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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.

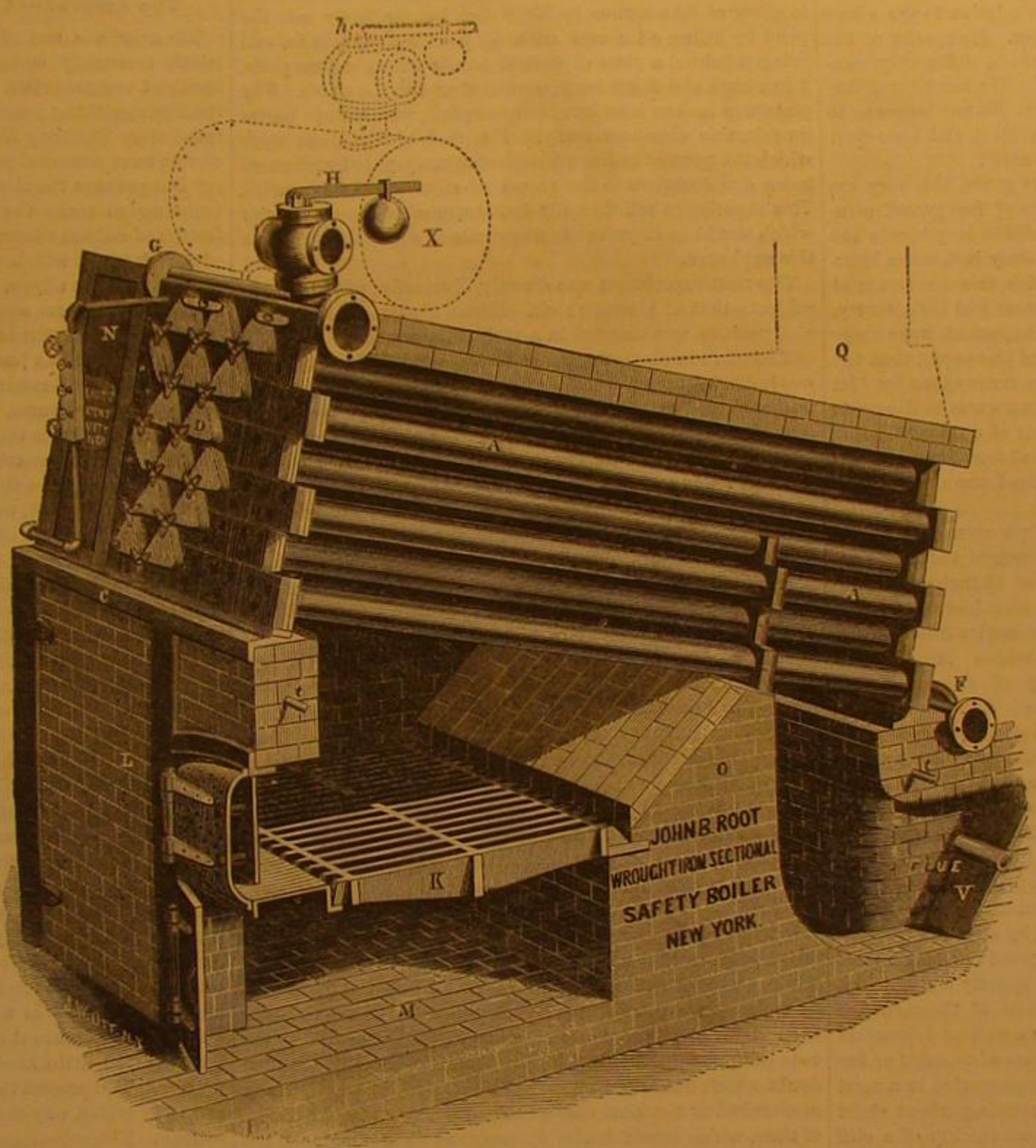
The inventor sets forth the advantages of his boiler by the following claims: First, safety; owing to the small diameter of the tubes, not over five inches, and tested to 500 lbs. to the square inch. In case of burning or cracking, no explosion can occur, but only a rupture, confined in its effects solely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

