SCIENTIFIC AMERICAN

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

Vol. XXI.---No. 6. [NEW SERIES.] NEW YORK, AUGUST 7, 1869. $3 per Annum. [IN ADVANCE.]

Caissons for Pier-Building.

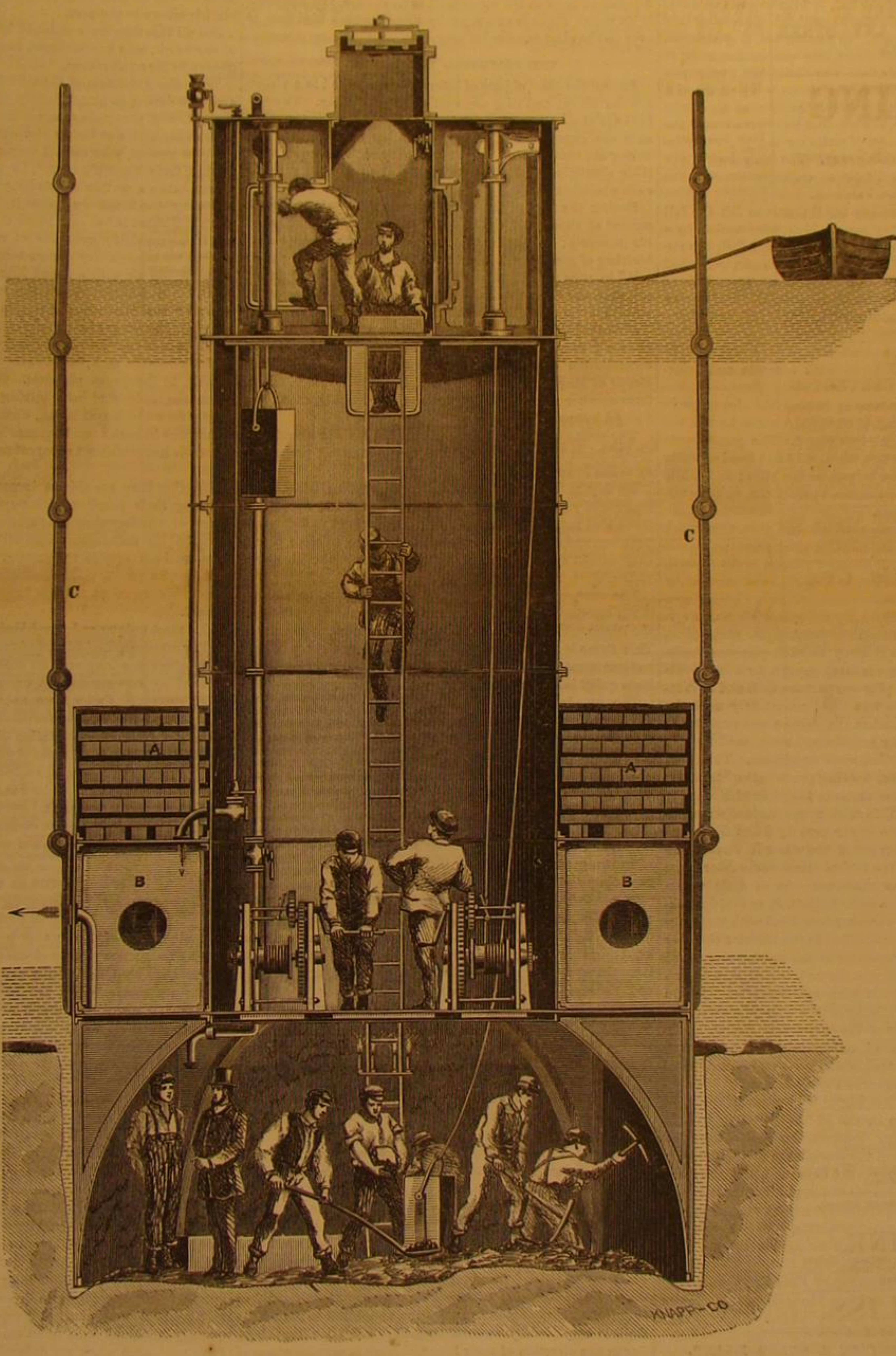
Before more particularly describing the engineering illustration we give this week, taken from the London *Architect*, as showing a new and very clever method of building bridge piers, it may not be uninteresting to many of our readers to refer to one or two former contrivances which have been employed for that purpose.

Dr. Ure, in his "Dictionary of Arts," mentions what is considered to have been the first application of sinking cylinders through sand and water (quicksand). He says that a mining shaft formed of a series of large sheet-iron cylinders riveted together was sunk to a great depth through the bed of the river Loire, near Languin. The seams of coal in this district of France lie under a stratum of quicksand, from 18 to 20 meters thick—equal to about 58 to 66 feet English—and they had been found to be inaccessible by all the ordinary modes of mining previously practiced. The difficulty of reaching them had been thought so entirely insurmountable that every portion of the great coal basin, which extends under these alluvial deposits, though well-known for centuries, had remained untouched. To endeavor, by the usual workings to penetrate through these semi-fluid quicksands, which communicate with the water of the Loire, was, in fact, nothing less than to try and sink a shaft in that river, or to drain the river itself.

This difficulty, however, was successfully grappled with by M. Triger, an able civil engineer. By means of the sheet-iron cylinders we have mentioned, he contrived with the aid of force-pumps to keep his workmen immersed in compressed air of sufficient density to force back and out of the bottom of the cylinder all the water which was there, and thus enabled the men to excavate the sand, gravel, and stones to such a depth that when the cylinder was sunk to a water-tight stratum, the compressed air was no longer necessary. An air-tight chamber at the top of the cylinder had a man-hole door in its cover and another in its floor; when the men had entered this chamber the upper door was closed, and compressed air from the cylinder was then admitted by means of a stop-cock. As soon as there was an equilibrium of pressure established between the chamber and cylinder, the man-hole door into the cylinder was opened and the men descended to their work. Here they had to work in air at a pressure of about three atmospheres, *i. e.*, equal to a pressure of, say, 44 lbs. per square inch. While the compressed air thus drives the water of the quicksand out of the shaft, it is said to infuse at the same time such energy into the miners that they can easily excavate double the work, without fatigue, which they could perform in the open air. Upon many of them the first sensations are painful, especially upon the ears and eyes; but they rapidly get accustomed to the bracing element. It is even said that old asthmatic men here become effective workmen, deaf persons recover their hearing, while others are sensitive to the slightest whisper. Much annoyance was at first experienced by the rapid combustion of the candles, but this was obviated by the substitution of flax for cotton wicks.

The contrary principle to this of sinking cylinders was proposed by Mr. Potts, a medical gentleman of great inventive ability. His system was adopted in sinking the piers of the Black Potts Bridge, which crosses the Thames near Richmond. Each cylinder was lowered into the river in its proper vertical position, and then loaded sufficiently to make it sink when the greatest vacuum was obtained. The vacuum was produced by means of suction pumps, and then the external pressure of the atmosphere forced the mud, sand, or gravel and water from the bottom of the cylinder up inside of it, thus allowing the cylinder to descend as much as the displacement of the material at its base in the bed of the river would allow with the force of its own weight and load. The material thus forced up into the cylinder was scooped, or dredged, out as much as possible, the operation of creating a vacuum being again and again repeated until the cylinder was sunk to the supposed proper depth. It has been said that some of the cylinders sunk when the weight of the bridge and proving load came on them. This fault, however, cannot be charged to the mode of sinking, for in that case the cylinders could not have been sunk deep enough, or they were imperfectly filled in. At the same time, if the water had been forced or kept out by means of compressed air, there would naturally have been far greater facility for seeing and insuring a good and secure foundation.

The new cast-iron arched bridge over the Medway at Rochester is one of the first bridges built upon cast-iron piles sunk deep into the bed of a river by means of compressed air, used to keep out the water while the workmen were employed in excavating the material inside the piles, and allowing them to sink by means of their own weight and the load placed on them. This bridge is built near the site of the celebrated old bridge at Rochester, and consists of three spans (one an opening span). Each pier is formed of 14 cast-iron cylinders placed in a double row and sunk through the bed of the river into the hard chalk. All these cylinders were sunk by means of compressed air, to keep out the water while the men were at work in them, in a very similar manner to the method adopted by the French engineer, M. Triger, for sinking his shaft. Mr. John Hughes, Civil Engineer, was the first to adopt this mode of keeping the water out of piles while being sunk to form piers in the beds of rivers, and great praise is due to him for the thorough and practical way in which



NEW BRIDGE AT COPENHAGEN.

this system was carried out, in sinking seventy cylinders to a great depth in the bed of a strong tidal river like the Medway. The bed of the river was found to consist of strata of soft clay, sand, and gravel over the chalk, which was reached at a depth of 44 feet below average water line. Each cylinder was like an immense diving bell, always having its top out of the water, no matter at what depth the bottom was. They are formed of cast-iron pipes, 9 feet long and 7 feet diameter, with internal flanges, so that the external faces are free of any projections that would interfere with their free descent through the bed of the river. The accesc to and from the inside of the pile, while being sunk, was through two air-locks or chambers, made of cast iron, passing through the cover-plate bolted on the top length of the pipe forming the pile. The tops of these locks had openings 2 feet in diameter, and flap-doors which, when closed, allowed them to be filled with the compressed air from the cylinders. From each air-lock there was a vertical door opening into the air-chamber, which, when closed, was also air-tight, so that when the workmen had to pass in or out, or to take out the excavated material, they could do so without decreasing the pressure of the air very much. In coming out, they entered, through one of the vertical doors, into one or the other of the air-locks, and when this door was closed, the pressure of the air was reduced to atmospheric pressure by means of a small cock, opened to the atmosphere. As soon as there was an equilibrium of pressure, the top door was opened and the men came out. The operation of entering the pile or cylinder was the reverse of coming out. The only loss of the compressed air from the cylinder at each operation was the amount contained in the small air-lock.

