-waggle." At last he did succeed in getting him to make the holes so big for the pins that the joints could "wiggle-waggle." This done, all difficulties disappeared.

A good locomotive engine-man could very easily drive his engine up an incline which was not more than four or five feet in a length of 60 feet or 70 feet. True it was a deep incline, but it was so short that there could not be many wagons at a time on it, so that, while one or two wagons were on the incline, the others would be on the level; thus any ordinary locomotive engine went up the incline without knowing it was on an incline. It might be said there would be a difficulty in coming down. There was a difficulty, and he expected the railway locomotive staff would have to undergo an education. He did not know any other way of making them undergo a thorough education than by letting them make some horrible blunder. He got the company to let him have a train of the oldest wagons they possessed. He told them secretly to make every preparation for taking the wagons out of harbor. He got the oldest locomotive engine they had, and he took care that the fireman and driver could swim. He found the brakesman could not swim, and on reflection he was glad of it, because they seemed dreadfully afraid of getting in, and the consequence was that not one of the brakesmen ever allowed a carriage to pass the chalk mark which he had drawn on the deck, because he could not swim.

Having made these arrangements, the practical result was, that by beginning gradually, and going on gradually, and giving the men a fortnight to learn, by making them put in trains and take out trains every day faster and faster, first with one carriage, then with two carriages, then with three, and ending with the locomotive engine, they at last acquired the power of doing all these things, which they thought at the beginning were impossibilities. These impossibilities were so accomplished that the term the people applied to the formidable enterprise, as they thought it, of putting a locomotive and train on board, *Kinderspiel*, which meant "child's play." There was no merit in all this, but there was one advantage, and that was simplicity. There was no machinery required, no fixed engines, no inclined planes, no moving machinery of any kind; there was simply a railway station, and all the appendages on both sides were nothing more than the common appendages of a railway station. Therefore he was proud of the word *Kinderspiel*.

These were all the land difficulties he had to overcome; there still remained water difficulties. The water difficulties were various. In the first place, how was he to navigate a ship which was 220 feet long out of and into a harbor which at no place was more than double that length, and where he had to wind in a circuitous route to quays where other vessels were being unloaded? It would be seen there was considerable difficulty in the navigation. The entrance to the harbors was in one case 100 feet wide, and in the other considerably under 100 feet. Of course in a dead calm, and with no speed on, the ship could get in and out. But when there was a hurricane blowing—for though this ship did not carry sail, yet with a long train, high out of the water, she would have some sideway on her with a strong wind—the task of getting into harbor was a difficult one. At the beginning it was thought this was an impossibility, and it was very near being an impossibility. When a big ship like that, drawing six feet of water, came into water six feet six inches deep, sailors said "she smelt the ground." In this case she so smelt the ground that she ceased to have any scent whatever for the the opinion of the steersman or the action of the rudder; and in shallow water such as that, the steering of a vessel 40 feet wide was impossible. In order to meet the difficulty he had to teach the engineers, the steersman, and the captain, totally new lessons. He ought to mention that they had no stem or stern to the boat; both ends were stems and both ends were sterns, and there was a rudder at both ends. There was a great difficulty down stairs. To say "Go ahead!" or "Go astern!" was impossible, because the engineers could not tell which end was meant for the stem and which for the stern.

At last he solved the difficulty by steering entirely by the two engines and abandoning the rudder, with the following code of rules: The captain stood in the center of the vessel with two tubes, one to the right engine, the other to the left engine. Out of these confined harbors they had to perform a very sharp circle to get out. But the plan they adopted was so successful that the first time they tried it the ship went right out of this complicated harbor, which was said to be impracticable with a rudder, and with a landsman in command. The command was given, "Right engine three turns!" That was part of the code that there should never be an order given without saying when the engine was to stop, "Right engine two turns, left engine three turns!" Accordingly the vessel began to describe a curve in order to get out of the harbor. If she did not describe the curve exactly, the next command would be, "Right engine two turns and a half, left engine four turns." So, without ever stopping, the ship went in the exact curve, and from that day to this, the moment the crew had learned this power of manœuvring, the vessel could be made to turn on a pivot, or to perform any number of curves without a rudder. Thus that great difficulty was got over, and the vessel now entered the harbor without ever touching a pier or touching another vessel.

Next, let him say one word as to the consequences of the construction of such a vessel. Trains coming from a great distance did not unload their goods, they went right across without delay, and the lake was now, for all practical purposes, a continuous railway. The time in putting a train on board was six minutes, the time in taking a train out was ten minutes, the time in going out of harbor was five minutes, the time in going into harbor was ten minutes, the time in crossing the sea was, the shortest, forty minutes, the longest, fifty-five minutes; so that in an hour and a quarter the whole operation was accomplished. Formerly the time occupied was two hours and a half. Need he say with regard to the heavy goods, such as machinery, engines, and boilers, that under the old system of craneage the labor of transporting them across the lake occupied several days?

He had now to say that, whereas everybody would talk of the impossibility of making a great floating railway across the Straits from Calais to Dover, there are also apparent impossibilities of every kind in the present instance, but only on half the scale. From Dover to Calais the distance was twenty miles; here it was ten miles. The ships proposed for Dover and Calais were 400 feet long; here they were 200 feet. The depth of water at Calais was difficult, but it might easily be made double the depth of the water in the Swiss harbors. With regard to the sea, where the waves were gentle swelling waves, they were of no consequence; it was only where the waves were short, sharp, striking waves, that they were of any consequence. He could assure them that if a vessel were made of the proper size, proportion, and shape, and of the right stability for these waves, there was scarcely a constitution so delicate that would not be able to cross from Dover to Calais without any sensation almost of having been on the top of the sea.

Capriciousness of the Colors of Fish.

A. C. Hamlin, in an article on "Salmon Fishing in Maine," contributed to *Lippincott's Magazine*, for May, says;

"The colors of fish are very capricious, and often depend upon local and adventitious influences. The coloring matter is not in the scales, but in the surface of the skin immediately beneath them, and is probably a secretion easily affected by the health of the fish, the quality of the water in which it lives, the light to which it is exposed, and the kind of food which it eats. In the dark waters which flow through boggy moors the tints of their finny inhabitants are deep: the light silver hues change to a golden yellow, and into the intermediate shades, even to a dark orange. But in the crystal waters of the purest stream, flowing over pebbly bottoms and white sands of decomposed quartz, the colors of the fish are very pure, and the luster is of such brilliancy as to give the appearance of transparency. We do not only observe this assimilation of color in fish to the places they frequent, but it is the same with the animals of the land. It is one of Nature's provisions, and is required for safety and concealment. Dr. Stark showed many years ago how suddenly the stickleback and other fish changed color when removed from dark pools and placed in white bowls. The change of hue took place with as much rapidity as though it were subject to the caprice of the fish, as is the case with the chameleon.

Food has a very decided influence, and, in connection with other circumstances, will produce a marked effect in the appearance of salmonidæ, even in the same lake. Thus in Lake Guarda, in Italy, we may observe one specimen with silver sides, blue back, and small black spots, and another of the same variety with yellow belly, red spots, and an olive-colored back. The like phenomena have been observed with trout of the same variety in the lakes of Germany and Ireland. Differences of food and habits, says Davy, may occasion, in a long course of ages, differences of shape and color which may be transmitted to offspring. Trout that frequent clear and cold waters, and feed much on larvæ and their cases, are not only red in flesh, but they become golden in hue, and the red spots increase and outnumber the black ones; but when feeding upon little fish they become more silvery in color and the black spots increase. We have some singular examples of the effects of difference of diet. The peculiarity of feeding on shell fish produced the gillaroo trout, a remarkable variety found only in the Irish lakes. The charr also is liable to great variations from the effects of its food, and its history has in consequence been much confused by the naturalists. We observe similar effects with the corregoni, or white fish; for instance, the powan of the Scottish and the pollan of the Irish lakes. Agassiz noticed that pet parrots, when fed upon certain fish of the Amazon, changed colors, and their green plumage became spotted with yellow.

Age also often causes a great difference in the appearance of fish, and the markings of the young change singularly with their growth; the Cornish sucker has two large ocellated spots behind the eye, which are not visible in the young fish.

WHAT IS A FLUX?

The definition of a flux is according to Morfit, "a substance usually saline, mixed with other bodies in order to promote their fusion, and to render them more soluble in water and acids." Mitchell, in his "Manual of Assaying," makes two classes of fluxes—metallic and non-metallic. Under the head of non-metallic fluxes, he places silica, lime, magnesia, alumina, silicates of lime and alumina, glass, borax, fluor-spar, carbonate of potash, carbonate of soda, niter, common salt, black flux and its equivalents, argol, salt of sorrel (binoxalate of potash), and soap.

In the class of metallic fluxes he places litharge, ceruse (carbonate of lead), glass of lead (silicate of lead), borate of lead, sulphate of lead, oxide of copper, and oxides of iron.

We have found this classification in no other work and we see no good basis for it. Oxides of metals are found in both classes, and many substances which might properly be considered as fluxes are not enumerated. Matthiessen in his definition of an alloy appears to us, to have given the entire philosophy of the action of fluxes. He defines an alloy as a "solidified solution of one metal in another." If this definition be accepted—and we see no reason for rejecting it—a metal which forms alloys with one of more difficult fusibility may be considered as a flux. A flux in this view is a solvent, which acts together with heat to reduce a solid to a liquid state.

The limits of this article will not admit of many illustrations of this definition of a flux, but one or two may be mentioned, premising that a flux most generally enters into chemical combination with the substance dissolved.

The use of borax in welding iron is one of the most common examples. The object to be attained in this case is the bringing of the surfaces of two pieces of iron so near together that cohesive attraction may unite them into one piece. This intimate approach can not be attained so long as the oxide which forms in the heating process remains upon the surfaces of the iron. The presence of borax prevents oxidation to a great extent by flowing over the surfaces; at the same time it liquefies whatever oxide is formed, so that the surfaces may be brought closely together and cohesion may take place. Sand is used in welding iron to iron for a similar purpose.

Mercury dissolves gold even at ordinary temperatures; the use of heat does not therefore alter the *rationale* of the action of fluxes, it only weakens the cohesive power of the substance to be fluxed so that the solvent action may readily take place. It therefore must be concluded that when a flux is used the melting of substances is not a process of simple fusion, but also one of solution.

Brickmaking in Scotland.

A writer in the *Scotsman*, on manufacturing in native clays, says: "The number of bricks made in Britain in the year 1802 was 714 millions; in 1840 it was 1, 725 millions; and in 1850, the year in which the duty was abolished, it was 1,563½ millions. The number of bricks made in Scotland annually was 15½ millions in 1802, and 47¾ millions in 1840. If the great increase in railway and other works, the rapid enlargement of towns, and other recent causes leading to a more extensive use of bricks be considered, the number now made in Scotland cannot be less than 300 millions a year.

There are in Scotland 122 manufactories of bricks, tiles, and articles of a similar nature; and in connection with these from 4,000 to 5,000 persons are employed. The manufactories are widely scattered over the country, the farthest north being at Banff, and the farthest south at Dalbeattie; but the greater number are in Lanarkshire and Fifeshire, in which counties valuable beds of fire-clay exist. The most extensive manufactory is that of the Garnkirk Fire-clay Company, situated on the Caledonian Railway line, about six miles east from Glasgow. The company was originally formed to work coal, but, finding that extensive seams of fire-clay existed on their property, they took to manufacturing that material, which now almost exclusively engages their attention. The principal seam of clay is 7ft. in thickness, and lies at the average depth of twenty-eight fathoms. Its quality is considered equal to that of the best Stourbridge clay. The manufactory covers upwards of six acres of ground, and is surmounted by thirty tall brick chimneys, which give it an extraordinary appearance. Raw material is brought in, and finished goods are sent out, by branch railways, the traffic of which never ceases, from one week's end to another. Two hundred tuns of clay, and about an equal weight of coal, are used every day. Upwards of 300 men and boys are employed by the company, and these are aided by three steam engines with an aggregate of 150 horse-power. This is exclusive of the power employed to bring the clay and coal out of the pits. The clay is of a dark color, owing to the presence of a small proportion of bituminous matter; but when that is expelled by the action of fire, only silica and alumina remain, and it is the presence of these substances in certian proportions that decide the value of the clay. As it comes from the pits the clay is entirely devoid of cohesion or plasticity; and in order to bring it into working condition it has to be ground very fine, and then mixed with water. Several powerful mills are used for this purpose. They consist of great iron rollers, which travel round a circular trough, and pass over the clay. Several hundred-weights of material are operated on at once, the time for which the grinding is continued depending on the quality of the articles to be produced.

EXPLOSIVE COMPOUNDS FOR ENGINEERING PURPOSES.

NO. VI.

Concluded from page 274.

The second of the two principal opponents which gunpowder has to contend with is gun-cotton. This proposed substitute was discovered by Schonbein in 1846, since which time it has been greatly improved as far as regards manufacture, and attempts have been made in various countries to apply the material to purposes for which gunpowder hitherto had been alone used. In England, its manufacture on a large scale was commenced by Messrs. Hall, the gunpowder makers, at Faversham. An explosion, however, soon occurred at the works, killing a number of men, the cause being the spontaneous ignition of gun-cotton. This led to the abandonment of the manufacture on a large scale, and gun-cotton was apparently lost sight of until 1854, when Hadow published some results of his investigations into the nature of gun-cotton. In France, gun-cotton was made the subject of experiment as early as 1846, and its manufacture was carried on at the Government Powder Works at Bouchet, near Paris. Here, however, disastrous explosions also occurred—one in March, 1847, and two in 1848, several lives being lost. These disasters appear to have put an end until quite recently to experiments with gun-cotton in France. In Austria, where great attention has been paid to gun-cotton, Baron Von Lenk was commissioned to inquire into the merits of the material, and a manufactory of gun-cotton was established at the Castle of Hirtenburg, near Vienna. The material was applied for a while to cannon, but soon grew into disfavor, owing to its uncertainty of action. In 1862 an explosion occured in a magazine at Simmering, near Vienna, which caused the use of gun-cotton in artillery to be put a stop to; and in December, 1866, by order of the emperor, the use of gun-cotton by the Austrian artillery and crops of engineers was entirely prohibited.

Important progress has, however been made in the development and practical application of gun-cotton by Professor Abel and others, since its study was resumed in this country about six years ago.

Professor Abel has identified himself with the advancement of the gun-cotton question, and great credit is due to him for the light he has thrown upon that question by long and patient experimental research. Still greater credit is due to him for having discovered and perfected a method of treating gun-cotton whereby it is rendered non-explosive when burnt in the air, but in which the full energy is developed when fired in a close chamber. The method consists in reducing the gun-cotton fiber to a fine state of division or pulp, as in the process of paper making, and in converting this pulp into solid masses of any suitable form or density under a pressure of 18 tuns to the square inch.

The most recent feature in the development of the gun-cotton question is the rendering of the safety gun-cotton, just referred to, violently explosive when in the open air. This is effected by means of a detonating tube attached to a fuse, similarly to the method adopted by Mr. Nobel to explode dynamite, an engraving of which is here given copied from the *Mechanics' Magazine* of April 2d. It consists of a copper tube,

A, containing the fulminate. B is the ordinary mining fuse which is inserted in the tube. In firing the fuse is inserted in the tube, the opening, C, being nipped upon it with a pair of pliers. This tube is then inserted in the fuse-hole of the charge within about three-fourths of an inch of the charge and afterward fired. This safety gun-cotton, therefore, which will only burn in the open air if ignited by any ordinary means, will, it appears, develop all its deadly energy if fired under the same unconfined conditions, but with a special detonating fuse. In proof of this, some experiments were recently carried out at Stowmarket by Messrs. Prentice. The author appends a few particulars of these trials, which took place on January 22d. The first experiment consisted in placing a disk of gun-cotton, weighing about 1lb. 1oz., on the stump of a tree lately felled, and igniting it by an ordinary piece of miner's fuse. At the instant of ignition it was enveloped in flame, and moved about for the two or three seconds required for its combustion. About half the quantity was then placed on the same spot, and ignited by a small detonating fuse. A sharp, sudden report was heard, and the stump was found on inspection to be partly penetrated just where the charge had lain, while the twigs of the hedge close by suffered severely. The root of a large tree which lay on the ground was then attacked. A disk of gun-cotton, weighing about 1lb. 1oz., was placed in a hollow beneath it, a detonating fuse being inserted. The explosion shattered the old stump, and scattered its fragments in all directions. The next experiment was calculated to prove the question from a military point of view. A row of palisades, composed of trunks of trees, some 18in. in diameter, and all sunk 4ft. into the ground, was provided. A long tree trunk lay touching the foot of the palisade, and upon this 5lbs. of gun-cotton were laid. Wires communicating with a magnetic apparatus were affixed to a detonating tube, which was placed in contact with one of the disks of gun-cotton. Upon the explosion only one trunk was seen to fly away from the spot, and that proved to be the one upon which the charge had been placed; the palisades, although shaken, were comparatively unharmed. A charge of 15lbs. of gun-cotton was then placed against another part of the stockade, which was perfectly sound, and fired. The result was a general smash up, and a tumble over of all the trunks in numerous pieces; and so it ought to have been with such a charge as was employed.

If we compare the relative safety of dynamite and gun-cotton, there appears to be no difference between them. The only doubt upon Mr. Nursey's mind is whether, after long storage, any dangerous change may take place in either of the two substances. Mr. Nobel has endeavoured to answer this question with regard to dynamite, but the author thinks a year is scarcely sufficient time to determine this matter in such a comparatively recent discovery. So, too, with regard to the compressed gun-cotton. The author thinks a longer time must elapse before the new form of gun-cotton can be pronounced absolutely safe. The old gun-cotton was supposed to be safe in storage, but accidents at home and abroad have shown the contrary; and, however Professor Abel may now have eliminated the eliment of danger, as far as chemistry can, it is not for any one to say it is a reliable material until such time-tests have been applied as shall satisfy not only chemical science, but common sense. With regard to the question of relative powers of dynamite and gun-cotton, these appear also to be nearly evenly balanced; we may take it that for all practical purposes they are so. It would appear, however, to the author that dynamite was actually the stronger of the two, for, from his experience of that substance, he thinks that much less than 5lbs. of dynamite would have effected what 5lb. of gun-cotton failed to do at the palisade experiments—viz., to demolish it.

The most deadly explosives are at hand ready for work, but as harmless for mischief as so much sawdust or paper. They may be transported with safety, and played with by a child when unconfined; but when imprisoned they will tear down the hardest rock in liberating their gases. These are some of the marvels of the age in which we live, but which some new scientific discovery may eclipse before many years pass over.

The Senate Committee on Pacific Railroads.

"The report of the Senate Committee on Pacific Railroads favors two additional trunk railroads to the Pacific—one from Lake Superior to Puget's Sound; the other from Little Rock, in Arkansas, and from the terminus of the Kansas Pacific railway in Kansas, by the route of the thirty-fifth parallel, to San Diego and San Francisco. The report declares that the bill reported by the majority of the committee was intended to be the finality of legislation in aid of Pacific railways; that after having provided substantially two additional trunk outlets—one for the Northern States and one for the Southern States—at suitable initial points, it was intended to stop there all Congressional aid, and leave to private enterprise and State endowment the future construction of branches. The report shows at length, and with a large array of statistics, derived from the experience of the influence of railways in England, France, Belgium, Holland, and the United States, that they are the greatest of all modern agencies for the production of wealth and the development of trade and commerce. It demonstrates that the import and export trade of the principal countries in Europe are in precise proportion to the development of their railway systems, respectively; that the experience of Belgium, France, Austria, Spain, and Italy, shows that a tax on railway receipts is the best sinking fund thus far devised for the speedy payment of national debts. It also shows that two additional trunk railways to the Pacific are commercially necessary, demonstrating that a single line cannot do the work that will be thrown upon it; that additional lines, free from obstruction by snow, are needed to maintain uninterrupted intercourse; to prevent the evils of a monopoly; to avoid political discontent in the Northern and Southern sections of the Union; to bring the public domain into market; to increase immigration from Europe; to quadruple our yield of gold and silver; to save two-thirds of the cost of wagoning supplies to the 100 military posts in the Indian country, which now amounts to about seventeen millions a year; to reduce by one-half the number of troops maintained in the Territories by the greater mobility the roads will give the remainder, and to practically end Indian wars, which the report shows cost the country during the last campaign about one million dollars a week. The majority of the committee urgently recommend aid to the roads as a measure of immediate and lasting economy to the Government. The report proves that it is safe for the Government to aid them, without reference to the incidental advantages of doing so, by showing from the accounts of the Quartermaster's Department with the Kansas Pacific Railroad that upon an average use of 220 miles of the road its earning for work done for the Govrenment not only paid the interest on the bonds advanced to the road and provided the sinking fund to redeem them, but brought the Government in debt to the road. The report opposes grants hereafter of Government aid like that given to the Union Pacific and Central Pacific, in bonds directly issued, but advocates a guarantee of the interest of the mortgage bonds of the two additional trunk Pacific roads, to be issued to a defined and limited extent. It declares that they are military, commercial, and political necessities, and concludes with the averment that the people demand their construction, and do not, as has been alleged, participate in, or sympathize with, the recently raised outcry against Pacific Railway aid."

This is all very well. We are in favor of railways and other internal improvements, but it has become a very serious question and it is one in which "the plain people" are interested—namely, can these railroads be built, or can any public enterprise be carried on now without swindling? A few years ago we could answer this inquiry in the affirmative, but in these latter days there seems to be a job in every work of a public character. It is also charged that Members of Congress are in these things. Is it not, therefore, about time for us as a people to stop just long enough to find out whether we are not rushing on a little too fast? We fear that the country cannot much longer sustain such manifest disregard of honesty in public affairs.

Lumber of the Upper Mississippi.

The lumber product of the Upper Mississippi and its tributaries was very large last year, and it is estimated that the supply for 1869 will amount to six hundred and twenty million feet. Less than half this amount was cut in 1857, and yet the lumbermen of this region suffered heavy losses from the slight demand. Now, however, it is asserted, that the business is sure and very remunerative. The extension of the railroads in the adjacent States, and the construction of the Union Pacific, are assigned as the causes of this usual prosperity. A single lumbering firm in Minnesota is reported as owning over 100,000 acres of selected pine land. It is feared that the trees of this region will all be cut down, and that the land will remain desolate.

Amateur and Scientific Farming.

Mr. J. H. Hall, a member of the Farmers' Club and New York State Poultry Society, has purchased a farm on Long Island for the purpose of testing general questions of interest in agriculture. One of these is the value of artificial manures, the profitable growing of imported seeds from Washington, and the feasibility of raising poultry on a large scale. Dr. Pratterre, of the Eccelabeon celebrity, has kindly consented to aid him in the hatching of eggs by the hundred with his imported and improved machine.

The eleventh exhibition of American manufactures, machinery, new inventions and works of art, under the direction of the Massachusetts Charitable Mechanics' Association, will open in Boston on Wednesday, September 15th. Faneuil Hall and Quincy Hall will be used as heretofore, and it is in contemplation to erect in South Market street a building several hundred feet in length to afford accommodation for the proper display of articles which have heretofore lacked proper space for an appropriate display. This building will be erected on iron pillars, and will not interfere with the trade or travel of the thoroughfare.

Applicants for Patents want their claims examined more promptly. The Patent Office has got into a very lazy condition, and needs to be stirred up. Commissioner Fisher cannot do a better service at the outset than to devise measures to clean the docket of pending cases. Upon investigating the condition of the Patent Office in this respect he will find it very unsatisfactory. Examiners might, if they would, perform a little extra labor to bring up the back work of the Office.

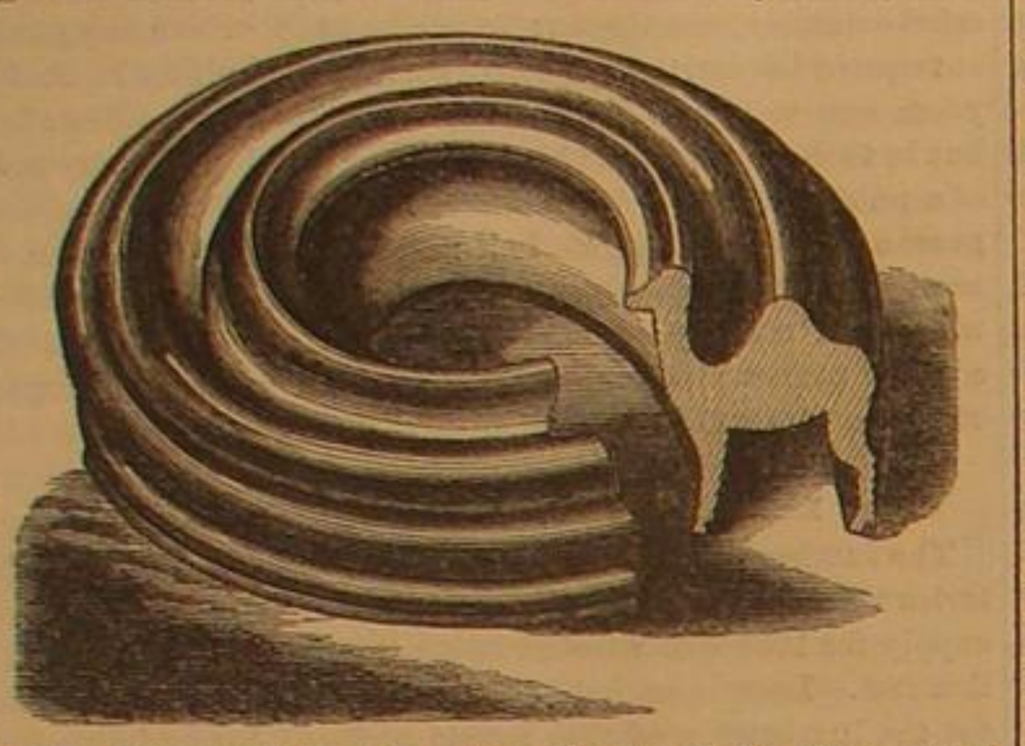
Lighting up the Stomach.—We find the following curious statement in a Canadian paper: "M. Milliat, in France, introduces into the stomach, glass tubes of small caliber, connected with a strong battery, and containing the electrodes necessary for producing a brilliant galvanic light. Tumors or ulcers in the abdomen can thus be observed through the skin, and the interior lit up as when the feeble light of a candle renders the finger translucent.

Sunflower Seed Tea—A Remedy for Summer Complaint.—A correspondent writes us that a tea made of the seeds of the sunflower, roasted like coffee berries, are an admirable remedy for all species of summer complaint. A half pint of the seed is sufficient. It should be remembered, however, that serious results often follow the too sudden stoppage of diarrhœa by astringents, and with this, as all remedies of a similar nature, caution should be used.

A Texas gentleman has received a quantity of silkworm eggs from France through the post. Some of the eggs hatched on the way, and the worms were living on their arrival.

Timber Beasts.

Mr. John R. Jackson, Kew, contributes the following curious article to *The Gardener's Chronicle*: That economic botany has a wide range of application the varied contents of the museum at Kew clearly illustrates. One of the most peculiar, and at the same time amusing of recent additions to that collection, is a series showing the mode of manufacture of children's toys as carried on in Saxony, and presented by Dr. Reichenbach. Everyone knows what a child's Noah's Ark is, and everyone is more or less acquainted with the orthodox forms of the representations of the beasts which it contains; and further than this we believe most of us have at some time asked ourselves the question, "How is it possible for these toys to be made, brought into this country, and sold at so low a price as they usually are?" But this question is partly solved by a glance at the collection at Kew. The wood used is the common white deal of carpenters, and the mode of manufacture is so ingenious that a description of it cannot fail to be of interest. The wood is first turned in a lathe in circular pieces, which look when entire very like circular picture frames. Cross sections of the proper width required are then cut out of these "frames" in the direction of the grain of the wood where a horse, a cow, a lamb, or a dog, or whatever animal has been designed in the lathe, presents itself. This will be more clearly understood from the accompanying figures. The section now has to be finished by hand; all it



requires, however, is to have the angles rounded and smoothed, and the tail, horns, etc., which are turned in separate pieces, attached; after which the whole is painted, and the animal is complete. In the case of an elephant, the ears, tusks, and trunk are all turned in distinct circular pieces, and sections are cut out in a similar manner to those intended for the body. This mode of manufacture is very ingenious, and in some degree explains the possibility of the production and importation of such large quantities of these toys for sale at such cheap rates. Since these specimens have been exhibited at Kew, they have attracted a large share of the attention of the numerous visitors who flock there.

The Golden House of Nero.

On that part of the ruins of Imperial Rome lying between the Palatine and the Esquiline Hills—a space which was more than a mile in breadth—Nero erected his "Golden House," as he called the new palace in which he fixed his abode. The vastness of extent and the varied magnificence of this imperial residence and its ornamental grounds almost surpass belief; and if the details that have come down to us respecting it were not too well authenticated to admit of doubt, they might be regarded as fabulous. Within its inclosure were comprised spacious fields, groves, orchards, and vineyards; artificial lakes, hills, and dense woods, after the manner of a solitude or wilderness. The palace itself consisted of magnificent buildings raised on the shores of the lake. The various wings were united by galleries each a mile in length. The house or immediate dwelling of the emperor was decorated in a style of excessive gorgeousness. It was roofed entirely with golden tiles, and with the same precious metal the marble sheathing of the walls was also profusely decked, being at the same time embellished with ornaments of mother-o'-pearl—in those times valued more highly than gold—and with a profusion of precious stones. The ceilings and woodwork were inlaid with ivory and gold, and the roof of the grand banqueting-hall was constructed to resemble the firmament. It was contrived to have a rotatory motion, so as to imitate the motion of the heavenly bodies. The vaulted ceiling of ivory opened and let in on the guests a profusion of flowers, and golden pipes sprayed over them the most delicate perfumes.

Stewart's New Model Dwelling.

We have already noticed the grand project of Mr. A. T. Stewart, of this city, to construct a model dwelling, designed as a home for worthy working women. The *Evening Post* gives additional particulars concerning the structure, which are worthy of attention. Mr. Stewart's purpose is to erect a magnificent palace of iron, somewhat resembling his store on the corner of Broadway and Tenth street, which will have stores on its ground floor, and sleeping and eating accommodations for fifteen hundred persons in the remaining stories of the building. The extent of the new structure will be 197½ feet on Fourth avenue, and 205 feet on both Thirty-second and Thirty-third streets. It will surround a court 100 feet square, and, consequently, every apartment will possess windows upon the open air, and ample consequent ventilation. The hight will be seven stories upon the Fourth avenue, in addition to the basement, and eight stories upon the side streets. The whole building will be painted white, externally and internally, and crowned with a Mansard roof of slate. It will be bricked behind the iron walls, and be thoroughly fireproof. The staircases will be of iron, and an elevator will be attached, which will transport luggage and residents to the various stories. A water tank will exist on the top of the house, and water will be in abundance upon every floor. The rooms will each be heated by a coil of pipes, affording means of regulating the temperature. Those for sleeping purposes will either be small, for single inmates, or eight feet by eighteen, for two persons. Others will be sixteen feet by eighteen, for four persons. All will be well furnished, and contain every essential convenience. The partitions will be of iron and brick. As little wood will be employed in the building as practicable. Bedsteads and tables will be of iron. The basement will contain the engine and heating apparatus, bathrooms, and storerooms of different kinds. In the back part of the ground floor, which will have no face on the street, and cannot be used for stores, the kitchen and laundry will be located. Above these will be the restaurant or dining room, and a large parlor for social purposes, elegantly furnished. To this a library and reading room will be added. The cost of the whole may exceed $3,000,000. A handsome interest upon this will be met, to a large degree, by the lease of the numerous stores below, leaving a very small sum to be paid for each of the rooms. The food furnished in the restaurant will be at cost, in addition to the expense of cooking, serving, etc., and it is calculated that an inmate will be able to live abundantly well, washing, rent, and food included, for little more than $2 a week. The more numerous the household, the less the expense to each.

Hartford Steam Boiler Inspection and Insurance Company.

The following report of this Company's inspections during the month of March is made to its directors:

During the month 327 visits of inspection were made and 628 boilers examined—543 externally and 181 internally—while 47 were tested by hydraulic pressure. The number of defects in all discovered, 404. Number of dangerous defects, 63. These defects were as follows: Furnaces out of shape, 7; fractures, 116—34 dangerous; burned plates, 39—6 dangerous; blistered plates 57—5 dangerous; cases of incrustation and scale, 70—5 dangerous; cases of external corrosion, 36—1 dangerous; water gages out of order, 20; blow-out apparatus out of order, 11—1 dangerous; safety valves overloaded, 20—4 dangerous; pressure gages out of order, 38—5 dangerous; boilers without gages, 9; cases of deficiency of water, 7—4 dangerous; cases of internal grooving, 3.

The unusually large number of defects reported may be accounted for by the fact that considerable work for the month was done in mining and iron-working districts. The boilers of mines and iron works are usually urged to their full capacity and almost constantly, hence the opportunities for frequent examinations are less than in many and most other establishments. By dangerous defects we mean those that are liable to result in rupture or explosion at any time. Fractures are very common, and, as will be noticed, out-number other defects. These occur from various causes—overpressure, burned plates, cold water on hot plates, and faulty construction.

The tendency of manufacturers to continue in use boilers of too limited capacity for their wants is the direct cause of many disasters. There is no valid excuse for this, for while the increasing business of a manufacturer demands additional machinery, he should remember that the boiler power adapted to his early beginning is ill adapted to present wants. This is, however, frequently overlooked, and a forty-horse power boiler is made to do the work of a sixty, or even more. This goes on until continual repairing becomes a nuisance or the boiler actually explodes.

Sufficient attention is not given to the feed water in rural districts. In many instances the water is gathered in ponds and contains much vegetable matter. This makes a deposit of greater or less thickness, which should be frequently removed if the manufacturer has not the means of filtering the water thoroughly before it is pumped into the boiler. Incrustation, deposit, and scale seriously interfere with the rapid generation of steam; hence, motives of economy should lead steam users to frequently clean their boilers.

In one instance, where insurance was desired, the engineer was requested to "blow out" the boiler, when he replied: "It must be pumped out for we have no place to 'blow it off.'" On examination it was found that the boiler had neither blow-out pipes nor hand holes. It had not been opened for more than two years. Is it a wonder that boilers explode?

The explosions during the month have been numerous and disastrous. Yet, while many of the boilers under the care of this company have been found in dangerous conditions, none have exploded. It may be well to add that on inspection all boilers found to be in an unsafe condition are regarded as uninsurable until thoroughly repaired.

A New Copying Ink.

A black copying ink, which flows easily from the pen, and will enable any one to obtain very sharp copies without the aid of a press, can be prepared in the following manner: One ounce of coarsely broken extract of logwood and two drachms of crystallized carbonate of soda are placed in a porcelain capsule with eight ounces of distilled water, and heated until the solution is of a deep red color, and all the extract is dissolved. The capsule is then taken from the fire. Stir well into the mixture one ounce of glycerin of a specific gravity of 1·25, fifteen grains of neutral chromate of potash, dissolved in a little water, and two drachms of finely pulverized gum arabic, which may be previously dissolved in a little hot water so as to produce a mucilaginous solution. The ink is now complete and ready for use.

In well-closed bottles it may be kept for a long time without getting moldy, and, however old it may be, will allow copies of writing to be taken without the aid of a press. It does not attack steel pens. This ink cannot be used with a copying press. Its impression is taken on thin moistened copying paper, at the back of which is placed a sheet of writing paper.

BEET ROOT SUGAR.

No. VIII.

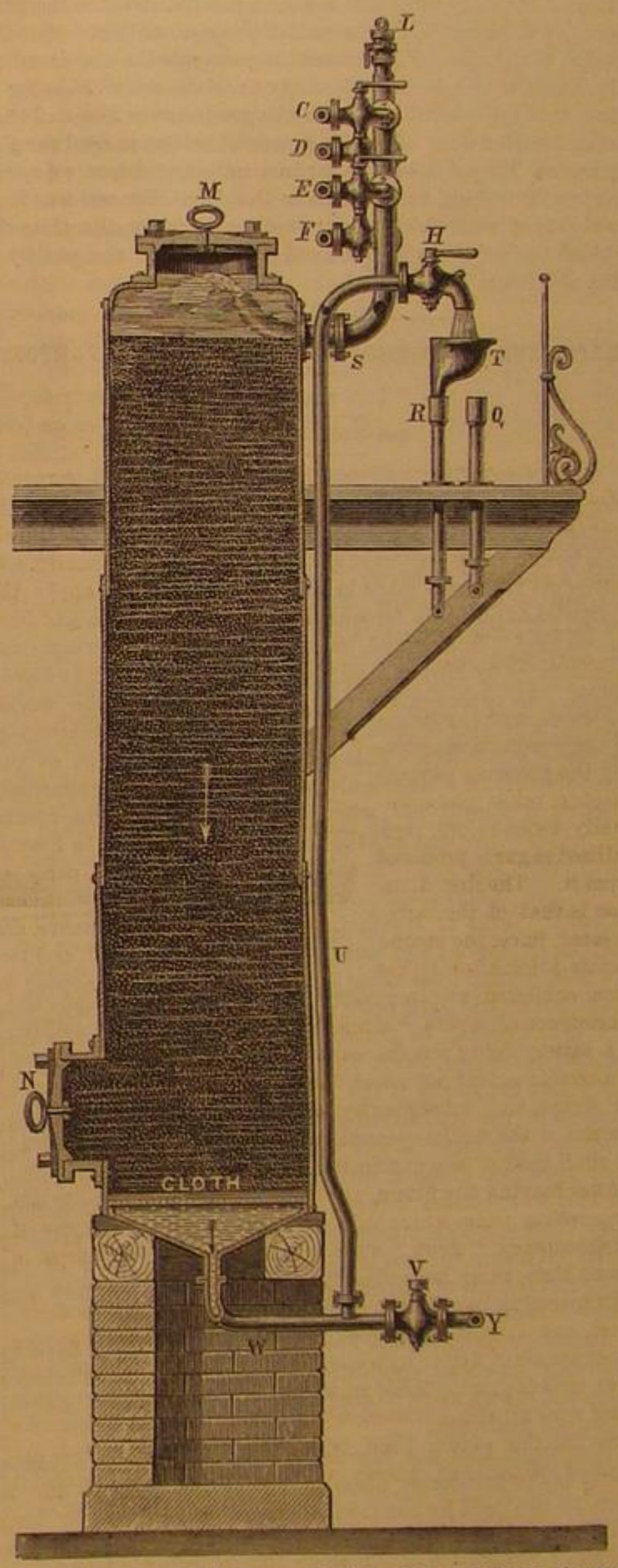
TECHNOLOGY.—PART V.

FILTRATION AND CONCENTRATION OF THE JUICE.

After leaving the carbonatation pans, the beet root juice, retaining still a certain proportion of both organic and inorganic impurities, is run into a tank or reservoir, from which it is conveyed into large filters, filled with granulated bone-black. These filters are upright cylindrical vessels, made of boiler plate, generally from 12 to 15 feet high, with an internal diameter of from 39 to 40 inches.

Several filters are always placed in a row, in close proximity to one another, forming what is called a filter "battery."

The following figure is a section through one of the filters in



such a battery. M is a cover, fitting very tightly on the top, through which the bone black is introduced. N is a man-hole for drawing out the spent bone black, and also for admitting a sieve, covered by a cloth spread carefully over it, which is introduced into the bottom of the filter before the bone black is admitted. S is a wide pipe for the introduction of steam, pure water, beet root juice, and sirups into the filter; this is effected by means of the pipes, F E, D C, which are in connection with S, through which the passage of either of these fluids is regulated at will by means of special cocks.

In order to preclude the possibility of mistakes being made by the workmen in the handling of these cocks, the pipes are superposed in the order of the density of the substances which are to be run through them, thus the steam pipe, F, is the lowest, next comes the clear water pipe, E, next that for the carbonatated juice, D, and uppermost of all, the pipe for conveying sirups, C.

The steam pipe, F, is connected with the other three by means of a smaller pipe, in order to permit of their being occasionally cleaned by blowing steam through them.

The reservoir for carbonatated juice is placed above the top of the filters; the higher the better, as it increases the hydraulic pressure, and forces the juice through the bone black with greater energy.

The pipe, S, is also fitted with a small connecting pipe, L, through which the air escapes from the filter as it is gradually filling with liquid. The juice, after having traversed from top to bottom the whole body of bone black in the filter, is not allowed to run out at the bottom through the pipes W Y; the cock, V, being kept closed so as to force it to ascend through the upright pipe, U, from whence it is allowed to flow out through the open cock, H.

This arrangement prevents a filter from ever running dry, as it will necessarily always remain full of juice to the level of H.

The juice is received in a movable funnel, T, which fits on the upright pipes, R and Q. If juice is being run through the filter, the funnel is placed on R, and is thus conveyed either directly to a tank, to a *monte-jus*, or to the evaporating pans, according to the disposition of the works. If sirup is being passed through the filter, the funnel is placed on Q and run to the concentrating pans, either directly or through a special *monte-jus*.

When not in use, the top orifices of the pipes, R and Q, must always be carefully closed by metallic plugs. The accidental introduction of foreign substances into these pipes would cause very considerable trouble, loss of time, and expense.

As in some cases it is necessary to filter the same solution twice over, a communication is often established between contiguous filters by means of a special system of pipes and cocks.

In our figure, V is used for running water into the pipe Y, which carries it off as waste, or which conveys it to the bone black department, where it is used in the process of "fermentation," which we shall describe in due time.

Filtration of the whole of the products undergoing the processes of manufacture takes place normally twice before crystallized sugar is produced from it. The first filtration is that of the carbo-[illegible]ated juice; the second [illegible] this juice, after it has been subjected to evaporation, until it has reached the consistence of a thin "sirup." The working of the filters in a battery being simultaneous for both juice and sirup, and to a certain extent combined, the same filters being first used for sirups, and subsequently for juice, we shall reserve our account of the *modus operandi* of filtration in general until we shall treat of the purification of sirups.

After leaving the filters, the clear juice is conveyed to the evaporating pans, where it is reduced to a certain degree of consistentency, "sirup," after which it has to be filtered a second time, as we have already said.

Evaporating pans in the olden times, were simple contrivances, and consisted in open boilers, either heated by the direct action of fire or by steam passing through double bottoms, or coil pipes. Some small sugar factories still use this latter system, which is wasteful in fuel and makes sugar of a more inferior quality than is done by the more perfect appliances of our day, known as the "triple effect vacuum pans."

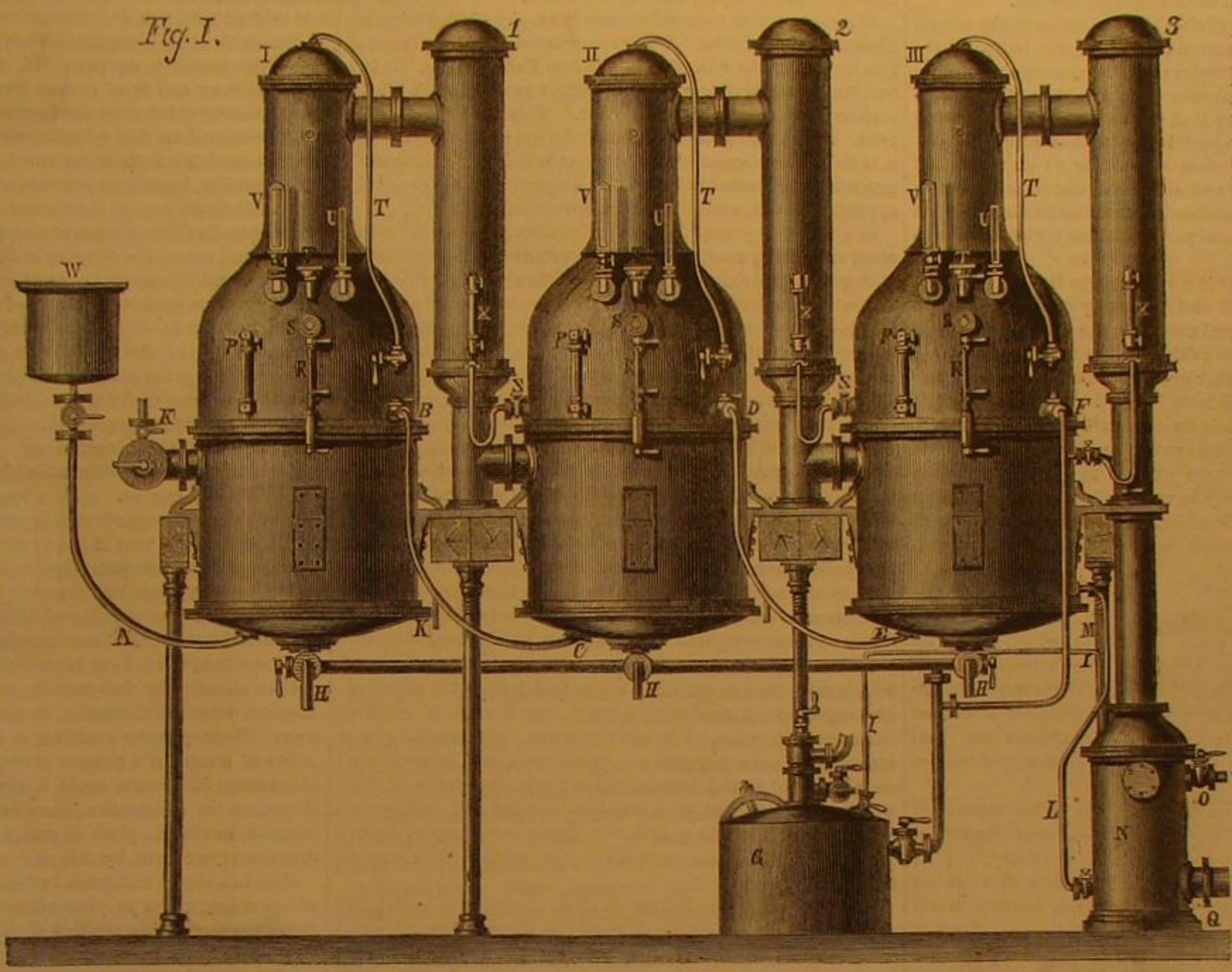
It would be tedious and unprofitable for us to sketch the history of the gradual progress in the perfection of vacuum pans, from the primitive Rillieux "double effect pan" to the more perfect "triple effects" now in use. We shall consequently limit ourselves here to the description of one of the best known, "Robert's pan," which, if well understood, will permit the reader to readily comprehend the working of all others, no matter what modifications or improvements they may present. Let us add, in this respect, that the original Robert vacuum pan is hardly to be found in any manufactory unless it has been more or less altered in some details of its construction. Before explaining the use and advantages of the vacuum pan, we give a description of its various parts, which will facilitate our task.

Fig. 1 is a side view of the whole apparatus. The three pans, or bodies, are marked I, II, III, the three intermediate vapor columns are numbered 1, 2, 3. A is the pipe which carries the juice into the first body. B C is a pipe which carries the juice from the first body to the second, and G F, another which conveys it from the second to the third body, from whence the pipe, F, takes it to the *monte-jus*, G. H is a pipe through which the pans can be entirely emptied. I is a pipe communicating a vacuum from the condenser to the *monte-jus*. K is a pipe and valve for introducing the steam for heating into the first body. K' is a pipe for running off condensed water. L M is a pipe for conveying spent steam and condensed water to the condenser, N. O is the injection pipe of the condenser. Q is the outlet for the hot water of condensation. P is a glass indicator for the hight of the juice in the pan. R is the apparatus for sampling, in order to learn the density of the juice. S represents the glass bull's-eye for observing the progress of ebullition. T is a small funnel for the introduction of melted fat to arrest too violent ebullition. T' is the small cock for admission of air. U is a thermometer indicating the temperature of the boiling juice. V is a special barometer for low pressures for determining the degree of vacuum. X is an indicator for the water accidentally collected in the columns. Z is the pipe for running out the liquid which has found its way into the column.

A man-hole is constructed in each body, but not figured in our cut, as it is placed at the back of the pan, as here exhibited.

Fig. 2 shows a section through the last body of the above apparatus, so as to give a view of the internal arrangement of a vacuum pan.