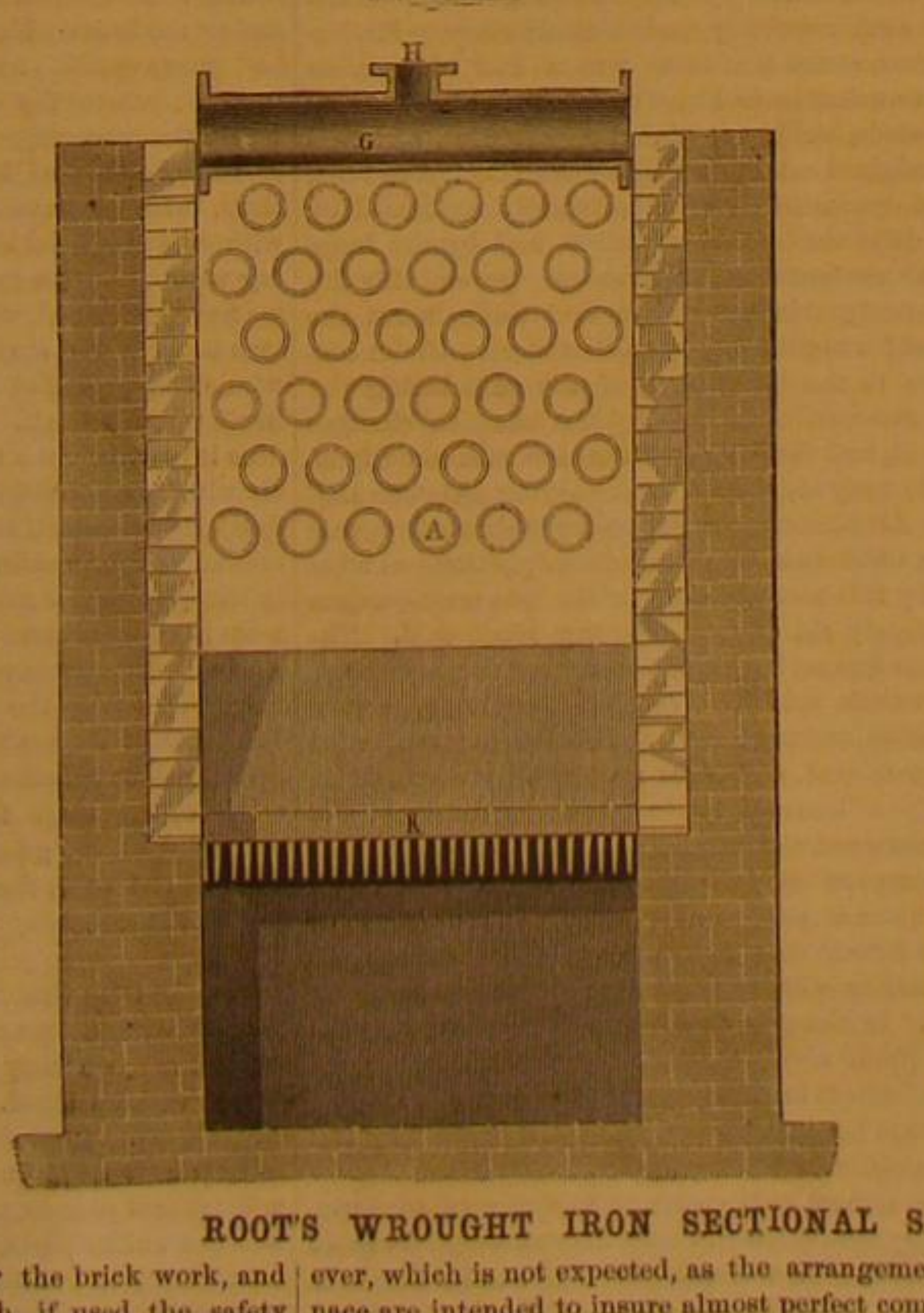
Second, economy; the inside surfaces constantly washed by rapid circulation, and the products of combustion—flame, heated gases, smoke—thrown against every portion of the heating surfaces by eddies which change the otherwise diretc course of the draft.