Within the cylinder were two small cranes to lift the full buckets and lower the empty ones, which were worked by a two-handled windlass. As each pile was sunk 9 feet, the air-chamber was disconnected and a fresh length of pipe bolted on, and the air-chamber bolted on top of this. At each joint a floor or staging was fixed, with openings to allow of the ascent and descent of the workmen and the full and empty buckets, etc. These cast-iron pipes form part of the permanent structure of the piers, and when they were sunk to their proper depth they were filled in with concrete and brick-work.

The method of working was by setting the air-pumps in motion, having the top door of one of the air-locks and the bottom one of the opposite air-lock closed. The pumps were of such a size that in about five minutes 15 feet head of water was forced out through the bottom of the piles; and while the pumping continued the workmen passed through the air-locks to their various stations.

The engineering illustration which we give this week shows a more economical method of building piers in the beds of rivers, or under water. It shows a caisson or diving-bell, designed by Messrs. Burmeister and Wain, and adopted by them in building the piers of the new bridge in Copenhagen. The principal economy consists in having the caisson, or cylinder, of less cubic capacity than the finished pile of the piers, and in being able to take it away as each pile was built. When the excavation was made deep enough for a firm foundation, the building of the pile was commenced, and as it increased in hight the caisson was lifted accordingly until the pile was above water-line, when the caisson was removed to the required position of the next pile, and so on, until the two piers, each formed of two piles, were completed. This plan of lifting the caisson avoided leaving the whole of the piles of the piers encased in ironwork, as in the piers of Rochester and many other bridges. This caisson was made of wrought-iron, 18 feet diameter at the lower part by 8 feet high, and above this to the air-chamber out of the water it was only 10 feet diameter. Just above the 18-feet diameter chamber there were two annular rings, or chambers—one to contain iron ballast, A, and the lower one water ballast, B, so that in sinking the caisson the water chamber was filled with water for weight in addition to the iron ballast in the annular chamber above. When they had excavated to the solid strata, a bed of concrete 3 to 4 feet thick was formed, and on this the remainder of the pile was built with granite facing filled in with brickwork. As the building of the pile proceeded, the caisson was lifted by means of the suspension chains, C, connected with staging overhead, and by pumping air into the annular air-chamber, B, to displace the water. The finished piles are about 18 feet diameter at their bases, and 16 feet diameter at their tops, by 30 feet high. The whole of the work below water line was done in the 18 feet by 8 feet chamber at the bottom of the caisson. Between the time of lowering it to the bed of the river and the completion of the first pile to water line was only twenty-eight days, and then the apparatus was moved into position for the next pile. In lowering it for the second pile, it unfortunately got upset, and caused so much delay that it took thirty-six days to complete this pile. The third pile, was, however finished in sixteen days, and the fourth in seventeen days.

The air-chamber and locks on top of the caisson were very similar to those used for sinking the piles of Rochester Bridge.

OBJECTS OF INTEREST ON A GUANO ISLAND.

A recent writer from Baker's Island, in the South Pacific, off the coast of Peru about 2,500 miles, gives an interesting account of life on that little patch of *terra firma* which carries upon its bosom nearly a million tuns of guano.

He mentions that fish of remarkable size and beauty, weighing from fifty to sixty pounds, are abundant, and are easily taken with a hook. Sharks abound also—murderous sharks who swarm about the ship with greedy and persistent devotion. These sharks are, by hereditary proclivity, man-eaters; and the white man who comes within their reach is snapped at in an instant by a score of ravenous mouths. But, strange to say, a dark-skinned Polynesian will swim about in their midst and rarely be molested. I have seen a native of the Hawaiian Islands fearlessly jump from the bow of a ship into the midst of a "school" of these fellows, swim, with the end of a line in his mouth, to one of the buoys, and return to the vessel uninjured.

Whether there is a sort of freemasonry between the sharks and the Kanakas, or whether the tastes of the shark are too fastidious, and not sufficiently cannibal to relish cannibal flesh, has not been satisfactorily explained. But the shark and the Kanaka are on the friendliest terms imaginable.

The flying fish abounds in these waters. When pursued by the dolphin, their foe, whole schools of them may frequently be seen to leap out of the water and fly for several hundred yards, skimming along quite near the surface, and now and then gaining new velocity by striking the crest of a wave with their long, ray-like, pectoral fins. But this beautiful fish has enemies in the air as well as in the sea, and frequently its aerial flight is cut short by some fleet sea bird that is ever on the alert to seize its prey.

THE FEATHERED INHABITANTS.

Among the chief objects of interest on the Island to a visitor are the birds; and they are well worthy of study. The sea-fowl are at all times a noisy set, but at night, while the older ones are engaged in the quarrels of love-making, and the young are complaining over their scanty rations, the Babel of their chattering is destructive to the sleep of one unused to such disturbance.

During the first night of my stay on this forlorn spot, it seemed at times as if the house were besieged by innumerable tom-cats; then the tumult resembled the suppressed bleating of goats, and I heard noises as of bats grinding their teeth in rage; again it was the querulous cooing of doves, and soon the chorus was strengthened by unearthly screams, as of ghouls and demons in mortal agony. But on going forth into the darkness to learn the cause of this infernal serenade, all was apparently calm and serene, and the radiant constellation of the Southern Cross, with the neighboring clouds of Magellan, looked me peacefully in the face, while, from another quarter of the heavens, the Pleiads shed their "sweet influence" over the scene.

The most quiet time of night with the birds is about day-break, when they seem to subside into "cat-naps," preparatory to the labors of the day.

By day many of the birds range on tireless wing, over leagues of ocean, in quest of fish. But still the number of those that remain about the island is so great as to defy computation, and as you pass through their haunts, in some places they rise in such clouds as actually to darken the air above you.

The eggs of some of the birds are of fine quality, and are much esteemed by the Americans as well as the Hawaiians on the island. Those of a bird called the *nu-e-ko* are most valued. This name is an imitative word, derived from the cry of this restless creature, and is applied to it by the Hawaiians, who have quick intuitions in onomatopoetic matters.

The *nu-e-ko* is a bird of moderate size bearing a strong resemblance to the piping plover. It is less phlegmatic and stupid than most of the other birds, and does not waste so much of its time in droning and crooning and love-making.

Yet it is not undomestic in its habits. While the father is engaged in the business of the island, providing for the wants of the family by fishing, the mother is ever hovering near her half-fledged young, now invitiug them to try their wings in flight, and now hustling them out of sight under some clump of brown grass, and teaching them to lie close in order to escape observation.

The *nu-e-ko* does not make its home on the guano fields, but prefers the sandy shingle nearer to the ocean. The plumage of its back is brown, spotted with gray, a color so nearly resembling that of the sand upon which it makes its nest, that it might almost escape detection. But, when danger approaches it rises on the wing, uttering its shrill, peculiar cry of "*nu-e-ko*! *nu-e-ko*!" and leaves its egg or its young to the tender mercy of the intruder. As it spurns the ground it shows its throat, breast, and wings, lined with sheeny feathers, that glint in the sun like flakes of silver, while it whirls and curvets in the air. This bird is plain in its tastes, and for a nest is content with a simple hollow, scooped out of the sand, the warmth of which assists in the incubation of its speckled egg.

The gannet (*Sula bassana*) is a bird of great power and beauty. The color of the grown bird is white, with wings that are tipped with black. It has a long sharp beak which is serrated and slightly curved at the end, a formidable weapon of attack as well as of defense. Its wings are of immense strength, and when fully spread, they span about seven feet from tip to tip. In their fishing expeditions they range for hundreds of miles from their nesting places, and late in the day ships in mid-ocean often see long files of them returning home like heavy laden treasure vessels speeding to port. This sight is regarded by seamen as a sure indication that land lies in the direction of their flight, though it may be scores of leagues away.

In regard to moral character, the birds may be divided into two classes—those which make an honest living, and those which are robbers. The gannet stands at the head of the respectable birds, and is a thrifty and honest citizen of the air.

The representative of the thievish class is the frigate-pelican, or man-of-war hawk, (*Tachypetes aquilus*). This bird has a dense plumage of gloomy black, a light wiry body, that seems made for fleetness, and wings of even greater spread than the gannet's. Its tail is deeply forked, its bill is long, sharp, and viciously hooked. Audubon regards the frigate-bird as superior perhaps, in power of flight, to any other. It never dives into the ocean after fish, but will sometimes catch them while they are leaping out of the water to escape pursuit. It is often content to glut itself on the dead fish that float on the water, but it depends mostly, for a subsistence, upon robbing other birds. It is interesting to watch them thus occupied.

As evening comes on these pirates may be seen lying in wait about the island, for the return of the heavily laden fishing-birds. The smaller ones they easily overtake and compel them to disgorge their spoils; but to waylay and levy black-mail upon those powerful galleons, the gannets, is an achievement requiring strategy and address. As the richly laden gannet approaches the coast of his island home, he lifts himself to a great hight, and steadily oars himself along with his mighty pinions, until he sees his native sands extending in dazzling whiteness below. Now sloping downward in his flight, he descends with incredible velocity. In a moment more he will be safe with his affectionate mate who is awaiting his return to the nest.

But all this time he is watched by the keen eye of the man-of-war hawk, who has stationed himself so as to intercept the gannet in his swift course.

With the quickness of thought the hawk darts upon him, and, not daring to attack boldly in front, he plucks him by the tail, and threatens to upset him, or he seizes him at the back of his neck and lashes him with his long wings. When the poor gannet, who cannot manœuvre so quickly as his opponent, finds himself pursued, he tries to buy his ransom by surrendering a portion of his fishy cargo, which the hawk, swooping down, catches before it has had time to reach the earth. If there is but one hawk this may be a sufficient toll, but if the unwieldy gannet is set upon by a number of these pirates, he utters a cry of real terror and woe, and, rushing through the air with a sound like a rocket in his rapid descent, he seeks to alight on the nearest point of land, well knowing that when once he has a footing on *terra firma* not even the man-of-war hawk dare come near him.

The man-of-war hawk is provided about its neck and chest with a dilatable sack, of a blood-red color, which it seems to be able to inflate at pleasure. On calm days, about noon, when the trade-wind lulls, giving place to a sea-breeze that gently fans the torrid island, these light, feathery birds may sometimes be seen at an immense hight balancing themselves for whole hours without apparent motion on their out-stretched vans.