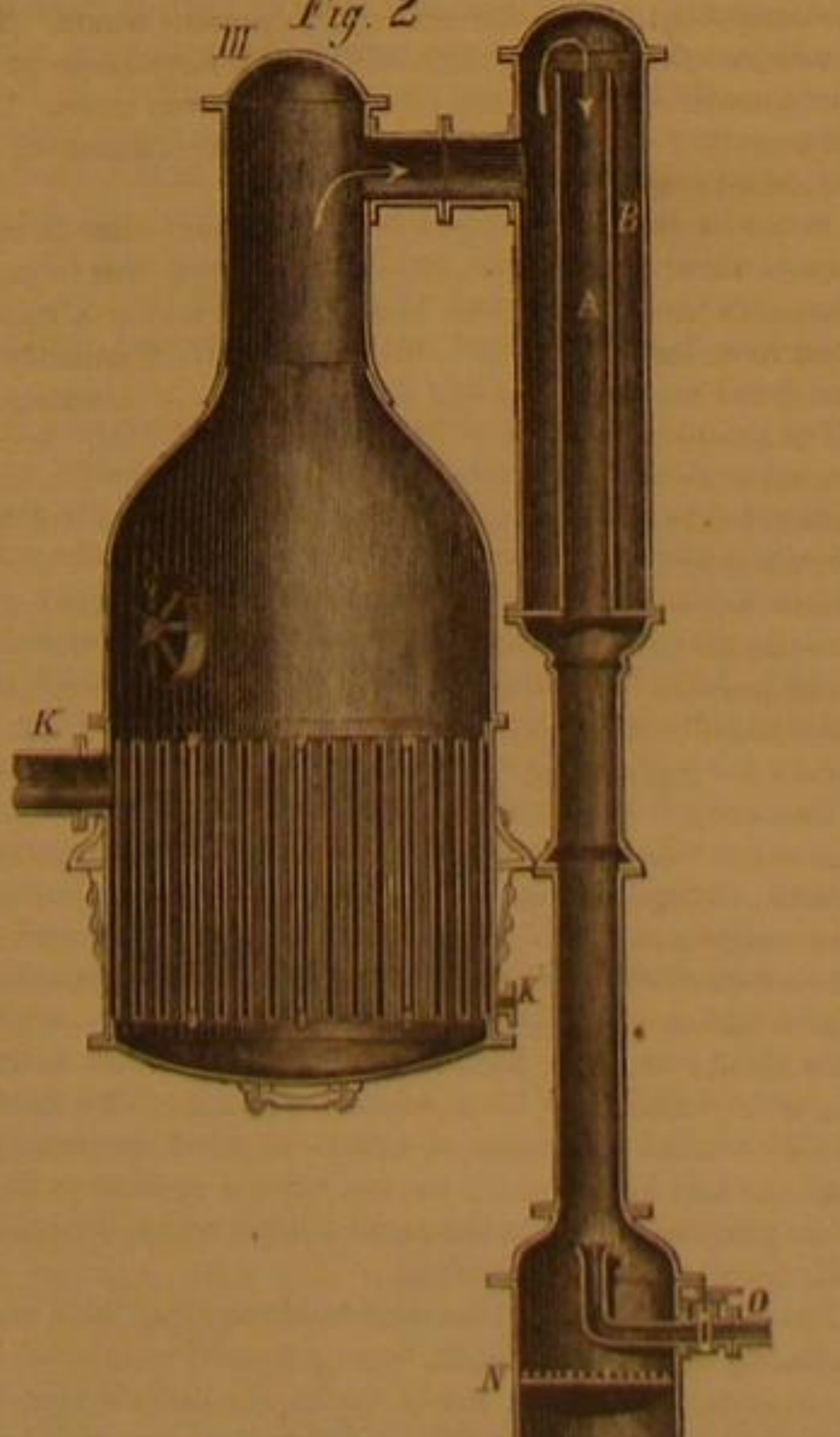
Fig. I.



ROBERT'S TRIPLE-EFFECT VACUUM PAN.

The lower portion of the body, III, shows the disposition of the tubes, around which the steam for heating the juice circulates. These tubes are inserted at both extremities into perforated end plates. The space above the top plate is the steam or vapor chest, where the vacuum is formed, and the steam of the boiling juice collects before being carried off. N is the condenser; O its injection pipe; M the exit pipe for heated condensation water, which is drawn off by an air pump; A is an upright pipe surrounded by an empty space, B, in which accidental water and liquid collects.

Fig. 2



In our next article we shall furnish a concise exposition of the theory and practice of the working of the triple-effect vacuum pan.

The Spring Freshets.

It is said that the spring floods of 1869 have been unusually destructive. On the Connecticut river, the height of the water has only been exceeded four times in the last seventy years. In Hartford, the water on April 23d, at noon, was 26 feet 8 inches above the low water mark. In 1854, the gage marked 30 feet. In Canada, the ice began to move out of the St. Lawrence on the night of April 22d, and the towns along the banks were seriously damaged, houses and embankments having been swept away and several lives lost. In New York State, along Black river and the lower part of Lake Ontario, the floods were very violent. Factories, tanneries, dams, and flumes were carried off. Near Watertown, a boom, restraining several acres of timber and flood wood, broke away from the chains, and carried off railroad bridges, mills, factories, furnaces, and machine shops. In the John Brown tract, the flood was caused by the breaking of a heavy dam, built to restrain the water of a series of lakes, and forming a feeder to the New York canals. Near Utica, the State dam, at a reservoir covering 500 acres, gave way, and the flood destroyed mills and other property valued at $100,000. On the Hudson and Mohawk rivers, the inundations have been very extensive, and the streets of Albany, Troy, and other cities in that vicinity, have been covered with water several feet deep.

WOOD ENGRAVING—ANCIENT PROCESS.

The exact origin of wood engraving is enveloped in considerable doubt; it is of very ancient date however, and the best authorities on the subject agree that it dates back some centuries anterior to the Christian era. It is useless to speculate upon fancied theories; for all practical purposes it is only necessary to present a skeleton review of the art, in its primitive days, or that portion of it that can be gleaned from reliable sources. Even this would be superfluous in this connection, except that it affords to practical mechanics, and those interested in the art, an opportunity of contrasting the means and appliances employed in the olden time, with those of our modern day.

According to the best authenticated authority, wood engraving, as an art, was first followed in (European countries) in Italy, about the middle of the fourteenth century, one of the early specimens of which is presented in Fig. 1, representing "The Knave of Bells."

This specimen is traced to one Antonio Carrigi, a manufacturer of playing cards in Venice, where, at this time, card playing as an amusement, and also for gambling purposes, was indulged in by the nobles and wealthy classes. These rude cuts were afterward painted in several gaudy colors with a pencil and sometimes ornamented with gilded borders. Although Carrigi may have been the first to follow the business of wood engraving in Europe, specimens of the art were occasionally met with that were supposed to have been executed many years previously; their exact origin never could be traced. For centuries anterior to this period, wood engraving was known to have been practiced as an art among the Chinese people, who have always been recognized as the most ingenious artisans in the world, in a number of the mechanic arts. The civilized or Christian nations, however, were not allowed to benefit by their ingenuity. An insurmountable barrier was ever interposed, precluding all communication with the outside world of the Chinese Empire.

China was not alone in giving birth to those works wherein mechanical skill was evinced at a very early period of the world's history. Late discoveries made in excavated catacombs in Egypt, and similar discoveries made amid the ruins of Herculaneum and Pompeii, also lead to the conclusion that wood engraving was known and practiced centuries before its now advent in Italy. It is therefore reasonable to suppose that with the decline and destruction of those countries, in which many of the higher branches of the mechanic arts, had reached the zenith of their perfection, they perished with them.

In historical annals there is a wide gap in their art records, a lapse of ages ere the skill and ingenuity of man is said to have revived and re-invented many of the arts, sciences, and manufactures, thus lost to mankind. Even tradition furnishes nothing but a faint glimmer of objects that lived and had their being in the past, and have left nothing to posterity but the wrecks and ruins of their former glories.

True, occasional relics reach us of the present day, affording a faint reflex of what once existed in the palmy days of this or that country, but they have served to gratify a passing curiosity only, or, it may be added, to stimulate the efforts of mechanical geniuses to reach even a higher scale of excellence.

The parchment scrolls lately excavated from mounds in the neighborhood of the Pyramids in Egypt, present many curious hieroglyphical and other characters which leave no room for doubt that the impressions were made from blocks of wood. It is impossible to fix a time when these were executed. In the same way with occasional specimens of a similar character, of Chinese origin, exhibited in cabinets and museums in European cities; their antiquity is simply a matter of speculation.

As we are cut off from any data previous to the fourteenth century, when wood engraving as an art was first adopted in Europe, we are compelled to accept the above theory.

In its application to books the earliest accounts that can be traced are in the first quarter of the fifteenth century, when engraving on wood was applied to the multiplication of copies of religious designs, which were at this period in demand among the people of Italy and Germany. This demand was created from the establishment of a number of monasteries and other religious institutions in these two countries, and a consequent demand for the reproduction of manuscripts of a devotional character. Strange to say, the demand for playing-cards, about the same time, led to the employment of a number of artisans who engaged in the business of wood engraving; religion and its antipodes, in this regard, being in perfect accord.

The story retailed by certain history manufacturers that the first wood engravings known in Europe were executed by a brother and sister of a noble fam ly of the name of Cunio, in 1285, representing the actions of Alexander the Great, is without the slightest foundation. Montague tells us that the sister, who had a talent for drawing, may have sketched some designs on tablets of wood, then used as slates are in our modern schools, representing in a crude form, Alexander in some of his heroic exploits; and that the brother may also have cut into the lines, thus drawn, with a stiletto or sharp instrument, as school boys are in the habit of cutting letters animals, etc., with their penknives, on walls, fences, etc. It was not until late in the fourteenth century that the Venitian merchants were allowed to have commercial intercourse with the inhabitants of China. It is fair to suppose therefore that in that part of Italy bordering on the Adriatic, specimens of wood engraving brought over from China by the trading argosies, were then seen for the first time. This agrees with the time when Carrigi is said to have inaugurated the art of wood engraving in Europe.

From this period until the middle of the fifteenth century rapid strides were made in perfecting the art and in making it available for business purposes. At first the demand was limited and confined to the religious orders. The representations of saints and other scriptural objects which the monks had for some centuries been in the habit of painting in their parchment Bibles and missals were by the early wood engravers copied in outline on wooden blocks, and divested of their brilliant colors and rich gilding, presented figures exceedingly rude in their want of proportion and not a little grotesque, from their constrained and ludicrous attitudes. But they were nevertheless highly popular, and as these crude pictures were accompanied with certain passages from scripture, they supplied the first inducement of the laity to learn to read, they being extremely ignorant at the time. There is no doubt that as crude and simple as these illustrations were, they assisted in a measure in preparing the way for that diffusion of knowledge which subsequently accompanied the invention of printing from movable types. Mankind however, are not indebted to religion, as previously remarked, for the introduction and application of wood engraving as an art, or a business vocation. Carrigi and his playing cards undoubtedly have the precedence, and called forth the art of the limner and the engraver long before religion stepped in to as a foil neutralize the bad effects they were producing upon the noble and the wealthy classes of Venice. Gambling, like many other vices and follies, is an heir loom that descends from the great to those below them in the social scale. It is easy therefore, to understand that the followers of courts and camps, as well as the artisans and dealers in the towns, seeing the amusement which their superiors derived from these bits of stout parchment, would be anxious to possess the same means of pleasurable excitement in their hours of idleness. In this way the demand for playing cards increased so rapidly that other engravers beside Carrigi entered the field, and for some time a thriving business was done in supplying not only the home demand, but for export to other countries.

Wood engravers were subsequently employed in getting up illustrations for books. The first specimen of any note of this kind is in the collection of the late Earl Spencer. It is a curious cut taken from a wooden block, representing St. Christopher carrying the infant Savior. This work bears date 1423. If not the first specimen of the art of line engraving, it is the earliest undoubted document which determines with precision the period when wood engraving was generally applied to books, and objects of a devotional character.

In a very few years after the period above named, the art of wood engraving reached a more important object: viz., that of aiding in popularizing books of instruction. Up to this time Bibles were written on parchment and could only be obtained at a fabulous cost. It was then thought that a selection of subjects from the Bible with appropriate illustrations, both engraved on wood, might be acceptable to the common people. Such a book was produced in the year 1440, and was called "Biblia Pauperum"—the Bible of the poor. This very rare book consisted of forty leaves of small folio, each of which contained a small wood cut with extracts from the scriptures and other religious authorities. This was followed by other works of a similar character, the most remarkable of which is called "Speculum Salutis"—the Mirror of Salvation. In this performance the explanation of the texts are much fuller than in the work previously named. In this work the illustrations and the texts are printed from wooden blocks. In addition to these religious works wooden blocks were also used to print small manuals of grammar, called "Donatuses," which were used in schools. From this period the art of engraving on wood gradually merged into the art of printing from movable types. The early printers, imitating the manuscript books upon papyrus and parchment, used largely wood engravings of initial letters, and at times the pages of their works were adorned with wood-cut borders and frontispiece illustrations. At this period if a figure or group of figures were introduced, little more than the mere outline was attempted.

In the "*Historiæ Veteris et Novi Testamenti,*" published about this time, a number of wood-cut illustrations appeared in it, the one in the frontispiece is especially note-worthy from the fact that a better class of wood engraving, in which gradations of light and shade, and the light hatching dots subsequently used, were represented. Mr. Ottley, in his "Early History of Engraving" tells us that an engraver on wood named Wohlgemuth, who flourished in Nuremburg, in 1480, first succeeded in imitating the bold hatchings of a pen drawing, on wood. Subsequently Albert Durer, became the pupil of Wohlgemuth; and by him and later by Holbein (both artists of note) wood-engraving was carried to a perfection, which it subsequently lost until its renewal in England by Bewick. For a century and a half, however, after the above named period, wood cuts were profusely employed in the illustration of books in Italy, Holland, France, Germany and England. Two of these early works, published in England, viz., "Hollingshed's Chronicles," and "Fox's Book of Martyrs," clearly attest how instructive and amusing illustrated works were considered even at that early day.

The gradual diffusion of knowledge and the consequent increased demand for books among the nobles and wealthy classes, led to a more costly style of embellishments than the crude wood-cuts then in use. This demand of the wealthy classes led to the discovery of engraving on copper plates. Sir John Harrington's translation of "Orlando Furioso," published in 1690, was the first English work in which copper plate engravings were used. From this time until the latter part of the eighteenth century the use of wood cuts gradually declined; that is to say, that as a high branch of art, wood engraving was almost entirely lost, until the appearance of Bewick, an ingenious artisan, who prosecuted his business at Newcastle-upon-Tyne. His cuts of quadrupeds and birds are as remarkable for their force and delicacy of execution as engravings, as, for the vigor and accuracy with which he drew them; and his humorous vignettes possess a truth of character which has been seldom equaled. The success of Bewick created a number of artists in wood engraving, but until the last half century the art was not applied to its legitimate purpose, which is the art of design naturally associated with cheap and rapid printing.

The wood engravers, who were contemporary with and immediately succeeded Bewick, were generally employed in the illustration of the most costly works, the introduction of the cuts often rendering the printing of the other portion of the book so expensive, that volumes thus embellished were as costly as though they had been printed from metal plates. The cause of this was simply because these engravers employed a certain method in working their blocks, requiring extraordinary care in the impressions after the engravings were executed, and the wood cuts being included in the same page and sheet with the text, even though a single wood cut appeared on a sheet, the attention it demanded from the pressman prevented the rapid working off of the other pages, thus compelling a great waste of time.

Correspondence.

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

Expanding Steam—Test of Engines.

MESSRS. EDITORS:—On page 197, of your current volume, I criticised the claims of certain steam engine builders by comparing their pretentions with some of the known laws of mechanics. These builders claimed, that in working steam at 60 pounds pressure in their engines, it expanded to 16 volumes, and still retained a pressure of 3 pounds, and showed diagrams of cards to prove the claim. I asserted that no such card could have been fairly taken from any engine, under the conditions claimed. From the editorial remarks upon that communication, it is evident that you understand me to have deduced those conditions from the diagram. This is not strange. But how your correspondent, on page 230, who claims to speak for those builders, and is, of course, familiar with their circular, could honestly think that the figures I gave of the amount of steam admitted to the cylinder, were obtained by estimate from the card, is a little more wonderful.

The truth is, I made no *estimate* whatever, of the amount of steam admitted, nor of the power obtained; but took both from the positive statements of the circular. It is there *stated* that "steam enters the clyinder at 60 pounds, and follows only $1\frac{1}{2}$ inches, and is instantly cut off." Again, (I quote from the circular), "thus we have the area of a 12-inch cylinder, which is 113 inches by $1\frac{1}{2}$—169·50 inches of steam to move the piston from one end of the cylinder to the other." And again, "steam striking the piston at 60 pounds, and falling to the 3 pounds at the end of the stroke, gives us an average pressure of $17\frac{1}{2}$ pounds, the entire length of the cylinder, requiring *only* $169\frac{1}{2}$ cubic inches of steam."

It was the above conditions that I asserted could never be realized by any engine.

Your Utica correspondent, forgetting these statements, very kindly informs us, that it is an error to suppose "the amount of steam used is measured by that admitted to the cylinder up to the point of cut-off," that "it is the volume of steam in the cylinder, at the opening of the exhaust valve, which determines the quantity of heat required to do the work." Could this important truth have been discovered by the parties who publish the circular in question, before analyzing their own diagram, what a difference it would have made in their figures! Their cylinder contains, at end of stroke, 2,712 cubic inches of steam, of 3 pounds pressure, by the gage. This, if admitted at 60 pounds, could not, with the smallest possible allowance for attenuation, have expanded to more than four volumes, so that, in place of using only $169\frac{1}{2}$ cubic inches, as they assert, we have, by this rule, at least 678 inches

Here is a slight difference in figures, but perhaps it may be of no consequence to your correspondent, as he proposes to disregard some other matters of importance. He says, "The item of units of heat lost in developing power may be disregarded, or rather only regarded generally along with other losses, of which the indicator takes no note, such as leakage of piston and exhaust valve, condensation, etc."

Now, it is true that leakage of piston, and valves, and condensation, are not considered in the *theory* of expansion, but the assertion that, in *practice*, they are taken no note of by the indicator, will certainly be received with surprise. And as to the heat lost in developing power, either the theory that disregards it is false, and the indicator that fails to note it unreliable, or the whole doctrine of the correlation of forces is untrue; for, according to that doctrine, the heat lost must be the equivalent of all the power utilized by expansion.

The writer complains that "the card published in the SCIENTIFIC AMERICAN is not exactly a reduced copy of the one in the circular," that "the compression curve" is not made by lead of steam valve, and that the card shows a "negative steam lead," etc. It is true this card is slightly inaccurate, but is rather nearer to the *described card* in the circular, than their own diagram. As to the "compression curve" and the "negative steam lead," every engineer knows that by closing the exhaust valve early and compressing the steam remaining in the cylinder, the pressure will rise at the end of the stroke, independent of the opening of the steam port; but that this pressure will continue to rise, "the steam valve not opening until the piston has moved some little distance on its forward stroke," is a discovery for which science must be greatly indebted to your Utica correspondent.

Now, a word on the practical side of the question: Mr. J. H. Fountain, of Elmira, N. Y., has, in his flouring mills, at that place, one of those "short cut-off" engines, which was warranted by the sanguine builder to save 40 per cent of fuel over any single slide valve engine. A test was was by the builder, of a ten hours run, which was satisfactory to himself, but not to Mr. F., who has since put in a small slide valve engine. This he did for the purpose of making a careful test. Under date of April 4th, he writes me as follows: "We tested the slide valve engine last week, on a ten hours run, with the same kind of grain and fuel as with the engine that was to save 40 per cent of fuel, and the slide valve ground *more grain*, and with *less fuel* than the other, saving just twelve per cent from the amount used by the short cut-off. The small one, too, worked to great disadvantage, as it was set on light timbers, in a temporary manner *geared* to the shaft of the other, and with a long steam pipe to it. Mr. —— (the builder), on making a test personally, with his engine, pronounces it as good a result as he ever knew, yet it is badly beaten by this country made engine." . . . Mr. F. also says, that the short cut-off gives an irregular motion, jamming the machinery, loosening the irons in the stones, the toes of the spindles, etc., which might be expected as a natural result, where the initiatory pressure is high and the final pressure a partial vacuum.

Keokuk, Iowa. E. S. WICKLIN.

Cheap Gas.

Messrs. Editors:—In reply to the writer of the article "Cheap Gas," page 295, current volume, of the Scientific American, who signs P. W. K., and criticises some of the statements made by me in a previous communication. I simply wish to remark, that never having personally made the subject of transmission of gas through mains a speciality, I employed for my calculations formulæ given by some of the best modern gas engineers, such as Clegg, Pole, d'Harcourt, Hughes, etc., in their published works. I was fully aware that further experiments in this direction were much needed, and think that P. W. K. would supply a desideratum by favoring the Scientific American with the result of his studies on this important question.

When, however, he affirms that he can carry carbureted hydrogen gas through mains a distance of 200 miles with a loss of less than 5 per cent by leakage, I cannot help expressing skepticism, since it is a well-known fact to all persons interested in gas works, that a larger amount of gas then that stated is actually wasted every day in the best constructed mains, and this on a stretch of five or six miles only; not simply by leakage at the joints, but by a remarkable phenomenon of direct penetration of the very substance of the pipes, analogous, if not identical, with dialysis, during which a certain portion of air is substituted for the escaped gas.

What I attempted to prove, was that bringing gas from the coal regions to New York through mains, would not cheapen it to the consumer, and would not be conducive of profit to the producer. This, I again affirm, notwithstanding what P. W. K. may say to the contrary. Supposing the plan a feasible one under his management, and at h.s own figures of $32,000,000, we see that the very interest on this sum of money would amount annually to no less than $2,275-000, or very nearly the present amount paid for freight on coals, leaving but a very small margin for the eventualities of such a venturous enterprise, or on which to base a reduction in the price of gas.

It would prove quite as profitable, and, I cannot help but believing, considerably safer, to place the "goodly" millions in a well-managed bank, and to continue, as heretofore, to pay freight on coal out of their accumulated interest.

I am, personally, a firm believer in the theory of the necessity of the "division of labor," and in the great principle of "live and let live," whether it be applied to the builders of our railroads, to the makers of our gas, or to the "illuminated" masses in general, whose own fault it is, if, in this free country of ours, through the choice of their representatives, they are imposed upon by monopolies.

Reduced freights, and a little more conscientiousness on the part of the gas companies, are all the consumer in this great metropolis calls for at present.

When P. W. K. has successfully put his project into operation, I shall be the very first to cry out *mea culpa*, especially if he thereby diminishes my present gas bill 50 per cent, as he promises to do, but until then, he must excuse me for dissenting from his views. X. Y. Z.

[Our correspondent is right. We consider it entirely impracticable, at the present time, to manufacture gas at the mines and conduct it through pipes to distant cities.—Eds.

Calculating Horse-power of Engines.

Messrs. Editors:—I notice an article under the above caption, on page 278, No. 18, current volume of the Scientific American, which is so manifestly crude and fallacious that, to prevent those who are not thoroughly posted on steam and steam engines from being misled, I offer you this note; not, however, that I expect that your correspondent will be converted, for he is an "old hand," and it is not expected that he will learn "new tricks," especially as he is so unfortunate as to find a scientific engineer with such an unfortunate rule.

Now let us look at a comparison of the two engines. The one 14 by 26 inches, 80 revolutions per minute, 346·4 feet; the other, 8 by 12, 450 revolutions per minute, 900 feet.

According to the old hand's theory, they are, respectively, thus: the 8 by 12 is equal to 28-horse power, the 14 by 26 is 33·33-horse power. Now, then, let us see what power they do absolutely exert to move themselves and the load or resistance attached. In making the calculation we will take the "Old Hand's" own data, so far as the elements required are put down; viz., the diameter, stroke, revolutions per minute, and pressure of steam on the piston. Of course an "old hand" would give the pressure on the piston, right from his good opportunities for observation, though he don't believe in text-books, or even the Scientific American! Give him the power of the 8 by 12, with 56 lbs. pressure per square inch on the piston, the resistance overcome would be 76·72-horse power. The 14 by 26 would be 89·26.

Perhaps, before he writes another article on the subject, it might be well for him to ascertain what constitutes a horse power, as known and used by engineers. If he finds it to be a given weight raised through a given space in a given time, he then can very easily find what pressure is required to do it, and will thereby learn that it is simply weighing, and measuring—the alphabet of engineering.

Now the discrepancy between the "rule of thumb" and the true rule, as above described, is a little too large for me to believe. "Twenty years' experience and good opportunities" are unfortunately at conflict with Gunter's rule and Fairbank's scale. Engineer.

The Dynamical Lever.

Messrs. Editors:—It appears to me that some of your correspondents have given the "dynamical lever" credit for effects which it has no agency in producing.

A correspondent in No. 18, current volume, page 277 of your paper, conceives that the fact that a horse can move, on a wheeled vehicle, 2,500 lbs. at the rate of 176 feet per minute (equal to 440,000 lbs, one foot per minute), while "the average capacity or power of a horse is 33,000 foot-pounds," is due to some magical power of the "dynamical lever."

Now, a horse can move, in a canal boat, a great deal more than 2,500 lbs. at the rate of 176 feet per minute, without the aid of wheels, or any other form of "dynamical lever." How will your correspondent account for this? His error consists in not recognizing the fact, that the moving of a ponderous body upon a horizontal line and on a vertical line are not precisely the same thing.

Again, this correspondent thinks, that the fact that a horse can move a heavier load, at the same speed, on a cart with large wheels than with small ones is due to the mysterious virtues of the "dynamical lever." In this he is mistaken. The fact is due to a difference of friction between the axle and the hub.

To illustrate: Suppose you have a load of 2,000 lbs. on a cart. It is manifest that at every revolution of the wheels, whether large or small, you will have to overcome the friction due to 2,000 lbs. weight on the bearings of the axle in the hub. If the cart has wheels 6 feet in circumference, to move it 60 feet you must overcome the friction of 10 revolutions; but if wheels, 12 feet in circumference, to move it 60 feet, you will only have to overcome the friction of 5 revolutions. In other words, by doubling the circumference of the wheels, you reduce the friction one-half. And this is the only reason why a horse can draw, on a level plain, a heavier load, at the same speed, on large wheels than on small ones. J. J. C.

[With this letter we shut down on this dynamical lever discussion. Our first correspondent, F. R. P., has been so clearly in the wrong throughout the entire discussion that any further demonstration of his error is unnecessary. We therefore wish no further communications upon this subject. If any of our readers should see fit to criticise the views of J. J. C. in regard to the origin of the gain in the use of large wheels on draft vehicles, there is room for some profitable discussion on that point.—Eds.

Required Power for Velocities.

Messrs. Editors:—In the Scientific American, of May 1, page 278, are several communications on the above subject. One from "F. R. P.," on his dynamical theory, to which it is hopeless and useless to reply. "Wm. Horsnell" overlooks the reduced load to the engine of one-half (so considered) when disconnected—thence, requiring only half pressure of steam for equal revolutions—but giving double with same amount of steam. "A. Dean" is laboring under a fundamental error in supposing a double velocity does not require a quadruple force. The pendulum exhibits this law very clearly. Its vibrations, whether of number or size, are dependent on the force (gravity) acting on the disk. A quadruple force is requisite to double the number, or to double their size respectively.

The usual estimate of vibrations by the square root of the length of the rod (inversely) is correct, but is merely incidental to the governing force of gravity, the weight sustaining action of the rod, taking off the gravitating force in the above ratio. Mr. Dean correctly states that in practice there is a loss not taken into account by the leading features of increasing velocities—the main loss would be in additional slip to the paddle or screw—inversely as the square root of the power applied, for the water, in conformity to the foregoing law, requiring a quadruple force to give way, or slip a double distance. Mr. Dean maintains that resistance is as the distance, without regard to time of making it; if it were so, a bluff-built vessel would be as easily propelled as one of sharp lines, for the midship sections is the measure of the water displaced in either case. T. W. B.

Pittsburgh, Pa.

Facts vs. Philosophy—Hot Air.

Messrs. Editors:—In your issue of April 24, is a labored article on the "Heating of Buildings." Much might be said to show its unsoundness, on its own basis, but I shall be content now with giving facts.

For more than twenty-five years we have lived in a stone house warmed by a hot-air furnace. The house has been kept warm, or even hot, night and day. We have raised a family of eight children, four of each sex. My wife is rather a feeble woman. Twenty-five years ago I weighed 145 lbs.; now weigh 225 lbs. Our doctor's bill has not been one hundred dollars for the twenty-five years. We have had no death in the family, our children are all vigorous and healthy. More than half of them have left home and settled in different States in the Union. Our family have suffered less with colds, and other kindred complaints, than almost any other family. If this is "destroying health and comfort" please give us more of it.

I know of many other families whose houses are heated by hot-air furnaces, who will testify to their great utility and comfort. Let doctors philosophize, the people are bound to live on. G. W. H.

Lockport, N. Y

[The logic of facts is hard to withstand, and if the cases cited by our correspondent were the only facts bearing upon this subject, we should have to admit that he had made out a fair case for the heaters. He has cited us a few cases where people have enjoyed good health and got fat, notwithstanding the heaters. We could cite many more where their deleterious effects were quite as obvious. His wife, he says, is in feeble health. Has it ever occurred to our correspondent, considering the difference in people's constitutions, and the other significant fact that she is more exposed to the injurious effects of the heated air, that possibly the heaters are the cause of her debility?—Eds.

Taps Cutting Varying Threads.

Messrs. Editors:—Is it a possible thing for a nut to be cut with a tap of a given number of threads other than the treads on the tap?

I have a tap that in the hands of an unskillful workman cut some three-quarter inch nuts in a manner that I cannot understand. The tap is a machine one that goes through the nut and leaves it on the shank. It cuts ten threads to the inch. He cut some of them correctly, the tap going through the nut in about forty revolutions. Those that were cut wrong were cut in about ten revolutions of the tap, it making five entrances to the nut, instead of one, as it should have done. W. H. K.

[We have often been puzzled with the difficulty alluded to by our correspondent, but never with a machine tap. We never could account for it, nor understand the "reason why." It is usually attributed either to defect in the tap or in the hole to be threaded, but this hypothesis is not sustained by the facts. An explanation from an observant mechanic would be well received.—Eds.

Fall of a Smoke Stack.

Messrs. Editors:—A short time ago the smoke stack, or chimney, of the flouring mill of Read & Bottom, of this place, fell, causing the entire destruction of the mill. The building was of brick, and the chimney fell across it, smashing walls, machinery, and everything before it. The cause of the fall appears to be the softening of the brick by the steam from the escape pipe, which had been turned into the chimney. The escape pipe was let into the chimney near its base, and at this point the brick could be crushed between the fingers, while the balance of the chimney was perfectly solid. As others may be allowing their exhaust to pass into their chimneys, it might be well to sound a note of warning.

Fairfield, Iowa. Wm. Louden.

Machinery not Hostile to Mental Culture.

The *North British Review*, in discussing the essays of Matthew Arnold, upon "Culture and Anarchy," thus disposes of that gentleman's assertions relative to the hostility of machinery to the highest culture of mankind.

"We cannot think that human nature, in finding an outlet for its many-sided activity in the direction of 'machinery,' acts in a way that is hostile to culture. We prefer (as in the case of religion) to include the practical tendency which finds scope in new inventions to accelerate labor, and to supersede manual toil by mechanical contrivance, within the sphere of culture. Let it be admitted, that it is intrinsically of much lower value than any other kind of effort, bearing on the perfection of the individual. Still, as it implies the victory of man over Nature, insight into her laws, and the utilization of her processes, it is the condition of other and higher grades of culture; and inasmuch as it is a virtual necessity of human life, let us concede its value and respect its tendency."

Diamond Turning Tool for Vulcanized Rubber and Emery Wheels.

We desire to call attention to the advertisement of the New York Belting and Packing Company, on the last page of this issue, of a new diamond-pointed turning tool for trueing up vulcanized rubber and emery wheels. The trueing up of these wheels by heating their perimeters to soften them during the operation of turning, as has hitherto been the practice, was liable to leave their surfaces in a softened and friable condition, unless the heat was carefully regulated during the process. One of these new tools will turn up a wheel eight inches in diameter, and having a face one and one-fourth inches wide, from three to four hundred times, leaving the surface in the best condition for work. The turning can be quickly and easily done without heat or other aid to the action of the tool. The objections which have hitherto been made to the use of these wheels for certain kinds of work, seem completely obviated by this invention.

The Law of Steam.

BY J. DEBY, C. E.

Calling P the pressure of steam in atmospheres; A the latent heat in steam of atmospheric pressure (537 deg. C., equal to 966·6 deg. Fah.); L the latent heat in steam of any other given pressure, in atmospheres; *b* a constant number (which for Cent. scale is 17, and for Fah. scale 30·6); T the Cent. temperature of steam, and T' its Fah. temperature; V its relative volume to water, and S its specific gravity, we see that *for every decrease in the latent heat of steam equal to* 17 *Cent* units, or 30·6 Fah., *there corresponds a doubling of the pressure; a decrease in volume*, equivalent to the number of times, minus one, that the number 17 is contained in this decrease of latent heat; *an increase in weight* equal to the number of times, minus one, that the number 17 is contained in the decrease of latent heat; *an increase in specific gravity* equal to 0·00059; and an *increase in sensible heat*, equal to 24·4 Cent. or 35·92 Fah.

If P=1, then L=537; T=100 C.; V=1696; W=62·32÷1696; S=1÷1696.

If P=2, then L=537—17; T=100+24·4; V=1696÷2; W=62·32÷(1696÷2); S=1÷(1696÷2).

If P=4, then L=537—(2×17); T=100+(2×24·4); V=1696÷3; W=62·32÷(1696÷3); S=1÷(1696÷3).

All the above are derived from a law, which we now announce as follows: *The pressure of steam increases in a geometrical progression*, the terms of which are multiples of two, as 1, 2, 4 8, 16, 32, etc., *while the latent heat decreases in a compound arithmetical progression*, the constant of which is 17 Cent. or 30·6 Fah., and the multipliers, respectively, as the numbers 0, 1, 2, 3, 4, 5, etc.

Machine for Making Drain Tile.

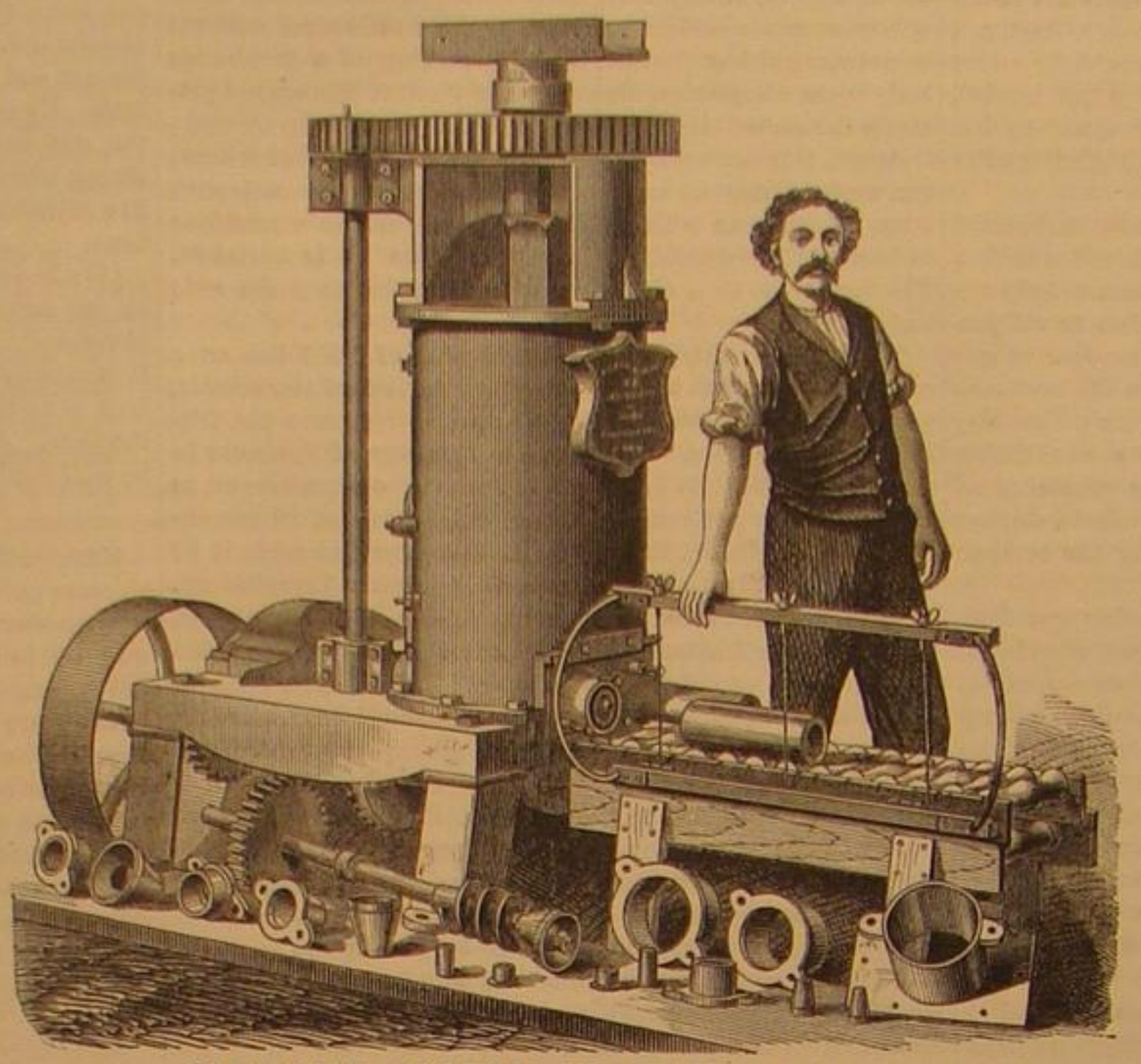
It is only a few years since draining lands by means of tiles was considered an experiment expensive in its operation and doubtful in its results. That period of doubt is past; and now tile draining is known to be a paying department of agriculture, not only for cultivated and arable lands, but for those which otherwise, from natural sourness, refuse to yield any return to the labors of the agriculturist. Any means, therefore, that facilitates the production and lessens the cost of drain tile is worthy of encouragement.

The engraving shows a machine for making drain tile, consisting of a "pug mill," having the usual curved knives, or arms, for disintegrating the clay, a screw-follower for carrying and forcing the prepared clay into the dies, and a series of dies or formers to give size and shape to the tile. This screw follower and an assortment of dies are seen in the foreground of the engraving.

In front of the die-openings is a bench containing a set of rollers, the surfaces of which are hollowed to receive the pipes as they come from the formers, and the operator, by means of a hinged frame furnished with cross wires, cuts the continuous pipe into proper lengths, while another attendant removes them to the kiln.

The blades of the pug mill reduce the mass of clay to a plastic condition, and the lowest series of blades are simply semicircular disks set spirally on the upright shaft, forcing the material on to the conveying horizontal shaft, furnished with a continuous spiral blade and a cone-shaped former turning within the fixed die. The continuous screw forces the doughy mass through the dies on to the rollers of the bench, where the fully-formed pipes are cut to convenient lengths by the hinged frame with its cutting wires. The rapidity of production of the machine is limited only by the alacrity of the attendants in taking away the sections (the mill being kept well supplied with material).

Patented through the Scientific American Patent Agency Oct. 4, 1859, and Feb. 26, 1861. Orders for Eastern, Middle, and Southern States should be addressed to Crossman Clay and Manufacturing Co., Woodbridge, N. J. For Western territory, address H. Brewer & Son, Tecumseh, Mich.



TIFFANY'S PATENT DRAIN-TILE MACHINE.

Improved Three-Wheeled Velocipede.

Probably the greatest objection to the three-wheeled velocipede, as ordinarily constructed, is not that it is larger than the bicycle or that it requires a greater exercise of power to propel it, but that every motion of the rear axle, when either of its wheels passes over an obstacle, is conveyed directly to the seat and to the body of the rider, so that there is a constant pitching to the right or left, which is wearisome to the rider and prevents that graceful motion that constitutes half the charm of the exercise to the operator and attraction to the spectator. Another difficulty in the ordinary "three-wheelers" is inability to turn short corners. The rigidity of the machine prevents any tipping or leaning of the body of the rider and the machine itself, that is as requisite in riding the velocipede in a circle or around a curve, as though the rider was mounted on a horse careering around the circus ring, or on skates "cutting a figure eight." It is evident, therefore, if these objections can be removed and if the tricycle possess the ease of guiding and grace of action of the bicycle, it will, in many cases, where safety is preferred to daring, be chosen. The inventor of the improvement shown in the accompanying illustrations thinks he has succeeded in this object.

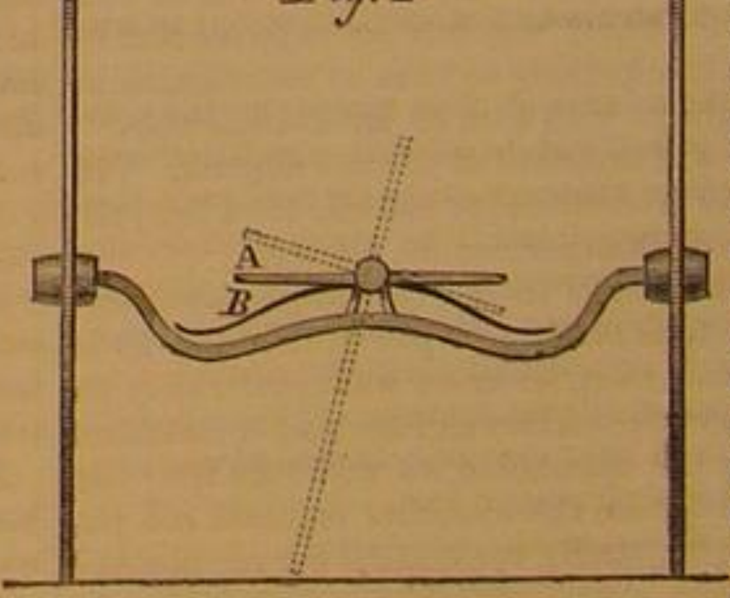
The improvement consists in the manner of connecting the forward or driving wheel with the rear axle by means of the reach, which is a hollow pipe, combining strength and lightlightness, or of round iron. On the front this connecting bar or reach is curved to the circumference of the forward wheel, then brought to a level, and running back to the center of the rear axle in direct line with the forward wheel and at the level of the axle. A sleeve, in which the reach turns, embraces it forward of the axle, to which it is secured by diagonal braces, as seen in Fig. 1. Directly over the rear axle, the end of the reach is secured to a cross bar, A, and a spring, B, Fig. 2, the ends of the latter resting on the axle. As the rider leans one way or the other, and the forward or guiding wheel is directed, the bar and spring are brought down to the axle, as seen plainly in the dotted lines of Fig. 2.

Thus the tipping or lifting motion of either forward or rear wheels is independent of each other. The bar prevents too great an action of the spring, while the rider is not compelled to exert his force or employ his weight to direct the rear wheels. In applying the power the ends of the fork that holds and guides the driving wheel extend below the axle, and a light steel frame is secured to studs projecting from the lower ends of the fork and to the ends of a yoke forming part of the fork directly over the wheel. In this steel frame there is a slide on either side to which the crank is connected, and also the treadles. The steering bar is of the usual form. The action of the slides is aided and the friction reduced by rollers; the stirrup, or treadle is adjustable to the length of limb of the rider. The feet have simply a direct up and down motion, not describing a circle, thus enabling the vehicle to be driven more rapidly with the same amount of motion of the feet. The inventor says that as the rider has only one wheel—not the whole machine—to keep upright and receives considerable assistance from the spring, it is a much easier machine to ride than the bicycle; as short a turn can be made with it, a slower motion sustained, and less chance for accident, as it cannot be overturned, and it is suitable for children and inexperienced persons.

Invented and patented by W. S. Hill, Manchester, N. H., through the Scientific American Patent Agency, April 13, 1869. The entire right is for sale. Address as above.

Fig. 1.

Fig. 2



HILL'S PATENT TRICYCLE.

Chair Wanted.

The *American Builder* anxiously asks: "Will somebody tell us where we can buy a chair? We want an office chair, a parlor chair, a dining-room chair, and a kitchen chair. We have experimented in chairs for a number of years, and always with the same results. They prove the wickedness of men who, in these degenerate days, make things to sell.

"Now, if there is any thing in the world built for the use of an American citizen which should be built in a substantial manner, that thing is a chair. It should be so constructed as to sustain a weight of two hundred pounds avoirdupois, on four legs, two legs, or one leg. As these very necessary articles of furniture are now constructed, they will not stand alone any considerable length of time in a room heated to a comfortable degree of temperature. The worthless glue with which they are stuck together thaws out, and then they fall in pieces. Some years ago we purchased of a highly reputable dealer—among the most reputable of his class, we mean—what we considered a very substantial as well as high-priced set of office chairs. They were in pieces in less than a month, and the reputable dealer's tinker was called upon, week after week, to pay them his attentions. But the tinker, with his glue pot, failed; whereupon we called in a son of Vulcan, who substituted iron in the place of glue, and with astonishing success. Subsequently, having occasion to purchase a set of office chairs, we thought to profit by our former experience, and, remembering the splint-bottomed arm-chair of our grandfather, which never broke down, we searched the city for duplicates. We found them after many hours' search. Alas these too were like the others; they commenced coming to pieces within a fortnight.

"We have arrived at the conclusion that chairs put together with glue are worthless. Now, will not some inventor give us a chair? We incline to the belief that a fortune is awaiting the man who will devise a method for putting together chairs in such a way that glue shall be dispensed with entirely."

The Crow's Value to the Farmer.

Whatever wrong the crow commits against the cultivators of the soil may, by a little painstaking, be materially lessened or wholly prevented. The benefits he confers are both numerous and important. During the time he remains with us he destroys, so says no less an authority than Wilson, "myriads of worms, moles, mice, caterpillars, grubs, and beetles." Audubon also affirms that the crow devours myriads of grubs every day of the year—grubs which would lay waste the farmer's fields—and destroys quadrupeds innumerable, every one of which is an enemy to his poultry and his flocks. Dr. Harris also, one of the most faithful and accurate observers, in speaking of the fearful ravages sometimes wrought in our grass lands and gardens by the grub of the May beetles, adds his testimony to the great services rendered by the crow in keeping these pests in check. Yet here in Massachusetts, regardless of such testimony in their favor, we have nearly exterminated these birds, and the destructive grubs, having no longer this active enemy to restrict their growth, are year by year increasing with a fearful persistence. We have seen large farms, within an hour's ride of Boston, in which, over entire acres, the grass was so completely undermined and the roots eaten away, that the loosened turf could be rolled up as easily as if it had been cut by the turfing spade. In the same neighborhood whole fields of corn, potatoes, and almost every kind of garden vegetable, had been eaten at the root and destroyed. Our more intelligent farmers, who have carefully studied out the cause of this unusual insect growth, have satisfied themselves that it is the legitimate result, the natural and inevitable consequence, of our own acts. Our short-sighted and murderous warfare upon the crow has interrupted the harmonies of Nature, disturbed her well-adjusted balance, and let loose upon agriculture its enemies with no adequate means of arresting their general increase.—*Atlantic Monthly.*

Recommencement of the Excavations at Herculaneum.

All those who take an interest in antiquarian studies, says the *Eclectic*, will rejoice to hear that, after a century of almost total neglect, the excavations at Herculaneum are now to be resumed, King Victor Emmanuel having conceived, or at all events carried out, the happy idea of assigning for this purpose an annual grant of thirty thousand francs to the charge of his civil list. He has, furthermore, undertaken to provide for the maintenance of a pupil at the Archæological School of Pompeii. These measures have been received with uncommon satisfaction in the Neapolitan provinces. As befitted an event of such importance as the recommencement of the long-abandoned excavations at Herculaneum, the opening ceremony was directed, and the first clod loosened by the king himself. What a rich harvest of discovery may reward the toil of future laborers in this mysterious soil! What further insight into the domestic life of the ancient world may not be obtained from the imprisoned treasures that have at last obtained their orders of release! The two buried sisters, Herculaneum and Pompeii, have undergone a very different fate in these latter times. The earliest researches were instituted in Herculaneum with magnificent results; but partly from the hardness of the material in which the ruins are imbedded, and partly also from a fear of endangering the foundations of the modern town of Portici, the works were discontinued and transferred to Pompeii, where the labor is far easier, and, therefore, more remunerative. As a set-off against this defect, the works of art unearthed here are generally of a superior character, not only because Herculaneum was itself a seat of a richer and more refined community, but also because the difficulties attending the excavations at Herculaneum have preserved its contents from the depredations to which Pompeii has been subjected at various periods.

We understand that extensive preparations are making at Lowell, Mass., to test the powers of turbine wheels by an entirely new method, the test to take place about the middle of May. The precise day is not yet fixed.

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Contents:

(Illustrated articles are marked with an asterisk.)

A REFORMATION IN THE PATENT OFFICE.

Secretary Cox enjoys the reputation of being a patriotic and incorruptible man. He has certainly given earnest proof of the possession of these sterling qualities by breaking up the villainous rings that so completely demoralized the service of the Indian Bureau.

In the selection, also, of Col. Fisher to occupy the important position of Commissioner of Patents, we are still further assured that Secretary Cox intends to put an end to imbecility and corruption in the management of the affairs of that Office. It has come to pass, somehow, that the Patent Office has fallen under suspicion. The misappropriation of the funds of the Office in barbaric decorations, Dempsey & O'Toole contracts, and other transactions of a somewhat doubtful character, served to justify Congressional interference. But worse even than these things is the current impression that the Patent Office had fallen into the hands of a corrupt clique who molded the decisions of the Office to suit their own interests. We cannot say that this suspicion was justly founded, but we do know that its general influence upon the character of the Office has been pernicious in the extreme. It is also well known that certain parties about the Patent Office have hitherto been too much in the habit of claiming a sort of paternity to the Commissioners, as if they were merely creatures of their breath. This may have been merely a vain and innocent conceit; but such things tend to degrade the character of the Commissioner of Patents and expose him to unjust suspicion.

Col. Fisher is indebted to none of these parties for the position he now holds. It is well understood that other candidates were urged by them, they knowing probably full well that should Col. Fisher get the appointment he would be fully competent to undertake all the duties of the Office without their intrusive advice, and moreover his character was a sufficient guaranty that corrupt rings could not bind his independent action. We feel encouraged, therefore, that brighter days are in store for the Patent Office, and that the new Commissioner will fully justify the confidence reposed in him.

THE SALE OF GAS BY QUALITY AS WELL AS QUANTITY.

We notice that the absurdity of selling gas by measure merely without regard to its quality, to which we called attention in an article on "Gas Measurement," nearly a year ago, has begun to attract notice both in this country and in Europe. *Engineering*, of April 9th, contains an able editorial on this subject, in which it almost reiterates the very language we used in the article referred to. It says: "There seems to be a very general opinion on the part of gas consumers that they should have some readily accessible certification of the quality of gas in regard to illuminating power and purity; and that since the supply of this lighting material is virtually a monopoly, the relations between the price paid for it and the qualities above mentioned, should be regulated in such a manner that the consumer might obtain a fair equivalent for his money, while the gas companies would be secured a reasonable interest on the capital and expenditure necessary for their operations."