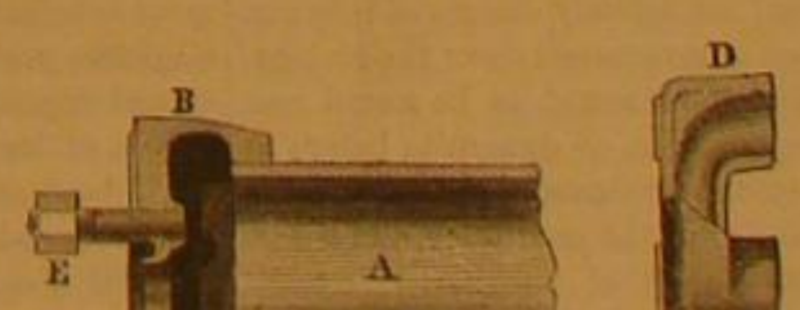
Third, durability; preventing bad results of unequal expansion and contraction by the use of elastic joints, impossible in shell boilers, which, owing to greater necessary thickness and variation of the amount of that thickness, as where joints occur, encourage unequal expansion, and suffer most from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

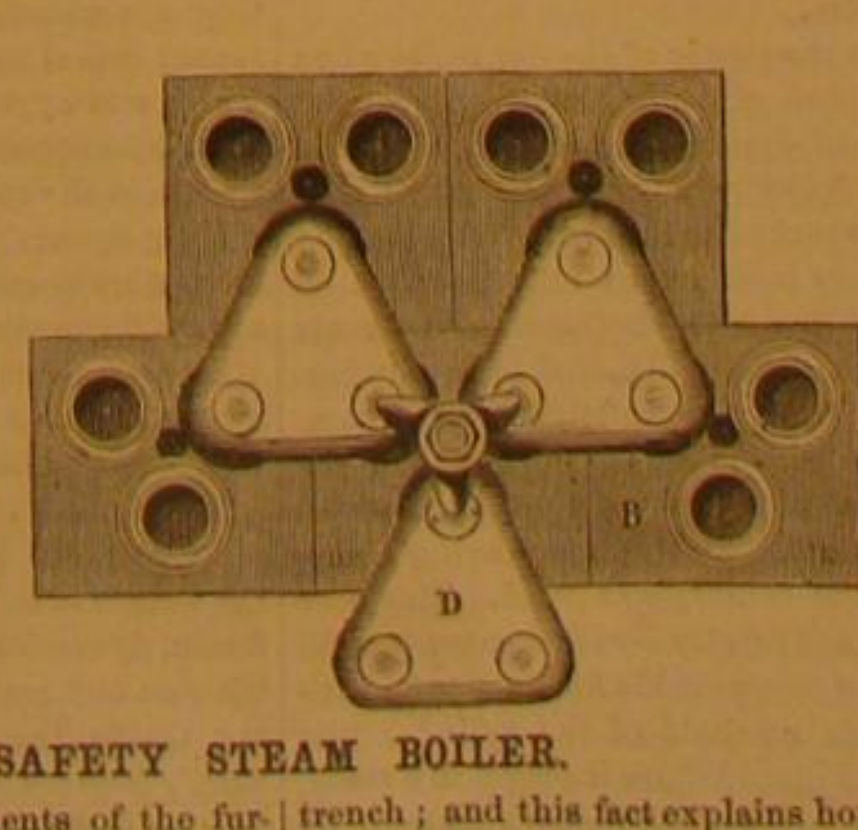
Finally, cheap and quick removal of an injured part (no weakening by patching), and facility for examination and cleaning of either inside or outside surfaces, and, also, facility of enlargement without disturbing the boiler as first erected.

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 witlr 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 con cussion 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 b'asting 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 1¼ 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 ¾-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 fundamental 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.	At a distance of 0·5 in.
Sulphuric ether	0·747	below 58°	—
Bisulphide of carbon	1·270	" 58°	—
Petroleum benzine	0·706	" 58°	—
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	0·889	" 87·8°	81°
Crude paraffine oil	0·841	" 89°	84·2°
Crude naphtha	0·881	" 90°	86°
Dutch gin	0·930	" —	90°
Wood spirit	0·827	" 96·8°	84·2°
Illuminating naphtha	0·829	" 100°	91°
Wine spirit	0·817	" 101°	73°
Whisky, 15 overproof	0·885	" 109°	85°
" 11 overproof	0·905	" 115°	84·2°
Kerosene	0·891	" 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	0·995	" —	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."