Whether they are able to increase their specific levity by inflating their pouches with a gas lighter than the atmosphere, or whether they are sustained by the uprising column of heated air that comes in on all sides from the ocean, is a question I am unable to answer. While floating thus, this bird has its pouch puffed out about its neck, giving it the same appearance as though it had its throat muffled in red flannel.

The most unique and novel bird on the island is the tropic-bird or marlin-spike (*Phæton phœnicurus*).

Its wings are long and its flight very rapid. It is distinguished by two slender, tapering feathers, of rare beauty, which project like a long steering oar from its wedge-shaped tail.

I cannot resist the temptation of alluding to one other bird that abounds here. It is the Mother Carey's chicken (*Thalassidroma Wilsonii*)—an ocean butterfly—the pet and favorite of every true sailor. This bird is about the size of a chimney swallow. Its pretty ways and seemingly innocent affectations, are enough to win the heart of almost any one. The society and study of these birds are not without an inspiration.

(From the Waltham Watch Papers.)

EFFECT OF MAGNETISM ON TIME-PIECES.

The intention of the present paper is to point out a defect in the construction of time-pieces of every description in which balances are used, and at the same time a source of error in their performance, which has been hitherto little, if at all, suspected, but which, where it occurs, completely defeats all the ends intended to be answered by the application of the above-mentioned ingenious contrivances; and that it does occur very frequently will be made sufficiently obvious by a simple detail of facts supported by actual experiments.

It has been suspected by some and denied by others that the balances of watches when manufactured of steel, as they mostly are, might be in a small degree magnetic, and consequently be disturbed in their vibrations, but that a circular body, such as a balance is, should possess polarity—that a particular point in it should have so strong a tendency to the north, and an opposite point an equal tendency to the south, as to be sufficient to materially alter the rate of going of the machine when put in different positions, has never, I believe, been even suspected. If it had, the use of steel balances would have been laid aside long ago, particularly where accurate performance was indispensable, as in time-pieces for astronomical and nautical purposes. Though I have frequently examined with great care watches that did not perform well, even when no defect in their construction or finishing was apparent, and suspected the balance to be magnetic, yet I never could have imagined that this influence, operating as a cause, could produce so great an effect as I found upon actual experiment; for I did not expect to find that a balance, even when magnetic, should have distinct poles.

Happening to have a watch in my possession of excellent workmanship, but which performed the most irregularly of any watch I have ever seen, and having repeatedly examined every part with particular attention, without being able to discover any cause likely to produce such an effect, it put me upon examining whether the balance might not be magnetic enough to produce the irregularity observed in its rate of going. I took the balance out of its situation in the watch, and after removing the pendulum spring, put it into a poising tool, intending to approach it with a magnet, but at a considerable distance, to observe the effect, while at the same time the distance of the magnet should preclude the possibility of the magnetic virtue being thereby communicated to the balance. I had no sooner put it into the tool than I observed it much out of poise—that is, one side appeared to be heavier than the other; but, as it had been before examined in that particular by a very careful workman more than once, I was at a loss to determine what to think of the effect I saw; when happening to change the position of the tool upon the board, the balance then appeared to be in poise. As there could be no magic in the case, it appeared that the balance had magnetic polarity, as no other cause could produce the effect I had witnessed, and which was repeated as often as I chose to move the tool from the one position to the other. It happened that I was then sitting with my face to the south—a circumstance that led me, in placing the plane of the balance vertically, to put it north and south, and of course the axis east and west, the only position in which the magnetic influence could make itself most apparent, and which will account for the circumstance not having been observed by the workmen who examined the poise of the balance before I did; for, as often as I placed the plane of the balance vertically between east and west it was in poise, whichever end of its axis was placed toward the south.

Having pretty well satisfied myself as to the cause, I now proceeded to determine the poles of the balance. With that view I placed its axis in a vertical situation, and of course its plane was horizontal; and I was much surprised to find that in that position it possessed sufficient polarity to overcome the friction upon its pivot, for it readily turned on its axis to place its north pole toward the north. Making a mark on that side, that I might know its north pole, I then repeatedly turned that point toward the south; and, when left at liberty, it as often resumed its former position, performing a few vibrations before it quite settled itself in its situation and came to rest, exactly as a needle would do if suspended in the same manner. I was extremely happy that that I had observed these effects before I brought a magnet to make the experiment I first intended, as I might, and as others also might have concluded, that the polarity had been produced by the approach of the magnet. I now, however, brought a magnet into the shop, and presenting its south pole to the marked side—that is, to the north pole of the balance, the balance continued at rest; but upon presenting the north pole to the marked place, it immediately receded from the magnet, and resumed its former position whenever the magnet was withdrawn.

No doubt now remaining as to the facts, and being in possession of the position of its poles, I proceeded to examine the effects produced by this cause upon the watch's rate of going. Having put on the pendulum spring, and replaced the balance in the watch, I laid the watch with the dial upward, that is, with the plane of the balance horizontally, and in such a position that the balance when at its place of rest should have its marked side toward the north; in this situation it gained 5′ 35″ in twenty-four hours. I then changed its position so that the marked side of the balance when at rest should be toward the south, and observing its rate of going for the next twenty-four hours, found it had lost 6′ 48″, producing by its change of position alone a difference of 12′ 23″ in the rate.

It must be obvious to every person, that even this difference, great as it was, would be increased or diminished as the wearer should happen to carry in his waistcoat pocket a key, a knife, or other article made of steel. This circumstance, taken along with the amount of the variation occasioned by the polarity of the balance, was fully sufficient to produce all the irregularity observed in the going of the watch. I then took away the steel balance, substituted one made of gold, and found it as uniform as any watch of the like construction; for though it was a duplex escapement, which is perhaps the best yet invented, at least for common purposes, it had no compensation for the expansion and contraction by the heat and cold, and therefore a perfect performance was not expected. Steel balances being commonly in use, and on that account easiest to be procured, and being on many accounts preferable to any other, I was unwilling to abandon them entirely, but resolved to take the precaution of always trying them before I should apply them to use. The mode I adopted was, to lay them upon a slice of cork sufficient to make them float upon water, and I was in hopes that out of a considerable number I might be able to select sufficient for my purpose; but, to my surprise, of many dozens which I tried in this manner, I could not select one that had not polarity. Some of them had it but in a weak degree, and not more than one or two out of the whole quantity appeared to have it so strong as the one which gave birth to these experiments and to the present paper, which is perhaps more prolix than could be wished; but the subject appeared to be not uninteresting, and I hope the remarks I have offered will be not altogether useless, as everything that can tend to add to the perfection of time-pieces, to remove any cause that operates against their perfection, is of some importance.

SOME English capitalists are about to dispatch workmen to New Zealand to commence the business of preserving mutton. The meat is to be put up in tin cans of various sizes. Meat has thus been successfully and profitably shipped from Australia to England, and there is no good reason why it may not be transported any distance in this manner.

ON ROPEMAKING.

(From Chapman's Treatise.)

HEMP.

Seed to be sown, should be of the preceding year, because it is an oily grain, and is apt to become rancid if kept too long; it is also advisable to choose the seed every second year from a different soil.

The time for sowing is from the beginning to the end of April; if sown earlier, the plants become tender, the frost will injure, if not totally destroy them. The plants should be left thick, as without this precaution, the plants grow large, the bark woody, and the fibers harsh.

The ripeness of the male plant is known by the leaves turning yellow, and the stem of a whitish color; and the ripeness of the female, by the opening of the pods so much that the seed may be seen—they will have a brownish appearance.

The harvest for pulling the male is about August, the female not being fit until Michaelmas. When gathered, it is taken by the root end in large handfuls, and with a wooden sword the flowers and leaves are dressed off—twelve hands form a bundle, head, or layer. It is immersed in water as soon as possible; as by drying, the mucilage hardens, and it requires a more severe operation to develop the bark than when macerated directly, which is injurious to the fiber. If let lie in water too long, the fibers are too much divided, and by an undue dissolution of the gum, would not have the strength to stand the effort it should, in being dressed. But if not sufficiently steeped, it becomes harsh, coarse, non-elastic, and encumbered with woody shives, which is a great defect. The next operation is to separate the fibers from the stem; this is done by a process called scutching, formerly practiced, but now by a machine called a brake; the operation is only breaking the reed or woody part, for the fiber itself, of which is the filamentous substance; hemp only bends, and does not break. The strength of the longitudinal fibers is superior to the fibers by which they are joined; or, in other words, it requires more to break them than to separate them from one another, as rubbing or beating causes the longitudinal fiber to separate, and in proportion to the greater or less degree of that separation, it becomes more or less fine, elastic, and soft.

When intended for cordage or coarse yarn, it requires only to be drawn through a coarse heckle; but if for fine yarn, through heckles of various degrees of fineness. In this process the pins carry off a part of the gum in the form of dust, which is very pernicious, and by dividing the fibers, separate entirely the heterogeneous mass. To effect this, the heckle is fixed upon a frame, one side inclining from the workman, who, grasping a handful of hemp in his hands, draws it through the heckle pins, which divides the fibers, cleanses and straightens them, and renders the hemp fit for spinning; if the fibers were spun longitudinally, the yarn would be stronger, would more easily join, and require less twist.

SPINNING.