It is evident that if the gas delivered to customers be of uniform chemical composition, and be delivered under uniform conditions of pressure, its illuminating power will be uniform. These conditions can be only approximated in practice, but there are certain limits beyond which no variation ought to be tolerated.

A photometric test is one which is out of the question for universal use. Beside requiring personal attention at every application, there is no unit of measurement that can be relied upon as being uniform. Candles vary widely in their illuminating power, and the oil lamp of Keates, recently invented for photometric use, seems to us far from perfect. There is also a necessity for the proper adjustment of burners to the quality of the gas in photometric tests. No test made with a single burner is reliable. Poor gas will flow far more freely through a small aperture than rich gas, and as the flow is intimately connected with the pressure, and the pressure with the illuminating power, the necessity for repeated tests with different burners becomes obvious. These considerations show that this kind of testing can never be made available to consumers at large.

We believe a specific gravity test cannot be made applicable to the obtaining of approximate results as to the illuminating power, and the determination of those gases which are detrimental to the illuminating power of the complex mixture of hydrocarbons which constitute illuminating gas.

We speak of this here because it has been proposed several times of late, by inventors not fully acquainted with the subject, to construct a meter having a register to run faster or slower, as the specific gravity of the gas might vary. We consider such a device a useless one, as the specific gravity of gas bears but a slight relation to its illuminating power.

Any method, to be of value to the consumer, must be one that can be applied at will and give the mean illuminating power for the periods of time for which bills are made out and collected.

The problem to be solved then is the invention of a means, either as an attachment to the ordinary meter or otherwise, whereby the mean illuminating power, per month or quarter, can be readily obtained by the consumer as well as the companies who supply the gas. This, with the quantity delivered and the mean pressure at which it has been delivered, would form an equitable basis for assessments. The determination of the mean pressure seems to us to be not a difficult thing to accomplish by some simple addition to the meter itself. The determination of the mean illuminating power is by far more difficult to accomplish by the use of mechanism. It does not seem impossible, however, to collect a specimen of gas by means of simple mechanism, that shall be a sample of the mean quality of the gas used during a given space of time.

But how shall this specimen be tested when obtained? There is room here for a good deal of study. It is possible that a fixed relation may be found between the illuminating power of gas and its heating power; if so, the test would be exceedingly simple, but we see reasons that lead us to suppose such a relation would be difficult to establish.

Notwithstanding the difficulties of this problem, we believe its solution is possible and that some inventor will yet realize a fortune, by giving to the public a simple, cheap, and efficient apparatus for determining the illuminating power of gas, and the pressure under which it is delivered as well as the quantity consumed.

EARTH CLOSETS.

The water closet, although a very convenient and almost indispensable appendage to a first-class residence, is open to many objections, arising from carelessness in its management, freezing of pipes, etc., which are too well known to need specification. The earth closet, improved as it has been already, and doubtless will be, is destined, if we mistake not, to prove a formidable rival to the water closet.

The general principle which gives value to the earth closet is the power of earth to deodorize decaying and decomposed organic matters. This is due partly to its absorbent power upon gaseous compounds, and partly to chemical reaction, between the substances of which earth is composed and the offensive matters. The absorbent power of earth upon effluvia has been long known. In rural districts the practice of burying clothes to rid them of smell caused by too intimate contact with that personally disagreeable, but to hop-growers exceedingly useful little animal, the skunk, is a common practice. It is well known that excrementitious matters, covered with dry earth, are not only completely deodorized, but form the most valuable of all known fertilizers.

The mechanical construction of earth closets, as they are now made, is such, that by a very simple movement, matters deposited therein are instantaneously covered with a layer of dry earth, and, thus deodorized, may be removed with as little offense or trouble as ashes.

The plan is commendable in many points of view. On shipboard its introduction would obviate the most intolerable nuisance. In hospitals it would greatly promote the health and comfort of both patients and their attendants. It is equally applicable to dwelling houses, wherever situated, and under any circumstances whatever, and is as applicable to a commode as to a room set apart for the purpose. It removes all danger of the impregnation of wells with excrementitious matters, an accident now of frequent occurrence, and the cause of frightful epidemics.

Its universal adoption would lessen the demand upon the water supply of cities to a very large extent—an important consideration. It can be made convenient in use, and lastly, but not by any means least, such a system might be made to restore to lands the large amount of valuable fertilizing matters which now flow through the sewers of seaboard towns to contaminate the water for miles around.

The value of this now wasted sewerage is enormous. It may be estimated in millions annually. Engineers have racked their brains to devise some means of utilizing this waste; it seems to us that the earth closet is the true method for its accomplishment. Not that we believe the principle has been yet wrought out to perfection, but that it is capable of being applied so as to cover all the requirements of the case.

Our attention was first called to this subject by the perfect absence of smell, and the superior cleanliness of the earth closets of the Oneida Community, an association which, whatever its errors of belief, is not open to any criticism on the score of cleanliness. These closets are daily cleaned, without inconvenience, by simply drawing away the earth and deodorized matter with the receptacle allotted to them, and replacing it by another. The compost is used on their lands, and is considered an extremely valuable manure.

We are glad to see that public attention is being directed to this matter on both sides of the Atlantic, and we trust the subject will be discussed, and the matter tested until its merits are fully established. A patent is pending at the Patent Office now on a very ingenious earth closet, the invention of an Englishman. As soon as the patent issues we shall probably illustrate the subject in these columns.

EATING CONSIDERED AS NOT A FINE ART.

A man is in one sense a machine. He has his levers, valves, pumps, and pipes. He requires fuel to run him. He is a locomotive engine on wheels, as Dr. Oliver Wendell Holmes has shown. True, his wheels are only segmentary, and each of the two segments has but one spoke; so an entire revolution of either is impossible; but each has a reverse motion, and is lifted and placed back to its proper position, relative to the entire machine, while the opposite one is propelling, so that the necessity of an entire rim and more spokes, connecting it with the hub (hip joint), is obviated. This hub is also a a wonderful contrivance; it has many axes of revolution. Instead of revolving on a single axle, it is a ball and socket joint, and may admit of motion on its vertical as well as its horizontal axis, thus enabling the locomotive to get around curves without increased friction, a desideratum long sought for the iron locomotives which man's hands have wrought. The spokes (legs) also have a movable joint in the middle, and another where they join the rim (foot), which latter is as full of joints as it can well be made, having thirty, or thereabouts, exclusive of the lateral articulations of its pieces. A pretty complicated wheel this, but it is nothing to the complication of some other parts of this wondrous machine.

It has arms and hands of still more complex structure with which it performs useful work. It has a force pump and bellows, working constantly, night and day, and a fire box, in which the fuel is placed to keep the whole apparatus in working trim, for if the fire ever goes out and the water gets cold in the boiler, that machine is done with forever; it is worth even less than the old iron of a railroad locomotive. Consequently the prime object of all men, except those unfortunates who desire death, is to supply fuel to keep up steam. The work of the machine then is, or ought to be, worth more than the fuel it consumes. Fortunately, this is the case. For the most part, the work of one of these machines will buy not only fuel for itself, but for a number of smaller ones, and a round house (or square one) in which they all may be stowed away comfortably, beside something to spare for those poor broken machines which can do no useful work but yet claim their share of fuel and cover from the storm.

Its bell and whistle are combined by a curious arrangement and placed in a singular place, *i. e.*, just inside the furnace door. The clapper of the bell is a wonderful piece of mechanism. Look at it closely and you will see that it must have been designed to do a great deal more than to warn folks off the track when the engine is coming. Scattered over its upper surface, most thickly on the posterior portions, are little protuberances, called by the learned papillæ, whose office is to determine the quality of the fuel put into the door, and if this is found to be inferior or injurious to the machine, it, together with the folding stove doors, is so arranged as to reject the fuel. At the same time the clapper most generally rings out a most discordant and angry peal.

Now, if men were machines only, the uses of this apparatus might well end with the selection of proper fuel, and the rejection of the bad or inferior; but we find that, on the summit of the machine, there is a curious apartment—the engineer's domicile, fitted up most elaborately, with two most beautiful windows in front, an apparatus for transmitting sounds upon either side, and another most remarkable arrangement just below the front windows, by which a most subtle and critical examination of fuel as well as other external objects may be made. By means of these beautiful contrivances, the engineer is able to communicate with other engineers, without leaving his apartment, which he never does until he finally abandons his machine as worthless. If we look still still more closely, we shall discover little cords running from each of the papillæ to the engineer's room, and also from each of the other pieces of mechanism which we have described. The engineer receives over these cords (each of them in itself a wonder), sensations of pain or pleasure. When bad fuel is put in the fire box, the sensation is generally painful, and *vice versa*. But there may be enjoyment in taking in fuel which has very little economical value, and hence such fuel finds market, and is useful because it keeps the engineer in good temper, and, not unfrequently, prevents disaster from the too free use of fuel which has too high a heating power to be safely used by itself. In fact, the sole end and use of the machine is to give pleasure and happiness to the engineer; for though he may, and should, often use it to give others pleasure, he only does this because he feels high pleasure himself in so doing, or corresponding pain if he leaves the duty unperformed.

To give pleasure to the fine sensibilities of the mind and body is the object of those arts which have been called the fine arts, and there is no doubt that the art of cooking may be legitimately placed in this category. But there is a certain class of philosophers, of whom the celebrated Baron Von Liebig stands at the head,who seem to look upon man,as regards his eating, solely as a machine, out of which the most work is to be got at the least possible cost. Now this appears to us a very unreasonable and narrow view of the matter. If man were merely a machine, it would be sufficient that pain should be felt when noxious substances are presented as food, and thus cause its rejection. The capacity for pleasure would be superfluous. But these reasons tell us the capacity for pain and pleasure are one and the same thing; that a nerve, to be able to transmit a pleasurable sensation, must also be capable of transmitting a painful one; that pain and pleasure are only relative terms; for what is agreeable to one may be disagreeable to another, and "one man's meat is another man's poison." Granted; but what has this to do with the subject? Those who resolutely regard eating as not a fine art, and will compute you the number of ounces of peas for a day's supply to keep a human body warm and provide fuel for useful work; and who,in the application of such rules and computations to the adjustment of a dietetic regimen for the unfortunates who are laid up in hospitals, almshouses, workhouses, and prisons, persist in looking at only the economic bearings of the subject, regardless of the natural and reasonable desires and capacities of human existence, would do well to confine themselves to their own rules for a few years, and see how they like it. We believe that every human being who has not by crime forfeited the common privileges of humanity, and who, by sickness or other unavoidable cause, is incapable of self-care, is entitled not only to mere existence at the hands of his fellowmen, but to the average comforts of life so far as his physical incapacities, which have made him dependent upon others, will admit.

Those who are not thus dependent are right in eating for pleasure as well as for sustenance,always provided they do not run into excess; and so far from calculating whether a certain kind of food is two per cent more nutritious than another, are right in consulting their tastes in the selection of diet; of course, with due reference to the effect the food in question will have upon their general health. In such matters, native instinct is as much to be relied upon as reason, and we are sure it will always be found that he who eats in moderation of the food he likes best, will, all other things being equal, be the healthiest man. It almost gives one the dyspepsia to read the analyses of pork, and beans, and mutton, and sausages, which form the basis of most of the learned dissertations on food now so popular; and for ourselves we shall not be sorry when some other topic shall become a prominent theme to the exclusion of this much hackneyed subject.

THE COLORS OF PLANTS AND FLOWERS.

The coming of spring brings the beautiful green foliage with which all the landscape will soon be covered. If we search in the dry shrubs, or trees, or grass roots, for green coloring matter, we shall not find it. It is not there, nor in the earth nor the air shall we be able to detect it. From whence, then, does it come, and what is it?

If we take some leaves of plants and digest them in alcohol, we shall, after a proper time, find that their green coloring matter is dissolved, and our alcohol has become a beautiful green solution. By careful evaporation we drive off the alcohol, and have left a splendid natural pigment, which chemists have called chlorophyll, from the Greek words *chloros*, green, and *phyllon*, a leaf.

It contains four elements, carbon, hydrogen, oxygen, and nitrogen, the first of which is black except when crystallized or combined with other substances. The other substances are colorless gases. These combined produce the tints of green which make the earth so beautiful in its seasons of verdure.

Chlorophyll is, according to Miller, of a resinous nature. By some authors it is supposed to be composed of two compounds, one of which is blue and the other yellow, which colors, blended, produce green. Be this as it may, the ultimate elements are those above mentioned. It is not known whether this matter is generated during the cold of northern winters, in the evergreens which retain their leaves during the months of frost, or whether the color produced during the warmer season is merely retained unaltered within the leaves. Whether this be the case or not, it is certain that without sunlight it never is formed. It is the sunbeam that mixes the color and, with exquisite pencil, adorns the delicate 'eaflet as it issues from the opening bud. Place a plant in t..e dark and it sports no beautiful colors. It dons white, the hue of death. Take it now and place in the light—not in the intense and concentrated light and heat of the sun—it is too weak to endure that—but in a shady place where the light can touch it gently and lovingly, aud see how delicately the tints will be laid on, deepening gradually until it is clothed with emeralds. A sunbeam is a painter which art cannot imitate or even approach.

The coloring matters of flowers have been made the subject of elaborate study by Fremy and Cloez. They consider these substances to be instrumental in producing all the tints to l. seen on the petals and internal organs of blossoms. These substances are respectively called Cyanin, Xanthin, and Xanthein. Cyanin is a vegetable blue, or rose color, which reddens by the action of acids. Blue flowers are found to possess a neutral juice, while the juices of red flowers have an acid reaction, corresponding to the action upon blue litmus paper of acids and alkalies. Xanthin is a yellow substance, insoluble in water, and existing in great abundance in the leaves of the sunflower. Xanthein is a yellow substance, soluble in water, and obtainable from the leaves of the yellow dahlia. Acids turn xanthein brown.

Miller says of these substances, however, that "not one of them has ever been isolated in a pure condition, and there is considerable doubt whether the colors of the flowers of different plants be due uniformly to the same materials. The yellow coloring matters, however, are clearly of a nature different from that of the blues and reds. Many red flowers become blue and green as they wither, but they never become yellow. Blue flowers are also sometimes observed to fade into red before the color disappears, but they never become yellow; and, on the other hand, a yellow flower as it withers never becomes blue."

The yellow color acquired by leaves before their fall in autumn, is ascribed by Fremy to the gradual destruction of a blue constitutent of chlorophyll, which he calls Phyllocyanin, the other constituent being a yellow substance which he calls Phylloxanthin. These substances may be separated by the following method, which constitutes a very pretty experiment:

Boil the alcoholic solution of chlorophyll, obtained as above, with an alcoholic solution of potash. Neutralize this solution hydro-chloric acid, and the phylloxanthin will be precipitated; the phyllocyanin remaining in solution, to which it gives a beautiful blue color.

VELOCIPEDE NOTES.

The *Ironmonger*, all along a firm believer in, and supporter of the claims of the velocipede to public esteem, thus sums up its merits: "The velocipede, as embodying the combination of physical with mechanical power, for the purpose of locomotion, has had its claims to adoption fully vindicated; while as an amusement, it is in many respects superior to horse riding, cricket, skating, or even rowing. A properly-designed velocipede, allowing, as it does, of the full development of the chest and lungs, constitutes one of the best aids to the much-desired improvement of the human body. Among other hygienic advantages, respiration is facilitated, and the muscles of the back and shoulders are relieved from the injurious strain often imposed by habits of stooping. Lastly, velocipathy—thanks to our *alma mater* for the term—is the most excellent tonic and appetitizer of the modern Pharmacopœia. Then as to the danger of running over people, the velocipede is more under the control of the rider than any horse-driven vehicle. But it is the country, not the city or town, that is destined to be the scene of its greatest exploits. Very few have had the opportunity of giving them a trial on our country roads, though there is no longer any doubt of their utility *in rure*. In France, velocipedes are not only the amusements of the Paris *gamins* of the Boulevards, but are found to constitute a convenient means of seeing a country without walking. Four velocipedes drove up the other day to the Hotel de France, at Mans, their drivers having started together on a tour from Trouville, whence they velocipeded up to Paris. From the capital they started for Bordeaux, Ferte, Bernard, and Mans, accomplishing, on an average, 30 miles per day. This fact testifies to the safety as well as the speed with which velocipedes may be driven, for it is only reasonable to suppose that somewhat rough ground must have been encountered on the tour."

The same periodical states that there are as yet no water velocipedes in the English market, but that various addenda, such as protectors from rain and dust, etc., etc., are in demand.

A French theater announces the "*pas diabolique*," whatever that may signify, to be performed with the prancing and curvetting *veloce* at full speed. The passion for velocipede performances is so great, that the Paris Censor has ordered that not more than twelve velocipedes should appear on the stage at any one time.

European exchanges show no falling off in the popularity of the bicycle in France, while in England the *furore* is on the increase.

In this country the popularity of the velocipede gains daily. What is wanted in each of our large cities is a velocipede race course. Upon this subject the New York *Sun*, which daily illuminates its readers upon velocipede matters as well as other subjects of popular interest, says: "Outside of Paris they have a regular velocipede course of a mile circle, with a roadway so smooth and hard that one could play billiards on it. The races on this course are crowded with fashionable assemblages, the ladies especially thronging the grand stand reserved for their use. On this course the extraordinary time of a mile in two minutes and fourteen seconds has been accomplished on a 45-in. wheel, French model. Now, we have as yet nothing like this course in this country, and one is wanted; and, if properly conducted, it would pay a handsome return on the investment. As regards locality, the Capitoline grounds, Brooklyn, are just suited for the purpose, but as yet no track has been prepared, the expense being rather great. The little experience already had in races—one opponent against another—in this vicinity, proves conclusively that such contests would be extremely attractive, and, what is more, would be well patronised by the reputable classes of the community. As for velocipede races on horse-track courses, the affair at the Union Course showed that anything of that kind would lower the standard of the sport, and, beside, be unprofitable. A horse race is exciting, but how much more so is a contest in fast riding between skillful velocipedists. Races of this kind have been adopted as one of the features of the exercises of the New York Athletic Club, and with the trials of skill which will take place between rival velocipede clubs, a series of exciting and deeply interesting bicyle races will be inaugurated for each year, well calculated to attract large and fashionable assemblages of spectators. Let us have no more races on trotting courses. Velocipeding now is in respectable hands, and has a reputable status as a gentlemanly sport and exercise. Let it be kept so, and do not allow it to be contaminated with the evil associations, such as have nearly killed the national game of base ball within the past three years.

"Owing to the lamentable ignorance of the common laws of phiysiology which prevails among the mass of the community, empirics find no difficulty in foisting the most absurd notions on the people as medical facts; but we have been surprised to see in the editorial columns of papers supposed to be edited by educated men, statements in regard to alleged injuries riders of bicyles are subject to, which are calculated to make respectable medical men laugh. The *Sunday Mercury* had an editorial lately, which actually attributed Bright's disease to the bicycle. The *World*, too, the other day, in an editorial snarl at velocipedists, attributed still more fatal results to the poor velocipedes. Now, in the first place, velocipede riding can have no objection urged against it as a cause of any class of injuries to which horseback riding is not equally amenable. But the most absurd charge yet made is that of its causing ruptures and hernia. The majority of the people who talk such stuff have about as much of an idea of what constitutes a rupture as they have of the theory of electrical phenomena. Except caused by a severe fall and consequent strain, a rupture from velocipede riding is an impossibility; and in regard to a fall, a man is as liable to it from that in a carriage, or on horseback, or in a ball field, as in falling from a bicycle. The whole subject of these alleged injuries, however, is the veriest bosh, and it is a disgrace to the editors of the journals who publish such paragraphs. Respectable physicians advocate it as a healthy healthy exercise, and practice it too."

Mr. Clow, proprietor of the Smoky City Rink, at Pittsburgh, has had a bridge made for his rink, which, we think, is the greatest obstruction yet surmounted by a velocipede; it is five feet high at center, the inclined sides being but twelve feet long by four wide, giving a rise of one foot in two; this was a dangerous looking affair, having no railing at the sides, and being placed near the middle of the floor, required a steady hand, head, and feet; it was, however, successfully crossed several times at the inauguration of the rink; the younger Pickering letting go the handles just before reaching the top, guided his machine over, and down and around the room entirely by his feet—two only of the scholars cared to attempt this feat, the first getting sufficient speed on his machine to carry it and him about half way up the incline, from which point he very graciously *backed down*, the floor receiving him and his veloce considerably *mixed*. Another member, in whose make-up the word "fail" seems to have had no part, then tried his try, and passing the upper point came down the incline safely until he reached the floor, when he and his veloce suddenly came to the ground; a second and third attempt proved more successful, and he now wants the bridge higher and longer.

A journey on bicycles from Liverpool to London, by way of Oxford and Henley, has just been accomplished by two of the Liverpool Velocipede Club. On the evening of March the 25th, A. S. Pearson and J. M. Caw, the honorary secretary of the club, set off from the shores of the Mersey for a "preliminary canter" to Chester, from which city they started in earnest on the following morning. After a ride of fifty-nine miles they arrived at Newbridge, near Wolverhampton, where they stayed the night. On Friday the velocipedians, having traversed the Black Country, went on to Woodstock, a distance of sixty-nine miles, where they slept. On Saturday night the tourists arrived in London, feeling none the worse for their long ride. Their bicycles caused no little astonishment on the way, and the remarks passed by the natives were most amusing. At some of the villages the boys clustered round the machines, and, when they could, caught hold of them, and ran behind until they were tired out. Many inquiries were made as to the name of "them queer horses," some calling them "whirligigs," "menageries," and "valaparaisos." Between Wolverhampton and Birmingham attempts were made to upset the riders by throwing stones. The tourists carried their luggage in carpet bags, which can be fastened on by strapping them either in front or on the portmanteau plate behind.

The New Explosive.

The recent disastrous explosion in Paris in a manufactory for the preparation of picrate of potassium, coupled with the fact that there are many other such establishments in which the accident may any day occur, gives a peculiar interest to details simply chemical in their nature. The picrate of potassium is the potassium salt of an acid to which the names trinitrophenol, trinitrocarbolic acid, picric acid, carbazotic acid, picranisic acid, chrysolepic acid, &c., have been given. The acid, a frequent product of the action of nitric acid on organic substances, was discovered by Hausmann in 1788; has been the subject of investigation by Liebig, Dumas, and Laurent; and was first accurately described by the last-named chemist, who proved it to be carbolic acid in which three atoms of hydrogen have been replaced by three atoms of the group NO_2. This constitution at once explains the explosive character of the acid and of its salts. It will be seen that the oxygen, of which there is a large quantity, is nearly all combined with nitrogen. Now, compounds of oxygen and nitrogen are very easily decomposed, especially in the presence of substances having a powerful attraction for oxygen, such as carbon and nitrogen. Gunpowder, for example, is a mixture of a substance containing oxygen united to nitrogen (saltpeter), and a substance having a strong attraction for oxygen (charcoal); while in gun-cotton, nitro-glycerin, picric acid, and the picrates we have the two united in one compound. Stored up in all these substances is a potential energy which betrays its presence by explosion when the oxygen leaves the nitrogen to unite with the carbon and hydrogen. The picrates differ a good deal as to the rapidity and violence of this decompositon; the picrates of mercury, silver and copper on the one hand burning quickly, like loose gunpowder, and on the other, the picrates of calcium, lead, and especially potassium, exploding with a loud detonation when heated on a flat plate, or when sharply struck by a hard body. The first to make practical application of this property of picrate of potassium was Mr. Whitworth, who used the salt to fill shells to be directed against the armor plating of ships. While picric acid may be prepared by the action of nitric acid on many organic substances, such as indigo, aloes, silk, carbolic acid, or salicin, the most convenient and economical material is the so-called "yellow gum," or resin of the *Xanthorrhea hastilis*, which yields, according to Dr. Stenhouse, about fifty per cent of the crystallized acid. The substance is chiefly used as a yellow dye for silk and wool, and as a means of distinguishing animal from vegetable fibers, the former being colored yellow by it, the latter remaining unchanged. It is employed in the laboratory to distinguish salts of potassium from those of sodium: the picrate of potassium being very sparingly soluble in water, while the picrate of sodium dissolves readily.

Changing Clothing.

Many persons lose life every year by an injudicious change of clothing, and the principles involved need repetition almost every year. If clothing is to be diminished, it should be done in the morning, when first dressing. Additional clothing may be put on at any time.

In Northern States the under garments should not be changed for those less heavy sooner than the middle of May; for even in June a fire is very comfortable sometimes in a New York parlor.

Woolen flannel ought to be worn next the person, by all, during the whole year, but a thinner material may be worn after the first of June.

A blazing fire should be kept in every family room until ten in the morning, and rekindled again an hour before sundown, up to the first week in June and from the first day of October.

Particular and tidy housekeepers, by arranging their fireplaces for the summer too early, oftentimes put the whole family to a serious discomfort, and endanger health by exposing them to sit in chilliness for several hours every morning, waiting for the weather to moderate, rather than have the fireplace or grate all blackened up; that is, rather than be put to the trouble of another fixing up for the summer, they expose the children to croup and the old folks to inflammation of the lungs. The old and the young delight in warmth; it is to them the greatest luxury. Half the diseases of humanity would be swept from existence if the human body were kept comfortably warm all the time. The discomfort of cold feet, or of a chilly room, many have experienced to their sorrow; they make the mind peevish and fretful while they expose the body to colds and inflammations which often destroy it in less than a week.—*Hall's Journal of Health.*

Editorial Summary.

THE outcry made some months ago against the abuse of the franking privilege on the part of Members of Congress seemed to put a check upon it for a while, but we have now before us a private business circular of a Washington firm, styled "Swetland & Co.," franked by the written signature of Hon. John T. Deweese, Member of Congress from North Carolina. We call the attention of the Hon. Mr. Deweese and of Postmaster-General Cresswell to this system of *sweating* the postal revenue. It's not fair, it's not honest.

IT is announced that the city of Boston was gently rocked in the lap of a tender earthquake on the afternoon of April 23d. The localities affected were Brookline, Hingham, Stoughton, Canton, Dedham, and South Dedham. It occurred at nearly three o'clock with a heavy report and a vibratory sensation, which did not last more than three seconds. The crockery-ware shook in the closets, and the glass in the windows. The weight and duration of the shock was greatest at Dedham.

A MUSEUM of Natural History is to be established in the Central Park, in this city, $50,000 having already been subscribed for that purpose. The Commissioners of the Park have offered the use of the large hall of the Arsenal Building as a place where the collections may be deposited until a suitable structure can be erected. We understand it is proposed to erect a museum building on Ninth avenue, fronting the block between Seventy-eighth and Seventy-ninth streets.

INVENTORS who have English patents, or would like to introduce their inventions in Great Britain, will find it for their interest to consult a member of an old established firm, who is temporarily stopping in this city. See advertisement on another page.

SOME of our cotemporaries are designating the new Commissioner of Patents as "Judge" Fisher and "General" Fisher, neither of which titles are applicable. Mr. Fisher is a lawyer by profession, and held the position of Colonel of the 138th Ohio Volunteers.

THE manufacture of beet-root sugar was begun in a small way at Oshkosh, Wis., some time ago, and proved so remunerative that an immediate enlargement of the works is contemplated.

COMMISSIONER FISHER has removed Examiners Peters and Barnett. It is likely that other changes will be made.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

STEEL RAILS.—The question of the manufacture of steel rails continues to be a subject of intense interest in the iron districts of England. The *Birmingham Daily Gazette* gives an account of the Siemens-Martin process, which has recently been brought into practice on a manufacturing scale at the North Yorkshire Steel and Iron Works, near Stockton-on-Tees, by Mr. Samuelson. The works were recently put into operation, and on the following day, the first rail was rolled for the Darlington section of the North Eastern Railway Company, with, it is said, perfect success. "The rail placed on bearings 3 feet 6 inches apart, was subjected to the impact of a ball weighing 22 cwt., falling from a hight of 30 feet, without showing the slightest flaw, and each subsequent day's product has borne the same extraordinary test." Mr. Siemens himself is erecting similar works in South Wales.

UTILIZATION OF BLAST FURNACE SLAG.—The following method is now adopted in several iron works in Belgium: The slag is allowed to run direct from the furnace into pits about eight or nine feet in diameter at the top, with sides sloping inwards towards the center, where they are about three feet deep. The mass is left for eight or nine days to cool, when a hard compact, crystalline stone is obtained, which is quarried and used for building purposes, but chiefly for paving stones. They appear to wear exceedingly well, being quite equal to the grits and sandstones already so much used.

The Lawrence (Mass.) *American*, gives the number of operatives employed in the manufacturing establishments of that city. The total number is 10,542; 4 558 males and 5,984 females. The Pacific Mills employ 3,687 hands; the Washington, 2,312; Atlantic 1,150; Everett, 883; Pemberton, 836; Arlington, 199; Duck Mills, 180; Russell Paper Company, 138; Lawrence Woolen Company, 116; Gilmore's Straw Works, 134; Wright Manufacturing Company, 99; Lawrence Worsted Company, 79. The total number of hands employed in the manufacturing establishments of Lowell is 13,927; 4,914 males and 9,013 females.

WISCONSIN WOOLEN MANUFACTURERS' ASSOCIATION.—The Wisconsin woolen manufacturers held their annual meeting at Milwaukee on the 13th of April. The display of samples from some of these mills was very creditable; the Racine shawls and Appleton doeskins, flannels, and cassimeres being especially fine. A committee was appointed to consider the expediency of holding an annual trade sale. The next meeting will be held in Milwaukee, in April, 1870.

A blast furnace for the manufacture of charcoal pig iron is, to be established at Frankfort, on the eastern shore of Lake Michigan, by a company recently organized in Detroit, with a capital of $100,000.

A furniture factory in Hanover street, Boston, employs 500 hands, runs a 100 horse-power engine, and keeps constantly on hand 1,500,000 feet of dry black walnut lumber.

In a few weeks the Rock Island and Pacific railroad will be completed to Council Bluffs, and thus Chicago will have two entirely independent lines to Omaha.

In the lumber yard of the Pacific railroad, at Omaha, are stored four and one-half million feet of lumber, and seven hundred and sixty-eight workmen are employed.

A rolling mill to employ one hundred and fifty hands is about starting at Joliet, Ill.

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; beside, as sometimes happens, we may prefer to address correspondents by mail.

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

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

S. J. K., of Vt.—No perceptible effect is produced upon a weight suspended from a spring balance during the conjunction of the sun and moon, by their united attraction. It is only upon very large bodies that this cause could produce a perceptible effect, and the effects perceptible in large bodies bodies of water are very slight when compared to their entire bulk. When you consider that the highest mountains are far less in proportion to the entire bulk of the earth than the wrinkles on the rind of an orange are to its bulk, you will see that the highest tidal wave is a very small thing compared to the mass of the earth. The statement that the sun is four millions of miles nearer than was originally computed from the transit of Venus, is based upon more recent calculations made from other data and is now universally admitted by astronomers. Nitro glycerin is made by dropping glycerin into equal parts of strong nitric and sulphuric acids; it is a dangerous plaything. You will find some hypotheses in works on physics, upon the cause of the refraction of light, but nothing positive has been demonstrated as to its ultimate cause.

H. A., of Col.—The cubic foot of water weighs 62½ lbs. and converted into steam of atmospheric pressure would contain for each lb. 537 centigrade units of heat, and for the 62½ lbs., 537x62½ or 33,562 units of heat. A nominal horse power, per hour of 60 minutes, is obtained by the combustion of 2½ lbs. of coal and evaporation of 25 lbs. of water, containing 25x537 or 13,425 units of heat. A nominal horse power per hour is equal to 33,000x60 minutes or 1,980,000 foot lbs. per hour. Dividing 1,980,000 foot lbs. by 13,425 would give us 1,474 foot lbs. as the mechanical equivalent of 1 unit of heat of atmospheric pressure—a portion of heat being lost. This equivalent is however too low by from 20 to 30 per cent.

T. J., of Ill.—"Can two pieces of flat iron be so fitted with a file, that by placing one upon the other—no oil or other substance between—the atmospheric pressure will keep them together." We see no reason why the two pieces cannot be fitted by the file; it is often done by scraping surfaces. We doubt, however, if the surfaces are held in contact by atmospheric pressure alone. Cohesion of particles is probably the source of the force or attraction that holds the two surfaces together.

A. T. C., of N. Y.—Castor oil is unfit for lubricating either gun locks or any other mechanism. It is viscid and "gummy." Better is pure sperm, porpoise, olive, or poppy oil. Don't gum up your gun with it.

G. F. S., of Mass.—If you cannot reach the defect in your steam cylinder to plug it, or melt in a composition, stop the hole with a mixture of two parts sal ammoniac with eight parts fine cast iron filings. No sulphur to be used.

A. T. C., of———To remedy the fault in your blackboard give it a coat of lampblack and japan varnish. The lampblack should be deprived of oil if necessery by heating in the usual way.

H. D. D., of Texas.—Water might without doubt be brought over the neck of land of which you speak in syphons. The distance however, is so great in proportion to the fall, that with your low head, you would get a sluggish flow on account of friction, we do not feel justified in recommending the attempt as a means of getting power.

A. W., of Mo.—The separation of silver from lead is profitably done in many places. The information you seek can be found in Phillip's "Mining and Metallurgy of Gold and Silver," sold by D. Van Nostrand of New York city.

W. S., of Wis.—We have carefully examined your article upon velocity, and it is evident to us that you do not understand the subject. We prefer not to publish crude notions upon abstract scientific subjects.

F. S., of Mich.—The cost of beet root sugar machinery given in our paper is based upon the charges in gold for such machinery in France. The other information that you seek on the subject will be given in the remaining article of the series.

R. M. C., of Iowa.—We cannot undertake to verify the correctness of your analysis of composite numbers. Such investigations require more of our valuable time than we can afford to bestow upon subjects of that character.

H. H., of Berlin.—You mistake our position entirely. We are opposed to all swindling rings, but we do not propose to revive and denounce old swindles that have gone out of sight. Our paper would not be large enough to keep pace with active operations of that kind going on.

J. B. U., of Md.—We did not preserve the letter of the correspondent to which you refer, therefore cannot send his address.

E. R., of N. Y.—Your idea of crossing Broadway by the use of wings or the flying trapeze, is novel, to say the least, but it scarcely merits notice as a practical scheme.

E. P., of N. Y.—We recommend you to write to H. C. Baird, of Philadelphia, for a work on the art of perfumery.

R. H., of Ill.—The law enacted by the legislature of your State, in reference to the sale of patent rights, is intended to put a check upon frauds. It cannot interfere with legitimate sales of patents.

C. F., of Ohio.—Good white lead putty is as good as anything for an aquarium. The water ought to be changed several times however before putting in your fish.

E. E., Ind.—A good varnish to protect tin plate is lacquer, similar to that used for brass, and applied in the same way.

NEW PUBLICATIONS.

A Practical Treatise on Metallurgy. Adapted from the last German Edition of Prof. Kerl's "Metallurgy." By William Crookes, F. R. S., and Ernst Rohrig, Ph. D., M. E. In three volumes. Vol. II. Copper and Iron. Illustrated with 273 Wood Engravings. New York: John Wiley & Son, No. 2 Clinton Hall, Astor Place.

It is impossible, in the brief space allotted for new publications in our paper, to give even the most cursory review of the volume before us. The well-known excellent reputation of the first volume of the series is fully sustained in this volume, which is devoted to the metallurgy of copper and iron. One of the many praiseworthy features of this work, is the attention paid to minute details. It is what it claims to be, "practical," and thus is suited to the exigencies of the unlearned. At the same time the scientific metallurgist will find all that is needful. The original treatise of Prof. Kerl has long occupied the front rank among works upon this subject. The mechanical part of the subject is sufficiently treated, although it is not made a prominent feature. We regard this as one of the most valuable additions to metallurgic literature that has issued from the scientific press. From the miner and smelter, to whom it is of the first importance, through all departments of iron and copper working, it cannot fail to be of great service.

We are indebted to the publishers, Messrs. Lee & Shepard, Boston, for two interesting and instructive pamphlets. "The Controversy Between True and Pretended Christianity" is a tersely-written essay, originally read before a Massachusetts Methodist convention, by Rev. L. T. Townsend, Professor of Historical Theology in the Boston Theological Seminary. Price, bound, 50 cents; in paper, 25 cents. "Woman as God Made Her; the True Woman." by Rev. J. D. Fulton, the popular, wide-awake pastor of Tremont Temple Church, Boston. Its aim is to set forth the divine ideal or women in her various relations, and under such heads as Woman as God made Her, Woman a Helpmeet, The Glory of Motherhood, Woman's Work and Woman's Mission, he presents his views in the pungent, epigrammatic manner characteristic of him either as pastor or author. Price, $1 bound; paper, 50 cents.

Recent American and Foreign Patents.

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

Manufacture of Pipe Elbows.—Edwin Norton, Toledo, Ohio.—This invention relates to improvements in the manufacture of pipe elbows, whereby it is designed to simplify and cheapen the cost of the same, and it consists in the production of the blanks, of the proper form, for both parts of elbow, from one sheet of metal, by dies so arranged as to cut the same at one blow, and without waste of metal.

Machinery for Washing Wool.—John McNaught and Wm. McNaught, Jr., Rochdale, England.—This improved machinery consists of a series of two or more rakes, or other equivalents, for traversing the wool, or other fibers, along the cistern to an inclined plane, up which they are moved by an improved cradle, or other equivalent, and delivered to a series of rollers which convey them to the squeezers.

Quilting Frame.—Josiah Odell, Petroleum Center, Pa.—This invention relates to improvements in quilting frames, designed to make them more conveniently and useful, as such, than any now in use, and to adapt them also for use as a clothes frames. It consists in certain improvements in means for clamping the bars of the frame together, and arrangement of the said bars calculated to adapt the frame to the said double use.

Machine for Bending Felloes.—De Lyon & Werner, Canton, Miss.—This invention relates to improvements in machinery for bending felloes, and consists of a curved former, mounted on an axis and working over a movable carriage, whereon the stick to be bent is placed between the face of the former and a metallic strap, which is bent up with the stick and secured to the former, to hold the bent stick until it becomes set.

Governor Valve.—W. W. Gilbert, New York city.—This invention relates to improvements in governor valves for steam or other engines, whereby it is designed to provide an arrangement whereby the valve may be opened or closed, either by a movement in the direction of its length or a rotary movement; also, to provide an arrangement whereby the valve will be automatically closed when the governor ceases working from any cause; and also, an arrangement to facilitate the increasing or diminishing the volume of steam through the medium of the said governor valve without effecting the operation of the valve by the governor.

Medical Compound.—Henry Adolph, Clinton, Kas.—This invention relates to a new and useful composition to be used as a liniment for external diseases in sheep, horses, and cattle, also valuable as a remedy for leprosy, and other diseases to which the human system is subject.

Heater and Ventilator for Railroad Cars.—Asa Weeks, Minneapolis, Minn.—This invention is an improvement upon the one patented by me January 5th, 1869, No. 85,712. It differs from it in the construction of the large heater, and the means for adjusting its draft, and for cleaning it out when foul.

Railroad Chair and Tie.—Thomas F. Fouts, Albia, Iowa.—This invention relates to new and improved method of constructing railroads, and consists in the peculiar form of the chairs and ties, and the manner of securing the rail thereto, and of preventing the spreading of the rails and the settling of the track.

Machine for Picking Curled Hair Rope.—H. R. Hildreth, Lynn, Mass.—This invention relates to a machine for untwisting and picking hair rope, thereby rendering it suitable for use in upholstering or other purposes.

Subsoil Plow.—James B. Pullman, Los Angeles, Cal.—This invention consists in the combination of a share of peculiar construction with a coulter having a concave cutting edge, both being affixed to a plow stock of the usual construction.

Toy Gun.—W. I. Blackman, Columbus, Miss.—This invention relates to that class of articles which are designed for children's use and amusement, and consists of a barrel, and stock, and rubber springs, combined and arranged so as to form a gun, the projectile being impelled by the recoil of the springs.

Straw Cutter.—Ellis Douty, Collomsville, Pa.—This invention relates to those straw-cutting machines, in which a straight knife or cutter is employed in a reciprocating frame sliding vertically on the front uprights, and operating to bring the edge of the knife downward across the end of the box.

Mash Tub.—Marshall J. Allen, New York city.—The object of this invention is to provide an improved means for heating and cooling the contents of mash tubs, such as are used in distilleries and breweries.

Mail-bag Fastening.—J. A. Truitt, Oakland, Pa.—This invention consists of a sliding chain arranged in one part of the bag, capable of receiving the staples of the fly through its links, and provided with a staple in each link, which will, when the said chain is drawn transversely of the bag, engage each of the said staples of the fly and thereby fasten the two parts together.

Registering Counter for Billiards.—W. A. Hough, St. Johnsville, N. Y.—This invention relates to improvements in connecting and registering apparatus for billiards, and has for its object to provide a simple and reliable apparatus that will keep the count for each game, and register the number played by each party, and the whole number played during a day or other stated periods.

Piston Packing.—Wm. Ord, Brooklyn, Ohio.—This invention relates to improvements in piston packing, designed to provide an arrangement of simple, and cheap construction, capable of more perfectly fitting the cylinder, simple of adjustment, and less liable to spring away from the cylinder after being set out than any arrangement now in use.

Farm Gate.—J. T. Moxley, Owasso, Mich.—This invention is to provide a farm gate which is simple and effective.

Clevis for Plows.—G. W. Holton, Berlin, Ky.—This invention consists in making the end bar of the clevis considerably longer than the present construction, preferably arranging the elongation below the part engaging the plow beam, and providing at the said end as many hitching rings as it will support by passing through transverse holes and preserve a sufficient amount of strength. The projecting end is strengthened by suitably bracing it.

Apparatus for Displaying Goods.—John D. Chambers, West Lebanon, Ind.—This invention relates to improvements in apparatus for displaying goods in mercantile establishments, generally woven fabrics; and it consists in the yard arms on which the goods are to be spread, adjustably supported on a stationary vertical shaft, so arranged that they can be raised up or let down, and turned to any point around the axis of said shaft desired, provided with a wire or cord above them for supporting covering for protecting goods.

Steam Pump.—W. W. Gilbert, New York city.—This invention relates to improvements in steam pumps, having for its object to provide an improved arrangement of the steam valve mechanism, designed to insure a better and more reliable action of the same; also, an arrangement of the pump valves to facilitate the removal of the same for inspection or repairs, as may be required.

Grain Drills.—H. B. Dean and S. A. Baker, Ludlowville, N. Y.—This invention has for its object to improve the construction of grain drills so as to make them more durable, convenient, and satisfactory in use.

Windlass.—L. M. Knowles, Owatonna, Minn.—This invention has for its object to improve the construction of windlasses for raising water and for raising and lowering light weights, so as to make them more convenient and reliable in use.

Derrick.—Newton Matlick, Williamstown, Mo.—This invention has for its object to furnish an improved derrick, which shall be simple in construction, easily moved from place to place, and conveniently operated, raising the hay or other weight, and, at the same time and by the same operation, swinging it into the position it is to be placed.

Railroad Bar.—James Myers, Jr., Williamsburgh, N. Y.—The nature of this invention consists in constructing a rail or railway bar, such as is used for the track upon which railway locomotives and cars are ordinarily moved, in such a manner that the rail or parts of the same shall consist of an interior core of ordinary wrought or malleable iron, and an outer envelope of steel, formed from a homogeneous bar of wrought or malleable iron by the conversion of the outer portions of such bar into steel by chemical processes.

Hay Loader.—Winfield Denton, Iowa City, Iowa.—This invention has for its object to furnish an improved device, by means of which the hay may be easily and conveniently loaded upon a wagon or cart without the necessity of hand pitching.

Seed Planter.—W. W. Haupt, Mountain City, Texas.—This invention has for its object to furnish a simple and convenient seed planter, which shall be so constructed and arranged that it may be easily and conveniently adjusted to plant various kinds of seeds.

Washing Machine.—David Graves, Spring Valley, N. Y.—This invention has for its object to furnish an improved washing machine, which shall be so constructed and arranged as to do its work quickly and thoroughly, under the combined operation of pressure, rubbing, and rinsing.

Elevator Attachment for Fan Mills.—Newell Hinman, Sparta Center, Mich.—This invention has for its object to furnish an improved elevator attachment for fan mills, by means of which the cleaned grain, as it runs from the mill, is raised up, and discharged into the hopper, from which it may be allowed to flow into bags or other receptacles.

Mowing Machine.—Wm. H. Knight, East Machias, Me.—This invention relates to a new mowing machine, in which the motion from the driving wheel is transmitted to the cutter bar or bars entirely, by means of levers, without the use of any cog wheels whatever, so that thereby a large amount of friction is saved and much power gained. The invention consists in the arrangement of the levers for transmitting the motion in the manner of connecting them for use on double cutters, and in the application of means for regulating the hight of the cutting apparatus and for throwing the same out of gear.

Metallic Beams and Girders for Bridges.—Joseph Gill, Cincinnati, Ohio.—This invention consists in the adoption of one, two, or more series of polygonal, or circular cells (measuring those of an hexagonal shape), formed out of flat bars of wrought iron, steel, or other metal, with the ends when turned into shape, either welded together, or left meeting in a butt open joint; and, having each of their sides perforated by punching, or drilling with one, two, or more holes for the reception of rivets, or screw bolts, to fasten them together; said cells, when so united, forming a rigid beam of metal, and which beams may be so built up to any hight, as to obtain any desired strength.

Syringe.—James J. Essex, Newport, R. I.—The object of this invention is to so arrange the discharge pipe of an elastic bulb syringe, that the admission to, and the consequent discharge of air from said pipe, cannot take place as long as liquid matter is forced through the same.

Deck Stovepipe for Vessels.—John Hall, Boston, Mass.—This invention relates to a new device for making the stovepipes on the decks of vessels flexible, to prevent their being injured when struck by swinging booms, yards, or other devices. When they are rigidly attached, as heretofore, it often, or generally happens, that, especially on cabins, galleys, and forecastle, they are bent, broken, or otherwise injured by booms or yards, or that the decks from which they project become leaky by the strain brought to bear on them.

Apparatus for Propelling Vehicles.—Peter Robert, New York city.—This invention relates to new machinery for operating the propelling apparatus of canal boats and other kinds of machinery, and also to a new kind of propelling apparatus for the same. The invention consists chiefly of a series of floats, or propelling feet, which are vertically lifted out of, and vertically carried back to the position which they operate. The invention also consists in the use of certain machinery for propelling the carriages from which the aforesaid floats or feet are suspended, and for elevating and lowering the said floats or feet at the end and commencement of each stroke.

Cooking Stove.—Wm. C. Durant, West Troy, N. Y.—This invention relates to a new cooking stove, in which a new device for heating the air that is brought to the fire box is provided by the peculiar construction of a hollow door, and in which a circulation of air is provided through the oven into the fire place, so that the oven may receive a constant supply of fresh hot air and transmit a constant supply of hot air to the fire place; thereby the oven is kept fresh and clean, and does not emit disagreeable vapors when opened.

Soldering Apparatus.—Charles Pratt, New York city, and Conrad Selmel, Greenpoint, N. Y.—This invention relates to a new attachment to soldering apparatus, of that kind in which the cans to be soldered are supported on a base plate, shield, or platform, the same being either rigidly secured to, or adjusted on a frame, or floating on the solder. The object of the invention is to prevent the can from adhering to the said supporting platform or shield, and to facilitate its removal when soldered. In the present apparatus, air is caught and confined between the lower end of the can and the supporting platform, or shield, and as the joint between the latter and the can is, by the liquid solder, generally made air tight, the removal of the can is made extremely difficult and connected with much loss of time.

Velocipede.—Wm. H. Smith, Newport, R. I.—This invention relates to a new velocipede, which is provided with a steering apparatus of novel construction, and also with a new brake attachment, its object being to simplify the construction of the parts and to obtain higher and steadier motion. The invention consists chiefly in connecting the rear steering wheel or wheels by a novel system of leverage with a steering handle in front of the frame, and also in providing to the front of the frame an up-and-down sliding brake and starter

APPLICATIONS FOR THE EXTENSION OF PATENTS.

Candle-mold Apparatus.—Willis Humiston, of Troy, N. Y., has petitioned for the extension of the above patent. Day of hearing, July 5, 1869.