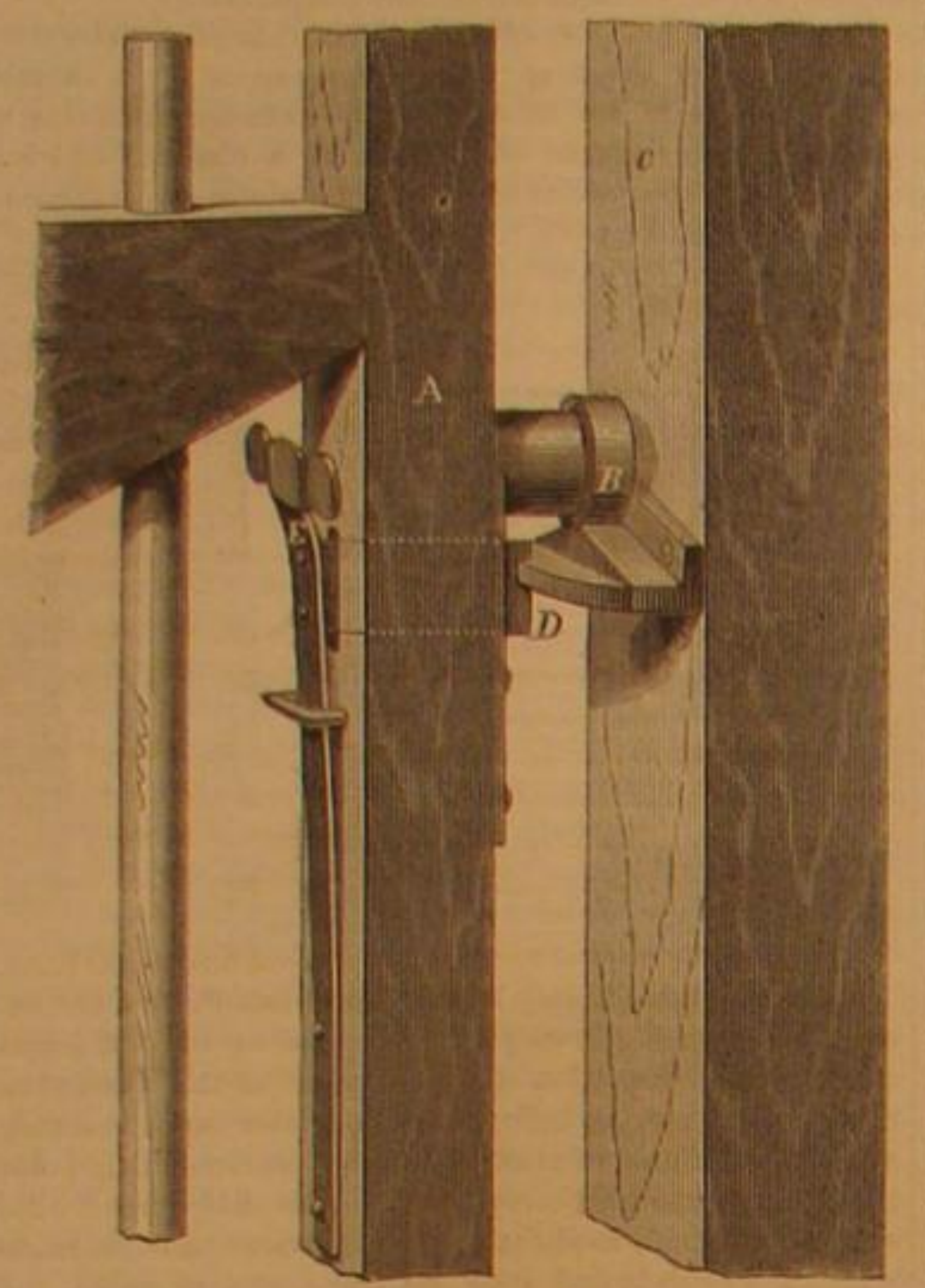
Action of Water on Lead.

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 *debris* 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:

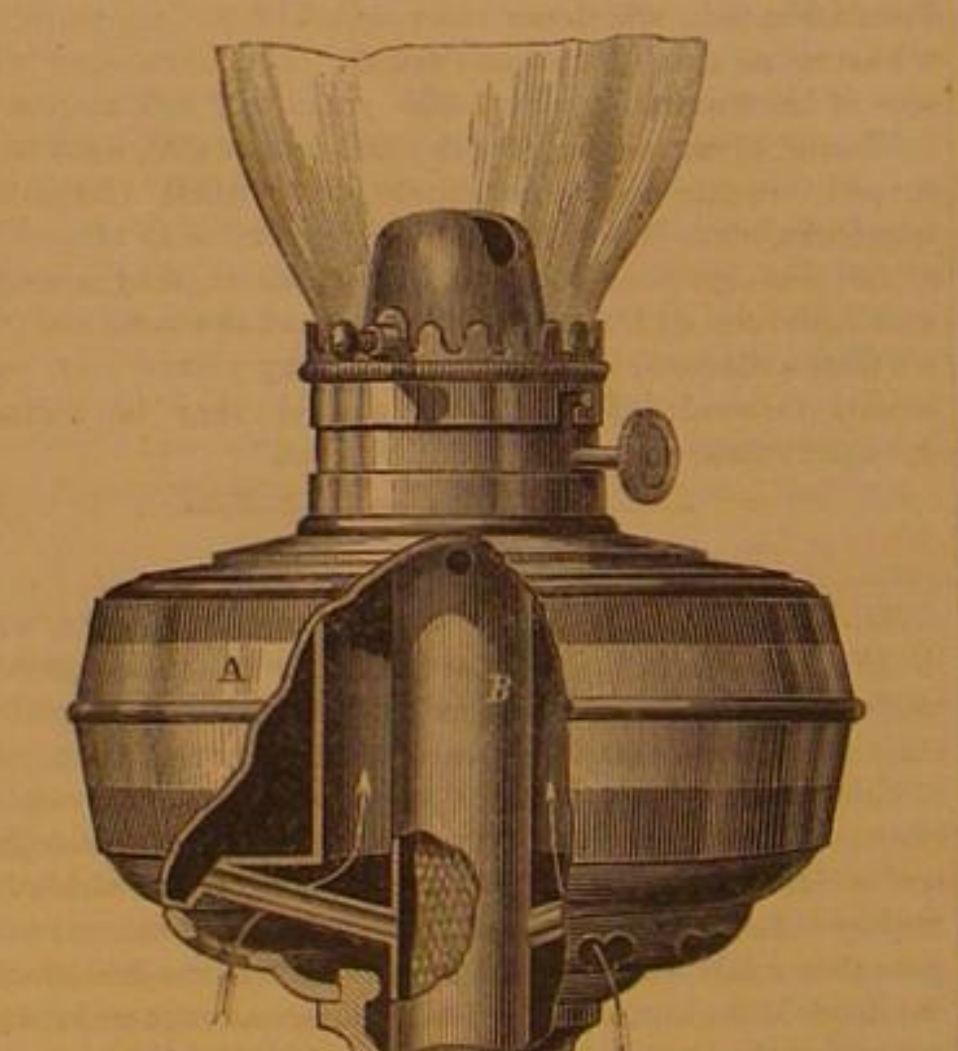
During late years, several more or less successful attempts have been made to introduce into the United States, sugar-producing plants to replace the cane. The beet root and sorghum are among the number, but one of the most valuable, which is cultivated in every cornfield in the Middle States as a side 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.

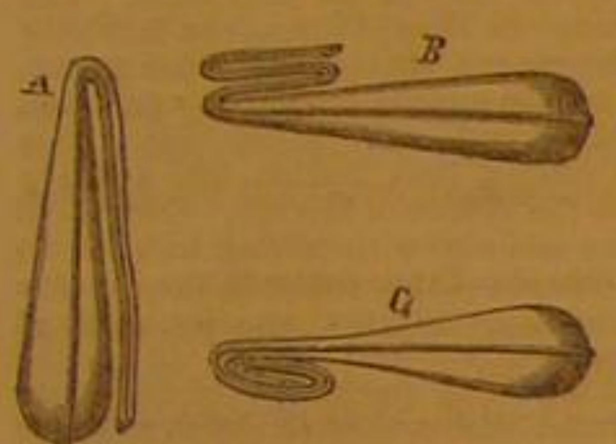
The scums formed during the process of defecation of the beet root juice being rich in saccharine matter must be made to give up as much of their valuable contents as possible. For this purpose they are collected in a special reservoir provided with a wide-mouthed faucet, through which they are filled 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.