When the spinner has placed the hemp around him, he commences by taking hold of the middle of the fibers, and attaching them to the rotary motion that supplies twist, which, upon receiving, he steps backwards, doubling the fibers in the operation. When the yarn is spun, it is warped into hauls or junks, which contain a certain number of threads or yarns in proportion to the size and weight. The hauls are then tarred, if required. The tar should be good, and of a bright color when rubbed by the fingers—Archangel being the best; mixing with it, at times, a portion of Stockholm, to ameliorate and soften that which has been boiled, as by repeated boiling it becomes of a pitchy consistency, and makes the cordage stiff, difficult to coil, and liable to break. The tar should at first be heated to a temperature of 220 degrees of Fahrenheit previous to commencing operations, so that the aqueous matter may be evaporated, and any dirt or other dense matter precipitated and taken out, thereby cleansing it from all impurities; as the yarn, passing through the tar, takes or draws in a quantity of moisture, and the atmospheric air in contact with the surface has a tendency to lower the temperature, it never should descend while in operation below 212 degrees to evaporate that moisture. The yarn should not pass through the tar at a greater speed than fifteen feet per minute, to allow it to imbibe a sufficient quantity to prevent decay, and cause an amalgamation to take place, rendering the cordage more durable in exposed situations, weaker by its adhesion to the fiber which makes it more rigid, and destroys a small portion of its strength and elasticity. After being tarred, the hauls are left for several hours to allow any moisture to evaporate; it is then coiled into the yarn-house, and left for several days to allow the tar to harden, and adhere more closely to the fiber; otherwise, should it be made into cordage directly after being tarred, the tar would press to the surface, decay take place in the center, and give the cordage an unsightly appearance. When the hauls have lain a time in store, they are wound upon bobbins, the haul being stretched along the floor of a shed; and each end being formed in loops or bights, are placed upon hooks, and made taut by tackles; the workman takes the end of four yarns, separates them, and, passing each end through a gage, attaches them to bobbins placed upon a machine to receive them, called a winding machine. When the bobbins are full, they each contain about 500 fathoms of yarn, or in proportion to the size of the yarn, and are taken from the machine and replaced by empty ones, and the operation proceeds.

The bobbins of yarn are then taken to a frame made to receive them, and the ends passed through a metallic plate perforated with holes in concentric circles; each yarn is passed through a single hole to the number of yarns required to form a strand; the whole are then brought together, and drawn through a cylindrical metallic tube, having a bore equal in diameter to the number of yarns when compressed. It is then attached to a machine which is drawn down the rope-walk by steam or some other power; at the same time a rotatory motion is given to twist the yarns into a strand, making an uniform cylinder. These machines are called registers, because they register the length. Forming, giving a proper formation, and equalizing for the equality of twist given the strands over the old method.

There are other machines for making cordage upon more scientific principles, and which give a greater uniformity of twist or angle, such as Captain Huddart's, for these reasons:—the backward traveling movement of any register, forming, or equalizing machine that is or may be used in a rope-walk, or the retrograde movement of such a machine towards the bottom of the walk to which the strands are drawn, and where the most improved and best principle is or may be adopted, has hitherto been found defective. The machines being worked by ropes applied in different ways, causes non-uniformity in the twist or angle; as, in some cases, the rope is made to draw the machine by fastening one of its ends to the machine and the other to a capstan at the bottom of the walk, the twist being given by the rotatory motion of the wheels upon which it travels; in other cases, a rope, termed a ground-rope, is made fast at each end of the walk, and, having one or more turns round the barrel of the machine, gives the required twist to the stands. Also an endless rope passing from one end of the walk to the other, the one end passing round a movable pulley, the other round a capstan, with power to drive the machine; the rope is then passed round a gab-wheel upon the machine the capstan being put in motion, the endless rope drives the gab-wheel, and causes the machine to retrograde or travel along the ground-rope which gives motion to the pinions, and twist the strands. The great object to be obtained is in regulating the retrograding or traveling motion, and to preserve a certain speed in a given time, in order that the strands may receive a proper degree of twist in a certain length.

The next operation, the strands are made into a rope by being attached to the machines at each end of the walk, and brought to a certain degree of tension by the means of tackles; a wood frame, called a drag, is made fast to the machine, and some heavy material placed upon it to retain that tension when released from the tackles. The machines are then put in motion, and as the strands receive tortion they shorten in their length—this is called hardening; but from various causes, during this process, an inequality of tension takes place, one strand becoming slack and the others tight, therefore of unequal lengths, although originally of equal lengths, and received the same number of twist or turns by machines of the most approved principle. The method practiced to remedy this, is to twist up the slack strand, making it harder and smaller, and consequently it cannot lay evenly in the rope, and will be the first to break. It is also obvious that an after-twist must be given the rope to cause the strands to unite, as for every twist given the rope the same is taken from the strands; hence the same number of twists the rope receives, the same number must be given to the strands, and any increase given the rope in making or rounding cannot be retained, but must come out when the rope is put upon a strain. When the strands have received a sufficient hardness of twist, they are placed upon one hook upon one of the machines; a cone of wood, called a top, with grooves cut in the surface sufficiently large to receive the strands, is then put between them; the machines are then put in motion, the strands made to bear equally, the tails wrapped around the rope, and all is ready for closing. The machine that twists the rope being set so as to make two revolutions, while the machine that twists the strands makes but one revolution; this extra revolution given the rope being requisite to overcome the friction which is caused by the top, tails, and the stake heads which are placed at every five fathoms to support the strands and rope, and which extra revolutions cannot be retained in the rope.

Acid Proof Cement.

R. F. Fairthorne writes to the *Journal of the Franklin Institute* that he has found the best preservative for corks exposed to acids to consist of a coating of silicate of soda and powdered glass. The cork having been bored to suit the size of the tube, is soaked for two or three hours in a solution of silicate of soda, consisting of one part of commercial concentrated solution, to three parts of water. The tube is next inserted, and when dry, the cork is covered with a paste made by mixing the condensed solution of the silicate with powdered glass in such proportion as to form a mass of about the same consistence as that of putty. This is spread on the under surface, and then washed with a solution of chloride of calcium. It soon hardens, but it is advisable to make the connection with the flask while the paste is in a plastic state, and to allow it to become solid before applying heat to the vessel containing the acid.

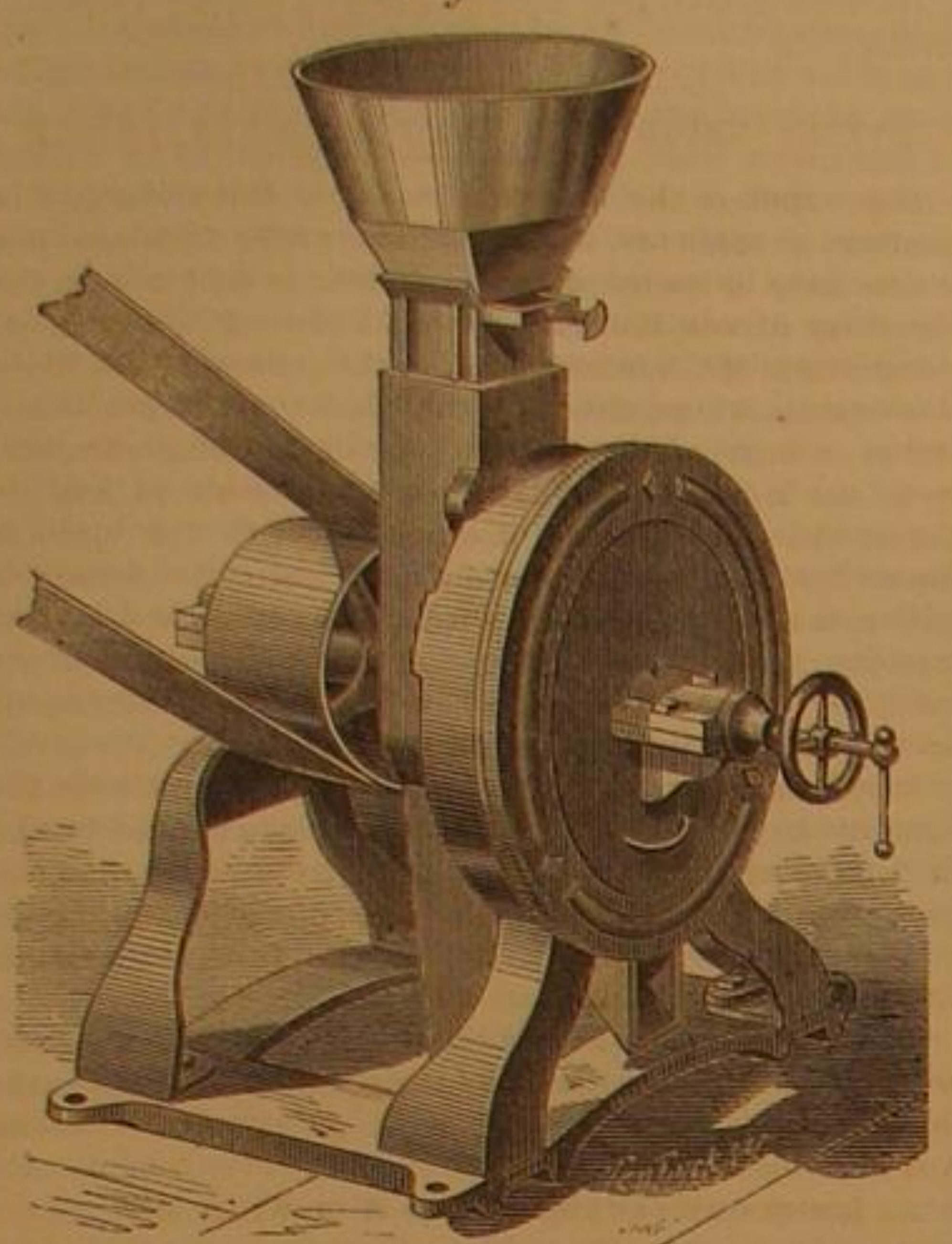
Corks protected in this manner are but slightly acted upon, though remaining over the boiling nitric acid more than four hours, and over hot acid for ten. In some instances, when not entirely covered, the vapor softens the cork beneath the silicate to the depth of about a quarter of an inch, but the cement has proved sufficiently strong to form a compact diaphragm, enabling the tube to be removed from the flask without danger of the fluid contained being contaminated. The application of this cement as a luting for chemical apparatus for general use, is suggested, as it is found that it remains unaffected even when immersed in strong nitric, sulphuric, or muriatic acids. The immersion in these liquids, made while the plaster is still soft, has the only perceptible effect of hardening the same immediately.

THE DIAMOND BONE MILL.

The great importance of the manufacture of bone fertilizers, the value of which is daily becoming better appreciated, and the great number of other purposes to which bones are applied in the arts, give interest to any device employed in their utilization. The reader will find on page 137, Vol. XX., of the SCIENTIFIC AMERICAN, an article on the "Value of Bones," and another on the "Utilization of Bones," on page 373, of the same volume, to which he is referred in this connection.