Bottle Stopple.—Thomas Allender, of Westhampton, Mass., executor of the estate of John Allender, deceased, has petitioned for the extension of the above patent. Day of hearing, July 5, 1869.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING APRIL 27, 1869.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

On each caveat	$10
On filing each application for a Patent (seventeen years)	$15
On issuing each original Patent	$20
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On an application for Design (fourteen years)	$30

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89,267.—Device for Cutting Bolts.—Geo. Adair and J. F. Pool, Monroe, Wis.
89,268.—Rotary Pump.—M. L. Andrew (assignor to himself and Geo. Burrows), Cincinnati, Ohio.
89,269.—Rotary Pump.—M. L. Andrew (assignor to himself and Geo. Burrows), Cincinnati, Ohio.
89,270.—Holder for Candles and Ornaments on Christmas Trees.—Gustav Anton, Philadelphia, Pa.
89,271.—Vapor Burner.—S. D. Baldwin (assignor to himself and Daniel Leonard), Chicago, Ill.
89,272.—Sash Lock.—R. R. Ball, West Meriden, Conn. Antedated April 24, 1869.
89,273.—Sash Lock.—R. R. Ball, West Meriden, Conn. Antedated April 24, 1869.
89,274.—Surfacing Fabrics with Bronze or Metallic Powders.—J. B. Batchelder, Boston, Mass.
89,275.—Sewing Machine for Sewing Leather.—E. E. Bean, Boston, assignor to David Whittemore, North Bridgewater, Mass.
89,276.—Fastening for Carriage Seats.—William Beers (assignor to himself and William McMillen), Milan, Ohio.
89,277.—Blind-slat Tenoning Machine.—Henry Bickford, Cincinnati, Ohio.
89,278.—Stove-cover Holder.—J. E. Blodgett, Oswego, N.Y. Antedated April 15, 1869.
89,279.—Method of Utilizing the Waste Products of Sugar Refineries.—V. G. Bloede, Brooklyn, N. Y.
89,280.—Stove Governor.—Reinard Blum, Champaign, Ill.
89,281.—Fence-board Gage-holder.—Daniel Bordner, Canton, Ohio. Antedated April 22, 1869.
89,282.—Chain.—J. F. Brewer, Plantsville, Conn.
89,283.—Nut Lock.—Kennedy Brown, Gardner, Ill.
89,284.—Adjustable Gate for Grain Elevators.—Simeon Brown, Utica, Ohio.
89,285.—Composition for Preserving Eggs.—W. C. Bruson (assignor to himself and Geo. Rounds), Chicago, Ill.
89,286.—Burglar Alarm.—I. N. Buck, Elgin, Ill.
89,287.—Hames.—W. H. Bustin, Watertown, Mass.
89,288.—Hames for Harness.—Wm. H. Bustin, Watertown, Mass.
89,289.—Steam-engine Cut-off.—Chas. Carr, Boston, Mass. Antedated April 17, 1869.
89,290.—Twisting and Drawing Heads for Spinning Machines.—Cyprien Chabot, Philadelphia, Pa.
89,291.—Steam Generator.—James C. Cochrane, Rochester, N. Y.
89,292.—Spring-balance Hammer.—John Collins, Parma, Ohio.
89,293.—Velocipede.—Edwin Cowles and George R. Metten, Cleveland, Ohio.
80,294.—Table Car or Caster.—Eli L. Crandall, Williamstown, N.Y.
89,295.—Door Fastener.—W. F. Davis, Boston, and C. E. Broad, Milton, Mass.
89,296.—Track Cleaner.—Augustus Day, Detroit, Mich.
89,297.—Swing.—C. M. Dillon, Philadelphia, Pa.
89,298.—Machine for Cleaning Coffee.—W. H. Elton, Baltimore, Md.
89,299.—Oil Can.—W. A. Fenn (assignor to himself and H. B. Beach), Rochester, N. Y.
89,300.—Animal Trap.—W. A. Fenn, Rochester, N. Y., assignor to H. B. Beach, Meriden, Conn.
89,301.—Gate.—Benjamin Franklin Fisk, Fredonia Township, Mich.
89,302.—Felt Suspender End.—T. J. Flagg (assignor to "Fisk, Clark & Flagg,") New York city.
89,403.—Culinary Steamer.—Israel Forman, Fairmount, W. Va.
89,304.—Stove Grate.—Calvin Fulton (assignor to N. H. Galusha), Rochester, N. Y.
89,305.—Fly Trap.—Benjamin Glasscock, Hillsborough, Ohio.
89,306.—Trestle.—Jonathan Goodher, Burlington, N. J.
89,307.—Book Holder.—W. D. Gridley, New Britain, Conn.
89,308.—Electric Signal for Railroads.—Thomas Hall, Boston, Mass., assignor to himself and William Dillon, Stamford, Conn.
89,309.—Fishing Torch.—George Haneline, Akron, Ohio.
89,310.—Oscillating Furnace for Puddling and Refining Iron.—John Heatley, Etna, Pa.
89,311.—Compound for Forming Building Blocks.—Geo. Helm (assignor to himself and John Ruchty), Napierville, Ill.
89,312.—Manufacture of Sheet Iron.—C. C. Hinsdale, Cleveland, Ohio.
89,313.—Apparatus for Scouring and Drying Sheet Metal.—C. E. L. Holmes, New York city. Antedated April 20, 1869.
89,314.—Medicine for Cattle and other Animals.—O. E. Hornidy, Chauncy, Ill.
89,315.—Dress Protector for Carriage Wheels.—P. G. Hubert and J. W. Pitney, New York city.
89,316.—Dental Impression Cup and Suction Mold.—G. H. Hurd, Memphis, Tenn.
89,317.—Rocking Chair.—Henry Hursh, Sen., Mansfield, O.
89,318.—Process of Distilling Spirits.—C. B. Jarvis, New York city.
89,319.—Machine for Wrapping Sugar Kisses.—T. Laramie and J. A. Scott, Wheeling, W. Va. Antedated April 17, 1869.
89,320.—Preparation for Raising Bread.—R. P. Leonard, Keene, N. H.
89,321.—Spring-bed Bottom or Cushion.—H. E. Maker (assignor to himself and H. C. Hoyt), Newton Upper Falls, Mass.
89,322.—Hub and Spoke for Carriage Wheels.—J. Maris, Marietta, Ohio.
89,323.—Oyster Dredge.—T. F. Mayhew, Port Norris, N. J.
89,324.—Harvester.—L. J. McCormick, W. R. Baker, and L. Erpelding, Chicago, Ill.
89,325.—Wash Boiler.—T. McMullin, I. N. Mendenhall, and M. Mendenhall, Jr., Osgood, Ind.
89,326.—Machine for Making Tin-lined Lead Pipe.—H. Merrie, Cincinnati, Ohio.
89,327.—Fruit Can.—Henry Mitchell (assignor to himself, G. W. Getzandaner, and J. H. Protzman), Osborne, Ohio.
89,328.—Watch.—C. S. Moseley, Elgin, Ill.

89,329.—Mode of Converting Articles of Iron into Steel.—Byron W. Nichols (assignor to himself, Cornelius Aultman, George H. Buckins, Percy S. Sowers, and A. Clark Tonner), Canton, Ohio.

89,330. — Preserving Fruits and Vegetables, and in Compounds Therefor.—E. R. Norny, McDonough, Del.

89,331.—Door Bell.—O. A. North, New Britain, Conn.

89,332.—Log Boat.—Albert Olmstead, Windsor, Mich.

89,333.—Grain Drill.—Henry Paddack and Caswell Hollar, Abington, Ind.

89,334.—Grain Separator.—J. C. Parmater and E. H. Bowen, Vinton, Iowa.

89,335.—Tool-adjuster for Lathes.—L. J. Parsons (assignor to himself and C. S. Bushnell), New Haven, Conn.

89,336.—Coupling eor Buggies.—L. G. Peel, Preston, Ga.

89,337.—Railroad-fare Box.—J. J. Phares, Zionsville, Ind.

89,338.—Pump.—John R. Pomroy and L. J. Walter, Lockport, N. Y.

89,339.—Chain-plate Attachment.—T. W. Porter, Boston, Mass., and J. D. Leach and Sabin Hutchings, Penobscot, Me.

89,340.—Safety Stove for Railroad Cars.—A. J. Pyle, New Galilee, Pa.

89,341.—Velocipede.—James Rankin, Detroit, Mich.

89,342. — Apparatus for Multiplying Photographic Images.—D. W. S. Rawson, Peru, Ill.

89,343.—Horse Rake.—Henry Rees, Petersburg, Ind.

89,344. — Pump Valve. — Alexander K. Rider, Elizabeth City, N. J.

89,345.—Mode of Preserving Telegraph Poles.—L. S. Robbins, New York city.

89,346.—Horse-collar Fastener.—W. A. Robinson, Grand Rapids, Mich. Antedated April 17, 1869.

89,347.—Basket Grate for Stoves.—Francis H. Root, Buffalo, N. Y.

89,348.—Harvester Pitman.—C. E. Roper (assignor to himself and I. Durlim, actuary of E. Ball & Co.), Canton, Ohio.

89,349.—Journal Box for Railway Cars.—H. B. Rowley, Buffalo, assignor to Carrie R. Laman, Painted Post, N. Y.

89,350.—Seeding Machine.—J. R. Rude, Liberty, Ind.

89,351.—Roller for Pavement.—E. M. Sealand, Cleveland, Ohio.

89,352.—Animal Trap.—Thos. Silliman, Three Rivers, Mich.

89,353.—Apparatus for Purifying and Rectifying Liquids.—T. R. Sinclaire, New York city.

89,354.—Pen Holder.—H. A. Spencer, Cleveland, Ohio, and R. S. Cutting, Providence, R. I.

89,355.—Car Coupling.—F. D. Sturges, and Wm. M. Young, Mount Vernon, Ohio.

89,356.—Sash Holder.—Geo. A. Sturges, Delhi, N. Y.

89,357.—Sewing Machine.—H. L. Swartwout, Chicago, Ill.

89,358.—Paper File.—J. P. Tirrell, Charlestown, and Hiram Whitney, Watertown, Mass., assignors, by mesne assignments, to Hiram Whitney and M. L. Marshall and Company.

89,359.—Quilting Frame.—R. C. Tomb, Cedar Run, Pa.

89,360.—Process of Ornamenting Sheet-Metal Ware.—John Toothill and Wm. Toothill, Meriden, Conn.

89,361.—Steam Plow.—E. A. Tounley and E. S. Friedrich, Washington, D. C.

89,362.—Tree and Plant Sprinkler.—Hiram Tyler, Gaines, N. Y. Antedated April 15, 1869.

89,363.—Turbine Water Wheel.—Alonzo Warren, Suffolk county, Mass.

89,364.—Shears and Scissors.—Hermann Wendt, Elizabeth, N. J., assignors to Henry Seymour and Company, New York city.

89,365.—Operating Picking Staff in Looms.—J. F. Wicks, Millville, Mass.

89,366.—Feed Water Filtering Heater for Boilers.—Daniel Wineland, McComb, Ohio.

89,367.—Lamp Chimney.—C. H. Wolcott, Randolph, N. Y. Antedated April 16, 1869.

89,368.—Horse Power.—Daniel Woodbury, Rochester, N. Y.

89,369.—Plane for Carpenters' Use.—S. W. Woodward, Buffalo, N.Y. Antedated April 16, 1869.

89,370.—Parlor Bath.—J. R. Worster, New York city.

89,371.—Spark Conductor for Railroad Trains.—Reuben Wright, Houston, Texas.

89,372.—Band Cutter.—Anton Zwiebel, Burlington, Wis.

89,373.—Pipe Coupling.—Levi Abbott (assignor to himself and Edwin H. Cummings), Lewiston, Me.

89,374.—Heating and Cooling Coil for Mash Tubs.—M. J. Allen, New York city.

89,375.—Sash Blind.—C. H. Anders, Myersville, Md.

89,376.—Combined Seeder Harrow and Roller.—John Anderson, Springfield, Ill.

89,377.—Washing Machine.—J. M. Austin (assignor to himself and J. P. Deardoff), Georgetown, Mo.

89,378.—Pump.—Salmon Belden, Visalia, Cal., assignor to himself and E. F. Roberts South Amboy, N. J.

89,379.—Rest for Shoeing Horses.—S. S. Blackburn, Fredericktown, Ohio.

89,380.—Toy Gun.—W. I. Blackman, Columbus, Miss.

89,381.—Piano Bridge.—C. W. Brewer, Racine, Wis.

89,382.—Necktie Supporter.—Simon Bruhl, New York city.

89,383.—Device for Displaying Dry Goods.—J. D. Chambers (assignor to himself and R. I. Bowlus), West Lebanon, Ind.

89,384.—Apparatus for Swaging and Welding Toe-Calks to Horse Shoes.—Almon Cook, Hillsdale, Mich.

89,385.—Wash Boiler.—Augustus Day, Detroit, Mich.

89,386.—Grain Drill.—H. B. Dean and S. A. Baker, Ludlowville, N. Y.

89,387.—Wood Bending Machine.—Victor de Lyon, and Valentine Werner, Canton, Miss.

89,388.—Hay Loader.—Winfield Denton, Iowa City, Iowa.

89,389.—Straw Cutter.—Ellis Douty, Collomsville, Pa.

89,390.—Apparatus for Compressing Air.—F. S. Dumont, New York city.

89,391.—Cooking Stove.—W. C. Durant, West Troy, N. Y.

89,392.—Milk Can.—S. J. Dwyer, Albany, N. Y.

89,393.—Syringe.—J. J. Essex, Newport, R. I.

89,394.—Gage for Setting Planing Machine Cutters.—Anderson Evans, Cincinnati, Ohio. Antedated April 20, 1869.

89,395.—Roofing Fabric.—B. F. Field, Beloit, Wis.

89,396.—Corn Harvester.—A. W. Fleming, Springfield, Ill.

89,397.—Railroad Chair and Tie.—T. F. Fouts, Albia, Iowa.

39,398.—Steam Pump.—W. W. Gilbert, New York city.

89,399.—Governor Valve.—W. W. Gilbert, New York city.

89,400.—Metallic Beam and Girder for Bridges.—Jos. Gill, Cincinnati, Ohio.

89,401.—Washing Machine.—David Graves, Spring Valley, N. Y.

89,402.—Life Preserver.—Alfred Gregory, New York city.

89,403.—Stovepipe for Decks of Vessels.—John Hall, Boston, Mass.

89,404.—Seed Planter.—W. W. Haupt, Mountain City, Texas.

89,405.—Machine for Picking Hair Rope.—H. R. Hildreth, Lynn, Mass.

89,406.—Elevator Attachment for Fanning Mills.—Newell Hinman, Sparta Center, Mich.

89,407.—Clevis.—G. W. Holton, Berlin, Ky.

89,408.—Game Register for Billiards.—W. A. Hough, St. Johnsville, N. Y.

89,409.—Cultivator.—B. S. Hyers, Pekin, Ill.

89,410.—Car Brake and Starter.—C. L. Irving, Indianapolis, Ind.

89,411.—Screw for Cotton and Hay Presses.—J. P. Kintner, Harrison county, Ind.

89,412.—Mowing Machine.—W. H. Knight, East Machias, Me.

89,413.—Water Elevator.—L. M. Knowles, Owatonna, Minn.

89,414.—Harvester Rake.—I. Lancaster, Baltimore, Md.

89,415.—Ruffling Attachment for Sewing Machines.—W. W. Lowerree, Albany, N. Y.

89.416.—Derrick.—Newton Matlick, Williamstown, Mo.

89,417.—Sewing Machine.—T. J. McArthur, New York city.

89,418.—Caster.—W. C. McGill, Cincinnati, Ohio.

89,419.—Culinary Boiler.—Lewis McLellan, Gorham, Me.

89,420.—Machine for Washing Wool.—John McNaught, and Wm. McNaught, Jr., Rochdale, England.

89,421.—Machine for Mitring Printers' Rules.—T. H. Mead, Boston, Mass.

89,422.—Cultivator.—J. B. Moody, Pembroke, Ky.

89,423.—Crank.—C. T. Moore, Gilmanton, N. H.

89,424.—Farm Gate.—J. T. Moxley, Owasso, Mich.

89,425.—Steel Surfaced Railroad Bar.—Jas. Myers, Jr., Williamsburgh, N. Y., assignor to the Barrons Patent Steel Manufacturing Company.

89,426.—Blank for Stovepipes.—Edwin Norton, Toledo, Ohio.

89,427.—Quilting Frame.—Josiah Odell, Petroleum Center, Pa.

89,428.—Steam-Engine Piston.—Wm. Ord, Brooklyn, Ohio.

89,429.—Animal Trap.—D. J. Owen, Springville, Pa.

89,430.—Beverage from Sour or Bitter Oranges.—P. G. Pearson, Jacksonville, Fla. Antedated April 20, 1869.

89,431.—Soldering Apparatus.—Charles Pratt, New York city, and Conrad Seimel, Greenpoint, N. Y.

89,432.—Subsoil-Plow.—J. B. Pullman, Los Angeles, Cal.

89,433.—Machine for making Paper Boxes.—B. F. Quinby (assignor to himself and G. W. Quinby), Boston, Mass.

89,434.—Quartz Crusher.—Jos. Repetti, Philadelphia, Pa.

89,435.—Propelling Apparatus.—Peter Robert, New York city.

89,436.—Wire Bracket.—W. W. Russell, Ludlow, Vt.

89,437.—Device for Transferring Freight on Railways.—L. Savage, Ashtabula, Ohio. Antedated April 16, 1869.

89,438.—Process of Hardening Talc, Steatite, etc.—J. F. Sell, Cambridge, assignor to Chas. Houghton, trustee, Roxbury, Mass.

89,439.—Blind Slat Fastener.—Wm. Sellers, New York city.

89,440.—Dish Stand.—Daniel Sherwood, Lowell, Mass., assignor to Woods, Sherwood & Co.

89,441.—Metallurgical Process and Furnace.—Charles William Siemens, Westminster, England.

89,442.—Bridge.—Frederick H. Smith, Baltimore, Md.

89,443.—Velocipede.—William H. Smith, Newport, R. I.

89,444.—Coal Hod.—John G. Somes, Charlestown, Mass.

89,445.—Take-up Mechanism for Looms.—John Sparks, Concord, Ky.

89,446.—Embroidering Attachment for Sewing Machines.—Joseph Thomas, New York city.

89,447.—Mail Bag Fastening.—J. A. Truitt, Oakland, Pa.

89,448.—Machine for Grinding Circular Saws.—Stephen D. Tucker, New York city.

89,449.—Still.—Joseph R. Van Marter, Lyons, N. Y.

89,450.—Machine for Making Covered Buttons.—Wm. W. Wade, Medford, Mass.

89,451.—Shoe Nail.—Aaron Waldron, Milford, Mass.

89,452.—Ear-drop Suspender. — Linus Weed, Norwalk, Conn.

89,453.—Diving Bell.—John A. Weisse, New York city.

89,454.—Anchor.—Frederick Wittram, San Francisco, Cal.

89,455.—Hose Coupling.—Albert F. Allen, Providence, R. I.

89,456.—Nozzle for Hose Pipes.—Albert F. Allen, Providence, R. I.

89,457.—Reversing Gear for Steam Engine.—Arthur M. Allen, New York city.

89,458.—Hot-air Furnace.—Charles Allen, Hartford, Conn.

89 459.—Blacking Brush.—C. L. W. Baker, Hartford, Conn.

89,460.—Nut Lock.—Wm. E. Ball, Belmont, Ohio.

89,461.—Wrench.—George W. Bishop, Stamford, Conn., assignor to the New England Manufacturing Works Company.

89,462.—Awning.—Henry A. Bowman, Worcester, Mass.

89,463.—Heating Stove.—Theodore Brockman, Davenport, Iowa.

89,464.—Butt Hinge.—Michael Bush, Bloomington, Ill.

89,465.—Whip Socket.—J. A. Caldwell and C. S. Bugbee, Springfield, Mass.

89,466.—Machine for Cutting and Threading Pipe.—William D. Chase, New York City.

89,467.—Lasting Pincers and Nailer.—Frank O. Claflin (assignor to himself and A. R. Carman), Brooklyn N. Y.

89,468.—Engine Lathe.—Alfred B. Couch, Worcester, Mass.

89,469.—Vise.—Edwin Crawley and Thomas L. Baylies, Richmond, Ind.

89,470.—Clod Fender.—Joseph C. Curryer and William F. Curryer, Thorntown, Ind.

89,471.—Steam Engine Valve.—Charles Dawson, Lanesborough, Pa.

89,472.—Machinery for the Manufacture of Match Sticks.—François de Bowens, Philadelphia, Pa.

89,473.—Shoe Tree.—Thomas R. Evans, Philadelphia, Pa.

89,474.—Safe.—Daniel Fitzgerald, New York city.

89,475.—Finger Ring.—Chester S. Ford (assignor to himself and Lewis J. Mulford), New York city.

89,476.—Machine for Concentrating and Separating Ores and Minerals.—Robert George, Denver City, Colorado Territory.

89,477.—Cork Extractor.—George L. Gibson, Jr., Concord, N. C.

89,478.—Horse Hay Fork.—Elam Harter, Dowagiac, Mich.

89,479.—Water Closet. — Joel Hayden, Jr., Haydenville, Mass.

89,480.—Machine for Molding and Working Butter.—James C. Hervey, Cincinnati, Ohio.

89,481.—Medical Compound.—William Hibbert, Manchester, England.

89,482.—Device for Winding Watches and Clocks.—E. H. Hull, Warren, Ohio.

89,483.—Bench Hook.—John Humphreys, Chicopee Falls, Mass.

89,484.—School Desk.—Alfred Hutchinson, Philadelphia, Pa.

89,485.—Flour Cooler.—Peter Johnson, Wauconda, Ill.

89,486.—Plow Point.—Charles B. Kerr, Columbus, Ind.

89,487.—Whip.—Gamaliel King, Westfield, Mass.

89,488.—Apparatus for Flowing and Sensitizing Photographic Paper, etc.—William C. Lukenbach, Newport, Pa.

89,489.—Sewing Machine.—Lucius Lyon, New York city.

89,490.—Coffee Roaster.—Benjamin K. Maltby, Cincinnati, Ohio.

89,491.—Machine for Spinning Metal.—J. J. Marcy (assignor to himself and E. Miller and Company), West Meriden, Conn.

89,492.—Retort for Preparing Charcoal for Rectifying Spirits, etc.—James McCann, St. Louis, Mo.

89,493.—Manufacture of Rosin Oil.—Joshua Merrill, Boston, Mass.

89,494.—Spring Bed Bottom.—M. Ohmer, Dayton, Ohio.

89,495.—Electro-magnetic Car Brake.—Joseph Olmsted, Galesburg, Ill.

89,496.—Fabric for Chair Seats, etc.—James W. Owen (assignor to himself and Edward M. Coe), New Haven, Conn.

89,497.—Churn Dasher. — William S. Owen, Council Bluffs, Iowa.

88,498.—Shears.—Seneca H. Parish, Chicago, Ill.

89,499.—Belt Hook.—Horatio L. Pierce, Taunton, Mass.

89,500.—Bag Holder.—Joseph I. Peyton and Chas. N. S. Wallach, Washington, D. C.

89,501.—Feed-wheel for Sewing Machines.—G. M. Pratt (assignor to Finkle and Lyon Manufacturing Company), Middletown, Conn.

89,502.—Pin Drill.—Thomas Prosser, New York city.

89,503.—Trunk.—C. R. Rand, Dubuque, Iowa.

89,504.—Manufacture of Boots and Shoes.—Everett P. Richardson, Lawrence, assignor to himself and Francis W. Carruth, Boston, Mass.

89,505.—Base-burning Cooking Stove.—Thos. P. Rossiter, Cold Spring, N. Y.

89,506.—Guide for Sewing Machines. — Augustus L. Rumpff, Dansville, N. Y.

89,507.—Envelope.—C. W. Saladee, Circleville, Ohio.

89,508.—Safety Attachment for Lamps.—John F. Sanford, Keokuk, Iowa.

89,509.—Harvester.—J. W. Shaw, Concord, N. H.

89,510.—Manufacture of Starch, Dextrine, and Glucose.—Thomas Sim and Elias S. Hutchinson, Baltimore, Md.

89,511.—Bolt for Shutters, etc.—James F. Sipple, Frederica, Del.

89,512.—Corn Planter.—Eugene Slosson and Edwin C. Slosson, Vienna, Ill.

89,513.—Abdominal Corset.—Cyrene Smith, Louisville, Ky

89,514.—Iron Cleat and Chock—Francis B. Stevens, Weehawken, and William Brown, Hoboken, N. J.; said Stevens assignor to said Brown.

89,515.—Method of Preserving Flowers.—Elizabeth Mary Stigale, Philadelphia, Pa.

89,516.—Toy Target.—B. L. Stone, San Francisco, Cal.

89,517.—Wrench.—Geo. C. Taft, Worcester, Mass.

89,518.—Saw Mill.—Ephraim B. Talbot, Knoxville, Tenn.

89,519.—Spool Reservoir or Case—J. Patton Thompson, Philadelphia, Pa.

89,520.—Lantern. — Nathan Thompson, Brooklyn (E. D.), N. Y.

89,521.—Fence.—W. H. Trimble, Hillsborough, Ohio.

89,522.—Plating Metals.—Hiram Tucker, Newton, Mass.

89,523.—Mode of Ornamenting Metal Surfaces.—Hiram Tucker, Newton, Mass.

89,524.—Railroad Revolving Time Table. — Aaron H. Vancleve, South Amboy, N. J.

89,525.—Car Coupling.—Wm. V. Wallace, New York city.

89,526.—Machine for Screening Grain and Seed.—Benj. F. Watson and Charles H. Tinkel, Bridgeport, Ill.

89,527.—Composition for Roofing, Pavement, Floors, etc.—H. A. Weber, Columbus, Ohio.

89,528.—Machine for Making Screws.—Allen Webster, Farmington, assignor to himself and N. C. Hubbell, New Haven, Conn.

89,529.—Heater and Ventilator for Railroad Cars.—Asa Weeks, Minneapolis, Minn.

89,530.—Device for Polishing Pencils.—E. Weissenborn, Hudson City, N. J.

89,531.—Composition for Artificial Ivory.—W. M. Welling, New York city.

89,532.—Composition Resembling Ivory.—W. M. Welling, New York city.

89,533.—Corn Husker.—Alonzo Whitcomb, Worcester, Mass.

89,534.—Steam Pump.—J. C. Wightman, Newton, assignor to Charles Houghton, trustee, Roxbury, Mass.

89,535.—Game entitled "Talisman."—John W. Wilson, New York city.

89,536.—Lamp.—J. S. Wood, Plainfield, N. J.

89,537.—Dining Car for Railways.—George M. Pullman, Chicago, Ill.

89,538.—Hotel Car for Railways.—George M. Pullman, Chicago, Ill.

89,539.—Lighting Railway Cars.—Aaron Longstreet (assignor to G. M. Pullman), Chicago, Ill.

89,540.—Corrugated Metal Building.—R. Montgomery, New York city.

89,541.—Elevated Railway.—Richard Montgomery, New York city.

89,542.—Railroad Car Seat and Couch.—T. C. Theaker Bridgeport, Ohio.

89,543.—Velocipede.—H. C. Laurence, Canandaigua, assignor to W. H. Moak and Benj. Jansen, Brooklyn, N. Y.

89,544.—Railway Car Coupling.—D. D. Wright, Oakville, Ontario, Canada.

89,545.—Wash Boiler.—Chas. E. Miller, Indianapolis, Ind. Antedated Oct. 27, 1868.

REISSUES.

20,835.—Steam Alarm.—Dated July 6, 1858; reissue 3,400.—Henry Martin, Wallingford, Conn., assignee, by mesne assignments, of S. W. Warren.

28,207.—Axle for Carriages.—Dated May 8, 1860; reissue 3,401.—A. E. Smith, Bronxville, N. Y.

10,386.—Hemming and Cording Umbrella Covers.—Dated January 3, 1854; antedated July 3, 1853; extended seven years; reissue 3,402.—Nathaniel Wheeler, Bridgeport, Conn., assignee of Sherburne C. Blodgett.

74,650.—Thrashing Machine.—Dated February 18, 1868; reissue 3,403.—A. S. Whittemore, Willimantic, Conn.

34,150.—Gate and Guide of Water Wheels.—Dated January 14, 1862; reissue 1,792, dated October 11, 1864; reissue 3,171, dated October 27, 1868; reissue 3,404.—J. S. Goode and John W. Bookwalter, Springfield, Ohio, executors of the estate of James Leffel, deceased.

23,291.—Metallic Band for Baling.—Dated March 22, 1859; reissue, 3,405.—George Brodie, Plum Bayou, Ark.

49,962.—Harvester.—Dated September 19, 1865; reissue 3,406.—Division A.—M. G. Hubbard, Syracuse, N. Y., assignee of L. M. Batty.

49,962.—Harvester.—Dated September 19, 1865: reissue 3,407.—Division B.—M. G. Hubbard, Syracuse, N. Y., assignee of L. M. Batty.

77,090.—Hot Water Elevator.—Dated April 21, 1868; reissue 3,408.—W. E. Prall, Washington, D. C. (for himself), and A. C. Rand, New York city, assignee of W. E. Prall.

85,340.—Clay Mold and Pattern for Casting Metals.—Dated December 29, 1868; reissue 3,409.—The Metallic Compression Casting Company, Boston, Mass., assignees of J. J. C. Smith.

72,555.—Axle for Carriages.—Dated December 24, 1867; reissue 3,410.—A. E. Smith, Bronxville, N. Y.

13,330.—Grain and Grass Harvester.—Dated July 24, 1855; reissue 882, dated January 3, 1860; reissue 3,411.—Division A.—Dan'l Urmy and John Manz, Wilmington, Del., assignees of Jesse Urmy.

13,330.—Grain and Grass Harvester.—Dated July 24, 1855; reissue 882, dated January 3, 1860; reissue 3,412.—Division B.—Daniel Urmy and John Manz, Wilmington, Del., assignees of Jesse Urmy.

23,703.—Machine for Making Drain Pipes.—Dated April 19, 1859; reissue 1,897, dated February 28, 1865; reissue 2,841, dated January 14, 1868; reissue 3,413.—B. S. Pierce, New Bedford, Mass., and M. R Pierce, Woodstock, N. Y.

DESIGNS.

3,450.—Trade Mark.—H. I. Barbey, New York city.

3,451.—Hat, in Imitation of Straw Braid.—S. A. Blake, Milford, Conn.

3,452.—Stove.—A. E. Chamberlain and J. B. Crowley (assignors to themselves, O. N. Bush, and F. V. Chamberlain), Cincinnati, Ohio

3,453.—Cook's Stove.—J. G. Clarke, Cincinnati, Ohio.

3,454.—Clock Case Front.—B. F. Corban, Bristol, Conn.

3,455.—Trade Mark.—R. F. Danforth, Cleveland, Ohio.

3,456.—Printers' Type.—Herman Ilenburg, Philadelphia, Pa. assignor to MacKellar, Smiths & Jordan.

3,457 and 3,458.—Grinding Mill.—W. D. Leavitt, New Orleans, La., and Henry Shaw, Cincinnati, Ohio. Two Patents.

3,459.—Hearse.—Henry Loehr, Boston, Mass.

3,460.—Stove.—John Rowe, Cincinnati, Ohio.

3,461.—Grinding Mill.—Henry Shaw, Cincinnati, Ohio.

3,462.—Hinge.—E. E. Stow, Plantsville, Conn.

3,463.—Grate Fork.—John Taggart, Boston, Mass.

3,464.—Clock Case.—S. B. Terry, Waterbury, Conn.

3,465.—Casing of a Soda Water Apparatus.—James W. Tufts, Medford, Mass.

3,466.—Ventilator Door.—M. B. Washburn, Brooklyn, N. Y.

3,467.—Floor Cloth.—J. T. Webster, New York city, assignor to Deborah Powers, A. E. Powers, and N. B. Powers, Lansingburgh, N. Y.

3,468.—Stove.—Alex. Wemyss, Philadelphia, Pa., assignor to Stuart, Peterson, and Company.

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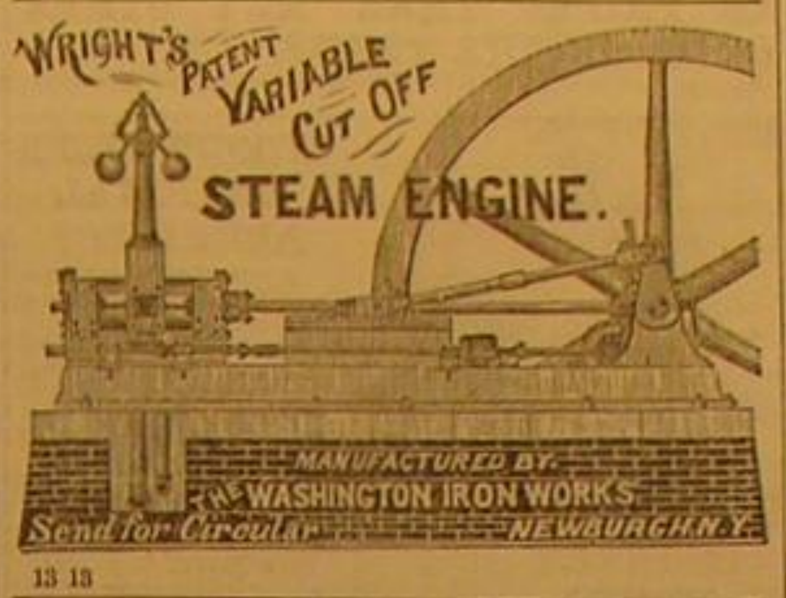

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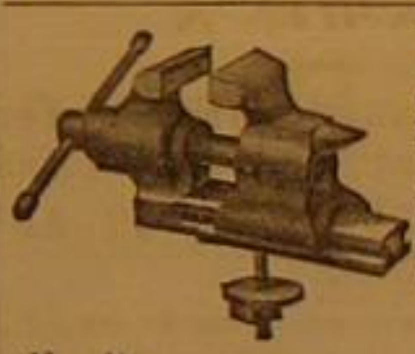

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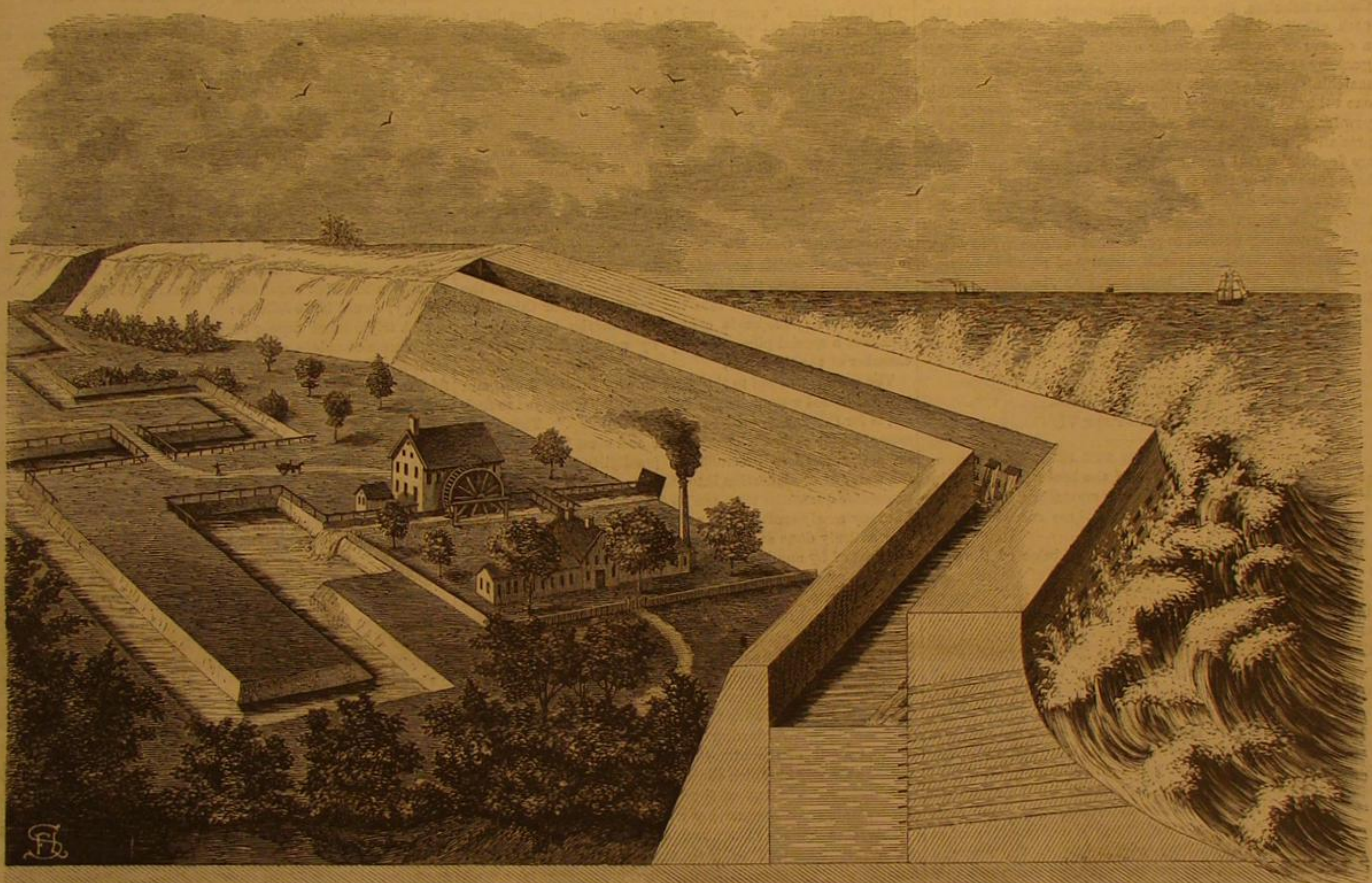
Vol. XX.---No. 21. [NEW SERIES.] NEW YORK, MAY 22, 1869. $3 per Annum [IN ADVANCE.]

Leon's Kimasthene.

People who live on the land and never visit the seashore or brave the dangers of a sea voyage, have very incompetent ideas of the force of combined wind and water. The force of a mass of water, as a wave thirty or forty feet high, moving even at a slow rate may be imagined, and possibly some idea of its effects on an obstacle in its course estimated from the descriptions of travelers; but the fact of the immense force of wind and wave must be, with all land dwellers, a mystery. It has been stated that the waves of the Atlantic, the "stormy ocean," are at their fiercest, only thirty feet high; from our experience we incline to a much higher figure.



LEON'S KIMASTHENE, A PATENT CONTRIVANCE FOR USING WAVE POWER.

This, however, is merely the wave on the wide ocean without an obstacle to resist its course, but when sufficient resistance is offered, it is wonderful how high the wind's force will carry the water. We remember the storm of April, 1851, which swept away the Minot's Ledge lighthouse, off Cohasset, Massachusetts, and lasted three days and nights. We then, from Lynn beach, saw the waves carried up the face of the rocks, off the peninsula of Nahant, sixty feet high, and at least twenty feet above, and thrown in spray over the land. At the entrance of the Cromarty Firth, Scotland, the waves, in a northeast storm, meeting the obstacle of the precipitous rock known as the "South Sutor," rise to its top, not less than one hundred and ten, or one hundred and twenty feet. The object of the plan shown in the accompanying engraving is to utilize this uplifting power of the wind-driven water for purposes beneficial to man. If waves impelled by the winds will leap up precipitous rocks, they will rise much higher when the surface on which they strike is curved to present an easy ascent. Such is the design of the breakwater shown in the engraving.

It is the invention of a Spanish engineer, J. Ruiz Leon, and was patented in the United States, March 30, 1869. He describes its construction and operation substantially as follows: On the sea coast he raises a hollow dike, the exposed face of which is curved, the base being an inclined plane continued several feet below the sea level, and being pierced with a series of conduits, the inner ends of which are provided with valves opening to the inclosed space, or reservoir. These valves allow the entrance of the water from the surf, but prevent its escape to the sea as the wave retires. Thus a quantity of water passes into the reservoir at each uplifting of the wave. Within the dike may be erected mills of various kinds moved by water wheels driven by this stored-up power.

Now, to return this water to the sea the inventor proposes a canal of a zigzag course, leading from the tail race of the mill to the sea through the embankment, the canal at its debouchure widening and having a number of piers, arranged like the alternate squares on a chess board. The object of these and of the angles of the canal is to prevent the action of the waves and to allow the water to be discharged at the ordinary ocean level. Already has this plan been successfully applied on the island of Cuba. Where the tides are insignificant in hight this device yields the best results. Where the tide creates great differences of level it is necessary to modify somewhat the plan, by placing the wheel on a floating platform or raft. The patentee thinks that it will not be difficult to create a power by his plan that will be equal and continuous all the year round; a simple method being to store up water raised in storms in a reservoir to be used in seasons of comparative calmness.

Further information may be gained by addressing J. Ruiz Leon, care of J. N. Paulding, 30 Broadway, New York city.

THE SCHULTZ WHITE GUNPOWDER.

We condense from an English exchange a description, of the white, or rather, tawny-colored powder lately devised by Captain Schultze of the Prussian service, and which, under the auspices of at least one London gunmaker, is finding large application among English sportsmen. The progress of manufacture is said to be most safe, as it is most ingenious. Only at the final stage of making this gunpowder is the process subject to any explosive contingency. In illustration of this, the following circumstance should be stated; in July, 1868, the manufactory of Captain Schultze at Potsdam, near Berlin, was consumed, burned quietly to the ground—burned, not exploded. The accident is altogether unprecedented; nothing like it could have happened to a manufactory of common black gunpowder.

We now come to the process of manufacture. The inventor begins by taking any of the common woods (he keeps the woods steeped in water) which have acquired celebrity for yielding gunpowder charcoal, and sawing them transversely into plates of the required thickness by a veneer saw. The plates, when sliced, are laid under a manifold punch and submitted to pressure, whereby grains of not merely definite and varying size, but definite and unvarying shape (a matter of some moment as influencing the constancy of impaction), result. Grains are thus evolved at the very commencement of the manufacturing operation, unlike what happens in the case of black gunpowder, wherein the operation of grainage is the last operation but one—glazing; and sometimes, powder not being invariably glazed, the last absolutely. The punched grains, being collected in a mass, are subjected to a treatment of chemical washing, whereby calcareous and various other impurities are separated, leaving hardly anything behind save pure woody matter, cellulose or lignine. The next operation has for its end the conversion of these cellulose grains into a sort of incipient xyloidine, or gun-cotton material, by digestion with a mixture of sulphuric and nitric acids. Practically it is found that absolutely perfected xyloidine (of which ordinary gun-cotton is the purest type), not only decomposes spontaneously by time, the chief products of combustion being gum and oxalic acid, but it is moreover liable to combustion of a sort that may be practically called spontaneous, so slight and so uncontrollable are the causes sufficing to bring it about. Cellulose, or woody matter, otherwise termed lignine, partially converted to xyloidine, is, Captain Schultze affirms, subject to neither of these contingencies. Chemists will understand that, inasmuch as the wood used as a constituent of the Schultze gunpowder is not charred, its original hydrogen is left, and by and by, at the time of firing, will be necessarily utilized towards the gaseous propulsive resultant. Next, washed with carbonate of soda solution and dried, an important circumstance is now recognizable.

The grains, brought to the condition just described, are stored away in bulk, not necessarily to be endowed with final explosive energy until the time of package, transport, and consignment. Only one treatment has to be carried out, and it is very simple. The ligneous grains have to be charged with a certain definite percentage of some nitrate, which is done by steeping them in the nitrate solution and drying. Ordinarily a solution of nitrate of potash (common saltpeter) is employed; but in elaborating certain varieties of white powder Captain Schultze prefers and uses nitrate of baryta.

Having traced the new powder to its final stage, we may contemplate it under the light of two distinct scrutinies—theoretical and practical. Review of the chemical agencies involved, or that may be evolved, suggests the reaction, especially under prolonged moisture, of the sulphur and niter of ordinary powder, whereby sulphide of potassium should result. Practice is confirmatory; under the condition indicated, sulphide of potassium, more or less, does result, and proportionate to the extent of decomposition is the powder deteriorated. Inasmuch as the Schultze gunpowder is wholly devoid of sulphur, so is the particular decomposition adverted to impossible; and theory, at least, fails to suggest any other decomposition as probable or even possible.

The specific gravity of the Schultze gunpowder may be roundly taken at half the specific gravity of ordinary gunpowder; or, in other words, for equal weights of the two, the bulk of Schultze's powder will be double that of its rival. Hereupon an important question is raised, the drift of which will be obvious to any practical gunner. Is the available projectile force of one volume of Schultze's powder equivalent to the available projectile force of two volumes of black powder? If not, it may be averred with tolerable confidence that the new material could never come into extensive practical use as a gunnery-projectile.

This consideration seems to have been duly considered by Captain Schultze. His powder is so devised and elaborated that each effective charge shall occupy equally the same space as a charge of common powder would have occupied. All his gunnery arrangements, therefore, are taken on the basis of matching volume against volume, the equivalent in weight to one volume of his powder being two volumes of ordinary gunpowder. It has taken fair hold on the English sportsman's appreciation, as before stated; but, as may be assumed, there are drawbacks, real or alleged, to its use, otherwise it would have gone further than it has to replace ordinary black powder. The chief disparagement alleged against it, is the difficulty, rather than the impossibility, of measuring out charges with the accuracy needful to practice. It is necessary to weigh the charges, gunmakers aver, if identity of result be contemplated. This allegation, if well borne out, implies a serious defect. Practical people will grasp its full purport, however much the unpracticed may make light of it.

BEET ROOT SUGAR.

No. IX.

TECHNOLOGY.—PART VI.

CONCENTRATION OF THE JUICE.

The concentration of the juice of the beet root to the point at which the sugar will most readily crystallize, is not effected in a single operation, but in two or three successive ones, separated by filtrations.

This concentration or evaporation of the juice of the beet is effected in most modern factories by means of vacuum pans, which, if not identical, are analogous to the one described and illustrated by us in our last article. The theory of the vacuum pan is very simple, being based on the fact that the juice boils at a temperature of about 212° Fah. under the pressure of the atmosphere (15 lbs. to the square inch), and that as this pressure is relieved, so is the boiling point proportionately lowered. By causing a partial vacuum within the pans containing the liquid to be evaporated, the pressure is thus reduced below that of the atmosphere, and it becomes possible to boil the juice at temperatures much below 212° Fah. The heating being done by steam it will be seen that, if, for instance, we make use of waste or exhaust steam from the engine and "returns," which has a temperature of at least 212° Fah., for the boiling of the juice in the first pan with no vacuum at all, this steam will, after it has left this first pan, and although it has lost a portion of its original heat, still retain enough of it, say 190°, when it has penetrated into the next pan, as will boil the juice in this second pan in a comparatively slight vacuum, and will, after having been used here, still retain heat enough, say 150° Fah., to boil the liquid in the third pan under the influence of a still more perfect vacuum.

In our practice the concentration of the beet root juice is nearly always effected by means of exhaust steam, costing nothing, and in a series of pans with respectively increasing vacuums. The time it takes to bring the juice to a certain degree of concentration depends upon the temperature of this juice, on that of the steam used for boiling it, on the extent of heating surface, and on the degree of vacuum within the pans. An increased heating surface, a more perfect vacuum, or hotter steam accelerates evaporation, and as a corollary, the larger the heating surface and the more perfect the vacuum the less heat will be needed in the steam. The greater the difference of temperature between that of the juice and that of the steam, the more rapid will be its transmission through the pipes or coils of the apparatus. The pressure in the last pan is reduced, that is, a partial vacuum formed, by injecting cold water into a condenser, which, through a wide pipe, is placed in direct communication with it. As at first, however, when the boiling is begun, the pans and heating spaces are filled with air which the injection water will not condense, and which it is essential to draw off; this is done by means of an air pump communicating with the condenser. This pump, when subsequently the boiling is in full activity, is used for the purpose of extracting the spent steam and water of condensation, which preserves the vacuum within the pans. The injection cock must necessarily be closed while the pump is drawing the air out of the pans.

A vacuum must be caused, not only in the upper bodies of the pans, but also in the heating or steam space, and these are all connected for this purpose with the condenser by means of special conduits.

As soon as the juice begins to boil in the first pan, the vapor and steam drive the air out of the body of the first pan into the second. As soon as the liquid in the body of the second begins to boil, its vapor and steam drive the air from the second into the third body, and when, lastly, the third pan begins to boil, its contained air, steam, and vapor are carried off directly into the condenser, and drawn out of it by the pump. The injection cock of the condenser must be slightly opened just at the moment when the juice begins to boil, in pan No. I., or as soon as the steam from No. II. reaches the condenser; this cock is then gradually opened wider and wider as the juice boils successively in pans Nos. II. and III., and is left wide open during the subsequent regular working of the whole apparatus. The air pump is also allowed to continue doing some amount of work through its cock being partially open.

Although the three pans are in direct communication with each other, and the condenser, a mean or average degree of vacuum is not produced through the whole apparatus, as might be supposed, but a different state of things exists in each separate body; the most perfect vacuum taking place in the last pan, while it is null or nearly so in the first. The cause of this difference is due to the variable speed of evaporation in the three pans.

If the "return" steam used for heating the pans has a temperature of over 212° Fah. no vacuum is needed in the first body, as it would cause the ebullition to be too violent and the contained liquid to "prime." If, however, the temperature of this steam be 212°, or lower, a partial vacuum has to be produced in the first body by means of a special pump acting on the second body.

In practice the liquid in each of the three pans has a different density, the thinnest being found in the first body, and the most concentrated in the last body. The process of evaporation is continuous through the whole system, the juice flowing constantly into the first pan while it runs out as "clear sirup" from the last pan, whence it is received in a *monte-jus*, which forwards it to its further destination. The vacuum causes the flow of liquids from one pan into the other, and also draws it into the *monte-jus*. For this latter purpose this *monte-jus* is connected with the condenser by means of a special pipe or simply by uniting it to the vapor chamber of the third pan.

The pump attached to the condenser for freeing it of steam and condensed water being at the same time employed to suck air, is for this reason called the "wet air pump." This pump cannot be too carefully constructed, and must be powerful in its action, so as to preclude all possibility of the rising of the water of condensation into the pans by its accumulation in greater quantities than can be drawn off in a given time. In many newly-erected sugar factories the "wet pump" is now entirely done away with, and the water of condensation disposed of by another appliance. For this purpose the condenser is placed at such a hight that the pipe for the egress of the water of condensation can be made to run down from a hight of from say 36 to 38 feet, while its lower extremity plunges into a small basin of water. This contrivance is connected with the upper portion of the condenser where a "*dry* air pump" needing very much less power than the "*wet* air pump," produces a partial vacuum. The water cannot rise in the pipe above the basin to a hight of more than 32 feet without overflowing, as it is balanced at this hight by the weight of the atmosphere; it forms, in fact, a real water barometer in which the water rises only to a hight determined by the extent of the vacuum caused by the injection water in the condenser, but which can never exceed 32 feet.