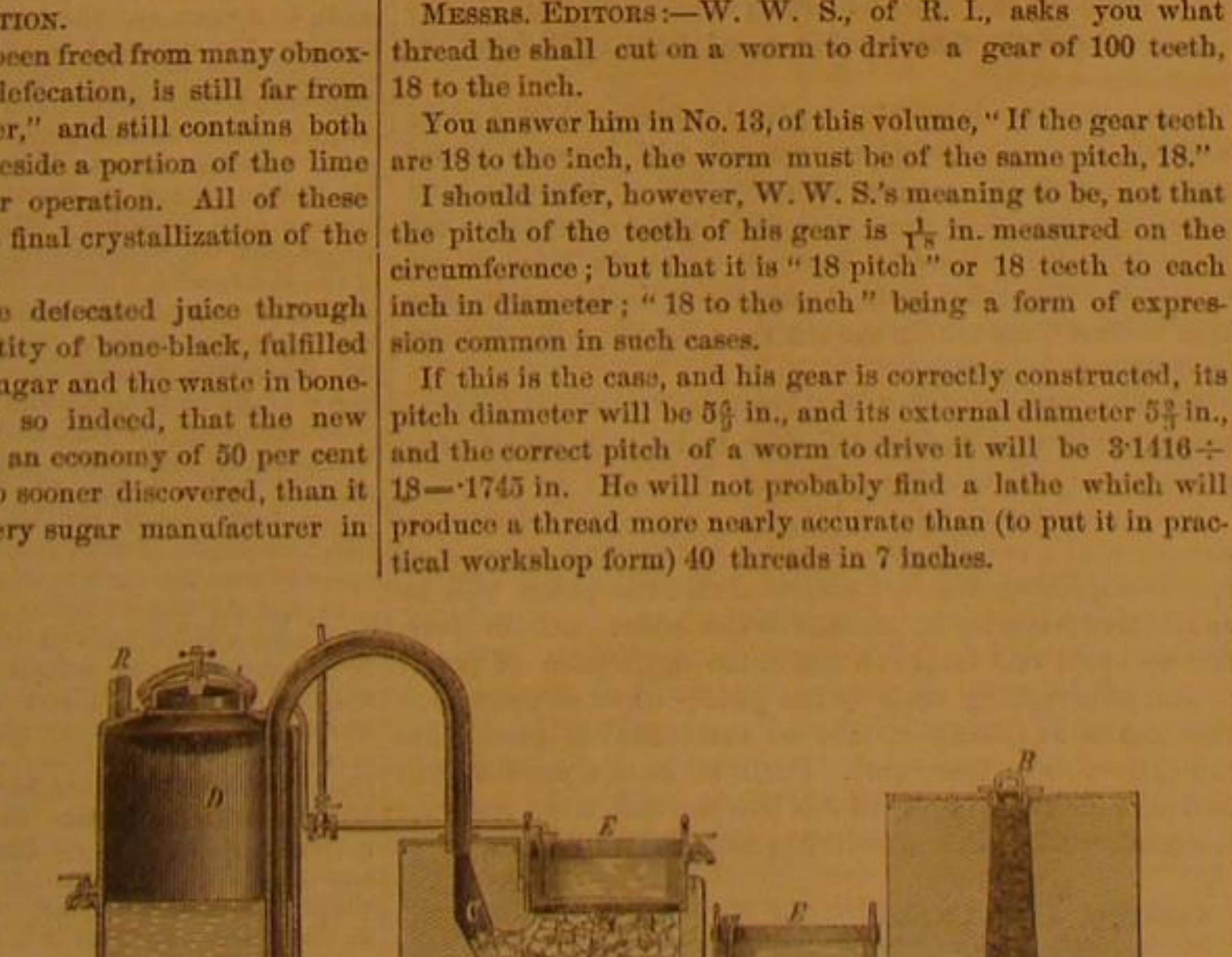
The beet root juice, after it has been freed from many obnoxious substances by the process of defecation, is still far from constituting pure "sugar and water," and still contains both organic and inorganic matter, beside a portion of the lime which has been used in the former operation. All of these 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 $3·1416 \div 18 = ·1745$ 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.