We illustrate herewith a machine for grinding bones,

Fig. 1



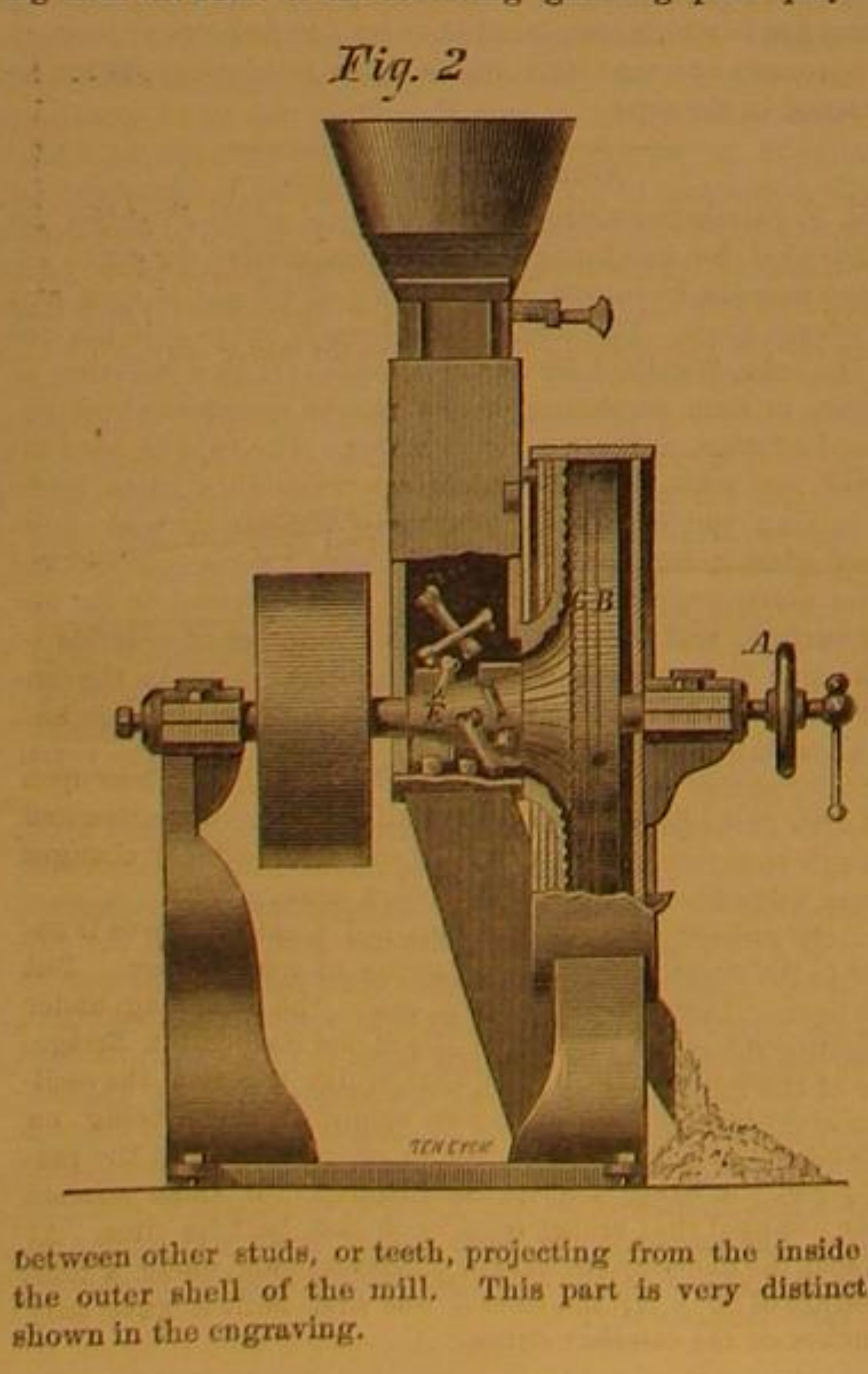
which has, although but recently introduced, attained an excellent reputation for its efficiency and other good qualities. An examination will satisfy all practical minds that the devices employed must secure good work.

Fig. 1 is an elevation of this mill, a vertical section of which is shown in Fig. 2. D is the hopper with a gate to adjust the feed. When in use the bones fall from this hopper down upon a powerful breaker or cracker at the bottom of the chute. From thence the crushed fragments pass in between the grinding plates, one of which is stationary and the other revolving. The revolving plate is made so as to conform to the shape of the stationary grinding plate, which latter has the form of the mouth of a trumpet. A screw, lever, and hand wheel, A, serve to adjust the revolving grinding plate, so that it will grind to any required fineness.

The revolving grinding plate is made of two metallic sections, an external one, B, and an internal one, C, which latter is the grinding plate proper. Between the sections, B and C, is a section of non-conducting packing, the object of which is to keep the mill from heating. The stationary grinding plate is also backed with similar packing for the same purpose. Fans are also attached to the periphery of the revolving grinding plate, by which, together with the non-conducting packing, the mill is essentially prevented from heating.

The breaker, or cracker, is formed by strong studs projecting from the shaft of the revolving grinding plate playing

Fig. 2



between other studs, or teeth, projecting from the inside of the outer shell of the mill. This part is very distinctly shown in the engraving.

The peculiar "dress" of this mill consists of hollow diamond-shaped projections, radiating in lines from the center to the periphery of the plate. These grinding teeth are of hard iron from one eighth of an inch to three sixteenths of an inch in hight, thus making from one quarter to three eighths of an inch of hard iron on both plates, which will last a long time.

This structure of the grinding plates renders the teeth self-sharpening. When dulled by use after running the mill in one direction, they are sharpened for the other direction, so that all that is required is to reverse the motion of the mill. These surfaces are also made in segments so they can be easily removed for repairs, or, if necessary, replaced. Thus an important advantage is gained over the burr stone mill; namely, the obviation of all necessity for "dressing."

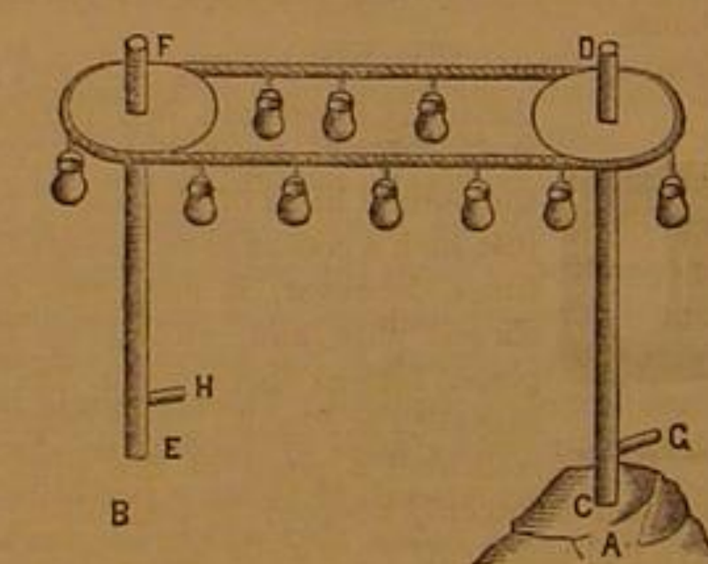
This principle has been successfully extended by the inventor to mills for nearly all grinding purposes.

A patent was obtained on this invention July 14th, 1868. A reissue was granted September 15th, 1868, and patents on other improvements are now pending.

For further information address Henry Shaw, agent, Diamond Mill Co., Cincinnati, Ohio.

A Very old Invention.

There is an old book, and a very scarce book now, bearing on its title page the following: "Mechanick Powers: or, the Mistery of Nature and Art Unvail'd. Showing what Great Things may be performed by Mechanick Engines, in removing and raising bodies of vast Weights with little strength, or force; and also the making of Machines, or Engines, for raising of Water, draining of Grounds, and several other Uses. Together with a Treatise of Circular Motion artificially fitted to Mechanick use, and the making of clock-work, and other Engins. A work pleasant and profitable to all sorts of Men from the highest to the lowest Degree; and never treated of in English but once before, and that but briefly. The whole comprised in Ten Books and illustrated with Copper Cuts. By Ven. Mandey and J. Moxon, Philomat. London: Printed for the Authors, and Sold by Ven. Mandey, next door to the Salmon, in Bloomsbury Market, and James Moxon, at the Atlas, in Warwick-lane, and R. Clavel, at the Peacock, in Fleet-street, 1696." This book is dedicated to his Grace, William Duke of Bedford, at that time Lord-Lieutenant of Middlesex, Cambridge, and Bedford, by his humble servants, Venterus Mandey and James Moxon, and contains much quaint matter. It claims to be the first treatise on mechanics written in English, with the exception of the work by one Bishop Wilkins, who wrote "but briefly, and rather historically than fundamentally." Among descriptions of "Engins moved by Smoak," of apparatus for indicating the distance traveled by a chariot or ship, of the effect of percussion or smiteing, we find the specification of a wire tramway, identical in principle with that of which we have lately heard



as a bran new invention, working successfully among the Leicestershire quarries:

"ENGIN VI.

TO REMOVE A MOUNTAIN, OR HEAP OF EARTH, FROM ONE PLACE TO ANOTHER EASILY AND QUICKLY.

"Let the mountain, or hill, or heap of stones be A, to be removed to the place B; to save time in going and returning from one place to the other, as also that the motion whereby the earth or stones is transferred from A to B may be swift, we may make use of the following industry: Erect at the foot of the mountain, or in its middle, a great and solid wooden column, or piece of timber, C D, and erect such another in B, namely, E F, affix at the top of each piece or column, the wheels, D and F, and make hollow each wheel in the circumference; and put about them a great strong rope, extended parallel to the horizon; but if the distance from A to B be great, least the rope should be too much stretched or bent, raise other such like pieces, or columns, in the middle with their wheels made hollow as aforesaid, to sustain the rope parallel to the horizon; on the rope thus doubled, here and there hang baskets, which must be so far distant from each other, that they hinder not one another; and the ends of the pieces must be so placed, that the power applied to the leavers, G and H, may be turned about their centers; for so the whole rope, with the baskets hanging on it, will be turned about successively; wherefore, if men keep filling the baskets in A, and others unload them in B, the whole hill will be easily transferred from A to B.