This is a simple, cheap, and efficient contrivance, which we highly commend to both sugar manufacturers and refiners.

The triple-effect pans have latterly been, to a considerable extent, replaced by "double-effect" pans, heated by exhaust steam alone, and are found to work satisfactorily. Their heating surface is calculated at one square foot for every 100 lbs. of beet root worked up per day, so that it would require 1,500 square feet of heating tube surface for the pans of a 150,000 lbs. per diem factory.

The modern arrangements for obtaining tight joints and for allowing the cleaning of the pipes, have, thanks to rubber plugs and rings, been much improved on in recent times.

Without entering into lengthy details, which could only find their place in a complete treatise on the manufacture of sugar, we cannot possibly describe the many dispositions which have been given to the bodies of vacuum pans (which are often horizontal instead of upright, as we have shown them in Robert's arrangement), nor can we either indicate the variations in the form and construction of condensers and of their pumps. We advise persons who might wish to establish a beet root sugar factory to have their vacuum pans and necessary apparatus made by only a first-class manufacturer of *beet root sugar* apparatus, one whose reputation and business depends entirely on his keeping pace with all the most recent improvements. Several such firms in Europe have acquired in this connection a world-wide celebrity, and some of them have agents in this city, from whom all desired information can easily be obtained.

As a general rule, in practice, the "return" steam is admitted into the first body of the vacuum pan with a temperature of about 220° Fah., into the second with a temperature of about 172° Fah., and into the third with a temperature of about 154° Fah.

The heating surface in square feet needed for the concentration of the liquids in vacuum pans is calculated on the basis of from 15 to 20 lbs. of water evaporated by every square foot.

The "first" or "clear sirups" run out of the pans must mark from 24° to 28° Baumé. In order to gain all possible advantages, the pipes and internal coatings of the heating apparatus must be kept bright, clean, and free from scale.

If violent "priming" takes place, which must be constantly watched for, a small quantity of melted grease is run on to the upper surface of the boiling liquid, through small grease cocks, this allays the tendency to foam. Grease must be used as sparingly as possible, as it interferes materially at a later period, with both the action of the bone black in the filters and the "boiling down" of the sirups.

The sirups marking 24° to 28° Baumé are collected into the *monte-jus*, and are from thence conveyed to the reservoirs of the filters, and from these through the bone black in the filters, in a manner we shall describe in our next article.

It is then ready to be taken to a second vacuum apparatus, single, double, or triple, where it is further concentrated to a consistency, which is generally indicated by a density of from 40° to 42° of Baumé's areometer.

The less dense are the concentrated second sirups after boiling down, the larger will be the grain produced from them; and on the contrary, the denser these "second sirups" the smaller and finer will be the size of the grains or crystals of sugar subsequently produced from them. In order to obtain large and even-sized, regular-shaped crystals the boiling in the second vacuum apparatus must be carried on slowly and quietly.

The right degree of concentration is practically known to a good sugar boiler by the "thread" test. This consists in taking up between the thumb and fore finger a small quantity of sirup and drawing it out as a thread by spreading the fingers. The length this thread attains before breaking, and the "hook" it makes at its broken ends allow of his judging very accurately when the sirup has reached the desired consistency.

From the boiling pans the second sirups are taken to vats, tanks, or "crystallizers," where the sugar is left to deposit itself in a solid form, which afterwards allows of its being freed from the surrounding liquid molasses.

The specifications for the evaporating and boiling department of a beet root sugar factory working 150,000 lbs. of beet per day, would be as follows:

1. A triple effect copper vacuum pan, with condenser and all fixtures complete, and 1,200 feet of heating surface, sufficient for the working of 160,000 lbs. of beets per day. Cost, $4,800.

2. One horizontal wet air pump, with its special 10-horse power engine. Cost, $1,460.

3. One iron vacuum pan, boarded with wood, triple coil pipes, with heating surface of 200 feet and capacity of 250 cubic feet, with cast-iron condenser. Cost, $2,200.

4. One horizontal wet air pump, with its special 6-horse power engine. Cost, $1,040.

5. Two iron coolers, each of a capacity of 750 gallons. Cost, $320.

6. Four reservoirs, each of a capacity of 1,000 gallons, and one *monte-jus* of a capacity of 50 cubic feet. Cost, $250.

Total cost, in gold, of the concentration and boiling department of a 500-acre beet root sugar factory. Cost, $10,070.

The filtration department of this same establishment would comprise:

1. Seven filters, 15 feet high, double-bottomed, with syphon tubes, copper pipes, juice, and water cocks, etc. Cost, $2,000.

2. An "organ" set of pipes and cocks for distribution of juice, sirup, water, and steam. Cost, $350.

3. A triple gutter above and one single gutter below. Cost, $250.

4. Two feed reservoirs, each of a capacity of 750 gallons, with their cocks, etc. Cost, $110.

5. Three reservoirs, each of a capacity of 230 gallons. Cost, $200.

Total cost of the filtering department, in gold, $2,910.

Commercial Value and Purity of Coal Gas.

The commercial value and purity of coal gas depend:

1. On its illuminating power.
2. On its freedom, to a certain extent, from ammonia.
3. On its freedom from sulphureted hydrogen.
4. On its freedom, to a certain extent, from sulphur in any form other than sulphureted hydrogen.
5. On its freedom from carbonic acid.

Illuminating Power.—It appears from documentary evidence that in the very early days of gas lighting the construction of burners was well considered, and the conditions necessary for the production of the best effect thoroughly understood, but in spite of the reiterated teachings of competent men, burners of erroneous construction have during many years been produced in great numbers. Forty-three years ago, Christison and Turner published a statement of their experiments, the conclusions deducible from which the author of this paper has summarized as follows:

1. That up to a certain maximum consumption for each burner, the light increases in a much greater ratio than the consumption of gas.

2. That for each burner there is a certain size of flame which is most economical—a corollary of the first proposition.

3. That in argand burners the size of the holes and their distance from each other are of the utmost importance. The holes should be so near to each other that the flame unites at its base. For gas sp. gr. 550 to 650, the holes should be 1-32d inch diameter and about 12-100ths of an inch apart. For gas of a higher gravity, the holes should be 1-50th inch diameter.

4. That the size of the central aperture of an argand exercises an important influence on the amount of light yielded.

5. That the greatest amount of light is obtained when the flame becomes tinged with yellow and is near to the point of smoking.

6. That the glass chimney should be proportioned to the size of the burner and the consumption desired.

7. That consumers, generally, cannot burn the gas in such manner as to produce the best effect, on account of the liability of the flames to smoke.

These propositions really comprise all that is known respecting the principles which should govern the construction of gas burners. The sixth proposition is impracticable of application. Narrow chimneys are apt to become partly fused and opaque, they are liable to frequent breakage, and flames inclosed in narrow chimneys are apt to smoke on the least disturbance.

Among the teachers on the subject of gas burners may be mentioned Clegg, Peckstone, Alex. Wright, Lewis Thompson, Dr. Letheby, and Henry Bannister. Alex. Wright stated that of burners equally suited for the gas, and consuming it at the same rate, the most advantageous is the argand, next the batwing, and then the fishtail. That the larger the quantity of gas properly consumed in a given time from a burner, the greater is the light given per cubic foot. That the best results arise with a well formed but flagging flame, and the worst with an irregular, wire-drawn flame. Lewis Thompson said in 1851, every burner has (1st) a certain fixed amount of gas which it will consume to advantage; and (2d) gives its maximum effect where the flame is on the point of smoking. That the quantity of light is greatest with the argand, and the intensity with the fish-tail. Poor or common coal gas should issue more gently than rich or cannel coal gas, and from burners with larger holes than those for the latter gas.

The yellow-tinged flame, the flagging flame, and the gentle current, all mean the same thing—viz., low pressure; and MM. Dumas, Regnault, Audouin, and Berard, have established as a general law "that the greatest illuminating power is obtained with low pressures, and the maximum light with pressures, equal to ·079 to ·12 of an inch head of water." They further state that batwing burners of the same diameter, burning the same quantity of gas, yield more light when the slits are wide —1-36th of an inch gave them the best results. The diameter of the burner should be proportioned to the desired rate of consumption, but is less important than the width of slit. That single jet burners are very disadvantageous. That a fishtail is not much superior to two single jets, with holes of the same diameter, if the holes be very small. That the fishtail is generally inferior to the batwing. That argand burners, of almost the same appearance, many require to burn double the quantity of gas to give the same quantity of light, which is dependant upon, 1st, the width of the jet holes or slit; 2d, on the number of holes; 3d, on the actual and relative dimensions of the apertures by which air gains access to the interior and exterior parts of the flame; 4th, on the hight of the chimney.—*Mechanics' Magazine.*

FORMATION AND PHENOMENA OF CLOUDS.

BY J. TYNDALL, L.L.D., F.R.S.,

It is well known that when a receiver filled with ordinary undried air is exhausted, a cloudiness, due to the precipitation of aqueous vapor diffused in the air, is produced by the first few strokes of the pump. It is, as might be expected, possible to produce clouds in this way with the vapors of other liquids than water.

In the course of some experiments on the chemical action of light, I had frequent occasion to observe the precipitation of such clouds in the experimental tubes employed. The clouds were generated in two ways. One mode consisted in opening the passage between the filled experimental tube and the air pump, and then simply dilating the air by working the pump. In the other, the experimental tube was connected with a vessel of suitable size, while the passage between the vessel and tube could be closed by a stopcock. The vessel was first exhausted. Turning on the cock the air rushed from the experimental tube into the vessel, the precipitation of a cloud within the tube being a consequence of the transfer.

The clouds thus precipitated differed from each other in luminous energy, which is, of course, to be referred to the different reflective energies of the particles of the clouds, which were produced by substances of very different refractive indices.

Different clouds, moreover, possess very different degrees of stability. Some melt away rapidly, while others linger for minutes in the experimental tube, resting upon its bottom as they dissolve like a heap of snow.

The clouds exhibit a difference in texture. A certain expansion is necessary to bring down the cloud. The moment before precipitation, the mass of cooling air and vapor may be regarded as divided into a number of polyhedra, the particles along the bounding surfaces of which move in opposite directions when precipitation actually sets in.

Every cloud particle has consumed a polyhedron of vapor in its formation; and it is manifest that the size of the particle must depend, not only on the size of the vapor polyhedron, but also on the relation of the density of the vapor to that of its liquid. If the vapor were light and the liquid heavy, other things being equal, the cloud particle would be smaller than if the vapor were heavy and the liquid light.

The case of tolnol may be taken as representative of a great number of others. The specific gravity of this liquid is 0·85; water being 1·0, the specific gravity of its vapor is 3·26, that of aqueous vapor being 0·6. Now, as the size of the cloud particle is directly proportional to the specific gravity of the vapor, and inversely proportional to the specific gravity of the liquid, an easy calculation proves that, assuming the size of the vapor polyhedra in both cases to be the same, the size of the particle of tolnol cloud must be more than six times that of the particle of aqueous cloud. Aqueous vapor is without parallel in these particulars—it is not only the lightest of all vapors, but also the lightest of all gases, except hydrogen and ammonia. To this circumstance the soft and tender beauty of the clouds of an atmosphere is mainly to be ascribed.

The sphericity of the cloud particles may be inferred from their deportment under the luminous beams. The light which they shed when spherical is continuous, but clouds may also be precipitated in solid flakes, and then the incessant sparkling of the cloud shows that its particles are plates, and not spheres. Some portions of the same cloud may be composed of spherical particles, others of flakes, the difference being at once manifested through the calmness of one portion of the cloud and the uneasiness of the other.

For the Scientific American.

STATISTICS OF THE PRODUCTION OF IRON.

BY PROF. PETER TUNNER.

In order to illustrate the importance of iron among other metals and non-metallic products of mines, it is necessary to condense the yearly statistics of the total mining production of the world. Statistics of this kind have been given by several writers, but none of them can be said to be strictly unobjectionable. It is even difficult to obtain the ever-changing figures from those states in which statistical records on mining are kept and collected regularly, and with the utmost care; and from countries where statistics are neglected, only approximative figures can be secured.

During the last thirty years, I have myself taken a lively interest in these figures. As a member of the jury of the metallurgical department of all the international exhibitions, I was favored with the best opportunities for obtaining the most accurate information upon the subject that could be secured. I now publish the following synoptical table, the figures of which are chiefly transcribed from records of the years 1861–5 as a result of my researches and observations:

MINING PRODUCE OF THE WORLD IN APPROXIMATE FIGURES, EXPRESSED IN GERMAN CWTS.

COUNTRIES.	Coal, cwt.	Iron, cwt.	Gold in mint pounds.	Silver in mint pounds.	Copper, cwt.	Lead, cwt.	Zinc, cwt.	Salt, cwt.
Great Britain	1,856,000,000	95,000,000	160	46,000	270,000	1,825,000	80,000	30,000,000
Austria	90,000,000	6,200,000	3,460	82,000	500,000	1,100,000	25,000	6,500,000
Prussia	420,000,000	14,500,000	5	46,000	53,600	45,300	1,250,000	4,000,000
Rest of Germany	40,000,000	5,000,000	50	71,000	4,000	24,000	——	3,500,000
France	222,000,000	27,500,000	250	25,000	35,000	45,000	10,000	7,000,000
Belgium	206,000,000	6,500,000	——	——	21,000	44,000	800,000	——
Russia and Poland	7,000,000	5,500,000	42,000	31,500	100,000	21,000	45,000	14,000,000
Sweden and Norway	300,000	3,000,000	8	45,000	45,000	11,000	——	——
Italy and Switzerland	2,000,000	900,000	250	2,200	6,500	11,000	——	4,500,000
Spain and Portugal	12,000,000	3,700,000	100	104,000	54,000	1,500,000	40,000	9,500,000
Turkey	500,000	300,000	1,600	——	12,000	——	——	1,000,000
America	350,000,000	22,000,000	192,000	2,400,000	400,000	300,000	100,000	(?)
Australia and other States	8,200,000	1,700,000	220,000	10,300	79,900	(?)	(?)	(?)
	3,214,000,000	191,800,000	459,883	2,863,000	1,581,000	4,926,300	2,350,000	80,000,000

These figures by themselves do not prove the relative importance of iron. In order to form a right idea of its real value, they must be converted into figures, comparable among each other by means of reduction to a mathematical standard, which can be easily understood all over the world, that is, with the money value of the produce mentioned in the table above. With respect to the precious metals, the average value is nearly equal in all countries; there is, however, a vast difference of prices for the common metals, the salt and mineral fuels in the various countries. The price of the German cwt. of anthracite and lignite averages in the various countries from 5 to 50 kreuzers, silver Austrian currency (the tun from 50 cents to $5 gold). In order to determine the average price of coal, the price of the English coal may be considered as decisive as representing more than half the aggregate production.

In view of this fact, 20 kreuzers per cwt. or two dollars gold per tun can be assumed as the average price of coal.

The figures for the iron nearly all refer to the weight of pig and cast iron; but the work for the smelter and metallurgist does not end here; the pig iron is transformed into wrought iron and steel, and for this reason the value of the cast and bar iron, and the various kinds of steel, must be taken into consideration. The more developed the industry of a country is, the greater will be the demand for iron in general, and more particularly for cast iron. Most frequently the demand of cast iron varies between one-fifth and one-third of the whole iron consumption, and the cost of cast iron ware can be rated at the average price of five florins (one tun at $50 gold). The price of bar iron varies between three and fifteen florins, but the real average can, at most, be rated at five florins, the price of the common English kinds being decisive in fixing the standard.

The manufacture of steel has increased considerably during the last few years; formerly it was one-fifteenth, now it has probably reached to one-tenth of the bar iron production. The cwt. of steel varies from six to thirty florins per cwt. (or from $60 to $300 per tun), but the average may be fixed at ten florins ($100) per tun. In view of this great variation of the kinds of iron and the consequent variation in the prices of the same, and considering the loss in the weight which is consequent upon the transformation of the pig iron to cast-iron ware, and of bar iron into steel, the price of four and a half florins per cwt. ($45 per tun) appears to be a fair average for this metal.

Attention may be called to the fact that the anthracite and lignite, used in the smelting of iron and steel, have to be deducted from the whole production of coal, but the deduction will be, instead of five cwts. of coal for every one hundred pounds of iron (which is the actual amount of coal required for the smelting), on account of the partial use of vegetable fuel, only three to four cwts. for every one cwt. of iron.

The pound of gold (German mint pound) commands the price of 675 florins; the pound of silver (German mint pound) 45 florins.

Copper, at the mines, costs 50 to 60 florins (average 57), because the better brands predominate.

Lead varies between 10 to 15 florins per cwt., average 12 florins.

Zinc varies between 5 to 7 thalers; average 6 thalers, or 9 florins per cwt.

Among the other metals, which are not quoted in the above table on account of their minor significance, the mercury may be considered as the most important; then tin, platinum, antimony, nickel, etc. Their yearly production may scarcely exceed in value the sum of thirty million florins, or one hundred and fifty million dollars gold.

The Value of Brains.

Working as an ordinary hand in a Philadelphia shipyard, until within a few years, was a man named John L. Knowlton. His peculiarity was that, while others of his class were at the ale houses, or indulging in jollification, he was incessantly engaged in studying upon mechanical combinations. One of his companions secured a poodle dog, and spent six months in teaching the quadruped to execute a jig upon his hind legs. Knowlton spent the same period in discovering some method by which he could saw out ship timber in a beveled form.

The first man taught his dog to dance—Knowlton, in the same time discovered a mechanical combination that enabled him to do in two hours the work that would occupy a dozen men, by slow and laborious process, an entire day. That saw is now in use in all the shipyards of the country. It cuts a beam to a curved shape as quickly as an ordinary saw-mill saw rips up a straight plank.

Knowlton continued his experiments. He took no part in parades or target shootings, and in a short time afterwards he secured a patent for a machine that turns any material whatever into a perfectly spherical form. He sold a portion of his patent for a sum that is equivalent to a fortune. The machine was used cleaning off cannon balls for the Government.

When the ball comes from the mold the surface is incrusted, and the ordinary process of smoothing it was slow and wearisome. This machine almost in an instant, and with mathematical accuracy, peels it to the surface of the metal, at the same time smoothing out any deviations from the perfect spheroidal form.

The same unassuming man has invented a boring machine, that was tested in the presence of a number of scientific gentlemen. It bored at the rate of twenty-two inches an hour, through a block of granite, with a pressure of but three hundred pounds upon the drill. A gentleman present offered him ten thousand dollars upon the spot for a part interest in the invention, in Europe, and the offer was then accepted.

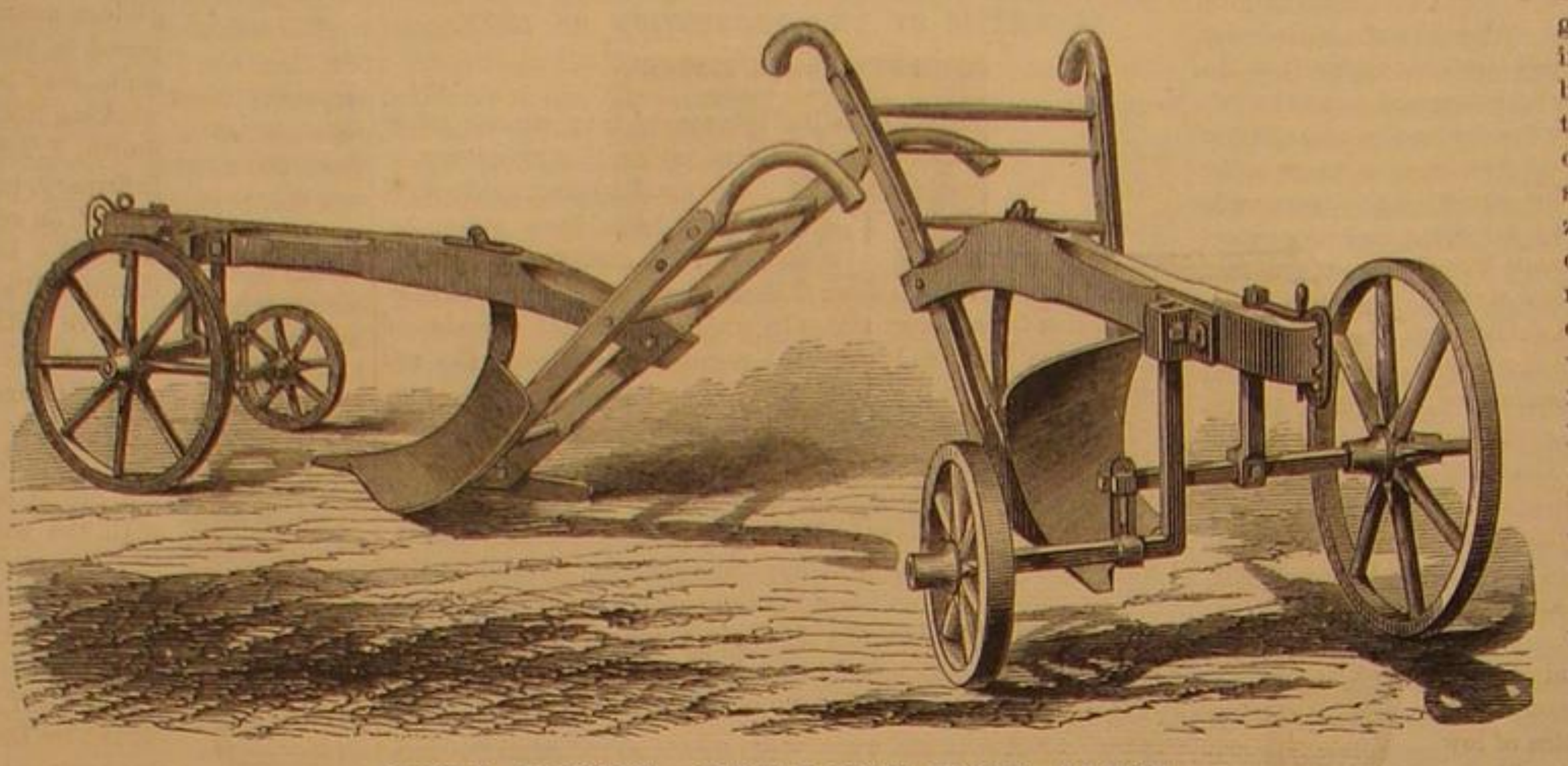
The moral of all this is that people who keep on studying are sure to achieve something. Mr. Knowlton doesn't consider himself by any means brilliant, but if once inspired with an idea, he pursues it until he forces it into tangible shape. If everybody would follow copy, the world would be less filled with idlers, and the streets with grumblers and malcontents.

THE FRENCH ATLANTIC CABLE.—The manufacture of the French Atlantic cable is rapidly approaching completion. Up to the 14th of April the total length manufactured was 3,034 nautical miles—about 2,214 miles of the section intended to be laid between Brest and St Pierre, and 716 miles of the section between St. Pierre and the United States. Only 474 miles of the former section and 57 of the latter remain to be completed. The whole length of the core for both sections was finished April 15th, at the Gutta Percha Works. The *Great Eastern* has taken on board 1,750 miles of the first section, and the steamer *Scandaria* 450 miles of the second section.

Improved Self-Holding Adjustable Plow.

The object of this device, as stated by the inventor, is to provide a simple and convenient arrangement for adjusting plows to the varying width and depth of the furrows, as may be required. Two views are shown in the accompanying illustrations, one exhibiting one side, and the other the opposite side of the plow with the truck attachment. The plow itself is an ordinary plow, such as is generally used, the attachment being capable of application as well to plows now in use as to those which may be built to receive the device. This itself is very simple: it being only two wheels of different diameters, on independent axles, the larger one to run in the furrow already made, and the smaller one to run on the untouched surface. By this contrivance any required depth and any required width of furrow may be assured, and the share made to take and sustain any angle.

On the plow beam, in front of the share, are bolted two plate sockets, one on each side, the holes in the sockets being square and vertical. In one, the shank of the bent axle of the small wheel fits, and is secured to any position by a set screw in the sleeve or socket. The other receives a bar similarly secured, the lower end of which embraces the straight axle o. the large wheel. At the end of this axle is a slotted arm the lower end of which embraces the horizontal portion of the small-wheel axle, while a bolt passing through the slotted arm and the end of the large-wheel axle, serves to hold both axles in position. By these arrangements either wheel is made capable of vertical adjustment, and the large wheel may be also adjusted horizontally to govern the width between the furrows. The relative positions of the two wheels may be changed to adapt them to a right hand or left-hand plow. Both the uprights are provided with marked scales for adjusting the depth of the furrow.



CLEE'S PATENT ADJUSTABLE PLOW TRUCK.

According to the inventor, a plow with this device is self-holding, the driver needing only to attend to his team; any one who can drive a team can plow better than the best plowman with the ordinary plow, without the truck; an equal furrow in depth, width, and direction; the plowshare being self-sharpening as its point is kept always level; the draft lighter, and thus the labor less on the team—the truck bearing the load usually borne by the horses; the weeds being turned under and held by the large wheel and axle until covered, and other minor advantages evident to the practical reader without special notice.

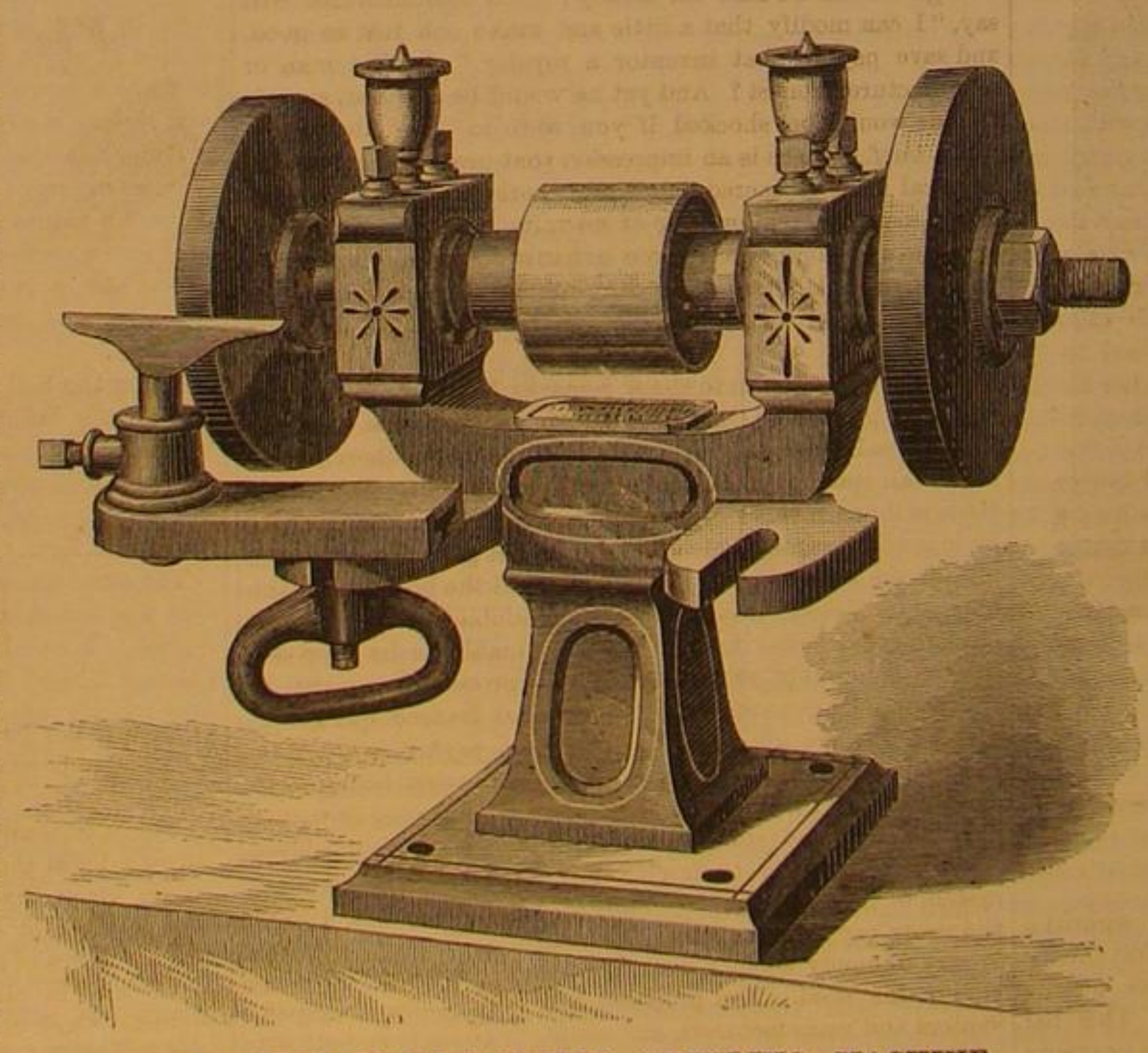
Patented through the Scientific American Patent Agency March 2d, 1869. State and manufacturing rights for sale by the inventor, Joseph Clees, or J. N. Clees, Nashville, Tenn.

Solid Emery Grinding and Polishing Wheels.

Solid emery wheels have lately come into very general use for grinding and polishing. When well made they wear evenly and cut rapidly, and as they require no redressing, but last until entirely worn out, they are rapidly superseding the old-fashioned wooden wheel coated with emery, and even usurping some of the functions of the ordinary grindstone.

The engraving presents a perspective view of a machine for carrying one or two of these wheels, fixed on the same shaft and driven by the same belt. A stand supports two bearings with their boxes, in which runs a shaft carrying, in the space between the boxes, a pulley, and on its ends solid emery wheels. A slotted projection at the base of either bearing receives an ordinary rest, such as is used on a lathe for hand turning, that is held in position by a nut and bolt. The machine is bolted to a bench at any convenient point.

The machine can be used for grinding tools of every description, is a great saver of files in reducing and polishing surfaces, and does the work in either case much more rapidly than can be done on the grindstone. Parties having them in use commend them in the highest terms. The wheels used are those manufactured by the Tanite Company, Stroudsburgh, Pa. For further information, address American Twist Drill Company, Woonsocket, R. I.



IMPROVED EMERY WHEEL GRINDING MACHINE.

Cleaning the Exterior of Buildings.

This question, says the *Mechanics' Magazine*, has been recently taken into reconsideration by our Gallic neighbors, and toward the end of last year, an order was issued by the Prefect that the façades of all dwellings in the 3rd, 4th, 9th, and 10th divisions (arrondissements) of Paris should be periodically cleaned, the law to take effect on and after May 1, of the present year. So far back as 1852 there was a law promulgated to the same intent, but its injunctions have been so frequently neglected that the authorities have thought it requisite to call prominent attention to it by issuing what might be termed a new edition. The old act ran as follows: "The façades of houses are to be kept in good repair. They are to be rubbed, plastered, painted, or the surface either renewed by cleansing in some manner or another, at least once in every ten years, at the expense of the proprietor. A noncompliance with this regulation will subject the offending party to a fine not exceeding £5. Although the legislation thus insisted on the general principle, the particular *modus operandi*, or means of putting the principle into execution, was left altogether to the discretion of the owner. The favorite method which has been successfully practiced for the last two years, is that of cleaning the walls by the employment of a jet of water projected under steam pressure. There are many advantages attached to this plan of proceeding. It not only restores the façades to their original appearance, but it does not injure the more delicate, decorative, and ornamental portions of the building, neither does it destroy the then protecting coat which the stone has received from the influence of the atmosphere. By this method we insure the fulfillment of several valuable conditions. First, cheapness; second, the preservation of the more fragile and sculptural work upon the edifice; and, third, universality of application. If, in addition to the enforcement of some regulation of this description, with respect to the buildings in our principal streets and thoroughfares, those in our narrow courts and alleys were brought under the same jurisdiction, the result, in a sanitary point of view, might not be inconsiderable. It has been calculated that were the exterior of the buildings in London kept in a clean fresh condition, instead of being nearly black from top to bottom, there would be a gain of nearly half an hour's daylight in every twenty-four hours.

Collecting and Utilizing Sewage.

The two main points in the sewage question are, the effectual removal of refuse and fæcal matter from our dwellings, and its efficient utilization upon our lands. Upon these points there exists a great variety of opinions, some advocating one method of removal and utilization, and some another. Into the various methods proposed, suggested, or in use, we need not here enter; they are sufficiently well known to all who know anything at all about the matter. We point to our Metropolitan main drainage as a sufficient answer to the first point in question, and to the Croydon irrigation works as an equally sufficient answer to the second. But it may be said that our cities and towns are not Londons or Croydons, and that many clusters of habitations are neither cities nor towns. Then naturally follows the question of how to deal with a limited amount of sewage? Of course, everybody will say, there are many ways of doing that. We admit there are, and we will now point out one of them, the most recent that has come under our notice. This is the system of M. Delbriel, which was explained to a meeting of gentlemen practically interested in the sewage question on the evening of 7th April. The meeting was held at the Inns of Court Hotel, Holborn, the Duke of Castelluccio in the chair. M. Delbriel's system of collecting and utilizing sewage is better known in France, where it is practically applied in several places as *vidance á vapeur*. It consists in using a traction engine, to which are attached tanks, into which the sewage is pumped by the engine. During the extraction of the sewage, the mouth of the cesspool is covered with sailcloth steeped in sulphate of zinc. The mephitic vapors are drawn off from the tanks by means of pipes which communicate with the engine furnace in which they are burned. By these means, it is affirmed that no unpleasant smell or noxious vapor ever finds its way to the air, while the sewage in the highest condition for fertilizing purposes does find its way on to the lands of the farmers. Depôts are established where the sewage is deposited, and from which it is distributed to the farmers. Or otherwise it is supplied on to their lands direct from the tanks. In all this there sounds to our ears—who have been accustomed to a widely different dealing with the same question—a return to the old cesspool system, the engine doing duty for the horse and men of the old night cart. But it must be borne in mind that with all our sanitary progress there are yet many spots in Great Britain where the system would be a great boon, and to these M. Delbriel proposes its application. That it has proved a great success in France is due to the very different sanitary and agricultural conditions of that empire as compared with the United Kingdom. On the whole, M. Delbriel's system is well worthy of consideration, and, therefore, we subscribe to the following resolution, which was passed at the meeting in question: "Considering the present great waste of the sewage of towns, etc., and the necessity of diverting it from rivers and streams, and the value of applying it to the purposes of agriculture, this meeting is of opinion that M. Delbriel's system is worthy the attention of the public, and more especially all persons interested in this important question, and that it is desirable that M. Delbriel should issue a translation of his pamphlet."—*Mechanics' Magazine.*

The Auroral Currents.

We are asked if the currents produced on the wires during these displays are atmospheric, acting direct from these auroral phenomena, thus irradiating the heavens, and which weave their triumphal coronas up apparently among the planets? Although there are, unquestionably, large masses of electric clouds sailing in the upper regions of the air during the presence of these auroral displays, yet the fact that all, or nearly all, interference from the currents then exhibited can be prevented by simply using two wires instead of the earth and wire, proves that these currents are caused by a disturbance of of the earth's normal electric state. The earth's ordinary electric tension is disturbed, and its currents are, so to speak, scattered by this induced current from the vast masses of electricity in the sky, but are ever seeking, by the violent action peculiar to them, to restore themselves to their normal condition, thus causing temporary electric currents of great power and rapid changes of tension. Thus they enter a wire from one earth connection in this effort at restoration, and are chased back by another from the opposite extreme, exhibiting the violent and changeful currents which mark these magnetic storms. The earth, itself, is a great reservoir of electricity, offering no sensible resistance to the entrance of electrical currents, yet varying in its electric tension or condition at different points. This causes an almost ceaseless action of the earth's currents, and at almost all times they can be felt upon the wires which they use to effect the equalization of their tension. During the auroral displays this action is excessive. At the same time it can scarcely be regarded as incorrect to say that it is the induction of vast volumes of electricity from the upper air which causes these extraordinary currents which, as we have seen, can be utilized and harnessed for human service; and as a line can be worked by any polarity, provided the whole wire is worked with a like polarity, the changing currents do not prevent the line from being operated during the violent contest for the supremacy of the one current or the other.—*Journal of the Telegraph.*

MATTER and motion constitute the visible universe.

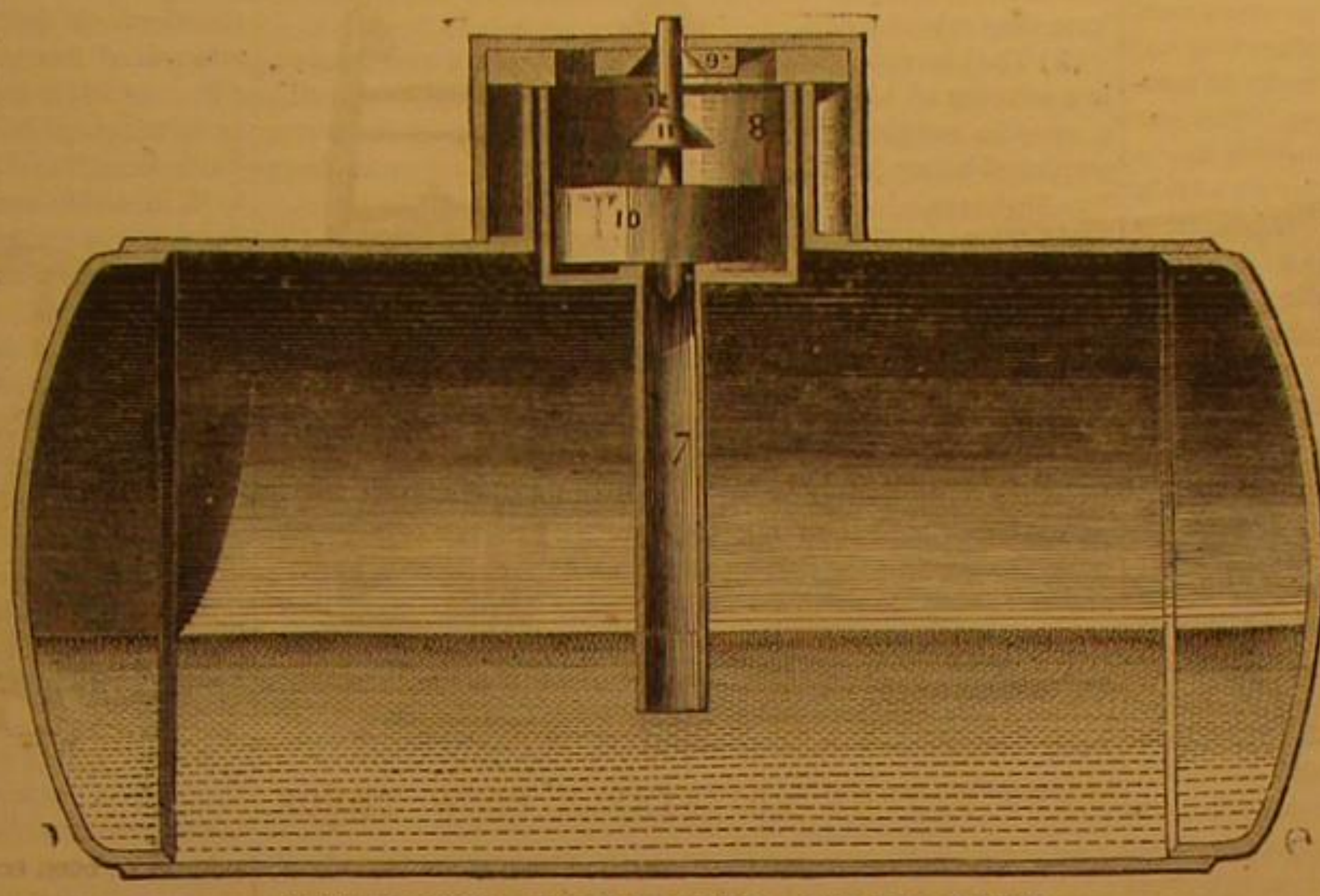
Improved Low-Water Steam Port.

Ever since the invention of the steam engine, the attention of scientific men has been directed to the discovery of means to guard against the danger of low water in boilers.

In consequence of the liability of supply pumps to become foul or defective, this danger is always imminent. A great number of devices have been tried, but nothing heretofore discovered was so eminently practical as to become a necessary appendage of the steam engine and an essential of every first-class boiler.

The void so long existing is now claimed to be filled by Cochrane's low-water steam port, constructed in accordance with principles of natural philosophy, well understood, and therefore always uniform in action.

A valve is made, composed of a spindle and piston united (10, 12). The latter is hollow, so as to make the specific gravity about the same as that of water. A chamber is constructed (8) in which the piston moves freely. The valve seat (9) in the head of this chamber is closed, as the valve rises, by a bulb (11) on the spindle. A tube (7) extends from the bottom of the chamber to low-water mark in the boiler. When there is a sufficiency of water, the steam forces it up the tube and fills the chamber. This sustains the piston and the pressure of steam upon the spindle and closes the valve. On the other hand, when the water is below the opening of the tube, the chamber is filled with steam instead of water, and the weight of the piston causes the valve to descend and open, allowing the steam to escape.



COCHRANE'S LOW-WATER STEAM PORT.

The action of this simple steam port is just as certain as the laws of nature on which it rests. It always gives timely notice of low water, and continues the warning till the boiler is supplied. The engineer will be greatly relieved, as it performs perfectly and constantly one of his most important and onerous duties. It does not merely act at the point of danger, but gives information in time for pumping to begin. Hence the boiler may always be worked with safety at the minimum of water, and with corresponding economy of fuel. Should this invention be the means of guarding against all danger from low water, its general use will mark an era in the history of the steam engine.

The inventor is J. C. Cochrane of Rochester, N. Y., who has secured patents in the United States and Europe. It is probable that the United States patent will be placed in a stock manufacturing company, either in New York or Boston, unless superior advantages are presented elsewhere.

HARRIS' IMPROVED PATENT SHUTTER AND BLIND OPENER AND FASTENER.

Opening and closing blinds and shutters from the inside of the house have formed the subject of a number of patents, some of which are of great merit, but few of them present equal claims to efficiency with that shown in the accompanying engravings, it having no springs or other adventitious aids to its proper operation.

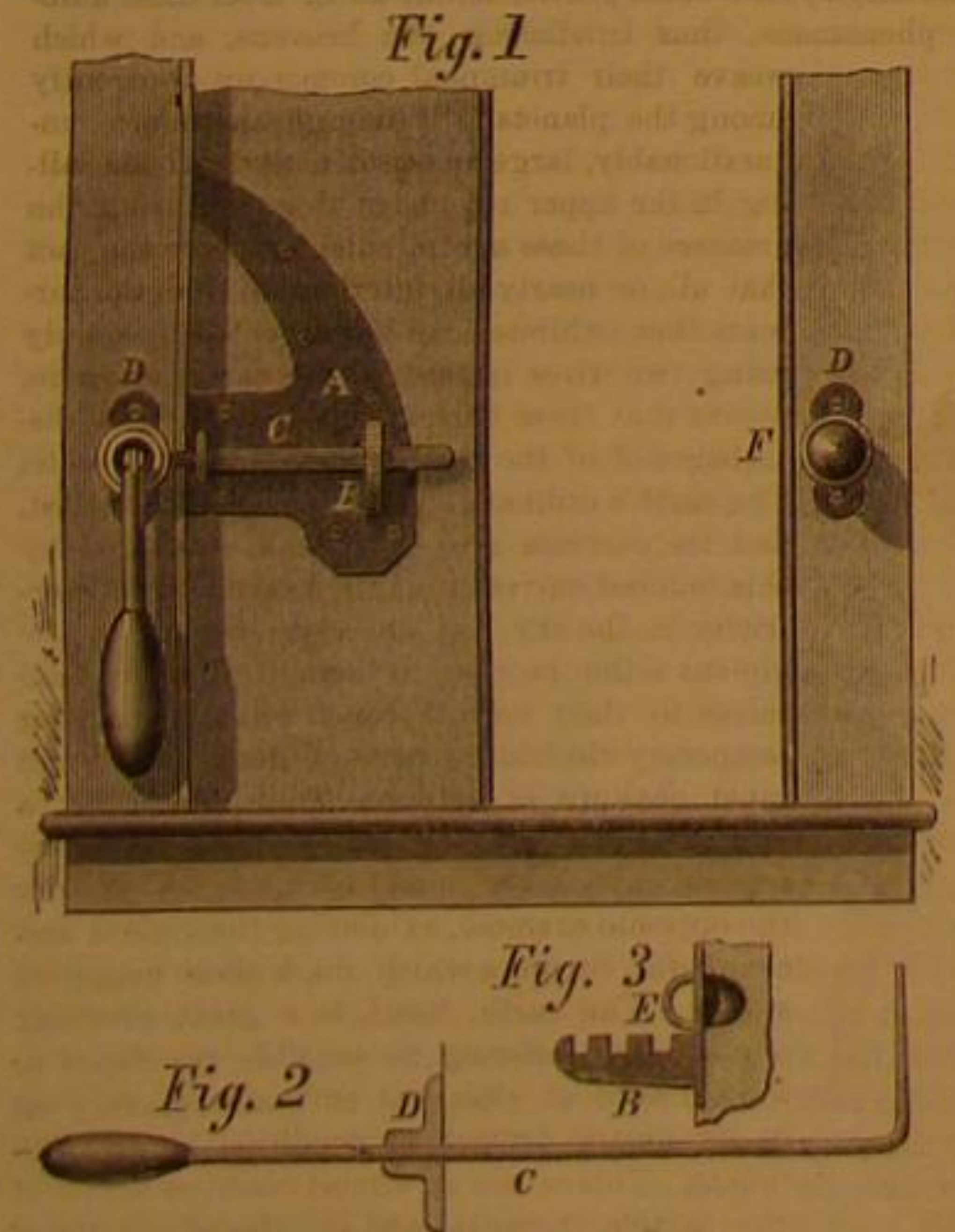


Fig. 1 shows one leaf of a shutter on which is secured a plate, A, shown in exaggerated proportions to exhibit the device plainly. On this plate is a catch, B, seen more plainly in Fig. 3, for receiving the bar, C, Figs. 1 and 2. This bar passes through a sleeve plate, D, secured to the stile or casing of the window frame, and is jointed, as seen in both figures—1 and 2. The bar or rod for ordinary blinds need not be more than three-eighths of an inch in diameter. A hinged loop or guide, E, guides the bar in opening and closing the blind. When the bar is turned partly around in its boss, D, so as to bring its bent arm to an upright position, and then pulled inward the shutter will be closed because of the connecting loop, E, and then by turning the bar in the opposite direction, the bent arm will again enter the catch, B. A reverse motion opens the blind when the position of the handle of the lever will be, as seen, as at F, Fig. 1. The different notches in the catch, B, are intended to "bow" or set the blind at any angle required, and the position of the blind is assured in any position by means of a set screw in the boss, D, seen in Fig. 1. Thus the shutter, or blind, can readily be held either opened back against the building, partially closed, or securely fastened when entirely closed.

Patented April 6, 1869, by George A. and John B. Harris, who may be addressed at Deerfield, N. J.

Property in Patents.

The farmer "rises up early and eats the bread of carefulness;" he spends his time and his money in earnest efforts to increase the value of his farm, his crops, and his stock. This property the law recognizes as his, and defends him in its possession. If a man steals one of his horses the law sends the thief to the penitentiary and public sentiment says "Amen!"

The inventor likewise devotes his time and money to the invention of that which will be useful to this farmer, and will aid him in the culture of his land or in securing his crops. He invents a reaper which gathers his grain, or a thrasher which makes it ready for the mill.

While the farmer is producing his crops he is furnishing bread to his family. While the inventor is devising his machine he is bringing in no bread to his family, but is exhausting the means already on hand, and his family is often in the greatest want.

Now, which should be the most sacred in the eye of the law, the horse raised by the farmer, or the invention perfected by the brain worker? Certainly it would be morally just as nefarious to wrong the inventor, by appropriating his property in ideas to which he has given an embodiment, as to steal a horse from the farmer. And yet how few regard the subject in this light. Many who see a new and valuable thing, look at it and want one, but say, "Well, I can make one good enough for me for half the money;" or a manufacturer will say, "I can modify that a little and make one just as good, and save paying that inventor a royalty." Is that man or manufacturer honest? And yet he would be shocked, and his friends would be shocked, if you were to insinuate that he was a *thief*. There is an impression that property acquired by physical labor is sacred, but brain work does not cost anything, and its creations are of no value. What a mistake! Brain work is immensely more exhausting to the vital forces than physical labor, and the discriminations of law and public sentiment, if any difference be made, should be in its favor.

We have been led into these remarks by the proposed passage of a bill by the Ohio Legislature, enacting that when an inventor sells a patent right, and receives a note therefor, the note shall state, on its face, that it is for a patent. Now, what sense is there in this? If the purchaser does not suppose that he is getting value received he should not give the note. The idea of the wise member who introduced the bill is, that the note thus drawn would not be negotiable, and if the purchaser of the patent finds it not as valuable as he supposed he may honorably repudiate. If this procedure is right, in this case, why not apply it in commercial transactions generally? Let a man give his note for a horse, saying, in the note, that it was given for a horse, the presumption being, as in the patent case, that if the horse is found unsound, the note shall be null and void, would that note have any market value? How would trade generally be affected under such a system of note giving? It would, at once, put us strictly upon the ready pay system, which, although best in the long run, is very unhandy when a man in want has not the money to supply his need. The proposed bill is an outrage upon inventors and manufacturers, and simply implies that they are a set of scoundrels whose main object is to swindle the public.