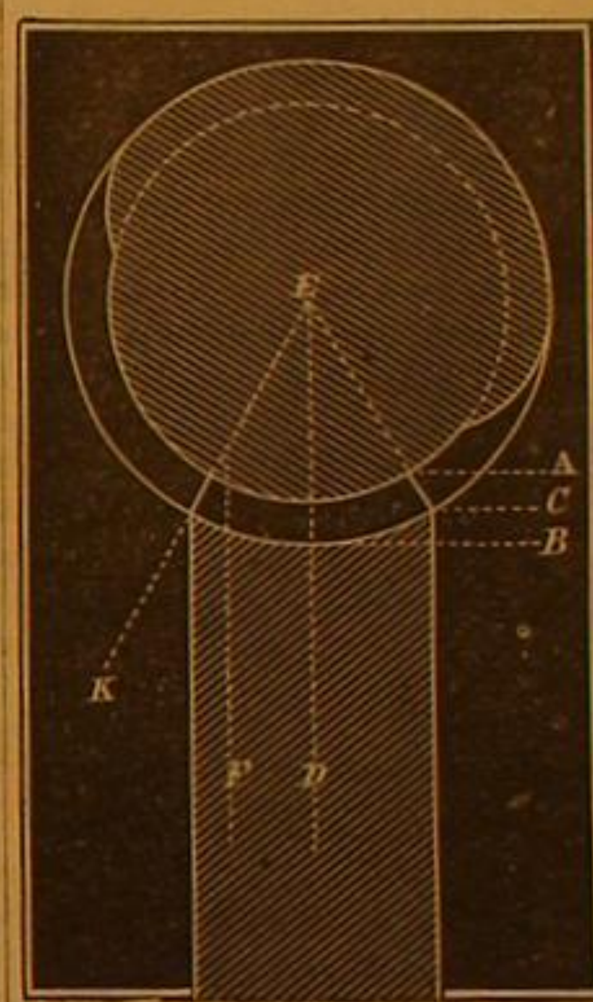
A well-constructed movement of this kind meets completely mechanical wants which could, otherwise, with difficulty be provided for. Its general proportions admit of considerable variation, but the range of proportions within which the best results are reached, is not so great as might be supposed.

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 $\times$ pitch $\div 3·1416 =$ diameter, and Diameter $\times 3·1416 \div$ 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 $\frac{2}{3}$ 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 $\frac{2}{3}$ 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 280, 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 $2,500 \times 176 = 440,000$ 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.

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

Fig. 1.