"Where note, that the greater the wheels D and F are, the swifter the rope and baskets will be turned about, which momotion about the axis or piece of timber being easie, may be accomplisht by means of short leavers, and so the motion of the baskets may be greater than the motion of the power about the piece of the timber. Besides the saving of labour, and the gaining of time, which is effected by this engin, it hath likewise this conveniency, that if between the two places, A and B, there should be a river, or stream, or such like inaccessible, as if the earth were to be transferred from a mound, or hill, to the next adjoining field, and there were a large deep mote or ditch before them, you could scarcely obtain your desire any other way."

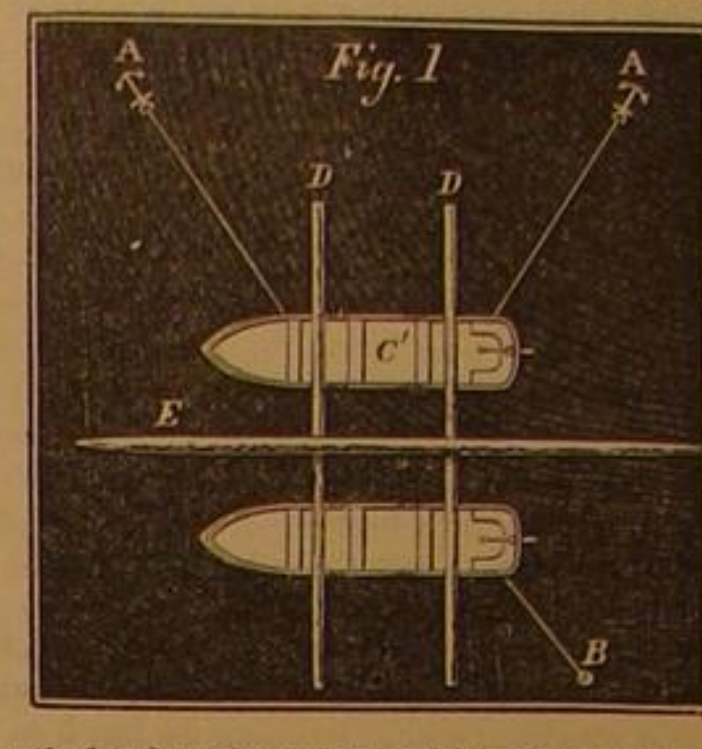
Venterus Mandey and James Moxon, Philomat, were thus nearly two hundred years in advance of the recent inventor of the wire tramway.—*Engineering.*

(For the Scientific American.)

THE SHAD FISHERIES OF THE HUDSON.

The American shad, *Alosa prœstabilis* of naturalists, one of the most esteemed fishes which frequent our waters, gives profitable employment to a large number of fishermen both on the New York and New Jersey sides of the Hudson river, and constitutes a much more important branch of piscatorial industry than is generally supposed.

These fish, leaving the ocean every spring, in vast numbers, penetrate most of the North American rivers which flow into



the Atlantic, for the sole purpose of breeding and spawning in fresh water, after which they return, thin and poor, to recuperate their strength in the briny deep. The further South we go, the earlier in the season are they found to make their appearance.

The period of the first arrival of shad in the Hudson river, varies somewhat according to seasons, or as old fishermen believe, with the state of the moon.

The very first fish, which always sell at fancy prices, are generally caught during the month of April. By the end of June the last of the stragglers has found its way back to its salt water home.

We are indebted to three brothers, James, Samuel, and John Ludlow, of Weehawken, N. J.,—who have been regularly engaged in shad fishing for more than thirty years, and whose father, James, and grandfather, Anthony Ludlow (an old soldier of the revolution), before them, followed the same profession,—for a considerable portion of the account we publish, of the usual manner of catching this excellent fish.

Everyone, who during the early months of the year, has crossed to or from New York, to Jersey City, Hoboken, Weehawken, Bull's ferry, etc., or who has had occasion to travel up or down the North river, must have noticed long lines of poles running across the river and projecting above the surface ot the water, and on inquiry will have learned that these were shad fisheries.

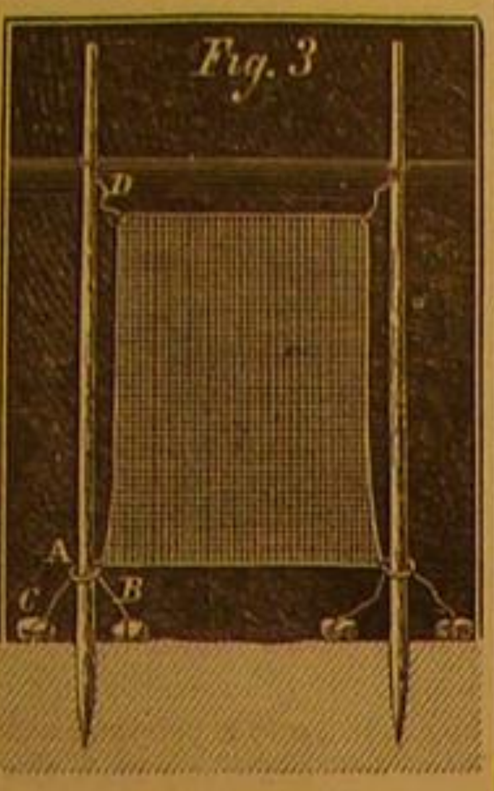
In general from 30 to 40 poles in a row constitute one fishing stand. In deep water, however they are less numerous. These poles are placed 30 feet apart. Their length varies from 20 to 90 and even 100 feet, this great hight being obtained by firmly splicing several pieces together; their lower ends are often from 12 to 18 inches in diameter, and 15 feet of the bottom end are tapered off to a point, so as to enable them to readily penetrate into the river bed. They are made of hickory or white oak, and when of large size do not cost less when set, than twenty dollars apiece.

The mode of driving in the poles is illustrated in the following diagram, Fig. 1.

Two boats C and C' are placed parallel to each other. One of them, C, is made fast by means of a guy line B, to a post, or fixture of some kind, the second boat, C' is held in its place by means of two anchors, A A, as shown in the figure. Two poles, D and D, are then placed crosswise over the top of the boats and the pole, E, destined to be sunk in the river, is laid across them. This last pole is now tilted up, so that its sharp pointed heavy lower end will sink in the water at the bow end of the boats. When it touches bottom, it is hauled up and down, a certain number of times, by main force, so as to make it take a firm hold, after which a cross beam called a "riding stick," Fig. 2, is firmly attached to it. On this riding stick, four men now stand up and by repeated measured jumps, drive the pole into the silt as far as it will go, often causing it to penetrate to a depth of 25 feet below the bed of the river. This firm attachment is indispensable in order to preclude the possibility of passing vessels drawing out the poles. As soon as one pole is in its place, the guy line of the boat, C, is attached to it, the boat, C', again anchored out at a short distance, and another

pole sunk in the same manner as was the first. The same operation is repeated until the whole row is "planted."

The nets which are spread between each pair of poles are from 20 to 25 feet in depth and their upper portion is generally situated at a depth of from 15 to 20 feet below the water surface, so as to avoid being caught by propellers, ships' rudders, etc.



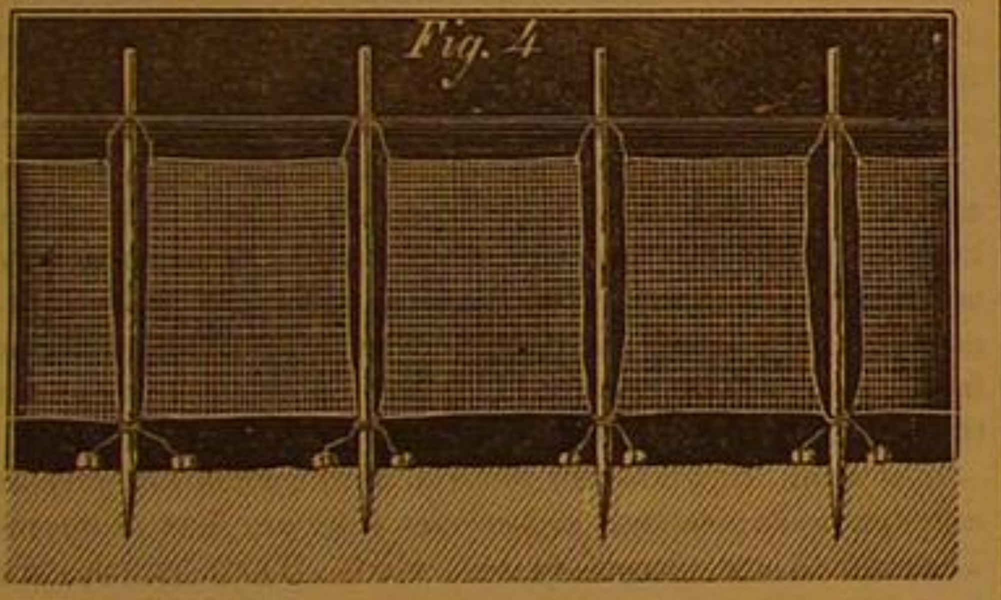
Over each pole is slipped a hoop, A, Fig. 3, to the bottom of which, by means of a fifteen fathom line called the "foot rope," B, is attached a heavy stone, C. The net is attached by one corner to the hoop and above to an "arm line," D, 15 fathoms in length. This arrangement as will be seen, allows of the passage of fish both above and below, as well as on the sides of the nets, when they are bagged by the tide. The following diagram gives an idea of this arrangement.

The planting of the poles, as well as all repairs to the nets, is made at low water slack. The meshes in shad nets vary from 4, or even less, to 5½ inches. The best fishermen employ only these last, and derive a larger profit through the sale of fewer but larger fish, than could be realized from a greater number of small and inferior ones. The nets are hauled up at every high water slack.

Shad is a very tender fish, which in warm weather is generally dead before being taken out of the net, but in cold weather it is much longer lived.

The deplorable fact is but too manifest to-day, that the shad fisheries of the Hudson river, through unpardonable legislative negligence, are rapidly declining, so much so indeed, that unless some energetic measures be resorted to without delay in order to protect both fish and spawning grounds, not many years will elapse before this fine fish will have entirely disappeared from our river. Less than fifty years ago, shad were so abundant in the North River that they sold regularly at seven dollars per hundred: this year they brought from 30 to 40 dollars, and averaged 30 dollars.