We had also another thing in view when we began this disquisition, and that is the disposition of unprincipled manufacturers to defraud the very men whom of all others they should most befriend. Instead of welcoming the new invention and dealing fairly with the inventor by paying him a royalty for his invention, their disposition is, as before stated, to take the main idea, make a slight modification, and put out the invention as their own. The public sentiment should be so changed that such a man shall, hereafter, be regarded as a dishonest man. Public sentiment makes law, and such a man acts honorably only through fear of the law.

[We find the above truthful remarks in the *Sorgo Journal and Farm Machinist*, published at Cincinnati, and commend them to legislators and others who are wanting in a proper appreciation of the rights of inventors.—Eds.

Diseases of Metal Workers.

The fact that metal workers are liable to the attacks of special diseases is admitted by all medical writers. The lead colic and lead palsy of plumbers and painters, the metal ague of brass melters, the pulmonary affections of dry grinders and needle pointers, and the peculiar ails of japanners, lacquerers, gilders, enamelers, and others who are exposed to the fumes of mercury, lead, or arsenic, may be cited as some of the ills that working flesh is heir to. Dr. William Frank Smith, F.C.S., the physician to the Sheffield Infirmary, publishes his notes, in the London *Lancet*, on seven cases of a paralytic affection which he terms Hephæstic Hemiplegia, or Hammer Palsy, and which does not appear to have hitherto attracted much attention. Two table-blade strikers, a razor-blade striker, a hammersmith, an engineer, a file-forger, and a silver-plater, were the patients. With one exception, they were either young or in the prime of life; temperate, healthy, and, with the exception of the continual use of the seven-pound, single-handed hammer of their trade, exposed to none to none of the causes of paralysis. It is satisfactory to learn that this new disease can be combated by medical skill, and that in all the cases recorded by Dr. Frank Smith complete or partial recovery has followed the use of phosphorus, iron, strychnia, and cod-liver oil, with absolute and prolonged abstinence from the forge.

ROWE'S MODE OF FASTENING CARDS TO CYLINDERS

There are two ways of clothing the cylinders of carding machines: one with sheets, and the other with filletings. The latter are used for "licker-ins," "deliverers," and "doffers," the other for the main cylinders. The cylinders are either of wood or iron; but in either case the material differs greatly from the leather that forms the basis of the card. This shrinks or stretches according to the temperature and length of time it has been in use, while the surface of the cylinder is not subject to these changes, or they are not equal in amount or coincident in time with those of the leather. In clothing the cylinder with sheet cards, the ordinary method is to tack the edges of the sheets to the cylinder, whether of wood or iron; in the latter case, holes being drilled in the iron and plugged with wood to receive the tacks. To strip the clothing off such a cylinder and replace them is a work requiring not only time, but skill and experience. In fact, the qualifications of a carder should be to clothe card cylinders as well as to manage the business of a carding room.

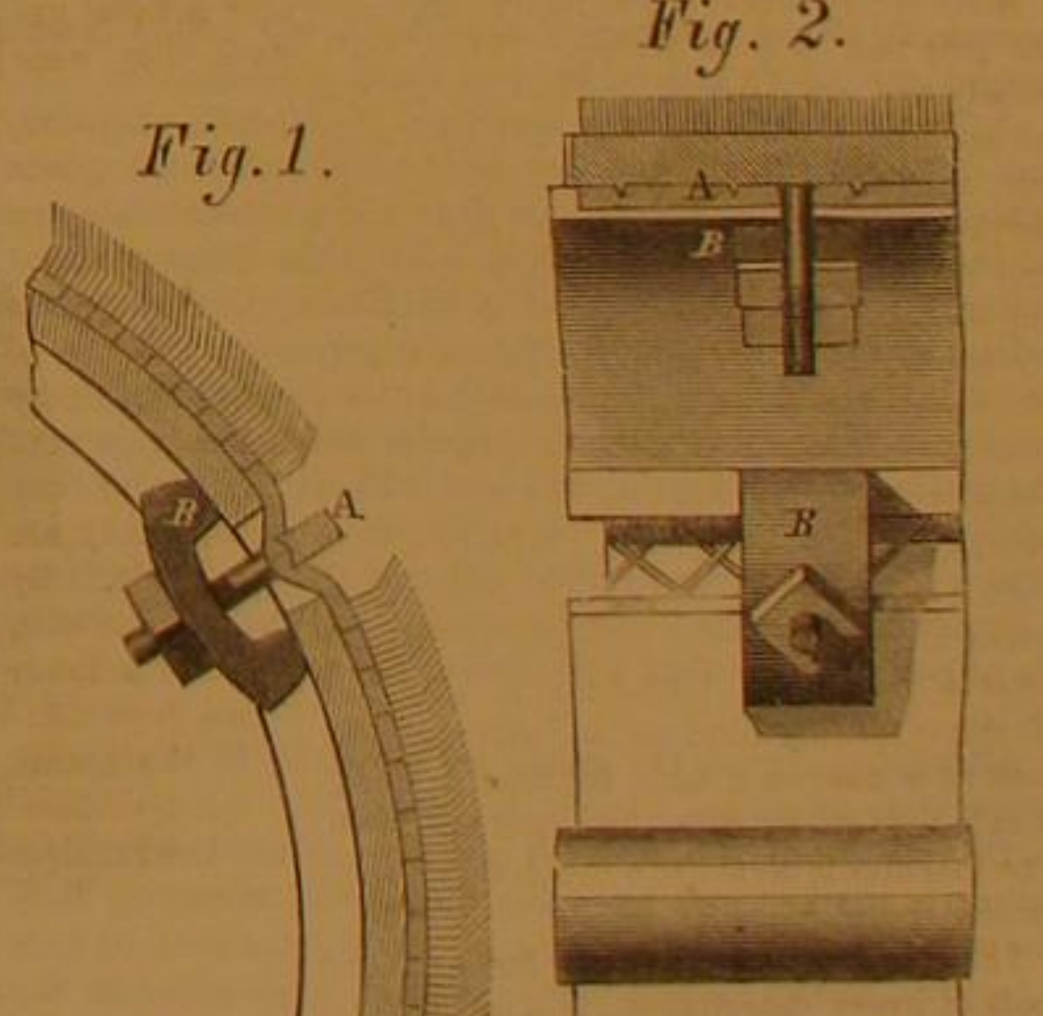


Fig. 1 of the device herewith illustrated is a vertical cross section of a portion of a cylinder, and Fig. 2 a longitudinal vertical section. The edges of the sheets are either sewed, riveted, or cemented to make a continuous band or covering. The cylinder at the requisite distance is scored with transverse grooves, about three-quarters of an inch wide, into which the edges of the card sheet are forced by means of a bar or rod, A, and a series of screw bolts and saddles, B, by which they are also held in place, and by which they can be adjusted as required. Card clothing by this means can be retained in place, and with sufficient tension to hold it until the card is entirely worn out. The advantages of this device are so apparent that any practical man cannot fail to appreciate them.

Patented Dec. 22, 1868. For further information address the assignees, Helmick, Mooney & Co., Pana, Christian county, Ill.

It is computed that the total number of persons annually employed in getting coal in Europe is 700,000. In Great Britain, 300,000; in Belgium and France, 120,000; in Prussia, 80,000, and the remaining 200,000 elsewhere.

THE PREPARATION OF COTTON WARE FOR DYEING AND PRINTING.

Written for the Scientific American] by DR. M. REIMANN.

SINGEING.

This is the first operation to which the cotton ware must be subjected. By it, the fine down which covers the wefts, and is of great inconvenience, especially for printing, will be removed from the ware. The old method consisted in turning the ware quite equally by means of rollers upon a cast-iron half cylinder or on half-cylindrical plates, which are heated from below, and are therefore red hot.

The goods are generally singed twice; at first upon the side which is to be printed, and then upon the other. Much better than the process of singeing with red-hot cylinders is that of employing for the same operation an intense flame. An alcohol flame is too expensive; the flame produced by oil attacks and injures the weft far too seriously to make it practicable. The most suitable flame is that of gas. The gas must be employed to proceed from an iron tube which has a series of small apertures beside each other, so that we obtain a flame of some length when the gas is ignited. Above this tube a horizontal tube is supported, which is, in construction, similar to a channel, and has an opening fronting the previously-mentioned tube. This channel is combined with other vertical tubes, and causes a strong draft of air, by which not only the products of combustion are removed, but the flame is also caused to pass over the meshes of the weft, and thus to consume all the down on the upper side of the weft. Hence, when gas is employed, the operation of singeing must be performed but once.

If the gas were to proceed directly out of the openings of the horizontal pipe, we would obtain the desired continuous flame, but it would ignite and render the weft black by its soot. To prevent this, there is inserted above every small opening from which the gas proceeds, a wide metal tube in a vertical position, so that it forms a right angle with the horizontal tube above. These wide tubes that are placed over every opening, have at their base two openings on each side. When the gas now proceeds out of the previously-mentioned small apertures, and a light is held over the upper end of the wide tube, so much air is drawn into the tube and mixed with the gas by means of the openings on the sides of the wide metallic tube, that the flame produced will not ignite fully, but burn with a weak blue light, which is free from all superfluous carbon, and will therefore not soot the weft. This sort of burner is generally known as the "Bunsen burner," and is the invention of the celebrated chemist of that name These Bunsen burners are generally employed in laboratories; at present they are, however, used also for domestic purposes whenever anything is to be heated without being covered with soot. The entire horizontal tube is then covered with these burners, placed alongside of each other. Then, when the gas is turned on in the burners, and a light applied, a long blue flame is produced, which, though it is devoid of full brightness, and not perfectly ignited, gives a very intense heat. Moreover, while the results attained by these burners are far more favorable than without them, the gas consumption is also less when they are employed. Until quite recently the goods were drawn over the top of the gas flames. The top of the flame being, however, everywhere a little higher where there was a burner below, the weft that was drawn across was necessarily singed irregularly, that is to say, either it was singed imperfectly at some spots or burnt at others.

A French manufacturer of machines, Mr. Tulpin, of Rouen, has lately introduced another mode of drawing the goods through the flame. He does not draw the goods over the top of the flames, but places on each side of the flame a metal roller, whose surface is touched by the flame. Over these two rollers he draws the weft, which no longer meets the top of the flame, but the sides. These sides of the flame can very readily be obtained of perfectly regular dimensions, and thus the goods are singed quite well and without any fault; they can, of course, be singed twice by one flame, if they are drawn the second time over the roller on the other side. By a simple construction it may be caused to touch the flame with its upper side the first time, and afterward with its lower side.

After being singed, the goods are subjected to the second preparatory operation, namely, bleaching.

This process must be divided into two parts. The manipulations in the first part have the purpose of removing from the weft the resinous substances, gum, and fat, contained in it by nature, as also those substances which were added in the process of manufacturing. The operation of the second series embrace the bleaching, *par excellence*, by these operations, both the coloring matter, contained by nature in the fiber, and that which was added to it in the processes of spinning and weaving are removed.

THE NEWEST BLEACHING PROCESS EMPLOYED IN MOST MANUFACTORIES.

It is necessary here to remark that the weights, as they occur below, are calculated with reference to a quantity of 60 yards of cotton ware.

(1.) The ware is at first boiled for five hours in the steam apparatus, whose description will be given further on, with lime milk. The tension of the steam must amount to at least 3—3½ atmospheres. The lime milk may be produced by combining with 80 lbs. of lime as much water as is necessary. The ware, after being boiled in the lime liquid, is cooled in the same apparatus with cold water, and then washed.

(2.) The goods are now placed from 7 to 10 hours in a bath of hydrochloric acid, 2½° strong, according to Baumé's areometer. After being sufficiently treated with the hydrochloric acid, the goods pass through the washing machine, and are (3) boiled with resin soap in the same steam apparatus.

The resin soap necessary for this purpose is obtained by boiling 120 pounds of colophonium with a solution of 200 pounds of soda-ash. When the goods are thoroughly boiled, the liquid is allowed to pass off, and the cotton is treated (4.) again with resin soap. This time the boiling operation must be continued for 4 hours; the same quantity of resin soap must be employed as in the first boiling operation. The same liquid may be used on the next occasion for the first boiling of the cotton. After this second boiling of the cotton ware with resin soap, the goods are either immediately washed or boiled for some hours in a solution of 200 lbs. of soda crystals. They are then washed and passed into the bleaching fluid. It is especially advantageous to perform this operation of boiling with soda crystals, when the water contains considerable quantities of lime, and hence a precipitation of lime soap might result.

(5.) The bleaching fluid with which the ware is now treated, is a solution of bleaching powder (hypochlorite of lime), with a specific weight of 1,025, the specific weight of the water employed being 1,000. In this liquid the goods remain from 7 to 10 hours.

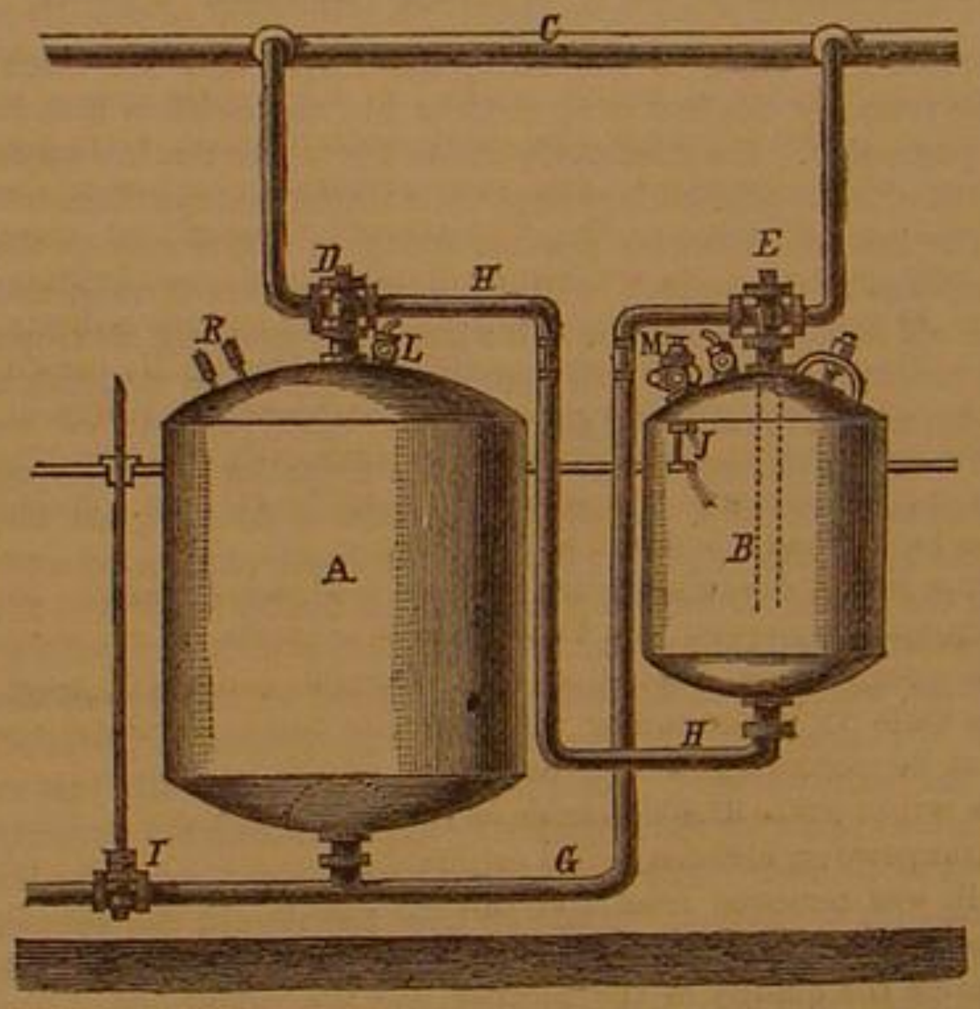
(6.) They are then washed and brought into a bath of hydrochloric acid. After remaining here for a similar length of time, as in the preceding case, and being washed, they are dried, either by suspending them in some apartment, or by means of a steam-drying cylinder.

In the operations designated above by the numbers 2, 5, and 6, the liquid with which the goods are treated from 7 to 10 hours is allowed to pass off some 3 to 4 times into a wooden vat below, and then again poured, by means of a pump, upon the goods. By this circulation of the fluid, the important advantage is gained that the cotton becomes more thoroughly impregnated, and therefore will be more equally bleached.

The fluids mentioned above must, of course, be replaced by fresh liquid every time that a new quantity of goods is to be treated.

THE STEAM APPARATUS AND ITS USE.

The drawing appended to this article represents the apparatus, we may therefore immediately proceed to the discussion



of its use. The bottom of the large boiler is covered with stones, and then the entire boiler is filled with the goods, in such a manner, moreover, that no empty space remains between the folds of the weft. The more the pieces of goods are pressed against the sides of the boiler, the better and more equally the boiling will proceed. When the boiler is filled, some layers of ordinary linen cloth are placed on the top of the cotton ware, and are in turn pressed by the addition of some stones. Then the manhole, R (see the drawing), is closed, the cock, I, opened, and steam allowed to enter through the cock, D. As the steam enters, it presses down the pieces and removes the fluid adhering to the ware, as also the atmospheric air. When the steam begins to rush out of the cock, I, this cock is allowed to remain for some minutes open; in this time the lime milk or the resin-soap solution is introduced through the cock, M, into the boiling vessel, B; these liquids are heated by steam, which enters through the cock, E. The cock, D, is then closed, so that the boiler, A, is in no combination, either with the steam tube, C, nor with the tube, H. After some minutes, when the tension of the steam in the boiler, A, is reduced by cooling, the cock, I, is closed, and the cock, D, opened, so that this boiler, A, is brought into connection with the tube, H. Then the pressure of the steam in the boiler, B, drives the fluid from the boiler through the tube, H, over the goods contained in the boiler, A. When the entire fluid has been driven from B into the boiler, A,—which may be observed by the glass tube, J,—the cock, E, is closed, so that the boiler is in combination neither with the steam tube, C, nor with the steam tube, G. Steam is now allowed to enter the boiler, A, and after some minutes, during which time the pressure of the steam in the boiler, A, rises, the cock, E, is opened. As the drawing shows, this cock connects the boiler, B, with the tube, G. In this manner the steam drives the fluid through the goods and through the tube, G, back into the boiler, B. It is necessary that during this process the air-cock, L, of the boiler into which the fluid is driven, be opened. At the same time equal caution must be observed in closing it in proper time, as otherwise the entire fluid might escape by means of it. When the entire fluid is again in the boiler, B, which may be observed by the glass tube, J, the steam is shut off and again passed into the boiler, B, to heat the fluid contained in it, and to drive it a second time into the boiler, A.

The operation described above is repeated for a period of four hours, which time suffices for a thorough treatment of the goods. Finally, the outlet-cock, I, is opened, and when the steam has driven the fluid out of the boiler, A, it is allowed to rush through the boiler for some minutes more, and then shut off, after which the air-cock, L, is opened. As soon as the steam in the vessel, A, has lost its pressure, the manhole is opened, and the goods cooled with cold water. In filling the boiler, B, a little space must be left, in order that the fluid may expand.

The proper dimension of the space to be left free is readily determined by the glass tube, J.

SHEARING THE WARE.

The shearing operation has as its purpose the removal of that portion of *down*, which is fixed by weaver's glue, and therefore not destroyed by singeing; it rises again after the removal of the glue by the bleaching. The shearing machine, which is most frequently employed, is that with the vacillating cylinder. The sheaving apparatus consists of a knife, from 3 to 4 feet long, and a wooden cylinder parallel to it, in which are set steel rails, formed like coils. The cylinder receives a rotating motion, backward and forward, by a simple mechanism. The knife raises the down, while the knives, set in the wooden cylinder, cuts it off. For removing the down which has been sheared, a brushing apparatus is employed. The ware is wound up after this operation, and is now ready for printing.

FINISHING, LAYING, AND PRESSING THE COTTON WARE.

The majority of cotton ware, whether it be white, dyed, or printed, must, before being ready for trade, receive a certain degree of stiffness and smoothness—that is to say, it must be finished. Finishing is effected with a more or less solid starch paste. In some cases this paste must be transformed by the addition of a little bleaching powder in solution into *Leiscome*.

If the goods are to be bright, it is necessary to add to the starch paste some way, stearine or spermacetti. As cotton always receives through the bleaching process a certain yellow shade, it is passed through water in which some ultramarine is in suspension, and then finished. It is also possible to add for the same purpose a quantity of ultramarine to the starch paste with which the finishing is effected. The pieces, after being starched, are calendered to impart to them a certain degree of smoothness. Previously, however, the pieces must be moistened.

This moistening of the ware is effected by entering it into a sprinkling machine. This consists of a cylindrical brush, the hairs of which dip into a vat below the brush, which is filled with water. The brush, when brought into rotation, rapidly throws a rain of small drops over the ware. The pieces are then allowed to lie quietly for some time, so that the moisture may extend over the whole surface of the ware. This moistening operation can be entirely dispensed with if in the course of the finishing operation there be added to the mass some hygroscopic salt, that is, one that attracts moisture from the atmosphere. If, for instance, the mass is allowed to contain a small quantity of hydrochlorate of lime, and is allowed to lie quietly for some hours in a cool room, so much moisture is attracted as to render the sprinkling unnecessary.

A finishing mass, which can altogether dispense with the sprinkling, may be composed as follows: In 25 gallons of the starch paste are dissolved 100 grammes (one-fifth of a pound) of hydrochlorate of lime. A weak finish is produced by allowing the moistened pieces to pass through a calender in which the roller in the middle is covered with felt or cloth. For obtaining a glazed finish, a machine is used consisting of 3 rollers, the upper and lower one of which are made of paper, that in the center of cast iron. This latter roller is hollow, and can be heated by steam. By means of levers or screws these rollers can be pressed more or less compactly together.

For the glazing finish the so-called friction calender is used. This glazing machine differs from the above-mentioned machine merely in the more rapid rotation of the hollow iron roller in the middle, which is effected by the insertion of an additional wheel in the mechanism.

For rendering the wefts similar to silk mohair, two finished pieces were formerly laid together and allowed to pass through the calender. By the pressure of the rollers of the calender, as the threads of the one piece are not parallel to those of the other, and therefore cross each other, the latter threads are pressed quite smooth, and a beautiful effect is thus produced. At present there are suitable machines employed for this purpose. They consist of a leather, paper, or wooden roller, and an engraved cylinder of copper or brass. Before the ware is passed through the machine, the paper or wooden roller must receive an impress of the engraving on the metal cylinder; this is effected by pressing the two rollers strongly together.

By employing a suitably-engraved cylinder all kinds of weft, as moreen, huckaback, quilting, reps, etc., may be readily imitated. Fine wefts, as jaconets, organdy, batiste, which are prone to contract, and whose threads often are drawn apart, must be strained after the process of finishing. The pieces, when finished and calendered are laid in certain layers, then sewed, marked, and finally pressed for some hours under a screw or hydraulic press.

The glazing finish is composed of 50 gallons of water, 40 kilogrammes of starch, and 2 kilogrammes of stearine, which which substances are boiled together for from 5 to 6 hours.

The San Francisco Mechanics' Institute will open its Seventh Annual Exhibition, next September, in a building covering 70,000 feet of ground, and erected specially for the purpose at a cost of $45,000.

Correspondence.

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

Krupp's Works.

Messrs. Editors: Having been favored with a visit to the celebrated works of Fred. Krupp, Esq., of this city, I think that a description of what was seen there may not be uninteresting to the readers of your journal. I have within the past few weeks visited the most extensive establishments of a similar nature in England, and I find that most of them bear about the same relation to Mr. Krupp's works as a yacht does to the *Great Eastern*. That such a gigantic concern was built up, owned, and managed by one man is truly wonderful, and, in order that some idea may be formed of its extent, I give the following account, which was furnished me at Mr. Krupp's office: This establishment has been in existence forty-two years, and has steadily grown, year by year, until at present it covers a continuous surface of 450 acres, 200 of which are under roof. The men employed number about 14,000. In the year 1866, the works turned out 61,000 tuns of material, involving the use of 412 smelting, reverberatory, and cementing furnaces; 195 steam engines, varying from 2 to 1,000-horse power; 49 steam hammers, from 1 cwt. to 50 tons; 110 smiths' forges; 318 lathes; 111 planers; 61 cutting and shaping machines; 84 boring machines; 75 grinding machines; and 26 sundry and special tools. There have been large additions to the above within the past three years. At the present time 180 steam boilers are used, evaporating 200,000 cubic feet of water into steam of 4 atmospheres pressure every twenty-four hours; and about 12,000 gas burners consume, in the same time, 500,000 cubic feet of gas—the gas being lighted night and day. There are about 20 miles of rails traversing the works in every direction, upon which run 7 locomotives and 150 wagons.

The principal articles manufactured are Bessemer steel rails, crucible steel, breech-loading guns to 96,000 lbs. weight, cast-steel marine crank shafts, cast-steel locomotive crank axles with cast-steel disk wheels of 6 feet diameter.

Here is the largest forging steam hammer existing; the "drop" alone weighing 100,000 lbs., and the casting for the hammer block 300,000 lbs. The foundation for this hammer is 60 feet deep, built up with timber and iron. I saw this hammer in operation forging a gun of the largest dimensions. One of the great secrets of the succes in making huge cast-steel forgings lies in having the weight of the hammer so proportioned to the size of the forging as to move the entire mass of metal at each successive blow of the hammer.

While recently visiting the works of Messrs. John Brown & Co., Sheffield, England,—the principal productions of which are Bessemer steel and iron armor plates—I saw plates 9 inches in thickness. There is, however, a limit to the thickness of iron plates for vessels, for a ship may be sunk by the weight of her own armor. But let us see what Mr. Krupp is doing. I was shown a 1,000-pound rifle breech-loading gun resting upon a cast-steel carriage. This gun was intended for coast defense service. It consisted of an inner tube upon which was shrunk cast-steel rings. The inner tube when finished weighed 20 tuns, and was forged from a massive ingot of 40 tuns; and the cast-steel rings, forming a threefold layer at the powder chamber and a twofold layer at the muzzle portion, weigh about 30 tuns—total weight 50 tuns. The diameter of bore was 14 inches, the total length 9 feet 2 inches, the number of rifled grooves 40, depth of rifling 0·15 in. the twist of rifling 980 and 1,014·4 in., the weight of solid shot 1,212 lbs., the weight of shell 1,080 lbs., and the charge of powder from 110 to 130 lbs. (The weight of shell was made up as follows: cast-steel shell 843 lbs., the leaden jacket 220 lbs., bursting charge17 lbs.—total 1,080.) It required sixteen months to manufacture this gun, working day and night. This cannon reposes upon a steel carriage of the weight of 15 tuns and together they work upon a turn-table of 25 tuns. The total weight of cannon, carriage, and turn-table was 90 tuns. The gun carriage slides smoothly upon the turn-table, and the necessary mechanism for working the gun is such that one or two men can easily elevate, depress, and turn the gun, and can with the utmost certainty follow and cover any passing vessel. The cost of this gun mounted complete is $187,000 gold. There are in course of construction thousands of tuns of these guns of all sizes down to 4 pounders, all breech-loaders; and it is supposed that a single discharge of Mr. Krupp's 14-inch cannon will sink any iron-clad afloat. The cost of transporting one of these large guns would be enormous. No railroad car possessing sufficient strength, Mr. Krupp manufactured his own car entirely of steel and iron, which rests upon twelve wheels, the total weight being 24 tuns.

The coal bed which is beneath the works supply the necessary fuel, and the continual undermining has resulted in a sinking of the earth and consequent damage to the buildings.

I was shown locomotive driving wheels, 6 feet in diameter with hub, spokes, rim, and crank all forged in one solid piece; the outside flange tire being shrunk on and fastened in the usual manner. I saw also some railroad frogs of cast-steel, and was told that they were cast in the same kind of clay, or earth, of which the steel crucibles are made. They were as perfect as any cast-iron castings.

Mr. Krupp has orders from different governments for cannons sufficient to run his works for more than two years.

As I passed over this vast establishment and viewed the immense masses of steel and the various appliances for handling, turning, and moving each piece, I wondered that so much could have been accomplished in a life-time. But there is every facility here for keeping up such an establishment. Labor is cheap; mechanics about one $1 per day and ordinary labor from fifty to sixty cents. The surrounding country is all cut up into governments—some of which are of no larger population and of less territorial extent than New Jersey—and each must have its standing army. Little Belgium keeps in time of peace a standing army of 50,000 men. In passing over any part of this country one meets soldiers at every corner and finds them in almost every railroad car. All this implies a constant demand for the *matériel* of war.

I find that the mechanics of Prussia are very much dissatisfied with the patent laws of the country, as they afford very little protection or encouragement to the inventor, and therefore do not serve to promote the arts or sciences. In ordinary pursuits and more especially in agriculture, work is performed in the most primitive manner. There is little to stimulate the inventive power of the mechanic, and it is only in a few large establishments like that of Mr. Krupp's that the genius of the country is to any extent developed. I think that the people of Prussia possess mechanical talent to a high degree, and that under more liberal patent laws she would in a short time stand side by side with any other nation. In warfare no doubt Prussia is the terror of Europe. The inhabitants numbering about 20,000,000, and every man having been educated as a soldier, she is thus enabled to raise an army sufficient to cope with any power. Mr. Krupp's works alone could supply her with weapons—in fact no government works in the world can at present equal his in extent, or facilites for manufacture. When other governments are entering into contracts with Mr. Krupp for guns, they seem to lose sight of the fact that they are building up an immense establishment in another country, while they should by every means pratronize and encourage home industry. Equal patronage would soon raise an enterprising American establishment to the high standing of Mr. Krupp's.

J. E. Emerson.

Essen, Rhenish Prussia.

Explosive Compounds.

Messrs. Editors:—I have read with much interest the articles which you have published on explosive compounds applicable for engineering purposes. The writer, however, does not give any information not hitherto known, and in gathering this he seems to have exercised but little discrimination. I will only refer to No. IV. of the series, respecting nitro-glycerin. In this article he gives little except what can be found in chemical works, and nearly one-half of the article refers to the oft-repeated accidents that have occurred with nitro-glycerin. But allow me to call your attention to a few of the author's assertions. In the first place, he states that nitro glycerin is made from one volume of nitric acid, specific gravity, 1·43, and two volumes of sulphuric acid, specific gravity, 1·83, and that it will congeal at 40° Fah. Practically considered, the specific gravity of the nitric acid is not sufficient, and nothing short of 46° will give a commercial yield. The freezing of nitro-glycerin varies from 43° to 44° Fah. Nobel says he has had it a liquid at 32° Fah.

In a frozen condition nitro-glycerin will not explode. An atom may be thawed by a blow, and the explosion of the atom will produce the detonation of the whole congealed mass. The scale for determining the explosive force of substances must be according to the expansion of the gases evolved. The writer gives 32,832 pounds as the average explosive force of gunpowder, because, on an estimate, a certain quantity of chalk was removed from the Dover Cliffs, of white sand, at Tunbridge, etc., with one pound of powder. He does not mention the quality of the powder, nor the conditions of application, whether or not the powder was placed so that the mere starting of the material would carry with it large quantities, as illustrated by chambering and barring. The expansion of gas developed on the explosion of an atom of nitro-glycerin may be thus considered. The chemical formula of nitro-glycerin is $C^6 H^5 O^3 (NO^5)$. Each 100 parts of exploded nitro-glycerin leave a residue of 20 per cent water; 58 per cent carbonic acid; 3·5 per cent oxygen; 18·5 per cent nitrogen; total 100. Specific gravity of nitro-glycerin 1·6, and one volume produces 554 volumes of steam; 469 volumes of carbonic acid; 39 volumes of oxygen; 236 volumes of nitrogen; total, 1,298, or nearly 1,300 volumes.

Artillery engineers have determined that only 32–100 of any charge of gunpowder can be exploded or converted into gas, but say 50 per cent, one volume giving 260 volumes, cold gas, deduction being made of the expansion produced by heat. Practically, however, the combustion is never so complete, and 200 volumes cold gas are, therefore, in all probability, above the real average result. It is difficult to determine the degree of heat produced by an exploding substance. According to theory, however, nitro-glycerin, on account of its complete combustion, ought to develop a much greater heat than gunpowder, and this is often shown by the rock located near the charge in a blast. The rock is disintegrated, and the hardest stone is easily broken with the hand. The heat evolved may be safely considered to be three times greater than that thrown off on the explosion of gunpowder; but I will base my estimates upon twice the degree of heat. The above facts being realized, we may conclude that, if one volume of gunpowder gives 200 volumes cold gas (practically, however, only 173 volumes), expanded by heat four times—equaling 800° of explosive force, and nitro-glycerin cold gas as above given, at 1,300 volumes, expanded by heat eight times—produces 10,400 volumes; so that nitro-glycerin, compared with gunpowder, possesses about thirteen times its power when volumes are considered, and eight times, considering weight, the specific gravity of gunpowder, being 1·0. In hard or wet rock, nitro-glycerin remains without an equal, and the particulars regarding the results of practical blasting must be considered in a future communication. What we fail to learn in the series above referred to, are practical experiments in the disruption of matter by these different explosives under like conditions. It is not for me to suggest how these experiments may be made, and perhaps the only way that their powers can be determined is by considering their chemical forces. The writer seems to suppose that nitro-glycerin has passed from any use in practical blasting. That may be so in the British Isles, but he ought to remember that the people of that country are very slow, and that men of enterprise have to struggle long, and with much patience, to get them to adopt new improvements, even after the commercial value of an invention is beyond doubt.

Tal. P. Shaffner.

Galvanized Iron Water Pipes.

Messrs. Editors:—An article in No. 18, Vol. XX. May 1st, asks if galvanized iron pipe is fit to convey water for culinary purposes. I will give you my experience. About six years ago I put down some 60 feet of 1¼-inch galvanized iron pipe, to convey water to my kitchen. Galvanic action took place immediately, and the water become so offensive from hydrogen gas liberated, that we could hardly stay in the room. My pump worked so well that I thought that I had better try to remedy the defect, so I proposed making a thin wash of hydraulic cement to coat the inside; but before trying it a heavy rain muddied the water in the well, and when it had settled and become fit to use, it had lost all the offensive taste and smell and has been good ever since. I would recommend a very thin wash of hydraulic cement and not wait for the rain.

P. M.

Paterson, N. J.

[The reaction described by our correspondent always occurs, to a greater or less degree, when water is first admitted to a galvanized iron pipe. The zinc is oxidized at the expense of the water which leaves hydrogen free. No harm, however, is to be apprehended from the effects of this gas, except a trifling temporary inconvenience. It is the subsequent dissolving of the oxide of zinc that renders the water hurtful. This we have shown does not take place except when impregnated with substances specified in the article referred to by our correspondent. If the water is free from these substances the use of cement is unnecessary, and if they are present such pipes should not be used.—Eds.

Extinguishing of Kerosene Lamps.

Messrs. Editors:—A kerosene lamp will be found extinguished in less than one minute from the time of complete disappearance of wick below the edge of tube through which it passes; care being taken not to turn it out of reach of that part which controls the action upward and downward. It is better to allow it remain turned down till relighting—absorption does not occur, gumming is avoided, and destruction of wick is retarded very materially, as the wick is constantly chargedwith oil. But if turned up after being extinguished, the wick becomes dry, and quite an amount thereof is consumed before concommittant actions of combustion come into play. Blowing into the chimney, or under it, is unnecessary, and quite unphilosophical, as a deleterious gas is evolved until wick and tube cool.

Enterprise.

Cincinnati, Ohio.

IMPORTANT DECISION ABOUT DESIGNS.

We call the especial attention of our readers to the decision of the Commissioner of Patents, published in another column, respecting an application made by Jason Crane for a patent for a design for box for ladies' furs. This decision is a very important one, as it determines the full scope and meaning of the statute of 1861, which was intended to afford a wide and liberal protection to certain useful articles of manufacture, such as did not come within the exact meaning of a "mechanical invention" or of an "ornamental design." We regret to say, however, that the plain purport of this law has been defeated by the Examiner in charge. He has persistently refused, so far as our experience goes, to allow patents except for works of art, or for some ornamental configuration or design. The law of 1861, which was intended to be an improvement on the old law, has failed, either through obstinacy or ignorance of the true intent of the law, to benefit those for whom it was enacted. It is, therefore, with great satisfaction that we record this decision. The law is expounded to mean exactly what we supposed it did mean, and we trust that the Commissioner will see that the practice of the office in this particular is made to conform to the decision.

New Method for Working Large Ventilating Fans.

A new method recently invented in England for driving the Indian "punkah," or fan, for which coolies have been hitherto employed, seems equally applicable to the driving of the large ventilating fans, used for promoting circulation in dining rooms etc., in this country.

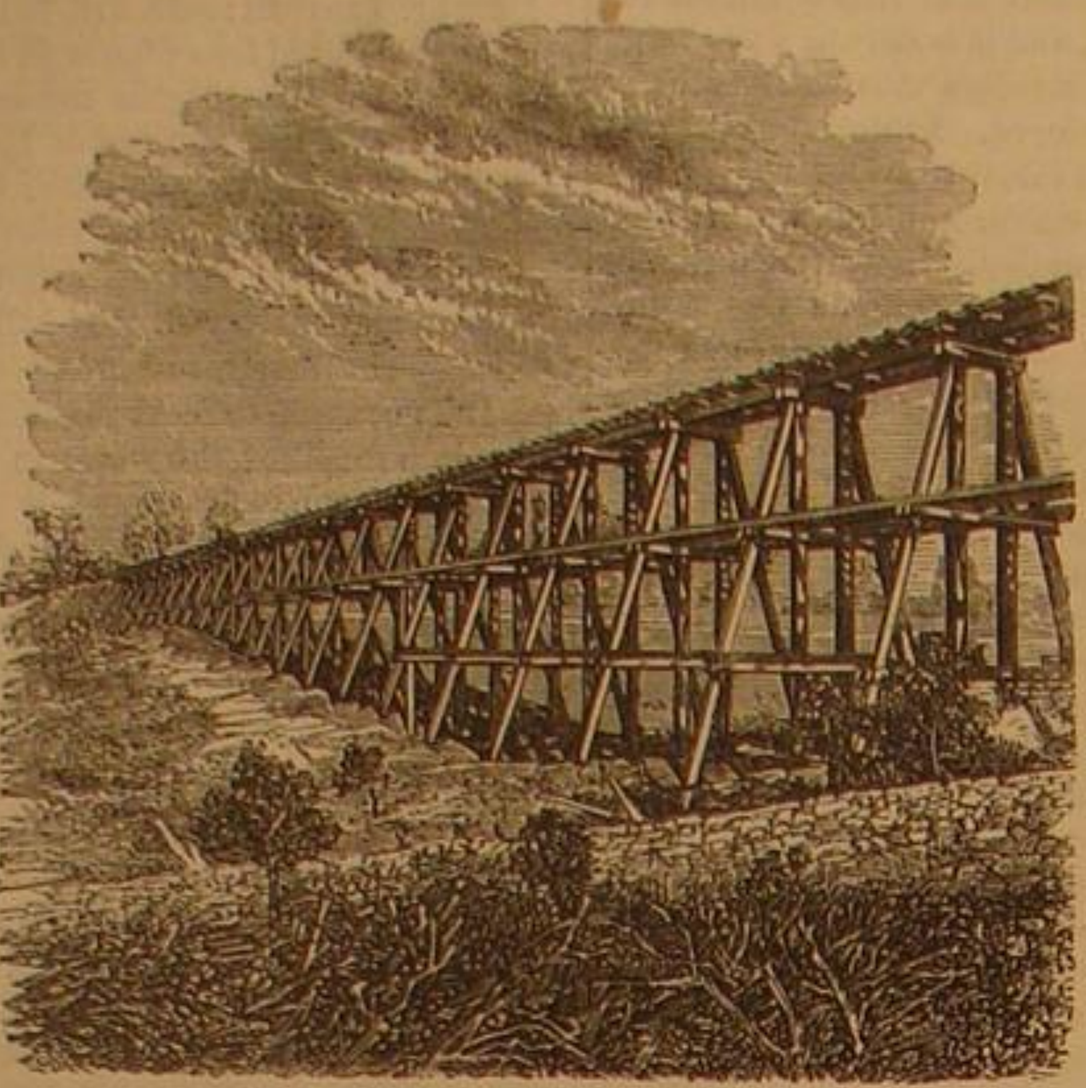
The mechanism of this contrivance is of great simplicity, and its perfect noiselessness is said to be one of its chief recommendations—the faint ripple of the linen "punkah" being heard amid the complete silence of the wheels that move it to and fro. A dead weight and train of wheel work give motion to a horizontal shaft and fly wheel, a slight jerk of the fan being given at each revolution of the wheel and oscillation of the fan, by the simple device of weighting one side of the fly wheel. This action imitates with admirable nicety of effect, the movement of the wrist when the "punkah" is worked by an attendant.

Forty mines in the White Pine (Nevada) district are named after General Grant, and nearly an equal number bear Sheridan's name in various forms. Morning Stars, Evening Stars, North Stars, and all sorts of fanciful appellations abound. Over 3,000 claims in all have been recorded.

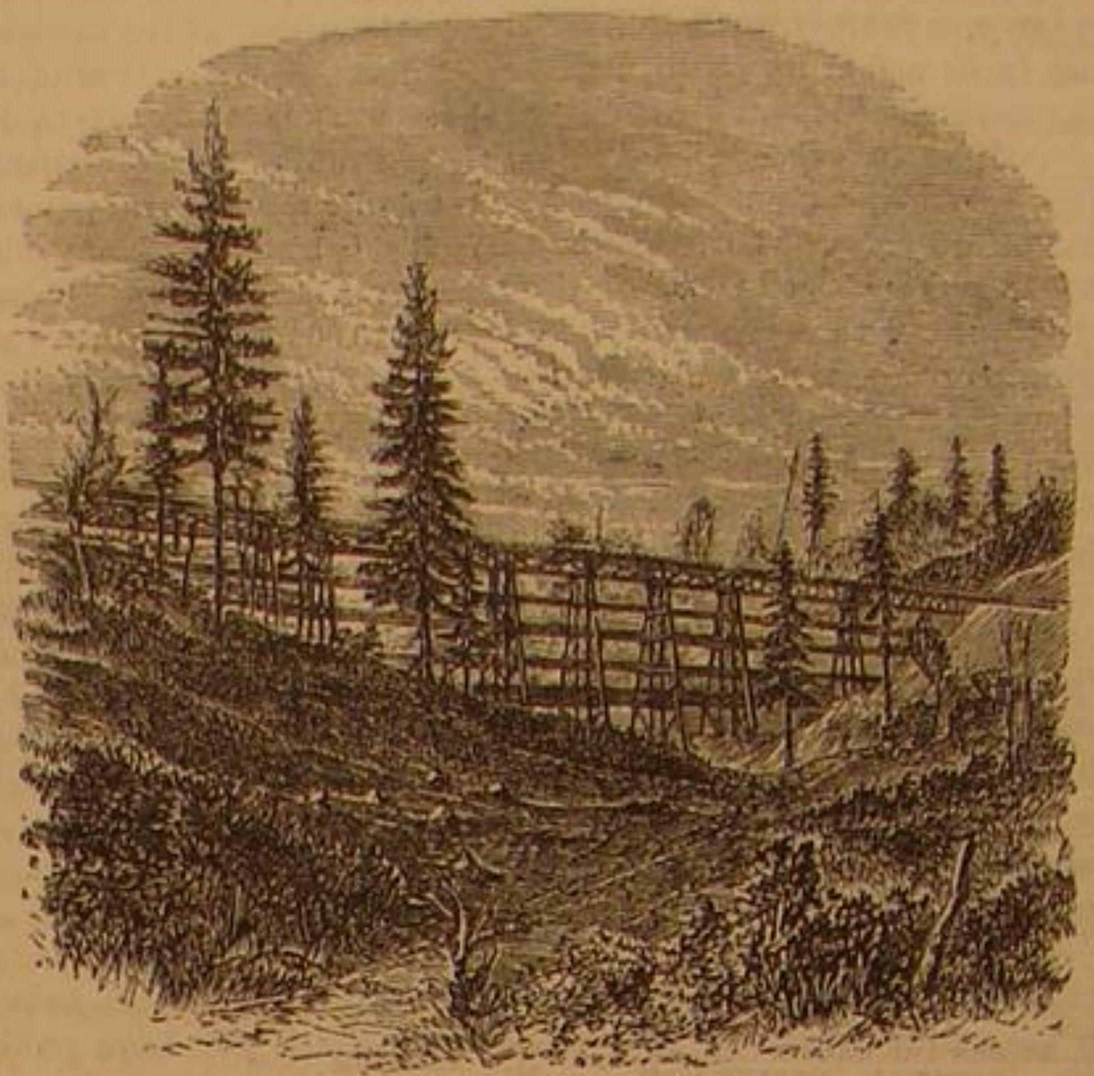
VIEWS ON THE CENTRAL PACIFIC RAILROAD.

To those unacquainted with the locality it is impossible to convey by description any adequate idea of the irregularities of surface which occur in the Sierra Nevada mountains, which are traversed by this line. The tunneling required has been of small extent. The peculiarity of the line is the very extensive employment of trestle bridging, and it is with the view of illustrating this that our engravings have been chosen, Nos. 1, 2, 4, 5, and 6, being examples of trestle bridging, and No. 3 showing a cutting 63 feet deep and 800 feet long through cemented gravel and sand, of the consistency of solid rock, and which is only to be moved by blasting. The trestle bridging has been all constructed as strongly as possible, and of the best obtainable material. The ties, stringers, and caps are of best quality pine (that from Puget's Sound, nearly equal to oak), and the posts, braces, sills, and piles of red wood. The main posts, 12 inches square, are placed perpendicularly, let into a sill of the same dimensions with mortice and tenon, immediately under the bearing of the track stringers. Outside the main posts, two posts 12 in. by 12 in. extend down, with a run of 1 foot in 3 inches to the sill to which they are tenoned, beside being bolted at the top to the main posts with inch bolts and cast-iron washers. The sills rest on piles on stone foundations. Piles, when used, are driven so as to come directly under the main posts and braces. The posts are capped with a timber 12 inches square and 9 feet long, into which the posts are tenoned and pinned. Upon the caps rest corbels 12 inches square and 9 feet long, and upon them are laid the stringers, 12 in. by 15 in., secured by iron bolts passing down through them to the corbels. The caps are notched 1 inch to receive the corbels. The cross ties, or sleepers, are securely fastened to the stringers, and upon the sleepers are laid the rails in the ordinary manner. The "bents" or frames are placed at intervals of 15 feet from center to center. Trestling thus constructed is said to last from eight to fifteen years. When necessary it can be renewed at small cost, or filled with earthen embankment by transporting material on cars at far less cost and trouble than would have been incurred in constructing an embankment at first.

It now takes three weeks or more to reach San Francisco *via* Panama, from New York. When the line is complete the journey can be made in seven days, and ultimately, without doubt, in even less time.

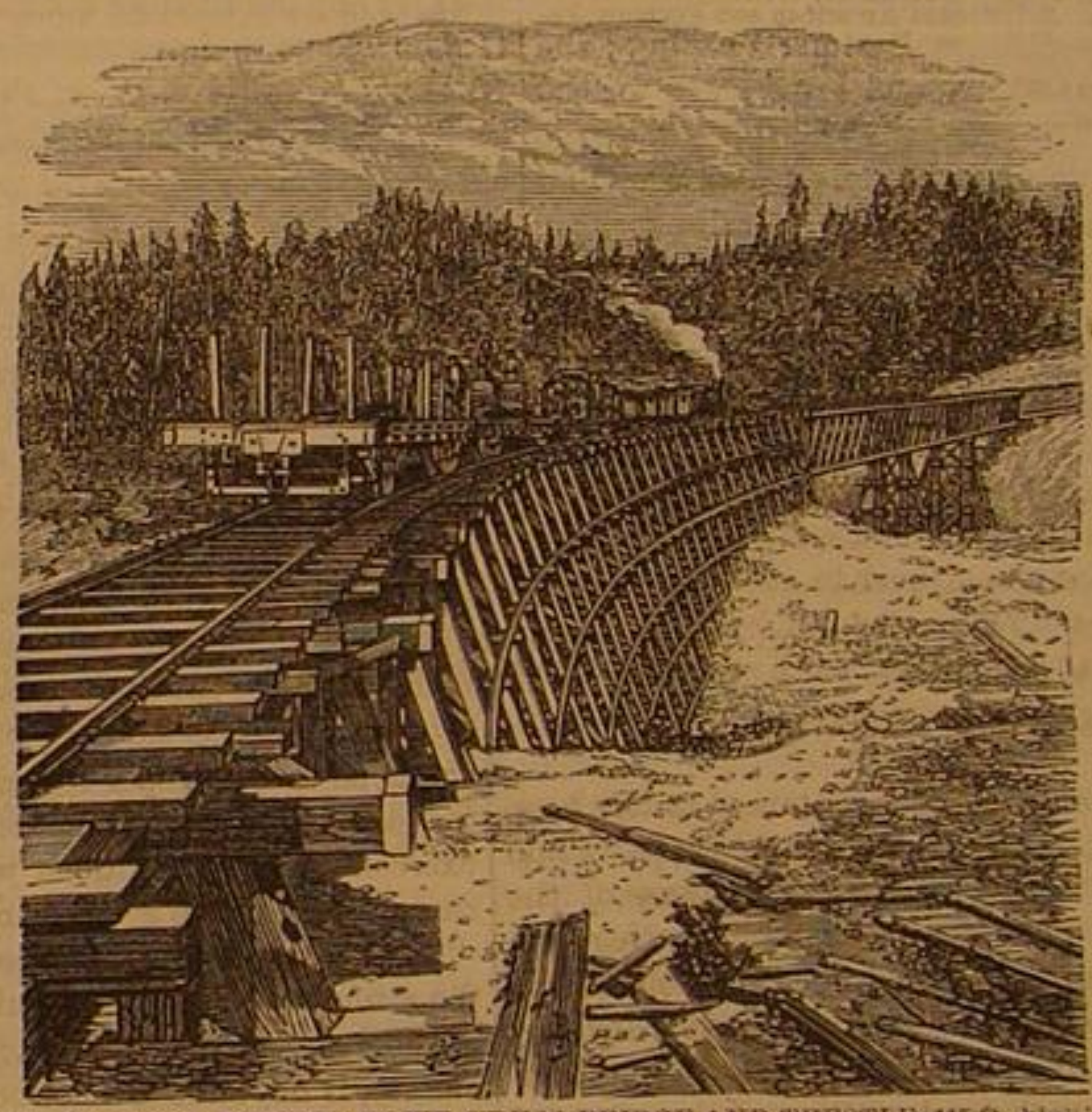


No. I.—TRESTLE OPPOSITE AUBURN.