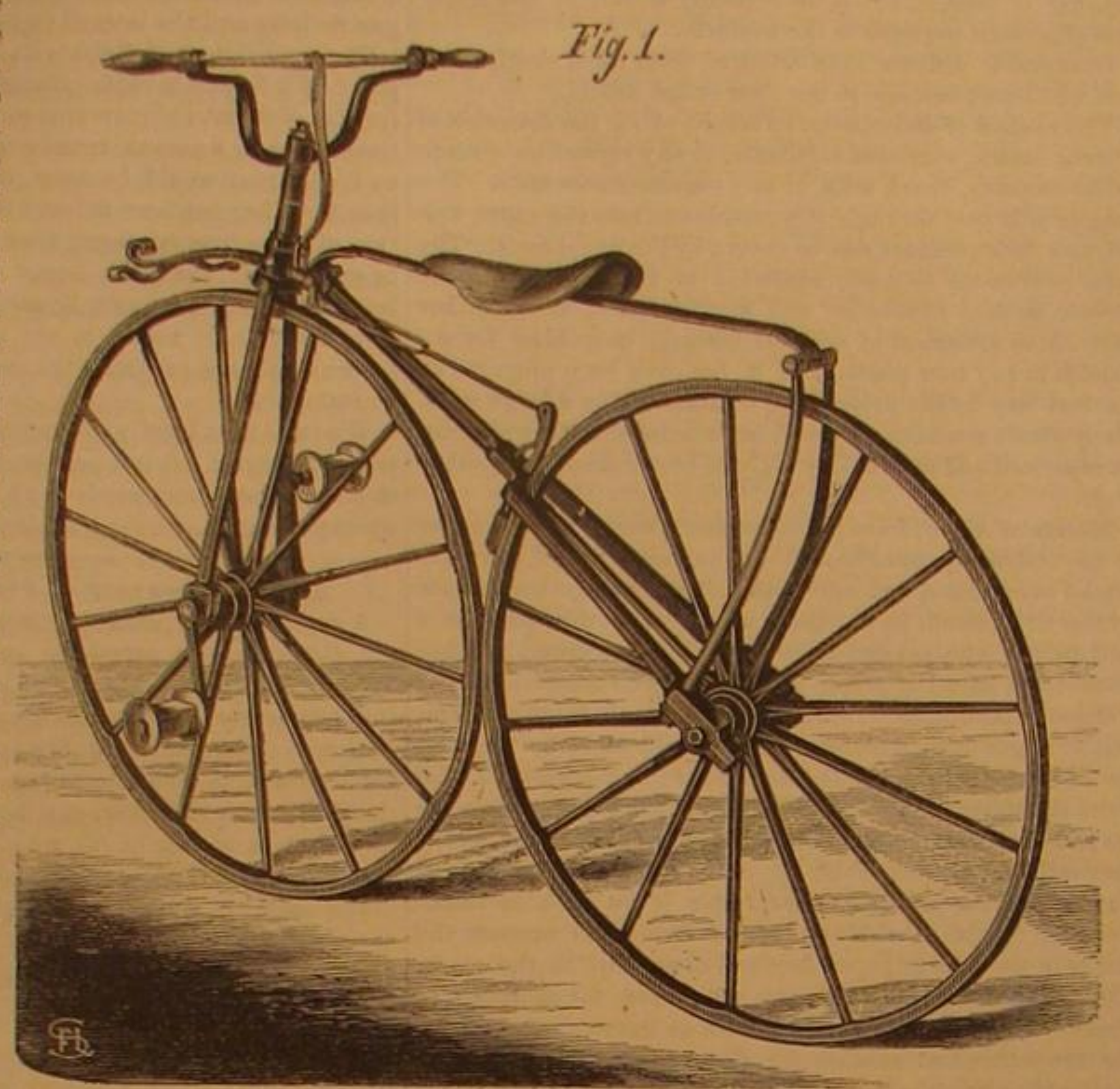


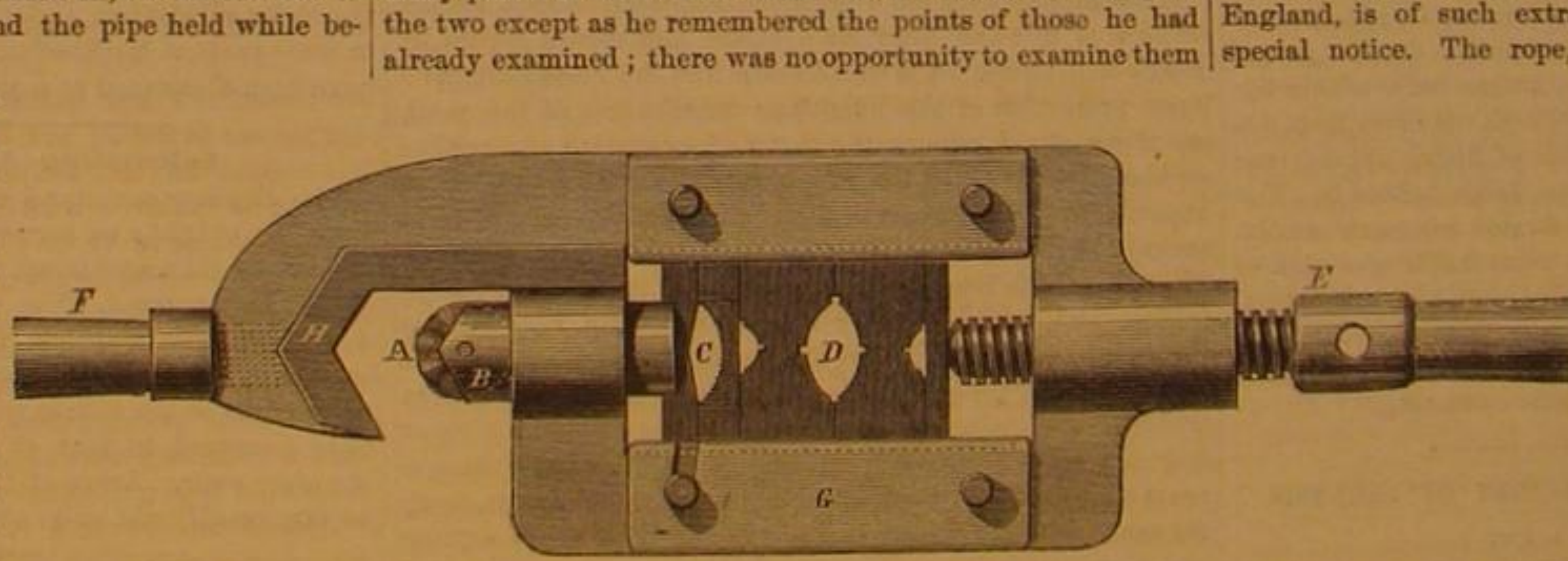
Fig. 2

MONOD'S IMPROVED BRAKE BICYCLE.

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*.

Scientific American.

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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 gatekeeper 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 gatekeeper 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 if 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, 85 grammes of this salt, dissolved rapidly in 85 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 5,200,000 pounds of wool, and making 2,000,000 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 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. 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.

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.

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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.

88,670.—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 to the extension of the above patent. Day of hearing, July 19, 1869.

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