Thirty years ago the great porgie, the striped bass, and many other fine fish were caught in abundance a long way up this river, but at present they have entirely disappeared from it, as have also the sharks which in the olden time were a terror to the bathers of the metropolis. The shad, if not looked after will in less than twenty years be "a thing of the past." Not one half of the number of shad that went up the river twenty-five years ago, do so at present, but the greatest falling off has taken place during the last five years.



This is attributed not so much to the continually increasing steam navigation of the river which scares the timid creatures, as to the license allowed the kerosene refineries and gas works to poison the water with their residues, as is clearly proved by the fact that some years back fish could be kept alive for our markets for weeks at a time in tanks filled with the river water, whereas to-day they die within a very few hours after being put into it.

The next reason for the rapid decrease in the number of shad is due to the fact, that this fishery in the Hudson is perfectly free and uncontrolled, that no regulations of any kind exist in regard to it, and that no laws have been passed protecting the future interests of the community from the thoughless cupidity of present fishermen.*

We earnestly commend this subject to our representatives. Regulations should be passed strictly forbidding the catching or vending of shad before the first of March, or after the 25th of May, and also prohibiting the use of nets whose meshes are less than 5½ inches. A fine of $500 for each violation of the law, with $100 of it for the informer, would soon replenish our stock of shad, and all would eventually be gainers by it.

The genuine fishermen of the North river, will, we know, be the first to sustain our views, and none but hungry poachers off the National domains will be found to oppose them.

* The laws existing in regard to our North River fisheries have become a dead letter to the fishermen, who are ignorant of their very existance, and unless the States of New York and New Jersey act jointly in the matter of new regulations, not much good will be done, even while stocking the River through the process of artificial incubation, as commissioner Green is at present attempting to do, near Coeyman's, some 150 miles up the Hudson.

GOOD strong tea, cooled with ice and flavored with lemon, with the addition of a very little sugar, is an excellent drink for hot weather.

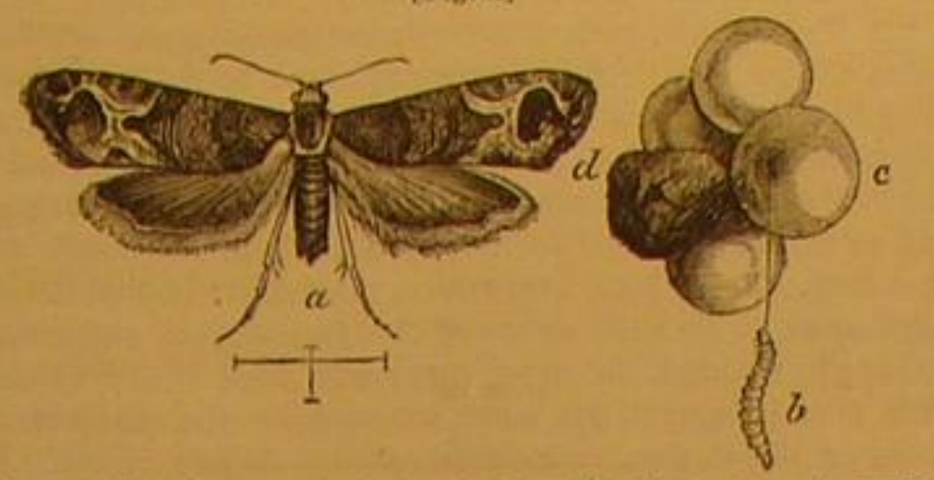
The Grape-Berry Moth.

(*Penthina vitivorana*, Packard.)

Scarcely a year passes but some new insect foe suddenly makes its appearance amongst us; and were it not for the fact that the ravages of others are at the same time abating, the destruction which they unitedly would cause would be intolerable.

The insect which forms the subject of this article may be cited as an illustration of such a sudden appearance in many different parts of the country, for until last year no account of it had ever been published, and it was entirely unknown to science.

[Fig. 1.]



Colors—(*a*) deep brown, pale buff and slaty; (*b*) olive-green or brownish.

It had, however, been observed in Ohio, for three or four years, and in Missouri and South Illinois. It has gradually been on the increase, and was never so numerous as last year. We found it universal in the vineyards along the Pacific and Iron Mountain railroads, in Missouri. It was equally common around Alton, in Illinois, and we were informed by Dr. Hull, of that place, that it ruined fifty per cent of the grapes around Cleveland, Ohio. It also occurs in Pennsylvania.

Its natural history may be given as follows: About the 1st of July, the grapes that are attacked by the worm begin to show a discolored spot at the point where the worm entered. Upon opening such a grape, the inmate, which is at this time very small and white, with a cinnamon colored head, will be found at the end of a winding channel. It continues to feed on the pulp of the fruit, and upon reaching the seeds, generally eats out their interior. As it matures it becomes darker, being either of an olive-green or dark brown color, with a honey-yellow head, and if one grape is not sufficient, it fastens the already ruined grape to an adjoining one, by means of silken threads, and proceeds to burrow in it as it did in the first. When full grown it presents the appearance of (Fig .1) *b*, and is exceedingly active. As soon as the grape is touched the worm will wriggle out of it, and rapidly let itself to the ground, by means of its ever-ready silken thread, unless care be taken to prevent its so doing. The cocoon is often formed on the leaves of the vine, in a manner essentially characteristic. After covering a given spot with silk, the worm cuts out a clean oval flap, leaving it hinged on one side, and, rolling this flap over, fastens it to the leaf, and thus forms for itself a cozy little house.

One of these cocoons is represented at Fig. 2, *b*, and though the cut is sometimes less regular than shown in the figure, it is undoubtedly the normal habit of the insect to make just such a cocoon as represented. Sometimes, however, it cuts two crescent-shaped slits, and, rolling up the two pieces, fastens them up in the middle as shown at Fig. 3. And frequently it rolls over a piece of the edge of the leaf in the manner commonly adopted by leaf-rolling larvæ, while we have had them spin up in a silk handkerchief, where they made no cut at all.

Fig. 2.

Color—(*a*) honey yellow.

In two days after completing the cocoon, the worm changes to a chrysalis. In this state (Fig 2, *a*), it measures about one fifth of an inch, and is quite variable in color, being generally of a honey-yellow, with a green shade on the abdomen. In about ten days after this last change takes place, the chrysalis works itself almost entirely out of the cocoon, and the little moth represented at Fig. 1, *a*, makes its escape.

Fig. 3.

The first moths appear in Southern Illinois and Central Missouri about the 1st of August, and as the worms are found in the grapes during the months of August and September, or even later, and there is every reason to believe that a second brood of worms is generated from these moths, and that this second brood of worms, as in the case of the Codling moth of the apple, passes the winter in the cocoon, and produces the moth the following spring, in time to lay the eggs on the grapes while they are forming.

THE REMEDY.

This worm is found in greatest numbers on such grapes as the Herbemont, or those varieties which have tender skins, and close, compact bunches; though it has also been known to occur on almost every variety grown.

As already stated, there can be little doubt that the greater part of the second brood of worms passes the winter in the cocoon on the fallen leaves; and, in such an event, many of them may be destroyed by raking up and burning the leaves at any time during the winter. The berries attacked by the worm may easily be detected, providing there is no "grape rot" in the vineyard, either by a discolored spot or by the entire discoloration and shrinking of the berry, as shown at Fig. 1, *d*. When the vineyard is attacked by the "rot," the wormy berries are not so easily distinguished, as they bear a close resemblance to the rotting ones.

Many wine makers are in the habit of picking up all fallen berries, and of converting them into wine. The wine made from such berries is but third rate, it is true; but we strongly recommend the practice, as upon racking off the juice obtained from them, countless numbers of these worms are found in the sediment, while unseen hosts of them are also, most likely, crushed with the husks. Those who do not make wine should pick up and destroy all fallen berries.—*Entomologist.*

ADVERSE REPORT ON THE EAST RIVER BRIDGE.

The writer of the following report is the projector of a number of extensive and important public improvements which have attracted much attention, one of which, the Broadway Arcade Railway, is well known to our readers. According to Mr. Nowlan's figuring the proposed East River Suspension Bridge, although the plans are indorsed, either tacitly or expressly by nearly all our leading engineers, will be a dead failure. He thinks it cannot be made to hold together except for a short time, and that with the hight of towers proposed the bridge will almost touch the surface of the water at high tide. Mr. Nowlan's report contains several interesting statements, and we have no doubt will call out suitable replies. It is, we believe, the first adverse report upon the project that has been made public:

Report on the construction of suspension bridges over the East River as proposed by a company incorporated by the Legislature of the State of New York, made before the Commissioners appointed under an order of the Senate of the United States, to meet at the city of New York, to hear such objections and recommendations upon the subject of such bridges as may be made by competent persons, professional or otherwise, such commission consisting of Gen. Newton, Gen. Wright, and Major King, all of the United States Army.

REPORT OF SAMUEL BARNES B. NOWLAN, C. E.

Gentlemen: In reply to your request, I submit the following report, based upon an experience of many years in practical engineering, and the attendant scientific investigation of details, particularly as applied to engineering manipulations in the construction of military works in connection with submarine engineering.

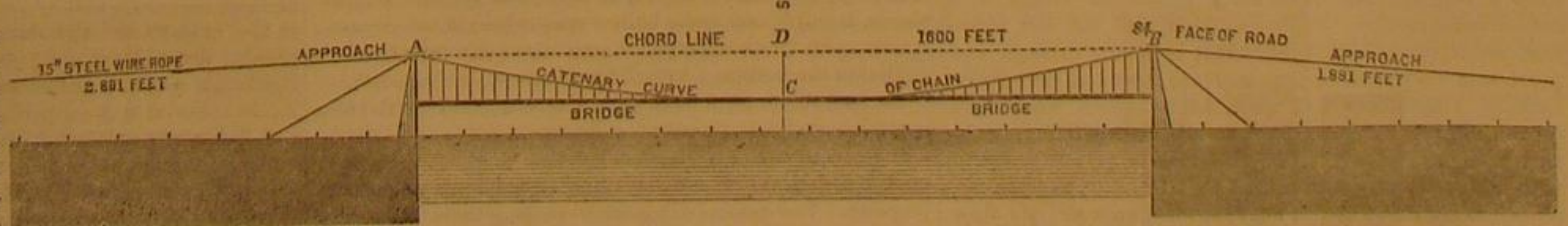
The proposed bridge, according to the plans now before the Commissioners, will be very nearly one mile (5,228 feet) in length. The abutment on the New York side will be at pier No. 29, and on the Brooklyn side at the slip at Fulton Ferry. The grade on the approach from the New York terminus at the City Hall Park to the level of the bridge will be 3½ feet in every 100 feet, while the grade on the Brooklyn side, from its terminus near the junction of Sands and Fulton streets, will be less.