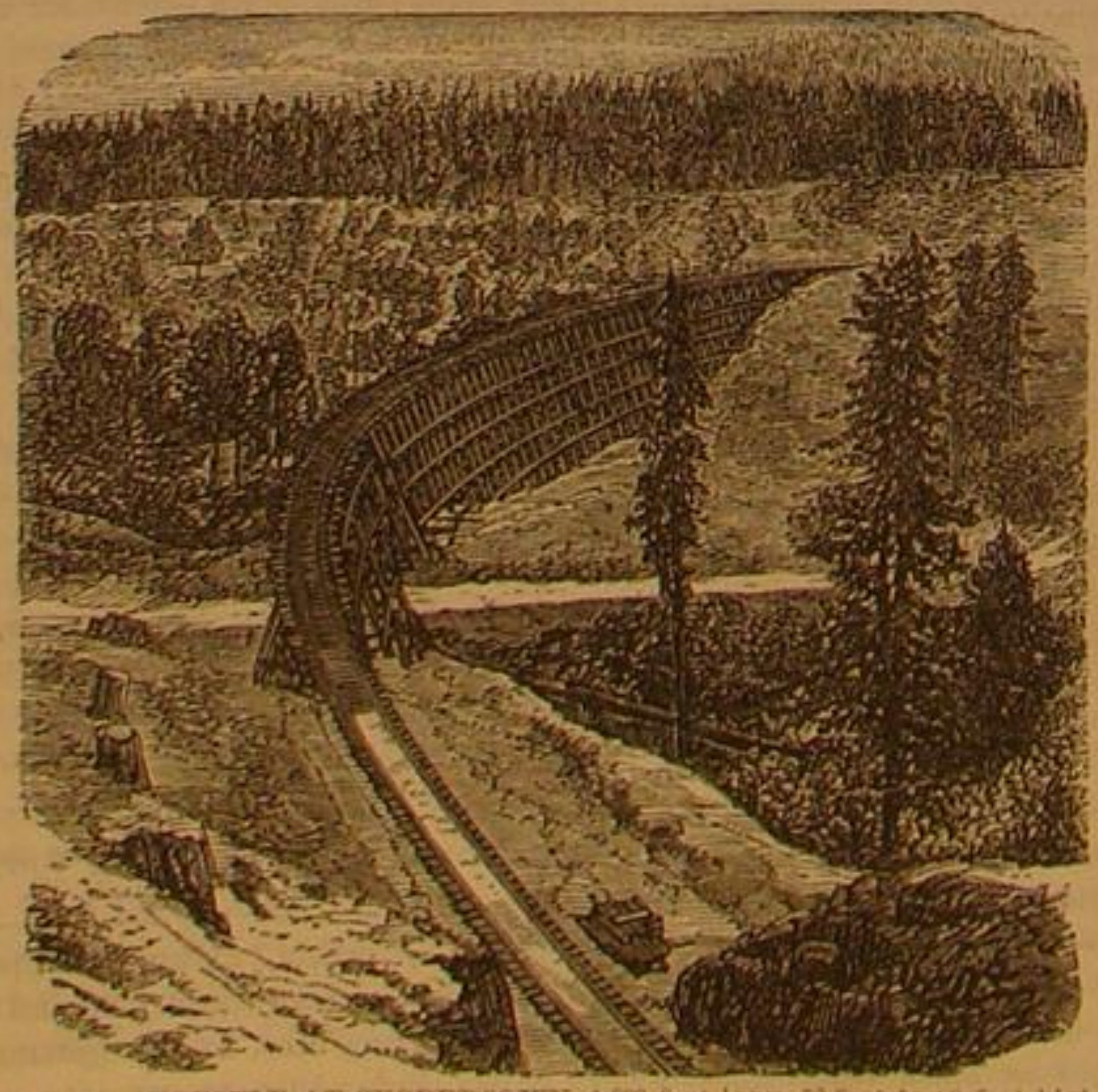


No. II.—TRESTLE AND TRUSS BRIDGE, CLIPPER RAVINE, 100 feet high.

No. III.—BLOOMER CUT, 63 feet deep, 800 feet long.



No. IV.—LONG RAVINE, HOWE TRUSS BRIDGE AND TRESTLE, 115 ft. high.



No. V.—TRESTLE AT SECRETTOWN, 1,000 feet long, 50 feet to 90 feet high

No. VI.—FIRST TRESTLE IN CLIPPER RAVINE.

Prof. Tyndall's Lectures on Light.

Prof. Tyndall has commenced a series of lectures on "Light," before the Royal Institution. Their publication will be awaited with eagerness on this side the Atlantic by those who have read his works on heat and sound. His opening address was of a very elementary character, but he introduced a new experiment to prove that the angle of incidence of light is equal to the angle of reflection. A rod of brass, graduated in inches, was supported in a horizontal position, and from its center a thread, drawn tight by a plummet descended into a basin of water, colored with ink in order to get rid of all but surface reflection. A small dimple was necessarily made at the place where the thread entered the ink. A small paraffine lamp was then placed with its flame nearly touching the rod, and at about a yard from the central thread. Upon bringing the eye along the other end of the rod, and watching the small dimple in the water, it was seen to be most brilliantly illuminated when the eye was at the distance of a yard from the center of the rod, thus proving that the angle of incidence is equal to the angle of reflection. To whatever distance the lamp was shifted from the central thread, the eye had to be placed at a similar distance on the other side to get the most brilliant reflection.

Blazing Stars.

In the year 1866 a star blazed up in the constellation of the Northern Crown, rapidly attaining the second magnitude. It soon began to decline in brightness, falling in twelve days to the eighth magnitude. It was subjected to spectroscopic observation by William Huggins shortly after it began to fade. This experienced observer was surprised with the phenomenon of two distinct spectra. One of these was the ordinary spectrum of dark lines, showing the existence of a photosphere of incandescent solid or liquid matter, inclosed in a vaporous atmosphere. Overlying this was a spectrum consisting of four bright lines. This plainly proved the existence of a second source of light, shown by its peculiar spectrum to be a luminous gas. Two of these lines were the prominent hydrogen lines, and their great brightness showed the gas to be hotter than the photosphere. The conclusion was obvious: the observer beheld a blazing world. A sudden flood of free hydrogen gas had apparently burst from the interior of the star, and was fiercely burning in contact with some other element. The intense heat of this conflagration had also heated the photosphere, so as to render its spectrum more vivid. If, then, the stars are thus liable to become enwrapped in the flames of burning hydrogen, we may speculate as to what would be the fate of the inhabitants of the planets were our sun to emulate the vagaries of its sister orbs and burst out in mighty conflagration.—*From "Spectrum Analysis," in Lippincott's Magazine for May.*

Modern and Medieval Architecture.

It is a sad truth that there is something in the solemn aspect of ancient architecture which, in rebuking frivolity and chastening gaiety, has become at this time literally repulsive to a large majority of the population of Europe. Examine the direction which is taken by all the influences of fortune and fancy, wherever they concern themselves with art, and it will be found that the real, earnest effort of the upper classes of European society is to make every place in the world as much like the Champs Elysées, of Paris, as possible. Wherever the influence of that educated society is felt, the old buildings are relentlessly destroyed; vast hotels like barracks, and rows of high square-windowed dwellings thrust themselves forward to conceal the hated antiquities of the great cities of France and Italy. Gay promenades, with fountains and statues, prolong themselves along the quays once dedicated to commerce; ball rooms and theaters rise upon the dust of desecrated chapels, and thrust into darkness the humility of domestic life. And when the formal street, in all its pride of perfumery and confectionary has successfully consumed its way through the wrecks of historical monuments, and consummated its symmetry in the ruin of all that once prompted to reflection or pleaded for regard, the whitened city is praised for its splendor, and the exulting inhabitants for their patriotism — patriotism which consists in insulting their fathers with forgetfulness and surrounding their children with temptation.

Is this verily the end at which we aim, and will the mission of the age have been then only accomplished when the last castle has fallen from our rocks, the last cloisters faded from our valleys, the last streets, in which the dead have dwelt been effaced from our cities, and regenerated society is left in luxurious possession of towns composed only of bright saloons, overlooking gay parterres? If this be indeed our end, yet why must it be so laboriously accomplished? And are there no new countries on the earth, as yet uncrowned by thorns of cathedral spires, untormented by the consciousness of a past? Must this little Europe—this corner of our globe, gilded with the blood of old battles, and gray with the temples of old pieties—this narrow piece of the world's pavement, worn down by so many pilgrims' feet—be utterly swept and garnished for the mask of the future? Is America not wide enough for the elasticities of our humanity? Asia not rich enough for its pride? or among the quiet meadow lands and solitary hills of the old land, is there not yet room enough for the spreadings of power or the indulgences of magnificence, without founding all glory upon ruin, and prefacing all progress with obliteration?—*John Ruskin.*

Simplicity is one of the greatest elements of utility in machinery. Complexity should, if possible, be always avoided.

Scientific American.

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Contents:

(Illustrated articles are marked with an asterisk.)

DISCUSSION OF PURELY SPECULATIVE TOPICS---TO CORRESPONDENTS.

We are always glad to give our correspondents a hearing upon subjects which we consider likely to be beneficial to our readers at large, but we find it necessary occasionally to hold our correspondents in check. At the present moment we find our desk loaded down with articles upon purely speculative topics, involving abstract theories which have puzzled the wisest of all ages. We cannot give up our columns to the discussion of such subjects, as very little can be evolved therefrom, either new or profitable to our readers. We prefer something practical, something that shall add to the general stock of useful knowledge, and aid in promoting and developing the industries of the world.

Let us enumerate some of the topics contained in this heap of rejected correspondence. We have several upon the "Fluid Character of Electricity;" another upon "The Cause of the Attraction of the Positive Pole of a Magnet for the Negative Pole;" another, which comprises as nearly as possible all the speculative inquiries of past and present ages, and which demands answers to no less than seventeen "whys," all pertaining to force considered as an abstract entity, and the origin of all existence; another upon the "Origin of all the Forces upon the Earth;" another upon the "Solidity of the Earth's Center," and so on to the bottom of the pile. Every one of these letters has been carefully read and considered.

What possible good can arise from the discussion of these and cognate subjects? We maintain that "why matter is and why matter moves" must, from the very nature of the case, remain beyond the pale of legitimate physical science, whose province it is to investigate the manner and succession in which natural events transpire, and not *why* things exist. The latter inquiry is either a subject for religious belief, or of speculative and transcendental philosophy, if that deserves the name of philosophy which is founded upon mere hypothesis. We know nothing of abstract force except by inference, if inference can be called knowledge. All that we can demonstrate is that matter under certain conditions moves in a manner always the same when the conditions are the same. This relation of motion to the conditions which precede it, is what we call law, a term which, in its physical sense, means only the constant relation which exists between any particular motion and the perceptible conditions under which it takes place. So far as we can see, matter and motion are always connected. If this is the result of an occult force, we know nothing of that force, and consider it impossible to demonstrate its existence. If its existence be admitted, we consider it just as legitimate a subject of philosophical inquiry to ask what underlies that force, and so on without end. If a first cause for matter and motion is a necessity of thought, what is the use of supposing intermediate causes between the first cause and matter and motion? We must finally stop at a cause uncaused, if we substitute a thousand intermediate causes. Why not say God created matter and put it in motion, and out of these facts, matter and motion, we have our universe? In this view, as soon as we step beyond matter and motion, we are in the presence of the first cause, Deity himself, and beyond the realm of physics. But it may be said the speculative theories which have suggested our correspondents' inquiries pertain, at least some of them, to this realm. We consider them of no greater value on that account. If their tendency was to point the way to probable discovery, they might be of some value; but so far as we can see, they do not: their discussion can therefore be of no benefit. We trust our readers will not permit their attention to be distracted from practical questions. It is futile to seek by scientific methods for the "*why*" of existence, but we may find out the "*how*" of many things that will confer good upon ourselves and our fellow men. This is the lesson we set out to teach.

EXPLOSIVE COMPOUNDS.

The subject of explosive compounds for engineering purposes, which has been discussed in several late numbers of our paper, has attracted considerable notice, and though the articles in question have been valuable, they fail to give that precise information which practical men desire, especially in this country, where energy and enterprise are developed in the highest degree. Mining men wish to know what explosive will do the most execution, considering safety and expense, which includes "time" as well as actual outlay of capital. For example, a railway may have a tunnel to complete before the road, previously constructed, can be made available. At the Hoosac tunnel it is estimated that, with nitro-glycerin, the opening can be made from one to two years earlier than it can be done with gunpowder. We are also informed that the Union Pacific Railway has used large quantities of nitro-glycerin to hurry the completion of a tunnel, and in order to get even a small quantity, the contractors purchased a car, and sent with it, at considerable expense, a messenger to hasten it forward. These are practical evidences in regard to nitro-glycerin. But, then, we must not omit to consider the efficiency and relative safety of other modern explosives. In California, dynamite, or giant powder, has been introduced into over 700 mines. In Pennsylvania, the oriental powder has been considerably pushed, with some degree of success. Periodically, the world has thrust upon it, some new development in the useful arts, and, at the present, we have a variety of explosive agencies, forcibly recommended by inventors, each claiming superiority for their respective products, and each claiming positive safety. Before the questions are satisfactorily solved, commercially considered, there will be some loss of life, and we cannot do more than to hope that the loss will be small.

Colonel Shaffner, whose letter appears in another column, gives no information relative to the explosive point of the substances enumerated, when produced by concussion.

Gunpowder will explode at 600° Fah., Horsley's powder (called in America, Ehrhardt powder), at 430°, gun-cotton from 350°, Schultz's sporting powder 385°, nitro-glycerin 360°, and percussion cap fulminate 340° Fah. These respective degrees of explosion mean, that when each is put in a vessel or room, they will explode when the temperature given is attained. But who can tell the exploding point under conditions of percussion—under a tap of the hammer, whether of metal, stone, or wood? Each explosive may have thrown around it all the precautions of safety, but, after all, mining men will have the article that will best subserve their interests, and, thus considering the subject, we can only indulge the hope that a proper regard for human life will not be overlooked by manufacturers and consumers, and that they will exercise those precautions which will lessen hazard and secure success to the greatest number.

Among the most hazardous of all the explosives claiming the attention of engineers, nitro-glycerin undoubtedly stands at the head, and its efficiency over that of its derivative, dynamite, is not sufficient, in our opinion, to compensate for the hazard involved in its use and transportation. We feel it our duty to express a decided preference for dynamite, where a very powerful explosive is required. The frightful accidents which have occurred from the use of nitro-glycerin, have no parallel in the history of any other explosive compound, and when we take into consideration the difficulty in enforcing care in its handling and packing, we do not hesitate to assert our opinion that its indiscriminate use should be prohibited by statute.

We see that some foreign papers take opposite ground in regard to safety attending the manufacture of the Schultz sporting powder, from that taken by the author of the series of articles which have been called in question. In order that our readers may judge for themselves, we publish, in another column, a description of the process by which it is made. The subject of explosive compounds is an important one, and worthy of the fullest discussion.

COMPLETION OF THE PACIFIC RAILWAY.

The announcement is made that the Pacific Railway is completed. Amid the conflicting statements in regard to the manner in which the work has been performed, we know not whether the people ought to rejoice or to feel sorry. It is generally admitted that the road has been laid in an imperfect manner. Some will even have it, that it is a mere sham, only built as a matter of form to obtain the very liberal subsidies granted by the Government. This may be an extreme statement, but between those of the friends of the enterprise and its foes, there is room for no little fear that the immense franchise granted to the company has resulted in no adequate return to the people at large.

If this should prove to be the case, through want of vigilance on the part of the Government, we see no reason to find fault with the company. As business experts they would naturally give only what was demanded of them. The Government has had it in its power at any time to withhold its aid until the terms of the charter were complied with, and if the company have found pliant tools in the Government officials, who were willing to rob the people for their own profit, it was to be expected that they would use them.

We are confirmed more and more by daily developments in the belief that such enterprises should be either carried forward entirely by the Government, or accomplished solely by private enterprise.

The system of making appropriations in aid of such works, is a vicious one, leading naturally to official corruption and fraud.

It is loudly asserted, in many quarters, that the company have made too much money, and that they have at least attempted to cheat the Government. If the latter part of this charge is true, and if it means that the acceptance of inferior work has been sought by concealment of deficiencies, it ought to divest the corporation of all the privileges it holds under its charter. The former is no charge at all unless coupled with dishonesty. The right to make money, if it can be made honestly, is one nobody has hitherto denied either individuals or corporations. If the company have built as good a road as they contracted to make, we care not how much profit rewards their enterprise. If they have made their money dishonestly, and by performing their work in a manner inferior to the provisions of their contract, a remedy for the people ought not to be difficult to find, a remedy that will teach future solicitors for Government help, that it is dangerous to trespass upon the rights of the people. If, however, the cheating has been done through the honorable gentlemen who were stationed to guard the public purse, the public will transfer their wrath from the company to these offenders.

We should not envy the position of those gentlemen should the people find that they have permitted themselves to be derelict in their duty in this matter.

We give, on another page, a number of views taken from different points along the line of this road, which will interest those unacquainted with the peculiar features of the section it traverses.

AFFAIRS AT THE PATENT OFFICE.

Commissioner Fisher takes hold of the affairs of the Patent Office with an earnest purpose to effect a speedy reform of past abuses. He recently invited the Examiners and Assistant Examiners to his room, where some time was spent in interchange of views regarding the business of the office as it relates to the examination of cases, and he proposes to dispense with some of the present useless forms, in order to facilitate the procuring of patents. The Commissioner gave some opinions for the guidance of the Examiners, in order to secure more uniformity in the general practice of the office.

The following removals were made—viz., N. Peters, Examiner; D. Curle and C. L. Coombs, First Assistants; T. H. Sypherd, Second Assistant. Appointments were made as follows: John C. Tasker and George A. Nolen to be Examiners.

We are glad to learn that the present efficient Chief Clerk, Mr. Grinnell, is to be retained.

Mr. Tasker is a native of New Hampshire, and is a skilled and educated mechanic. He was, for several years, in charge of some of the most extensive works at Lowell, Mass; for the past three years has held a position as First Assistant in charge of the classes of wood working and of metal casting, and is said to admirably qualified for his new position. Mr. Nolan is a native of Massachusetts; was educated at Yale College, where he graduated with high honors, and was for some three years a tutor of mathematics and natural philosophy. He has been in the Patent Office as First Assistant about three years, and will make a most satisfactory Examiner.

J. W. Abert and J. H. Hawes have been appointed First Assistant Examiners; James Lupton and F. S. Lawson, Second Assistant Examiners. James Newlands and D. Wilson have been promoted from Second to First Assistant Examiners. W. A. Gutplim and A. R. Robinson have been promoted from temporary clerks to be Second Assistant Examiners. Michael Marley has been appointed chief Messenger in place of Chas. W. Thomas, resigned.

We are assured that these appointments will reflect credit upon the Commissioner and the Secretary of the Interior.

Commissioner Fisher has granted an extension to M. M. & J. C. Rhodes for their patent for a machine for leathering the heads of tacks. In the testimony taken in the case it was shown that over six millions of this style of tacks were used in the United States daily.

An interference case of some importance, in relation to a device for sharpening millstones, has also been decided by the Commissioner. The parties who were immediately interested were J. F. Gilmore, of Providence, Ohio, who had secured a patent, and George Hermon, of Paris, France. The claims of Hermon were sustained.

DUST.

At this period of moving, most people become familiar with the general appearance of dust, and the peculiarly disagreeable sensations produced by its getting into the eyes, nose, and mouth. Few pause to consider what it is or where it comes from. We repeat the passage, "Dust thou art and to dust thou shalt return," but we hardly realize that the almost impalpable particles which exert their pungent power to compel us to sneeze, or cough, or make the tears to run down our cheeks, may be composed of the same matter that constituted the body of some ancestor a thousand years ago, and for whom we never felt called upon to weep until now.

Our readers will recollect the significant query, "Who ate Roger Williams?" and how it originated in the discovery that the body of that resolute controversalist had been appropriated to the growth of a greedy apple tree, which, not content with the theft, mimicked with its roots the body and limbs it had devoured. Of course the fruit produced on this tree, doubtless eaten with satisfaction, some of it perhaps by the descendants of Roger Williams, contained the very matter which once was a living being; and the same matter may have been a million times exchanged and transported, so that the dust which is perhaps this moment provoking the reader to sneeze, may be a portion of that which once revolted against puritan persecution, and wended its way from the Colony of Massachusetts, to find a grave beneath a Rhode Island apple tree.

Dust is commonly regarded as being matter of death. But though upon examination with a powerful microscope we find it to contain myriads of skeletons of dead organic beings, we shall also find that we are not roaming in a microscopic grave yard merely. We shall find the reproductive bodies of the diatoms, about which so much has been written and said by microscopists as to whether they were plants or animals, finally resulting in the belief that they are plants. Ehrenberg has described several hundred kinds of diatoms found in atmospheric dust. There are also to be found encysted animalculæ and rotatoria, and their germs; spores or seeds of fungi, algæ, lichens, and other cryptogamic or flowerless plants, intimately mingled with particles, consisting of cells and portions of cells, of both animal and vegetable tissues, and finely comminuted mineral substances.

Among the latter, salts of sodium are some of the most generally diffused, although near bodies of salt water they are to be found in largest quantity, being carried into the air in the spray of oceanic waves, and afterward precipitated by the evaporation of the water which held them in solution. Silica, alumina, lime, and ox de of iron, are always found. Near manufacturing establishments there are always more or less of the materials used in the works to be found, as sulphur, oxides of the metals, and carbon deposited from smoke. In the vicinity of tanneries tannin may be found; and near dye-works, coloring matters.

Dust is so universally diffused throughout the atmosphere that no place within the limits of animated existence can be said to be free from it under ordinary circumstances. To remove it even from small quantities of air requires quite complex mechanical and chemical manipulations.

In regions subject to miasmatic diseases, organic matter is found in the greatest abundance in the form of spores. Its presence is determinable by a very simple test. Strong sulphuric acid has the property of freeing carbon from its combinations in organic substances. If a piece of wood be immersed in it it will be converted into charcoal. If then, a watchglass containing strong sulphuric acid, be exposed to the atmosphere the acid will after a time become blackened by the carbonization of the organic matter deposited upon its surface. It has been found that in malarial districts, sulphuric acid thus exposed becomes blackened much more readily than in other places, thus proving the presence of organic matter.

In view of these facts it will be seen that streets filled with dust, must be prejudicial to the sanitary condition of large towns, and that the laying of this dust by sprinkling, is more than a mere matter of comfort to their inhabitants. Our readers have been informed of the method adopted last year in London, *i. e.*, the use of solutions of deliquescent salts, to lay street dust, and of the success that attended the experiment. We have no doubt of the value of this method and urge its trial in the large cities of this country. The additional cost of the salts would probably be compensated for by the diminished necessity for frequent application, and the increased health and comfort of the people, as well as the saving to merchants of the damage to their wares, frequently a serious matter along dusty thoroughfares.

THE VELOCIPEDE IN EUROPE.

One of Hood's quaintest fancies is carried out in sober earnest in London, according to the London *Daily News*, which says: "The academy at which old boys were put out to board, and from which one of the pupils describes how his fellows cannot play at marbles because the game necessitates stooping, and their rheumatics are so bad; or how hoop is rendered impracticable by gout, or prisoners' base by asthma, or details equally incongruous—this description is realized almost literally at the velocipede riding schools. These abound in London just now. East, west, north, and south of the metropolis are lessons being given to men of all ages, with a decided run upon bald heads and gray hair among the pupils.

"Down St. Luke's Hospital way, and about midway between Moorgate station and that Goswell street which has become classical ever since the embarrassing scene which took place in it between Mr. Pickwick and Mrs. Bardell, is one of the best known of the velocipede schools. From ten in the morning till six at night it is very busy. A couple of broughams and several hansom cabs are waiting at the archway, leading to it out of Old street, at the time of the visit. Past these, and up a sort of court, and we are in a large factory, with crowds of mechanics busily at work. Velocipedes in various stages of progress are to be seen everywhere. They hang in thick rows like onions from the roof, they block up the floor, they are piled in pyramids against the walls. The majority are unfinished. Long lines of wheels, unvarnished and unpainted, are seasoning, while handles, seats, axle trees, and smaller wheels are being manipulated, or lie ready for use. There is as much scope for fancy about the decorations of a velocipede as in aught else, and whether one of the scores which were being made to order should be picked out with yellow or red as a relief to its dark body color was a subject of earnest discussion between two elderly officers during our stay. The guiding bar is one of the things upon which extravagance is expected to center. Already we were shown a very handsome one in burnished steel and with ivory handles as an 'extra,' and that 'we shall have to bring them out in silver before the season's over,' is an opinion confidently expressed.

"So far we have kept to the manufactory and its approaches. The riding school is beyond. The first-named place and the counting house adjacent have been full of signs of the sudden and enormous demand which has arisen for the last new hobby horse, while the school shows us how devotedly purchasers are qualifying themselves for riding it. Here is a stout country gentleman who has come up from a distant province for the sole purpose of receiving lessons. A stalwart attendant walks with him round the room, holding him on his velocipede, by keeping an arm firmly round his waist. The sitter keeps his head down and his knees in, as if he were attempting to master a particularly vicious and unmanageable young horse. His eyes are firmly fixed upon the wheels beneath him, his shoulders are up, his teeth are clenched, his hat is pressed resolutely over his eyes, and his entire demeanor is that of a man who sees his work cut out for him and who means to master it. At first his feet are allowed to hang uselessly down, while the attendant propels the velocipede by pushing it with his disengaged hand. The rider is directed to keep his attention to the handle, to balance himself by it, and to be careful at the turns.

"Round and round the vast bare chamber go the twain, the attendant walking slowly under his double task, and giving out instructions rather disjointedly for lack of breath, 'Give a looser hold to the handles, sir—(puff)—don't grip 'em as if you were afraid of tumbling off—(puff, pant, puff). I'll take care of that. (Pant.) Just feel 'em like; the lighter and gentler the better—(puff)—and whenever you feel your'r going over on one side, just turn an opposite handle, and you'll right yourself directly.' (Pant, puff, puff.) After a little time the novice is told to use his feet, and he then turns the wheels slowly for himself, being still held on by the attendant instructor. There are no fastenings for the foot—simply a rest which projects out from the axle trees; and whenever the handle is mismanaged, and the center of gravity lost, the rider comes to the ground on his feet, and so stands up in a very comic way. It is as if a very tall man were on a pony so small that he can at any moment allow it to run between his legs. But there is nothing corresponding to the stirrup in any way; and one of the most striking things we noted was the readiness with which even the least expert of novices could place himself at ease, by freeing himself altogether of the machine. Two such lessons as we saw given, would, we were assured, enable the gentleman before us to manage a velocipede for himself, and from this stage to a complete mastery, is a mere question of practice."

At a recent meeting of the Society of Inventors, in London, a paper on velocipedes was read by Mr. C. B. King, C.E. He began by noticing the gradually increasing public interest in the velocipede movement in England, as well as in America and France; and having given to a native of the latter country the credit of the invention of the bicycle half a century ago, he mentioned the names of various improvers from that time down to the present. One of their machines weighed half a tun, and would carry twelve persons; in another the brake, one of the most valuable features of the modern velocipede, was introduced. In order to bring them into general use, manufacturers should pay attention to springs, proportion, and finish. The exercise might be called "walking made easy," with the advantage of taking ten feet at a stride in place of two. He attached no importance to the supposed danger to pedestrians, inasmuch as, with ordinary skill, a velocipedist can stop more suddenly than he could pull up a horse. In America, with their usual appreciation of new ideas, they had established "Velocinasiums," and had invented such terms as "wobblers," "shavers," and "tumblers," to describe the several degrees of inefficiency of management. He urged, however, that, as a means of rapid and easy locomotion, the velocipede was well worthy of serious attention.

During a discussion which followed, it was suggested that inventors should endeavor to provide velocipedes suitable for ladies and children, as well as cheaper vehicles, on which working men could go to their employment, as some do in Paris. It was stated, however, that velocipedes are not fitted for London streets, and regret was expressed at their exclusion from the parks. Mr. Velogne said he had done the ninety miles between Paris and Rouen on a bicycle in one day. A mile had been done on good road in two minutes and four seconds: but the keeping up of so high a rate of speed was altogether exceptional. Eight or nine miles an hour would be done by an ordinary skillful man without great exertion. It was objected that at a tollgate on the Brighton road, velocipedes are charged under the same category as mules and donkeys. After the meeting, several bicycles were started, and did good work in Trafalgar Square, the Strand, and Fleet street

At a sensation velocipede exhibition given, recently in Boston, one Master John Reardon is stated to have ridden a velocipede with gooved wheels along a rope stretched from one end of the rink to the other, about twenty feet from the floor. In addition to this a trapeze was hung to the velocipede and Mr. Harry M. Stevens performed a variety of feats upon it, while the velocipede was moving along the rope. Two little girls, aged three and five years, rode velocipedes around the rink with the ease of experts.

Mr. Henry C. Platt, of Augusta, Ga., sends us a drawing copied with the following extract from page 434, Vol. 5, of the "Second American Edition of the new Edinburgh Encyclopedia," printed in the year 1814.

"In the 'Triumph of Maximilian,' a work executed in the years 1516, 1517, and 1518, curious readers will find plates of various carriages or cars, some drawn by horses, some by camels, some by stags, others impelled forward by means of different combinations of toothed wheels worked by men. Of one of the most remarkable of them we give an exact copy in plate CXXXI (of which the drawing is a *fac simile*)."

The drawing is extremely curious, and the machine is evidently a monocycle. We have sought in vain for the work alluded to in the public libraries of this city. Is it available to any of our correspondents? If so we shall be happy to hear from them.

Editorial Summary.

A SPRIGHTLY young paper published at Trenton, N. J. called the *Young Men's Monthly*, is devoting considerable space to the exposure of "Swindling in New York." Mayor Hall has also given a note of warning through the press against the numerous vampires who prey upon the credulity of the innocent and unsuspecting, but all labor bestowed in that direction will be temporary until people learn that the only safe course for them to pursue is to transact their business with reputable business firms. Gift enterprises are generally swindles; a great majority of advertised patent medicines are positively injurious to those who take them, and the public should beware of all advertisements that offer to send something for almost nothing. Such "catch-traps" are so numerous that we cannot undertake to name them; but of one thing our readers may rest assured—viz., that what cannot be purchased either of or through a respectable tradesman, is ordinarily not worth looking after.

Dr. Brown-Sequard, reports a curious case of a dog which had just died, having fresh blood passed into the carotid. The dead animal was revived, stood on his feet, wagged his tail, and lived over twelve hours, when he died again.

The above item is going the rounds of the newspapers. The error about the matter consists in the statement that the dog was actually dead. We undertake to say that the dog was but apparently dead. The simple introduction of fresh blood into the carotid of any dead animal would have no effect whatever.—We make this assertion on the authority of the New York *Medical Journal*, which announces in its last issue the death of a child under peculiar circumstances, adding sapiently to the statement that it was dead, *it could not be resucitated*.

THE *English Mechanic* in a recent issue discusses the defects in the British Patent System, and calls loudly for reform It wants a cheaper system, one that will make patents more valuable, and less assailable by those who, lacking genius, cultivate cunning and roguery.—It appears that there is now a surplus patent fund amounting to the sum of $2,000,000, out of which it is suggested that an industrial and inventor's museum should be established and endowed, and that the present patent fee should be reduced one-half. The gross injustice of charging such exorbitant fees is fully shown by the enormous surplus which has been accumulated under the present system. We therefore hope that the suggestions of our cotemporary may prevail.

THE work of clearing the obstructions at Hell Gate have come to an end for the present. Out of the general appropriation of $1,500,000 made by Congress for river and harbor improvements, the paltry sum of $80,000 only was allowed by the Secretary of War for this important work. We understand that Mr. Shelbourne, who was employed to blast out "Frying Pan" rock, has expended $20,000 out of his own pocket in preliminary experiments and preparations. This work is one of great national importance and ought to be vigorously pushed forward.

PROFESSOR POWELL, who departed nearly one year ago in charge of the scientific expedition to explore the Rocky Mountains, has returned to Bloomington, Illinois, for the purpose of procuring four portable boats in Chicago, which are to be carried out on the Pacific railroad as far as possible. The party are to embark in these boats at the headwaters of Green river, and follow that and other streams into which it empties to the Pacific Ocean. The party will spend some ten months. Mrs. Powell has returned to Bloomington, ana will not accompany the second expedition.

PROTECTING BIRDS.—The Legislature of Wisconsin, at its last session, passed a law making it a penal offense to destroy or kill, by any device whatever, brown-thrushes, blue-birds, martins, swallows, wrens, cat-birds, meadow-larks, or any other insect-eating birds, anywhere wthin two miles of any incorporated city or village in that State. The Legislature of Pennsylvania also passed an act, afterward approved by the Governor, which imposes a penalty of twenty-five dollars for the killing of any insectivorous bird, one-half of this fine to be paid to the informer.

THE appropriation for the survey of the lakes this season is $100,000—much below the amount appropriated for 1868. The organization of the surveying parties has not yet been completed. It is proposed to finish the survey of Lake Superior. In addition to the other work, it is intended to continue the operation of gaging the rivers connecting the lakes, with reference to the supply and outflow of water. The problem is one of very great general interest.

THE return of Dr. Livingstone, the veteran English traveler, was expected about four month since, but up to the present moment his movements are wrapped in mystery. At last accounts, December 14, 1867, he was proceeding along the eastern shores of lake Tanganyika, but no idea can be formed respecting his subsequent course. His fate is regarded with some degree of uncertainty.

ENGLISH coach builders are beginning to announce that they are prepared to build light carriages on wheels imported from America. They have discovered at last that the Americans are half a century ahead of them in the matter of carriage building.

HONOR TO AN AMERICAN CITIZEN.—A telegram from Paris, May 4th, announces that the Geographical Society of France have decreed a gold medal to Dr. Hayes, of the United States, for his eminent services in the work of Arctic exploration and discovery. That day the president of the society, with a deputation of members, waited upon General Dix, the American Minister, and presented the medal, requesting him to transmit it to his distinguished countryman, and accompanied the presentation with an earnest aspiration for continued friendship between France and America. General Dix, in reply, thanked the president for his friendly expressions in regard to his country, and said it was a true pleasure for Americans to see France and the United States working together in traditional friendship for the promotion of discovery, science, and general progress.

CHIMNEY SWEEPING EXTRAORDINARY.—The Amsterdam Soot Company, is the name of an association of chimney sweeps in Amsterdam, Holland. The director has the title of "Royal Chimney Engineer." The managing agent is a distinguished advocate. The company have also a set of commissioners designated by the government, comprising an inspector of public works, a great diamond merchant, already president of one industrial association, and an architectural engineer, who is also a manufacturer. The company has for it' business the sweeping of chimneys and trade in soot.

SCIENTIFIC EDUCATION.—The Lafayette College, Easton, Pa., has established a scientific department, A. Pardee, of Hazelton, Pa., having generously placed the sum of $200,000 in the hands of the trustees for that purpose. The department embraces a thorough technical course of study, with an able corps of professors. We are pleased to notice that a number of scholarships have been placed at the disposal of the faculty, for the benefit of young men of talent and good moral character. Application for these scholarships should be made to the President, W. C. Cattell, D. D.

THE manufactures of Baltimore are growing. The *Sun* of that city says: "In different quarters new establishments are appearing, and the indications are of a steady advancement of Baltimore as a manufacturing city. Baltimore has long been celebrated for the building of locomotives and marine engines, for her machine shops, rolling mills, agricultural implement establishments, and other branches of mechanical production, but there are other manufactures of more recent growth and of considerable importance."

WITH microscope and blowpipe, Mr. Sorby is developing a new method for the examination of minerals. He fuses a small portion (a bead) of the substance to be examined in borax, adds various re-agents according to circumstances, keeps the bead at a dull red heat for a short time, when crystals appear characteristic of the substance, and in some instances singularly beautiful in form. The whole process can be seen and the crystals identified under the microscope.

THERE is no other spoken language so cheap and expressive by telegraph as the English. So the electric wires are becoming teachers of our mother tongue in foreign countries. The same amount of information can be transmitted in fewer English words than French, German, Italian, or any other European language. In Germany and Holland especially, it is coming to be a common thing to see telegrams in English, to save expense and ensure precision.

PROFESSOR NICKELS, of the Faculty of Sciences of Nancy, in France, recently met his death in a very peculiar manner —by accidentally inhaling the vapor of concentrated hydrofluoric acid, while engaged in making experiments to isolate fluorine. Professor Nickles was the author of many valuable published scientific works.

Commissioner of Patents.

Grant is making many judicious appointments, but none more fit and appropriate than that of Col. S. S. F sher, of Cincinnati, as Commissioner of Patents. Col. Fisher is one of the most able and successful patent attorneys in the country. He is the author of "Fisher's Reports," the only compilation of reports upon patent causes n any language, and he has been occupied exclusively in patent practice for many years. He understands all the ins and outs of the Patent Office; its uses, abuses, and greatest nee ls; and he will make his administration illustrious by instating the Patent Department upon broader and higher grounds than it ever before occupied.

It should be stated that Col. Fisher did not seek nor desire the office, and is obliged to make very great pecuniary sacrifices in receiving it. In this case, like many others under the present administration, the *office sought the man*, and we have no hesitation in saying, that it sought and has secured the best man that could be found on the continent.

[We copy the above from the *Sorgo Journal*, published at Cincinnati, the home of Col. Fisher. It fully confirms all that we have said respecting him, and inventors have reason to thank General Grant for his careful consideration of their interests in making this selection.

Flooring Tiles and Slabs made from Slate Refuse,

The immense accumulation of refuse in the slate quarries has induced M. Sebille to convert it into paving tiles and other useful articles. The slate, with a certain proportion of river sand and pitch, all reduced to powder, is heated by steam, then poured into molds of the form required, and then subjected to hydraulic pressure. The tiles or slabs are then cooled in water, and the upper surfaces ground smooth if required. The density of these slate tiles varies between 2·2, and 2·5; they are not readily affected by acid or alkaline solutions, and will bear a temperature of about 160° Fah. without injury. The process is said to be cheap, and the artificial stones produced are harder than the slate from which they are made.

DECISION OF THE COMMISSIONER OF PATENTS ON DESIGN APPLICATIONS.

U. S. PATENT OFFICE, April 30, 1869.

In the matter of the application of Jason Crane for a patent for a design for a fur-set box. On appeal to the Commissioner of Patents.

The applicant designed a paper box, with compartments conveniently arranged for holding each of the articles composing a lady's set of furs. It is neat in appearance, as well as convenient in use, and has commanded a preference in the market over other boxes for that purpose.

It was at first claimed that the new arrangement of the compartments was the proper subject of a general patent. This was denied by the office on the ground that, although skill and good taste had been displayed in designing the article, it did not come up to what might properly be termed "a new invention."

A more limited patent is now asked for, to wit, for the design; and the question is presented, whether the case comes within the statute relating to design patents.

The construction which has been given to that act by the Office, ever since its passage in 1842, is, that it relates to designs for ornament merely; something of an artistic character, as contra-distinguished to those of convenience or utility. It was upon this view of the statute that the application was rejected by the Examiner in charge and, on appeal, by the Board of Examiners-in-Chief. No judicial construction has as yet been given to this part of the act. Considerable reflection upon the subject has satisfied me that the objects and intent of the statute extend beyond the limit assigned to it by the Office. It provides, among other things, that any citizen, "who, by his industry, genius, effort, and expense, may have invented or produced any new and original design for a manufacture" or . . "any new and original shape or configuration of any article of manufacture" may obtain a patent therefor. It does not say "ornamental design" or "artistic" shape or configuration, and I am unable to perceive any good reasons why designs for utility are not fairly or properly embraced within the statute as well as those relating to ornamentation merely.

The line of distinction between what is useful and what is merely ornamental, is, in some cases, very indefinite. By some it is said that any form or design that is most useful is also most pleasing.

It would be impossible, in the view of such persons, to make any improvement in utility that did not at the same time add to the ornamental and artistic.

I can perceive no necessity for the distinction. There is a large class of improvements in manufactured articles that are not regarded as new inventions or as coming within the scope of general patent laws. They add to the market value and salability of such articles, and often result from the exercise of much labor, genius, and expense. They promote the best interests of the country as well as the creations of inventive talent. It seems to me to have been the intent of Congress to extend to all such cases a limited protection and encouragement.

Whenever there shall be produced by exercise of industry, genius, effort, and expense, any new and original design, form, configuration or arrangement of a manufactured article, it comes within the provisions and objects of the Act creating design patents, whatever be its nature, and whether made for ornament merely or intended to promote convenience and utility.

The construction given to the statute by the Board of Appeals seems to me to be erroneous, and I accordingly overrule their decision.

ELISHA FOOTE, Commissioner.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

Improved ystems of extraction by the use of steam power appears to have exercised a beneficial influence on the mining industry of Prussia. In 1837 there were 1,587 mines worked in Prussia, giving employment to 33,161 miners. In 1867 this number had increased to 2,452, with 48,351 miners. The total value of the mineral production, which in 1837 was 833,932*l*, in 1867 amounted to upwards of 8,565,000*l*.

Jay Gould has notified the Postmaster General that unless the Department increases the pay for the Erie railroad service from $180,000 to $330,000, he shall refuse to carry the mails. The Postmaster General has informed Mr. Gould that this exorbitant demand cannot be acceded to. The pay now received by the company is the same per mile per annum as received by the Central and other roads.

A writer in *Hearth and Home* has found the best way to take starch out of bleached goods to be as follows "Make strong soap suds, and dip the goods in it, and hang them out to dry without wringing. They will be perfectly soft and free from starch, and nice to work either by hand or machine.

A railroad route has been surveyed from Pittsfield, Mass., to Hartland and thence to St. Albans, Vt., about two miles beyond Hartland. The route is very level, and it is estimated the road could be built for $16,000 a mile. The legislature has authorized the towns of Hartland and St. Albans to loan their credit for twenty per cent of their valuation, in aid of the enterprise.

It is stated that the committee of the New Orleans Chamber of Commerce invite proposals for deepening the water at the mouth of the Missis ippi. The committee are also instructed to endeavor to obtain from the Government the dredge boat now in use, with the balance of the appropriation yet unused, for deepening the passes.

A railroad tie, of polished California laurel, mounted on each end with solid silver, accompanied by a spike of solid gold, costing $300, was forwarded from San Francisco, on May 4, to the end of the Central Pacific Railroad. It is the last tie, and was to be laid by Leland Sanford, on Saturday, May 8, thus completing the Pacific Railroad.

The *Vancouver Register* says that an extensive coal bed has been dicovered on the east fork of Lewis River, twenty miles from Vancouver. The vein is fourteen inches thick and seven feet in width.

A large amount of lumber and iron ore will be landed at Michigan City, Iowa, this season. One contract is for 7,000 tuns of ore; and firms in Lafayette have contracted for the delivery of 4,000,000 feet of lumber and 3,000,000 shingles and lath.

A company has been organized, with the capital subscribed, to construct a telegraph line from St. Louis, through Texas, to the Pacific coast. Some of the parties were recently in Washington to perfect the arrangements.

At the Royal Bronze Foundery, at Munich, Bavaria, among other works in progress is Rogers' monument for the soldiers of Rhode Island, which, by the contract has to be finished and delivered at Providence about a year from this time.

The Commissioner of Internal Revenue has decided that the conditions printed on blanks for telegraphic messages are in the nature of an agreement and must have a five cent stamp.

In 1848 there were 4 247 patents in force in England. In 1868 the number had increased to 11,369, including 11 "prolongations."

Boston firms send about 17,000 casks of nails a month for building purposes all over the country, and dispose of nearly 2 000 each month at home.

In 1861, the boot and shoe manufacture of Baltimore amounted to only 500 pairs weekly; now, over 16,000 pairs are made in the same time, and the business is still increasing.

The iron founderies of Troy, N. Y., are all running on full time and employ an unusually large number of men.

Several locomotives were shipped lately from Paterson, N. J., for Minnesota and other Western roads.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

851.—TRACTION RAILWAY.—Wm. A. Sutton, New York city, and Eugene Crowell, San Francisco, Cal. Feb. 4, 1869.

751.—ATTACHMENT FOR ADJUSTING CORDS FOR HANGING PICTURES, ETC.—H. o'Heureuse, San Francisco, Cal. March 11, 1869.

844.—WATERPROOF OVERSHOES.—A. O. Bourn, Providence, R. I. March 9, 1869.

856.—APPARATUS FOR MEASURING LIQUIDS.—G. B. Massey, New York city. March 20, 1869.

914.—MACHINERY FOR FOLDING PAPER.—S. C. Forsaith, Manchester, N.H. March 25, 1869.

915.—MACHINERY FOR PRESSING OIL, TOBACCO, ETC.—Enoch Thomas, Craigsville, and R. C. Walker and S. R. Hodson, Parnassus, Va. March 25, 1869.

919.—ELECTRIC CLOCK.—S. A. Kennedy, Attleborough, Pa. March 25, 1869.

940.—BLOWING APPARATUS.—B. F. Sturtevant, West Roxbury, Mass. March 29, 1869.

941.—HORSESHOE NAILS, AND IN MACHINERY EMPLOYED IN SUCH MANUFACTURE.—S. E. Chase, Boston, Mass. March 29, 1869.

841.—WEIGHING SCALES.—Peter Falardo, Danbury, Conn. March 19, 1869.

848.—MOTIVE POWER FOR SEWING AND OTHER MACHINES.—Jacob Zuckerman, San Francisco, Cal. March 19, 1869.

857.—MOTIVE POWER ENGINES.—J. E. Culver, Hudson, N. J. March 20 1869.

830.—HAY-TEDDING MACHINE.—L. H. Tasker, Boston, Mass. March 22 1869.

873.—CHAIR.—J. E. Emerson, Trenton, N. J. March 22, 1869.

875.—MACHINERY FOR BURRING AND MIXING PAINTS, ETC.—Robert Poole Baltimore, Md. March 22, 1869.

887.—MACHINERY FOR MAKING MATCH SPLINTS, ETC.—F. de Bowens Philadelphia, Pa. March 23, 1869.

888.—HEATING OF CARRIAGES, VESSELS, BUILDINGS ETC.—W. L. Burton Richmond, Va. March 24, 1869.

896.—MECHANISM FOR WORKING ORDNANCE.—J. B. Eads, St. Louis, Mo. March 24, 1869.

912.—MACHINERY FOR TILLING LAND.—R. W. Heywood, Baltimore, Md March 25, 1869.

933.—PROCESSES AND APPARATUS FOR EXTRACTING OLEAGINOUS MATTER FROM VEGETABLE, ANIMAL, OR MINERAL SUBSTANCES, IN THE PREPARATION OF MATERIAL FOR DISTILLATION, ETC.—Thomas Sim and E. S. Hutchinson, Baltimore, Md. March 27, 1869.

937.—BREECH-LOADING FIREARMS AND CARTRIDGES THEREFOR.—Gustav Bloem, Dusseldorf, Prussia, and Ernest Scheidt, New York city. March 29 1869.

944.—STEREOSCOPE.—J. F Adams, New York city. March 29, 1869.

946.—SEWING MACHINE.—J. A. House and H. A. House, Bridgeport, Conn March 30, 1869.

956.—DISTILLING HYDROCARBON OILS.—Henry Grogan, Flatbush, N. Y. March 30, 1869.

957.—SEWING MACHINE TABLE.—Singer Manufacturing Co. (Incorporated) New York city. March 30, 1869.

981.—ENGRAVING AND CHASING ARTICLES OF METAL.—Thomas Lippiatt Orange, N. J. April 1, 1869.

990.—HAT.—Henry Herbert, Jersey City, N. J. April 1, 1869.

1,004.—COAL AND GRAIN BOAT ELEVATOR.—S. K. Hoxsie, Philadelphia, Pa April 2, 1869.

1,017.—BREECH-LOADING FIREARM.—Everett Boyd and P. S. Tyler, Boston Mass. April 3, 1869.

NEW PUBLICATIONS.

A Handy Book for the Calculation of Strains in Girders and Similar Structures, and their Strength. Consisting of Formulæ and Corresponding Diagrams, with numerous Details for Practical Application, etc., etc. By William Humber, Assoc. Inst., C. E., author of "A Practical Treatise on Cast and Wrought-Iron Bridge Construction," etc., etc. New York: D. Van Nostrand, Publisher, Nos. 23 Murray and 27 Warren streets.

The scope of this work is to give, in a concise and convenient form, formulæ for bridge and girder calculations, without giving more than is absolutely necessary for the complete solution of practical problems. A prominent feature of the work is the extensive application of simple diagrams to such calculations, involving only the use of the parabola and right lines. The work is a small octavo, and very conveniently arranged for reference, with numerous illustrations of joints for timber and iron structures, various sections of girders, etc., etc. We have not found time to examine minutely the various formulæ given, but the work is undoubtedly a valuable publication.

Transations of the Wisconson State Agricultural Society. With the Report of the State Horticultural Society and Condensed Reports on the International Exhibitions of 1862 and 1867. Vol. VII., from 1861 to 1868, inclusive. Prepared by J. W. Hoyt, Secretary.

We are in receipt of the above volume by the courtesy of Secretary Hoyt, and find therein much interesting matter, some extracts from which we will, in good time, lay before our readers.

Primeval Man. An Examination of some Recent Speculations. By the Duke of Argyll. George Routledge & Sons, No. 416 Broome street, New York city.

The author of this work is doubtless one of the ablest thinkers in Europe, and he has already given practical evidence of his ability in book making by the publication of a work on "The Reign of Law," which has received the commendation of the English press. The present work discusses the origin and antiquity of man and his primeval condition, reviewing the opinion of Sir J. Lubbock upon "The Early condition of Mankind," and Archbishop Whatley's "Origin of Civilization." It therefore has to deal with questions which touch upon the profoundest problems of our nature and of our history, and is altogether a very interesting and instructive work, one that all may read with profit. Price, $1·50.

We have received from the American Tube Works, Boston, Mass., a very neat specimen of advertising in the shape of a pocket-book, containing mechanical tables of value and other statistical matter, and entitled "Pocket Companion for Mechanics, Machinists, and Engineers." It is bound in morocco, with pockets for bills and papers, and is a very neat and useful article.

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; beside, as sometimes happens, we may prefer to address correspondents by mail.

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

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

A. H. C., of——wishes to know the amount of bituminous coal usually consumed in heating one tun of nail plate, we suppose he means during the cutting process; can any of our correspondents give the information?

J. E. B., of Mass.—Congress adopted the meter as a standard of measurement, July 27, 1866.

D. B., of Ca.—The substance used for gumming stamps is gum dextrine. It is applied like other similar substances.

L. V. B., of N. C.—The best thing to remove rust from needles is the common method of scouring them, by sticking them repeatedly in a small bag of fine emery.

G. B. F., of M. T.—We were well aware of the fact that Stringfellow exhibited a small engine at the Aeronautical Society's Exhibition in London, as we noticed it in the Scientific American, at the time; but no such engines can be obtained at the present time. The journal to which you refer is in the habit of taking our replies to correspondents and publishing them as its own.

E. R., of N. C.—There is no machinery in use operating upon the clock principle, that is capable of driving a watchmakers lathe. A small, cheap, and efficient power is much wanted for light work.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

Machine for Engraving Calico Printers' Rolls.—John Hope and Thomas Hope, of Providence, R. I., has applied for an extension of the above patent. Day of hearing, Aug. 2, 1869.

Sewing Machines.—James Harrison, of Jamestown, N. Y., executor of the Estate of James Harrison, Jr., deceased, has applied for an extension of the above patent. Day of hearing July 12, 1869.

Straw Cutters.—D. C. Cumings, of Smithville, N. J., has petitioned for [illegible]nsion of the above patent. Day of hearing, July 19, 1869.

Recent American and Foreign Patents.

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

Brake and Horse Holder.—G. B. Douglas, Sedalia, Mo.—This invention has for its object to furnish an improved brake, which shall be so constructed and arranged as to be self-locking, and at the same time serve as a horse holder for checking the horses should they start when left alone.

Sled Runner.—G. W. Hatch, Parkman, Ohio.—This invention has for its object to furnish an improved sled or sleigh runner, which shall be cheaper in construction, stronger, and more durable than the runners constructed in the ordinary manner.

Churning Apparatus.—S. S. Allen, Belvidere, N. Y.—This invention has for its object to furnish an improved apparatus for operating a churn, which shall be so constructed and arranged as to do its work quickly and thoroughly, bringing the butter in a very short time.

Log Carrier.—Calvin Taylor, Handsborough, Miss.—This invention has or its object to furnish an improved machine for carrying logs, which shall be so constructed and arranged that a much greater amount of timber may be carried with the same team than can be carried in any of the ordinary modes.

Heater.—Michael Lehmer, Oregon, Mo.—This invention has for its object to furnish an improved heater, which shall be so constructed and arranged as to furnish a large amount of heating surface, so as to utilize all the heat from the products of combustion before they pass off into the chimney.

Fire Grate.—George Williamson, Milwaukee, Wis.—This invention has or its object to improve the construction of fire grates, in such a way that when the grate is agitated, the ashes may be shaken down from above the entire surface of the grate, instead of being displaced only around the edges of the grate, as is the case with grates constructed in the ordinary manner.

Valve Gear for Hydraulic Presses.—Thomas Harbottle, Brooklyn, N. Y.—The object of this invention is to obtain a simple, and effective automatic valve gear for hydraulic presses, whereby the check valves will close instantly and automatically at the end of each stroke of the pump, and each of the relief valves will duly perform their respective functions without affecting the operation of the other check valves or relief valves connected with the same pump but different presses.

Lamp.—Solomon P. Smith, Waterford, N. Y.—The object of this invention is to provide for public use, a lamp in which a blast of air is supplied to intensify combustion, the parts which create and sustain the blast being so constructed as to operate without any of that disagreeable rattling and clattering that has heretofore prevented lamps constructed on the blast principle from coming into general use.

Velocipede.—Hiram T. Metzgar, Salem Cross Roads, Pa.—In this invention a novel method of propelling velocipedes is introduced, and the several parts are adapted to practical operation in connection therewith.

Horse Hay Fork.—Samuel T. Nigh, Leitersburg, Md.—This invention consists in combining with the two tines of a horse hay fork, a certain elastic curved box, and a certain central key rod, in such manner as that the tines may be locked when spread apart to their fullest extent, so as that one may serve as a handle for forcing the other into the hay.

Horse Hay Rake.—S. P. Smith, Waterford, N. Y.—This invention relates to that class of horse hay rakes, in which wooden teeth are employed, and its object is to construct the rake in such a manner as to render it more perfectly adjustable to the inequalities of the ground and the character of the work than heretofore.

Mule Saw Mill.—L. Morrison and A. G. Harms, Allegheny City, Pa.—This invention relates to certain improvements in the manner of hanging and adjusting reciprocating saws, so that the same will operate and be regulated with ease and without any difficulty. The invention consists in providing for a lateral adjustment of the upper saw guides for the purpose of giving the saw more or less throw; also, in making the wrist on the lower saw buckle adjustable more or less far apart from the lower saw pivot.

Buckle.—F. C. Richer, Gilmer, Texas.—This invention relates to a new buckle, which does not require to be sewed to either of the straps which it is to connect, and which will securely fasten and hold the said straps or bands in any desired position. The invention consists in the use of a buckle which has four transverse slots, with teeth on the inner cross bars, and in providing a buckle with slotted end bars, that is to say, with horizontal apertures through the ends, through which the strap to be held is passed.

Method of Producing from Printed Paper New Plates for Reprinting.—Charles Vogt and Christian Vogt, New York city.—The object of this invention is to devise a method for producing printing plates from printed paper, so that by means of such blocks, or plates, the design on the paper can be reproduced or reprinted on other paper or fabric. By this method, old, valuable, and difficult engravings, can, from single specimens, be transferred to metal plates and be copied with great accuracy. A new branch of industry will thus be established and the productions of renowned artists will become accessible to all.

Dough Rolling Machine.—H. Goodwin and C. H. Bennett, 2d, South Berwick, Me.—This invention relates to improvements in apparatus for rolling dough into thin sheets for pie crust, and also laying it upon the tops of a pie or in a vessel, as may be required.

Envelope Opener.—W. H. Mantz, Centralia, Ill.—This invention relates to a new instrument for opening envelopes and for removing letters therefrom. The invention consists of three plates, united by a common pivot, the two outer plates being furthermore connected by rivet or otherwise so that they cannot turn separately on the pivot, while the middle plate which carries the cutter can be swung out to allow the sharpening of the tool. The outer plates may be extended beyond the cutting plate to form a pair of clamps for grasping a letter and withdrawing it from an opened envelope.

Monkey Wrench.—F. C. Richer. Gilmer, Texas.—This invention relates to a new monkey wrench, which is operated by turning the handle, and has for its object to arrange as few parts in as simple a manner as possible, so that the device will be substantial and not apt to get out of repair. The invention consists chiefly in swiveling the handle to the shank of the lower jaw, and in screwing it upon the screw shank of the upper jaw so that it will, when turned, cause the lower jaw to move longitudinally in the desired direction. The shank and body of the lower jaw are hollow and fit upon the polygonal upper part of the upper jaw shank, so that they cannot turn with the handle, but merely move longitudinally.

Brick Machines.—Asa Morgan, Cedar Bayou, Texas.—This invention relates to improvements in brick machines, whereby it is designed to provide a simple and effective machine that can be constructed cheaply. It consists mainly in the arrangement of the presses and the slide for delivering the filled molds, and the means of operating them.

Looms.—Wm. Rosseter, Accrington, England.—The object of this invention is to provide an improved arrangement of means for changing self-actingly the shuttle in which the weft is broken or absent for another shuttle with the weft ready for weaving without stopping the loom.

Beehive.—R. P. Starbuck, Gallatin, Mo.—This invention consists in making the separate frames, with which the interior of a beehive is sometimes provided for the attachment of single combs, with zinc sides, for the purpose of keeping the combs cool; also, in providing the entrance with a protector for the purpose of excluding drones, and arranging swinging outlets in said protector for the purpose of letting drones out that may have gained access; also in a peculiar construction of moth traps; and also in inclining the bottom of the main compartment and providing it with an orifice covered with a wire screen through which the litter of the hive may escape.

Mill Bushes and Spindles.—John Williams, Sullivan, Ill.—This invention relates to improvements in mill bushes and spindles having for their object to provide an improved arrangement for tightening and lubricating the bearing surfaces of the spindle and the boxes.

Bearings for Vertical Shafts.—E. A. Dayton, Richmond, Va.—This invention relates to improvements in bearings for vertical shafts, designed to be applied either as steps for the ends of the shafts, or intermediate bearings, which said bearings are especially adapted to facilitate the lubrication of the shafts.

Churn Dashers.—Jas. M. Buchanan, Lawrenceville, Ill.—This invention relates to improvements in churn dashers, such as are used with the common hand-dasher churns, and consists in the construction of the same, in a manner calculated to produce greater agitation of the cream.

Feed-Cutting Attachment for Thrashing Machines.—G. W. Lee, Sandy, Ohio.—This invention relates to improvements in feed cutting apparatus, designed to provide a simple, cheap, and effective apparatus adapted for attachment to thrashing machines, and operated in combination therewith, in a manner to accomplish the work faster and in a better manner than can be done by cutting apparatus now in use.

Sadiron.—Mrs. Julie Dittrich, Hoboken, N. J.—The object of this invention is to construct a sadiron with a handle that can be readily removed, and with a shield by which the heat ascending from the iron is deflected away from the hand of the person using it. The invention consists in a novel manner of arranging a removable handle on the supports that project from the iron, and also in a novel method of suspending the shield from the said removable handle.

Uterine Supporter.—E. J. Fraser, M. D., Erie, Pa.—This invention consists in forming and applying a bell-shaped metallic ring, with supporting bows attached thereto, which ring is inserted and placed so that the base of the uterus is supported by, and rests within the ring.

Rotary Steam Engine.—Alpheus C. Gallahue, Morrisania, N. Y.—This invention consists in so constructing and arranging the parts that a continuous action of the steam upon the piston is obtained, and a uniform rotary motion is produced on the main shaft.

Spittoon Footstool.—John N. Morrison, Philadelphia, Pa.—This invention consists in forming a footstool with a hinged cover and so as to inclose a spittoon.

Circular Velocipede.—George J. Sturdy and Solomon W. Young, Providence, R. I.—This invention relates to a new and useful improvement in velocipedes, whereby they are reduced to their proper and legitimate function—that is, a medium of amusement and exercise for children and youths as well as for "children of a larger growth," adapting it for play grounds, lawns, gardens, and play rooms.

Automatic Cock for Filling Bottles.—E. Jeanjaquet, New York city.—This invention relates to a new and useful improvement in the method of filling bottles, or other vessels, from barrels, pipes, hogsheads, or other closed vessels, whereby the operation of drawing off the liquid contents of such barrels or vessels into bottles or other vessels is greatly facilitated.

Submerged Force Pump.—James H. Luddington, Bridgeport, Conn.—This invention relates to new and useful improvements in force pumps, which are operated when submerged in the water, as in wells and cisterns.

Velocipede.—John C. Smith, Brooklyn, N. Y.—This invention relates to a new and important improvement in the method of operating velocipedes, whereby they are propelled with greater ease, and whereby the limbs and muscles of the body are more generally brought into action than by any velocipede now in use.

Milking Stool.—Chas. F. Pollack and Nicholas Trickey, Theresa, N. Y.—The object of this invention is to provide a milking stool, which affords the means for holding the milk pail, and also for holding the tail of the cow so as to prevent the animal from annoying the person milking, by switching the tail.

Regulating Mast Hoops on Vessels.—Joseph Conway, Harrison, Md.—The object of this invention is to provide a cheap and simple device, which will prevent mast hoops from catching on the mast, and which will, by causing the hoops to slide smoothly up and down, greatly diminish the labor required to hoist and take in sail in fore-and-aft rigged vessels.

Pianoforte.—Daniel Stirn, Milwawkee, Wis.—In this invention a new form of sounding board and cast-iron frame, and a new arrangement of the sounding board with relation to the cast-iron frame, the strings, and the supports and fastenings for the latter, are employed for the purpose of giving greater volume, purity, sweetness, and brilliancy to the tone.

Gas Generator.—Josiah Jonson, Toledo, Ohio.—The object of this invention is to provide for public use a cheap, convenient, and substantial carbureter, the action of which can be so adjusted and controlled as to present a greater or less carbureting surface to the air, whereby the latter can be combined with any required proportion of inflammable vapor without changing the draft or quantity of air.

Paint Brushes.—F. P. Furnald, Jr., New York city, R. W. Champion, Brooklyn, N. Y., and I. N. Davies, Bergen City, N. J.—The object of this invention is to provide a more durable and economical connection of the handles and bushes of paint and other similar brushes than is afforded by the present construction.

Hay Elevating Apparatus.—O. E. Mable, Camden, N. Y.—This invention relates to improvements in hoisting apparatus for elevating hay and delivering it on to the bay, and consists of a tackle block, so formed that when the fork in its upward movement arrives at the said block from which it is suspended, the latter will become detached from its suspending device and permit the load to fall in a lateral direction upon the bay.

Cultivator.—J. M. Culver, Gilbertsville, Iowa.—This invention relates to improvements in cultivators, the object of which is to provide a light hand implement for garden use.

Screw Propellers.—Henrietta Vansittart, Richmond, England.—The object of this invention is to economize the power required in driving steam propellers for ships, or other vessels. This is effected by so modifying the form of the blades of screw propellers, as to cause them to act more effectually on the water and to prevent them from "churning" or uselessly stirring the water near the center of motion. The invention consists in an improved mode of determining the proper curvature of the blades, and of forming the said curves.

Starting and Stopping Cars.—G. W. Davis and Albert E. Smith, Providence, R. I.—The object of this invention is to provide a simple and effective means for stopping and starting railroad cars. It is designed more particularly for street cars, but the stopping device is also applicable to steam cars.

Neck Pad for Horses.—C. J. Fisher, Waukon, Iowa.—This invention relates to a new device for protecting the necks of horses between the upper ends of the collar, to prevent galling. For this purpose pieces of leather, cloth, or other material have heretofore been used, but without the desired success. Pads could not be made, as their inner faces could not be kept clear from wrinkles or protuberances, which are more injurious than the omission of a protecting device.

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89,546.—Corn Harvester.—B. F. Barney, Pontiac, Ill.
89,547.—Potato Digger.—L. L. Bettys, Ontario, N. Y.
89,548.—Spindle Step for Spinning Machines.—E. Blake, Chicopee Falls, Mass.
89,549.—Hot-air Furnace.—Nathaniel A. Boynton, New York city.
89,550.—Corn Sheller.—John Bowles, Augusta, Ga.
89,551.—Mouse Trap.—J. N. Bunnell, Unionville, Conn.
89,552.—Boot-blacking Machine.—Martin Burnell, Arundel, England.
89,553.—Rope Guide for Window Weights.—Edward Burnham, Framingham, Mass.
89,554.—Snow Plow.—Robert Bustin (assignor to himself, J. D. McDonald, and George Bedell), St. John, New Brunswick.
89,555.—Horse Rake.—Joseph Bohner, Alden, N. Y.
89,556.—Machinery for Planing.—John Casson, Sheffield Parish, England.
89,557.—Blind Stop.—W. A. Caswell, Providence, R. I.
89,558.—Tire Machine.—J. W. Cleveland, North Tunbridge, Vt.
89,559.—Saw Teeth.—Edward Colson (assignor to himself and C. B. Oakley), Fort Wayne, Ind.
89,560.—Cheese-hoop Follower.—Howell Cooper, Watertown, N. Y.
89,561.—Weft-stop Mechanism in Looms.—J. D. Cottrell, Hopedale, Mass.
89,562.—Medical Compound.—J. D. Curl and J. D. Bartlett, Mokena, Ill.
89,563.—Cartridge.—G. H. Daw, London, England.
89,564.—Fastening Handles to Tools.—J. M. De Witt Chicago, Ill.

89,565.—Plow.—J. M. Dormon, Claiborne Parish, La.

89,566.—Automatic Fan.—J. R. Dunn, Queens county, and G. B. Burroughs, Brooklyn, N. Y.

89,567.—Toy Velocipede.—Elijah Eaton, Hartford, Conn.

89,568.—Freeing Tool, Screw, and Jewel Setter Combined.—C. E. Evard, Leesburg, Va.

89,569.—Combined Measure and Funnel.—Joseph Fanyon, Providence, R. I.

89,570.—Device for Fastening Wagon Seats.—J. H. Fellows, Alba, Pa.

89,571.—Potato Digger.—W. A. Field, Schuylkill Haven, Pa.

89,572.—Wash Boiler.—Stephen Fisk, Winchester, Ind.

89,573.—Holdback.—W. Garrison and C. H. Stevens, Syracuse, N. Y. Antedated Dec. 3, 1868.

89,574.—Enameling Stone and Earthenware.—J. H. Giles, New York city.

89,575.—Wrench.—John Goodin, Centralia, Ill.

89,576.—Whip Socket.—G. H. Gregory, North Milton, Conn.

89,577.—Floor Clamp.—J. A. Haase, Philadelphia, Pa.

89,578.—Automatic Switch. — Samuel Hodkinson, Louisville, Ky.

89,579.—Flux for Extracting Precious Metals from their Ores.—W. W. Hubbell, Philadelphia, Pa.

89,580.—Automatic Feed Regulator for Lamps.—H. S. Hudson, Selma, Ala.

89,581.—Governor for Steam Engines.—R. K. Huntoon (assignor to himself and J. A. Lynch), Boston, Mass.

89,582.—Compound of Ivory Dust and other Materials.—J. W. Hyatt, Jr., Albany, and David Blake, Spencertown, N. Y.

89,583.—Watch-winding Device.—Isaac Ickelheimer, New York city.

89,584.—Mode of Guiding Velocipedes on a Single Track.—J. H. Irwin, Philadelphia, Pa.

89,585.—Sun Dial.—John Johnson, Saco, Me.

89,586.—Locking Nut.—C. F. Keller (assignor to himself, Wm. Balliet, and H. A. King), Nevada, Ohio.

89,587.—Sash Lock.—Geo. King, Frederick, Md.

89,588.—Apparatus for Making Illuminating Gas from Gasoline.—H. S. Maxim and Jas. Radley, New York city.

89,589.—Corn Separator.—E. McLane, Young America, Ill.

89,590.—Machine for Washing Hides and Leather.—H. N. Meeker, Smith's Mills, N. Y.

89,591.—Wash Boiler.—C. E. Miller, Indianapolis, Ind.

89,592.—Staddle Pipe for Hydraulic Gas Mains.—Peter Munzinger, Philadelphia, Pa.

89,593.—Forming Machine for Square Tin Cases.—J. H. Murrill (assignor to Murrill & Keizer), Baltimore, Md.

89,594.—Inhaling Apparatus.—E. W. Owen, Brooklyn, N.Y.

89,595.—Steam Generator.—W. S. Page and Richard East, Nine Elms Wharf, Nine Elms, England.

89,596.—Door Key.—Emery Parker, New Britain, Conn.

89,597.—Spinning Frame.—Samuel B. Parmenter, Lewiston, Me.

89,598.—Apparatus for Conveying Screw Blanks.—E. S. Pierce (assignor to National Screw Company) Hartford, Conn.

89,599.—Metal Binding for Oilcloth, Carpet, etc.—John Piper, Utica, N. Y.

89,600.—Lamp.—J. F. Sanford, Keokuk, Iowa.

89,601. — Hat-blocking Machine. — Julius Sheldon, New York city.

89,602.—Axle Skein.—Gottlieb Schreyer, Columbus, Ohio.

89,603.—Horse Hay Fork.—R. A. Smith, Washington Mills, N. Y.

89,604.—Carriage-sash Fastener and Supporter.—Wm. Stewart, Hartford, Conn.

89,605.—Horse Rake.—Sumner Stoughton, Windsor, Ohio, assignor to himself and Leverett Grover.

89,606.—Seeding Machine. — John H. Stringfellow, Richmond, Va.

89,607.—Toy Gun.—C. B. Thayer, Syracuse, N. Y.

89,608.—Plow.—S. R. Thompson (assignor to himself and Joseph Pinkham), New Market, N. H.

89,609.—Grinding Mill.—Almon Thwing, Hopedale, and C. H. Fowler, West Roxbury, Mass.

89,610.—Hot-air Furnace.—W. D. Titus, Brooklyn, N. Y.

89,611.—Machine for Raking and Cocking Hay.—Joseph Wadleigh, Chebanse, Ill.

89,612.—Cotton-bale Tie.—J. S. Wallis, New Orleans, La.

89,613.—Culinary Apparatus.—Benjamin Wardwell, Providence, R. I.

89,614.—Draft Equalizer.—S. H. Wheeler, Dowagiac, Mich.

89,615.—Root Digger.—Baxter Wright, Cardiff, N. Y.

89,616.—Churn.—S. S. Allen, Belvidere, N. Y.

89,617.—Method of Controlling the Flow of Liquids under Pressure.—J. S. Baldwin, Newark, N. J.

89,618.—Needle Setter and Thread Pincer.—C. T. Barber and B. T. Loomis, New York city.

89,619.—Hay Rack.—Angeline Bayley, Battle Creek, Mich., administratrix of the estate of A. C. Bayley, deceased.

89,620.—Metallurgic Furnace.—A. G. Bevin, East Hampton, Conn.

89,621.—Spring.—H. N. Black, Philadelphia, Pa.

89,622.—Book Binding.—W. I. Blackman, Columbus, Miss.

89,623.—Machine for Swaging Ax Polls.—R. Blake and Ansel Carpenter, Scranton, Pa., assignors to Robert Blake.

89,624.—Machine for Trimming Cue Leather.—J. E. Boyle, New York, N. Y.

89,625.—Adjustable Center Square.—W. H. Brock (assignor to himself and C. H. Huntoon), Bridgeport, Conn.

89,926.—Animal Trap.—Elisha Brown, Wayne, Mich.

89,627.—Miter Machine.—J. H. Brown, Brockport, N. Y.

89,628.—Caster.—Myron S. Brownell, Adrian, Mich.

89,629.—Churn Dasher.—J. M. Buchanan, Lawrenceville, Ill.

89,630.—Drain Pipe.—Stephen Carlton, Lynn, Mass.

89,631.—Upsetting Machine.—E. R. Carter, Medina, and C. D. W. Gibson, Bay City, Mich.

89,632.—Balance Line for Mast Hoops.—Joseph Conway, Harrison, Md.

89,633.—Boot Jack.—Patrick Cullen, Bridgeport, Conn.

89,634.—Garden Cultivator.—J. M. Culver, Gilbertsville, Iowa.

89,635.—Steering Apparatus.—G. H. Davis, Stony Brook, N. Y.

89,636.—Car Starter.—G. W. Davis, and A. E. Smith, Providence, R. I.

89,637.—Bearing for Vertical Shafts.—E. A. Dayton, Richmond, Va.

89,638.—Sadiron.—Julie Dittrich, Hoboken, N. J.

89,639.—Brake for Wagons.—G. B. Douglas (assignor to himself, and J. H. Scheer), Sedalia, Mo.

89,640.—Boot Crimping Machine.—W. R. Dunn, Alton, Ind.

89,641.—Key Fastener.—R. S. Dunning, Fall River, Mass.

89,642.—Manufacture of Metal Ornaments.—F. J. Emery, Chicago, Ill.

89,643.—Fanning Mill.—LeRoy Farnham and John Moshor, Delta, Mich.

89,644.—Beehive.—J. E. Finley, Memphis, Tenn.

88,645.—Churn.—J. E. Finley, Memphis, Tenn.

89,646.—Neck Pad for Horses.—C. J. Fisher, Waukon, Iowa.

89,647.—Uterine Supporter.—E. J. Fraser, Erie, Pa.

89,648.—Apparatus for Treating Diseases by Vacuum.—T. Fravel, Westville, Ind.

89,649.—Paint Brush.—F. P. Furnald, Jr., New York city, R. W. Champion, Brooklyn, N. Y., and I. N. Davies, Bergen City N. J.

89,650.—Rotary Steam Engine.—A. C. Gallahue, Morrisania, N. Y., assignor to himself and David Gillispie, New York city.

89,651.—Spring Bed Bottom.—G. L. Gerard, New Haven, Conn., assignor to himself, T. B. Carpenter, and J. E. Carpenter.

89,652.—Self-Oiling Pulley.—J. Goodrich and H. J. Colburn (assignors to Rollstone Machine Works), Fitchburg, Mass.

89,653.—Dough Rolling Machine.—Harmon Goodwin and Chas. H. Bennett, 2d, South Berwick Junction, Me.

89,654.—Medicated Cracker.—J. L. Halliman, Grand Rapids, Mich.

89,655.—Cooking Stove.—Robert Ham, Troy, N. Y.

89,656.—Hydraulic Press.—Thos. Harbottle, Brooklyn, N.Y.

89,657.—Water Wheel.—Wm. Haslup, Sydney, Ohio.

89,658.—Sleigh Runner.—G. W. Hatch, Parkman, Ohio.

89,659.—Nut-Lock for Fish Plates.—J. W. Hazelton and A. A. Southard, Drayton Plains, and Oliver Merwin, Elba, Mich.

89,660.— Stovepipe Thimble.—G. W. Helt, Alma, Mich.

89,661.—Potato Digger.—T. N. Henderson, Jackson, Mich.

89,662.—Pump.—D. P. Henry, Windsor, Ill.

89,663.—Propelling Boats.—Joseph Heroux, St. Paul, Minn.

89,664.—Bottle Filler.—E. Jeanjaquet, New York city.

89,665.—Apparatus for Carbureting Air or Gas.—Josiah Jonson, Toledo, Ohio.

89,666.—Ear for Water Pails.—J. G. Krichbaum, Youngstown, Ohio.

89,667.—Device for Setting the Hands of Watches.—A. Lange, Glashette, Saxony.

89,668.—Truss Supporter.—D. S. Leavitt, Grand Rapids, Mich.

89,669.—Feed Cutting Attachment for Thrashing Machines.—G. W. Lee, Sandy, Ohio.

89,670.—Coal Stove.—Michael Lehmer, Oregon, Mo.

89,671.—Vise.—J. H. Lewis, Duxbury, Mass.

89,672.—Pump.—J. H. Luddington, Bridgeport, Conn.

89,673.—Apparatus for Elevating Hay.—O. E. Mabie, Camden, N. Y.

89,674.—Gate for Water Wheels.—T. W. Mahler, Rome, N. Y.

89,675.—Envelope Opener.—W. H. Mantz, Centralia, Ill.

89,676.—Ditching Machine.—W. D. McKinney, Marion, Ind.

89,677.—Non-Freezing Rain Lead.—J. F. McNee (assignor to himself, and Martin McNee), Philadelphia, Pa.

89,678.—Horse Power.—C. L. Merrill, Watertown, N. Y.

89,679.—Velocipede.—H. T. Metzgar, Salem Cross-Roads, Pa.

89,680.—Brick Machine.—Asa Morgan, Cedar Bayou, Texas.

89,681.—Muley Saw Mill.—L. Morrison, and A. G. Harms, Allegheny City, Pa.

89,682.—Spittoon Footstool.—J. N. Morrison, Philadelphia, Pa.

89,683.—Horse Hay Fork.—S. T. Nigh, Leitersburg, Md., assignor to himself, J. W. Nigh, and Upton Bell.

89,684.—Milking Stool.—C. F. Pollock and Nicholas Trickey, Theresa, N. Y.

89,685.—Apparatus for Tempering Clay.—L. E. Ransom, Trenton, Mich.

89,686.—Fire Escape.—E. P. Richardson, Manchester, N. H.

89,687.—Tool for Turning Centers.—H. D. Richardson (assignor to himself and J. W. Wilson), East Hampton, Mass.

89,688.—Tool Holder.—H. D. Richardson (assignor to himself and J. W. Wilson), East Hampton, Mass.

89,689.—Buckle.—F. C. Richer, Gilmer, Texas.

89,690.—Wrench.—F. C. Richer, Gilmer, Texas.

89,691.—Railway Switch.—Andrew Rosewater, Omaha, Nebraska.

89,692.—Loom.—Wm. Rosseter, Accrington, England.

39,693.—Jacket for Fireplace Heater.—Watson Sanford, Brooklyn, N. Y.

89,694.—Power Loom for Weaving Carpets, etc.—Halcyon Skinner (assignor to Alex. Smith), Yonkers, N. Y.

89,695.—Velocipede.—John C. Smith, Brooklyn, N. Y.

89,696.—Lamp.—S. P. Smith, Waterford, N. Y.

89,697.—Horse Rake.—S. P. Smith, Waterford, N. Y.

89,698.—Stove Drum.—F. Stadter, Plattsmouth, Nebraska.

89,699.—Breech-Loading Firearm.—A. C. Stevens, Hudson, N. Y.

89,700.—Circular Velocipede.—G. J. Sturdy and S. W. Young, Providence, R. I.

89,701.—Heat Radiator.—D. F. Sweet, Otsego, assignor to himself and Reuben Sweet, Kalamazoo, Mich.

89,702—Wrench.—G. C. Taft (assignor to Loring Coes), Worcester, Mass.

89,703.— Truck for Carrying Logs.— Calvin Taylor, Handsborough, Miss.

89,704.—Mode of Putting up Caustic Soda for the Manufacture of Soap.—T. C. Taylor, Philadelphia, Pa.

89,705.—Magazine Firearm.—L. Z. Terril, Chicopee, Mass.

89,703.—Steam Heating Device.—J. B. Terry, Brooklyn, N. Y.

89,707.—Lamp Shade.—G. W. Tucker, Waterbury, Conn.

89,703.—Attaching Knobs to their Spindles.—H. B. Tuthill, New York city, assignor to himself, M. C. Ogden, and W. Slawson.

89,709.—Preparation of Glue Stock and other Products from Animal Substances.—D. K. Tuttle, and Orazio Lugo, Baltimore, Md.

89,710.—Combined Seed Sower and Harrow.—Myron Vandeusen, Oxford, Mich.

89,711.—Washing Machine.—J. D. VanDusen, Auburn, N.Y.

89,712.—Method of Construction for Screw Propellers.—Henrietta Vansittart Richmond, England.

89,713.—Oven.—John Vatter, Phillipsburg, Ohio.

89,714.—Low-Water Indicator.—W. W. Virdin, Baltimore, Md.

89,715.—Method of Producing from Printed Paper New Plates for Reprinting.—Charles Vogt and Christian Vogt, New York city.

89,716.—Cistern.—John J. Walker, Ann Arbor, Mich.

89,717.—Steam Enginery for Seine Hauling.—Peter M. Warren, Edenton, N. C.

89,718.—Drive Well Point.—Devolson Weaver, Anamosa, Iowa.

89,719.—Match Box.—Horace J. Wickham, Manchester, Conn.

89,720.—Fire Grate.—George Williamson, Sullivan, Ill.

89,721.—Mill Brush and Spindle.—John Williams, Sullivan, Ill.

89,722.—Pea Dropper.—A. J. Williams, Barnesville, Ga.

89,723.—Combined Lifting Jack and Wrench.—Richard A. York, Reading, Mich.

89,724.—Machine for Grinding Saws.—E. L. Abbott, Jamison H. Harrison, and W. P. Welch, Boston, Mass., assignors to E. L. Abbott; said Abbott assigns to himself and S. A. Woods.

89,725.—Device for Preventing Incrustation in Boilers.—Thomas Barfield, Athens, Ill.

89,726.—Wash Boiler.—Charles R. Arnold, Hamilton, Ill.

89,727.—Waterproof Coating for Various Purposes.—Emille Victor Audibert, New Orleans, La.

89,728.—Seeding Machine.—Henry Bean, Schuylkill, Pa.

89,729.—Corn Cultivator.—Solyman Bell and George W. Bronson, La Salle county, Ill.

89,730.—Harvester.—Henry Brackett, Valley Falls, N. Y.

89,731.—Harvester Rake.—Henry Brackett, Valley Falls, N. Y.

89,732.—Harvester Dopper. — Henry Brackett, Valley Falls, N. Y.

89,733.—Dropper for Harvesters.—Henry Brackett, Valley, Falls, N. Y.

89,734.—Self-discharging Blanket Ore Concentrator.—John M. Bryan, Lincoln, Cal.

89,735.—Pattern, Measuring, and Laying out Ladies' Dresses.—H. M. Burrows, Norwich, N. Y.

89,736.—Spring Seat for Chairs, Wagons, Cars, etc.—William Carr (assignor to himself and Charles P. Ford), St. Louis, Mo.

89,737.—Machine for Making Horseshoes.—James Christie, Pittsburg, Pa.

89,738.—Preparation of Copying Paper.—Charles Cowan, New York city.

89,739.—Seed Sower.—George H. Crocker, Marysville, assignor to himself and David L. Smith, San Francisco, Cal.

89,740.—Feather Renovator.—John Cyester, Osborn, Ohio.

89,741.—Sash Holder.—Addison Davis, Boston, Mass.

89,742.—Corn Dropper.—Loyal M. Doddridge, Henry Reitenour, and Jacob B. Swhier, New Mount Pleasant, Ind.

89,743.—Cap for Lamp Chimney.—Jules George Dreyfus, New York city.

89,744.—Velocipede.—L. E. Dugas, Warren, Ill.

89,745.—Bridge.—James B. Eads, St. Louis, Mo.

89,746.—Lock.—John Ebling, New York city.

89,747.—Stop Watch.—Henri Robert Ekegren, Geneva, Switzerland.

89,748.—Process of Ageing Liquors and Spirits, and for Producing Aromatic Ethers.—Charles Louis Fleischmann, Washington, D. C.

89,749.—Distilling Apparatus.—Charles Louis Fleischmann, Washington, D. C.

89,750.—Process of Extracting Oil from Cotton Seeds.—Charles Louis Fleischmann, Washington, D. C.

89,751.—Cotton Gin.—Charles Louis Fleischmann, Washington, D. C.

89,752.—Railway Car Wheel.—Addison C. Fletcher, New York City.

89,753.—Door Lock.—Monroe B. Foote, Northampton, Mass., assignor to himself, William M. Gaylord, and E. N. Foote.

89,754.—Edge Plane for Boots and Shoes.—Philander S. Foster, Richmond, Me.

89,755.—Bit Stock.—Dan P. Foster, Waltham, Mass.

88,756.—Refrigerator.—George A. Fountain, Newark, N. J.

89,757.—Electro-magnetic Temperature Alarm.—J. B. N Fournier and C. A. Lemaire, Paris, France.

89,758.—Apparatus for Changing Car Trucks.—S. L. Fremont, Wilmington, N. C.

89,759.—Carriage Step and Wheel Fender.—John W Gosling, Cincinnati, Ohio.

89,760.—Rocking Chair.—Carl Julius Graf, Chicago, Ill.

89,761.—Washing Machine.—Abraham Havens, Trenton, N. J.

89,762.—Alarm Lock.—Edward Herbster, Chicago, Ill.

89,763.—Method of Constructing Piles for Beams.—Charles Hewitt, Trenton, N. J.

89,764.—Device for Bending Plow Handles.—William Heylman, Peoria, Ill.

89,765.—Rock Breaker.—Alonzo Hitchcock, New York city.

89,766.—Fourdrinier Paper Machine.—Carl Hofmann, Elkton, Md.

89,767.—Divided Axle for Railway Cars.—David Brown Hunt, San Francisco, Cal.

89,768.—Compound Fabrics for the Production of Shirt Collars.—Walter Hunt, New York city, assignor, by mesne assignments to William E. Lockwood, Philadelphia, Pa.

89,769.—Hedge Trimmer.—S. T. Hyde, Piasa, Ill.

89,770.—Lantern.—John H. Irwin, Chicago, Ill.

89,771.—Coal Scuttle.—John William Jarboe, Brooklyn, (E. D.), N. Y.

89,772.—Suspender.—Ebenezer Jennings, Jr., New York city.

89,773.—Trunk Clamp.—Wm. S. Jessup, Newark, N. J.

89,774.—Horseshoe.—Jonathan Johnson, Lowell, Mass.

89,775.—Horseshoe.—Jonathan Johnson, Lowell, Mass.

89,776.—Sofa, Lounge, and Table.—William B. Jones, Cincinnati, Ohio.

89,777.—Propellor.—A. C. Loud, San Francisco, Cal

89,778.—Scythe.—William Lowden, Thornapple, Mich.

89,779.—Seat for Parks and Gardens.—Samuel Macferran, Philadelphia, Pa.

89,780.—Governor for Steam and Other Enginery.—J. Avery Marden (assignor to George M. Gibson and Thomas A. Johnston), Boston, Mass.

89,781.—Stop Valve.—Benj. G. Martin, New York city.

89,782.—Fireproof Building.—Edwin May, Indianapolis, Ind.

89,783.—Velocipede.—S. T. McDougall, Brooklyn, N. Y.

89,784.—Wash Boiler.—Fredrich William Miller, (assignor to Fares and Miller), Cincinnati, Ohio.

89,785.—Weather Strip.—William Miller, Chicopee, Mass.

89,786.—Steam Generator.—John H. Mills, Boston, Mass.

89,787.—Meat Cutter.—D. H. Mundy and H. W. Hoffman, Camden, N. J.

89,788.—Gang Plow.—Maurice Murphy, Vacaville, Cal.

89,789.—Machine for Buffing, Whitening, Glassing, Polishing, and Stoning Leather.—Albert W. Pratt (assignor to himself, William A. Perkins, and David H. Burbank), Salem, Mass.

89,790.—Wood-bending Machine.—Nathaniel Purdy, Milwaukee, Wis.

89,791.—Cultivator.—John A. Quick, South Danville, N. Y.

89,792.—Harvester Dropper.—Amos Rank, Salem, Ohio.

89,793.—Coal Chute.—L. D. Roberts and C. C. Roberts, Cleveland, Ohio.

89,794.—Submarine Drilling Apparatus.—T. F. Rowland, Greenpoint, N. Y.

89,795.—Safety Lamp.—Frank Saunders, Aberdeen, Miss.

89,796.—Side-Hill Plow.—Ives Scoville and H. H. Scoville, Oakland, Cal.

89,797.—Gang Plow.—George Seibert and John Seibert, Ashley, Ill.

89,798.—Machine for Skiving and Channeling Soles.—J. B. Sias, Beverly, assignor to H. S. Vrooman, Boston, Mass.

89,799.—Quilting Frame.—W. J. Simmons, Chariton, Iowa.

89,800.—Machine for Desiccating Fertilizers.—Amor Smith, Baltimore, Md.

89,801.—Cultivator.—Philander Sprague, Pecatonica, Ill.

89,802.—Producing Gas for Heating and Lighting.—T. G. Springer, Clinton, Iowa.

89,803.—Mop Holder.—Greenleaf Stackpole, New York city.

89,804.—Skate.—E. T. Starr, New York city.

89,805.—Process of Removing Soluble Matters from Artificial Stone.—E. T. Steen and W. B. May, San Francisco, Cal.

89,806.—Pianoforte.—Daniel Stirn, Milwaukee, Wis.

89,807.—Mule for Spinning.—Albert Stockwell, Providence, R. I., assignor to C. W. Greene, trustee, and said Greene, as trustee, assigns to Albert Stockwell and Winsor Stone.

89,808.—Horse Rake.—H. A. Streeter, Worcester, Mass., assignor to J. P. Streeter and Brother.

89,809.—Locomotive Steam Engine.—J. S. Stuart, Philadelphia, Pa.

89,810.—Horse Hay Fork.—J. B. Sweetland, Pontiac, Mich.

89,811.—Candlestick.—F. A. Taber, Baltimore, Md.

89,812.—Revolving Sulky Harrow and Seeder Combined.—A. L. Taveau, Chaptico, Md.

89,813.—Means for Hanging Window Shades.—J. I. Tay, San Francisco, Cal.

89,814.—Cheese Table, Shelving, etc.—A. M. Utley, Watertown, N. Y.

89,815.—Portable Laundry.—John Van, Cincinnati, Ohio Antedated April 16, 1869.

89,816.—Life Boat.—F. Vie, Havre, France.

89,817.—Combination Lock.—Ephraim Vorbe, San Francisco, Cal.

89,818.—Sole Channeling and Feather-Edging Machine.—H. S. Vrooman, Boston, Mass.

89,819.—Door Catch and Cushion.—Sam'l Wagner, Galion, Ohio.

89,820.—Belt Joint.—Bernard P. Walker, Wolverhampton, England.

89,821.—Sash Balance.—P. A. Wilson (assignor to himself, Matthew Whilldin, and Albert Atwood), Camden, N. J.

89,822—Velocipede.—Seth Wilmarth, Malden, Mass.

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89,828.—Ticket Punch.—John Chapin, Chicopee, assignor to R. H. Smith, Springfield, Mass.

89,829.—Branding Apparatus.—J. Wesley Dodge, Malden Mass.

89,830.—Lock for Prison Doors.—L. M. Ham, Boston, Mass.

89,831.—Apparatus for Rolling and Notching Rails for Railroads.—Wm. Hoffman, Pittsburgh, Pa.

89,832.—Sash Holder.—Bennett Kindblade, Geneva, Ill.

89,833.—Field Skate.—T. L. Luders, Olney, Ill.

89,834.—Hat Press.—G. C. Howard, Philadelphia, Pa. Antedated Nov. 4, 1868.

89,835.—Carriage Wheel.—Virgil Price, New York city.

89,836.—Buckle.—W. M. K. Thornton, Clinton, Wis.

89,837.—Trunk Lock.—Zachariah Walsh (assignor to himself and Cornelius Walsh), Newark, N. J.

89,838.—Washing Machine.—Jacob Weaver, Jr., Pittsburgh, Pa.

89,839.—Journal Box.—Rufus Sibley, Greenville, Conn.

REISSUES.

85,983.—Machine for Heading Bolts.—Dated January 19, 1869; reissue 3,414.—J. R. Abbe, Providence, R. I.

22,793.—Cracker Machine.—Dated February 1, 1859; reissue 3,415.—Joseph Fox, Lansingburgh, N. Y.

10,592.—Straw Cutter.—Dated March 7, 1854; reissue 2,293, dated June 26, 1866; extended seven years from March 7, 1868; reissue 3,416.—Warren Gale, Peekskill, N. Y.

65,579.—Method of Making Side Bands of Watch Cases.—Dated June 11, 1867; reissue 3,417.—G. W. Ladd and J. A. Brown, Providence, R. I., assignees, by mesne assignments, of G. W. Ladd.

74,116.—Lubricator for Loose Pulleys.—Dated February 4, 1868; reissue 3,418.—G. M. Morris and John McCreary, Cohoes, N. Y.

20,254.—Railway Day and Night Car.—Dated May 18, 1858; reissue 602, dated September 21, 1858; reissue 3,419.—J. H. Meyers, Rochester, N. Y., assignee, by mesne assignments, of J. B. Creighton.

60,213.—Combined Latch and Lock.—Dated July 30, 1867; reissue 3,420.—Division 1.—N. Peire, New York city, for himself, and assignee of J. H. Saggett.

79,929.—Button.—Dated December 31, 18 ?7; reissue 3,421.—W. H. Reed, New York city, Chairman of Committee on Organization, assignee of D. M. Somers and W. S. Atwood.

13,501.—Machinery for Trimming Books.—Dated August 28, 1855; reissue 3,422.—Michael Riehl, Philadelphia, Pa.

87,593.—Machine for, and Method of Compressing Cartridge Shells to a Tapered Form.—Dated March 9, 1869 reissue 3,423.—R. S. Roberts, United States Army.

85,620.—Hot-Air Furnace.—Dated February 2, 1869; reissue 3,424.—F. A. Woodson, Anna, Ill.

55,631.—Fruit Box.—Dated June 19, 1866; reissue 3,425.—T. B. Smith, Ansonia, and B. W. Corning, New Britain, Conn., assignees, by mesne assignments, of T. B. Doolittle.

DESIGNS.

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3,472.—Floor Oil Cloth.—A. E. Powers, Lansingburgh, N. Y.

3,473.—Trade Mark.—C. C. Savery, Philadelphia, Pa.

3,474.—Cook's Stove.—Robert Scorer and Robert Ham (assignors to Cox, Church & Company), Troy, N. Y.

3,475.—Show Case.—M. Terhune, Chicago, Ill., assignor to himself and W. H. Core, New York city.

3,476.—Clock Case.—S. B. Terry, Waterbury, Conn.

3,477.—Floor Oil Cloth.—J. T. Webster, New York, assignor to Deborah Powers, A. E. Powers, and N. B. Powers, Lansingburgh, N. Y.

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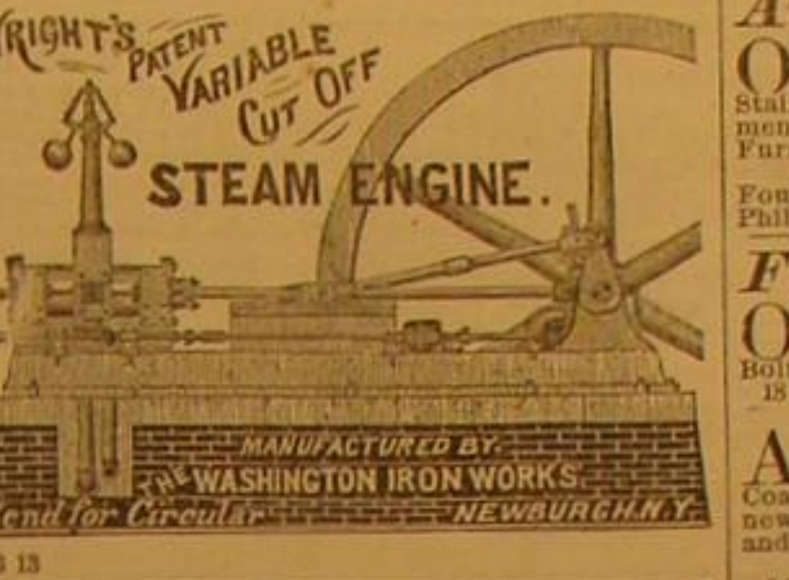

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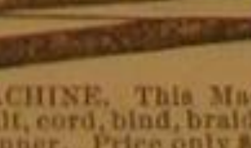

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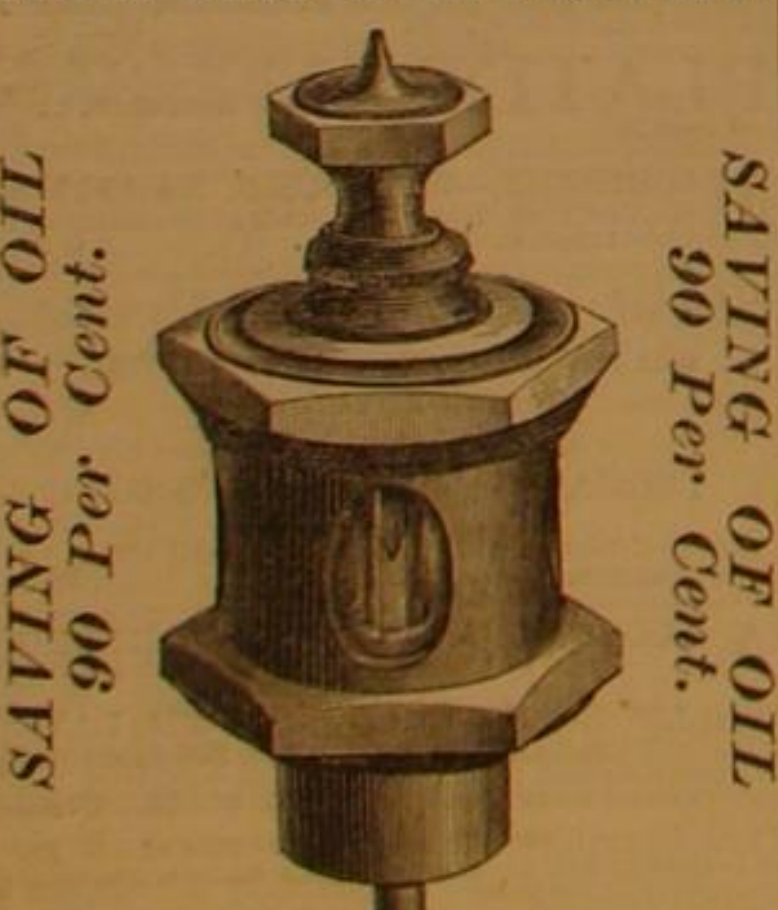

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