The hight of the bridge is to be 135 feet, as fixed by the State charter.

The center span will be 1,600 feet. It is very doubtful if 135 feet of hight would be sufficient to allow the passage of vessels of a large tunnage, and it seems impracticable to increase the hight of the bridge by reason of the steeper grade, which would render it too great for the convenience of travel. In slippery weather wagons would find it impracticable to ascend to the elevation of even 135 feet, and passengers would prefer the ferry boat.

As to the proposition of any bridge on the suspension plan by wire cables or iron chains, I desire particularly to give the causes and practicable results in cases of failure under similar circumstances.

Referring to the diagram, I would remark that the distance spanned will range about 1,600 feet. A B represents the chord, A C B the catenary curve with the line C D. Now, as the natural sag of the suspended chain should be in proportion as 1 is to 16, and the towers being as represented, 135 feet at the point of hight for the chord, the catenary curve being 1 in 16 would produce in the distance of 1,600 feet a sag of 100 feet, leaving only 35 feet for water way.



Should an unnatural strain or taut be brought to bear upon the suspended chain it would not allow for the deflection and variations of temperature, which from extraordinary changes may vary from 120° Fah. to 20° below zero.

When the catenary curve is obtained, a natural curve is obtained which will meet all deviations of temperature. But if not, the overstrain or taut will cause the snapping under the vibration, as in the case of the Menai Suspension Bridge.

The cause of the falling of that bridge was from the oscillating motion to which it was subjected, there being no strands employed on that bridge as now used by the projectors of the Niagara Suspension Bridge. If those strands were not used that bridge would not last half its time. At present the deflection is over 9 inches at noon under a temperature of 85°. At the time it was first built it gave only 5 inches on the catenary curve.

The great feature of the suspension bridge over the East River will be the two towers, and as the grade of the approach is given at 3½ feet for 100, and the towers are to be 135 feet, this will give the hypothetical grade line of 3,717 feet, which will carry the roadway across Broadway if the line be to the City Hall Park, or if it be taken in the direction of the Bowery will reach about Chatham Square. Now, if we consider the immense expense of some $5,000,000 or $6,000,000 merely to make an approach, without including the cost of construction, we may appreciate the motive that would induce such an unnecessary outlay of public money.

Each of these towers is proposed to be 134 feet at its greatest axis on line at right angles with the thread of the stream, and 36 feet the lesser axis in line with the thread of the stream; below the upper cornice at top of the tower these dimensions are reduced to 120. The elevation of the floor will be 118 feet above high water mark. The roofing above the floor is 150 feet, which will be a total hight of 268 feet from high water mark to this proposed roof. And the commencement of each tower will be three feet below low water mark, with a cubical content of stone in the two towers of 62,824 yards of 27 cubic feet each. The cubical contents of one tower 31,412 cubic yards multiplied by 27 cubic feet will give 848,124 cubic feet, or 67,850 tuns; add to this the greatest weight of superstructure and load of 4,753 tuns, and it gives a total of 72,603 tuns.

Now, the area of base at low water line is 4,660 feet, and therefore the pressure of the structure on each superficial foot will be 15 58 tuns.

The admitted usual pressure on the superficial foot is from 3 to 4 tuns on all railroad engineering in the construction of railroad bridges on piers of 50 or 60 feet in hight, and such pressure is always deemed secure on a bed of compact gravel or sand, provided there is no danger of undermining or spreading laterally.

This great weight sustained between these two towers, 1,600 feet apart, and sustaining a compound leverage and lateral abutting power, will evidently increase the destructive action of the dead weight of gravity of 4 chains. The weight given of the superstructure without cables will be 2,675 tuns, stretched over a space of 1,600 feet, the leverage strain on the center will be as 1 is to 8 by progression, so that 1 tun in distance from the abutting point is increased in its gravity to 8 tuns in the proportion of 1 foot to 8 feet.

By this calculate at half of 1,600 feet what is the supporting power required to support a dead weight of half the mean weight of superstructure, 4,753 tuns, equal to 2,376½ tuns, which, by the accumulated strain on the spandrel, as we may express it, of one side of an arch which is to cross a space of 1,600 feet, this will give a distance to each spandrel of 800 feet, and as each tun actually requires from every abutment for every 8 feet just 8 times its own weight to suspend it, then, consequently, 16 feet leverage will require 16 tuns abutting force to support 1 tun at that distance, and so on in proportion for the length of power represented and required at the extreme end of the entire section of each chain at mid center representing these spandrels.

When it is borne in mind that the action of the temperature varies from 10° below zero, to 120°, Fah., the destruction of this chain is greatly increased by the vibration in stormy weather, under a taut strain, below zero, and the deflection of the chain under a high degree of summer heat; and as the sagging of the chain on the catenary curve, can never of itself return to the original at night, say 60° which at noon gave 95°, Fah. The dead weight, has no power to rise of itself the space of its noon deflection, as illustrated in the Niagara Suspension Bridge, which when first constructed deflected only five inches on the span of 800 feet. But the set strain at each deflection, has now caused the present Suspension Bridge to permanently sag four inches from its former constructed catenary curve, the sine line being increased to 9 inches at noon, at a temperature of 95° Fah. This accumulating set strain caused the breaking of the suspension bridge at Brighton, England, and the Milford suspension for railway transit, which broke down in 1832, and 250 lives were lost, the train falling a distance of 46 feet into the river.

This principle of suspension bridges has been superseded in Europe by the tubular bridge invented by the celebrated Engineer Stephenson, who constructed the Victoria Bridge over the river St. Lawrence, Canada.

In the plans I submitted to the Commissioners, I obviate all these defects, and can construct a permanent bridge with arches indestructible, of 500 feet span, and 200 feet above high water mark, with a permanent approach through fireproof iron buildings, on line with the thread of the stream, forming stupendious and magnificent bonded warehouses capable of paying the entire expense of each building, in sixteen years, and without using one foot of private property, with free access to the river front at all points, as these constructions are raised 25 feet above the sidewalk and the flooring forms a perfect shelter for all merchandise temporarily wharved, from rain or snow in winter, and from the sun in the heat of summer.

I have the honor to be, Gentlemen, respectfully yours,

SAMUEL B. B. NOWLAN, C. E.

NEW YORK, April 17, 1869.

MARYLAND INSTITUTE EXHIBITION.—The second annual exhibition of the Maryland Institute for the promotion of the Mechanic Arts, will be found advertised in another column. The first was a success, and doubtless the second will also be a fine display. Manufacturers and inventors will do well to notice.

MAGNETS, whose coils are long, discharge their magnetism much less easily and slowly than those whose coils are short.

Correspondence.

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

Expansion of Mineral Oils.

MESSRS. EDITORS:—I inclose an extract from the *Tidioute* (Pa.,) *Journal*, in relation to the paper of M. Deville, on the "Expansion of Petroleum," commented on, in your issue of 17th inst., by Prof. Vander Weyde and yourselves. The article, as it states, agrees in its conclusions with practical observations on from 10,000 to 30,000 bbls. of crude oil, in iron and wooden storage tanks, car tanks, and barrels:

"A Frenchman, with the very aristocratic name of Henri Saint Claire Deville, has lately presented to the Academy of Sciences, at Paris, a paper—the third of a series—on the 'Physical Character of Mineral Oils,' in which he mentions the increase in bulk occasioned by an elevation of temperature, as a prominent cause of danger by fire where petroleum may be stored. From long experience, oil dealers in this country have come to be well aware of the fact of such expansions, although without, in most cases, any idea of its amount. This is odd enough, too, when we consider the constant use made of oleometers, 'measurers of the density of oil.' For this reason, the following remarks may not be inappropriate:

"The scale of Baumé's hydrometer, or oleometer, or densitometer, a wholly arbitrary one, represents for each degree within the usual limits of crude American petroleum, as nearly as may be, four and a half thousandths of the density of water at 60° Fah. As every increase of temperature of 10° Fah. equals a decrease in density of 1° B., the expansion of oil may be taken, without sensible error, to be ·00045 of its bulk for each degree of Fahrenheit's thermometer. Allowance for expansion is always made in shipping oil, except in the old-fashioned wooden tank cars, where the oil is permitted to force its way through the hatches, roof, and sides of the tanks. In shipping in barrels, it is customary to leave about one gallon 'outage,' as in 50° (which may be considered the extreme variation in temperature likely to occur while the oil is in transit,) 44 gallons would become 45. It would be safer and more economical to allow yet greater room, were it not for the advantage, in that case, apt to be taken of the shipper by the consignee. The allowance for expansion in Empire Line iron cars is very large, consisting of a cylindrical dome, about 40 inches in diameter, and 30 inches high—the capacity of which is about 4 per cent of the whole car—50° of temperature representing an expansion of but 2¼ per cent, it is evident that these Empire iron cars are as safe and economical as they are convenient. The writer has no knowledge of the empty space left in the five gallon cans so largely used for exported refined, but 5 inches square by 1 inch high would be sufficient.

"The increase in bulk, in the summer, of oil stored in iron tankage in winter, is of considerable importance in these times of high prices. A twelve thousand barrel tank is 60 feet in diameter, and 24 feet high, and holds in each inch of its hight 1762·56 gallons. The mean temperature of oil here in Tidioute is, in winter, about 20°, and in summer 70°—both very nearly. The range being thus 50°, the volume of oil to each inch, at 20° Fah., is increased 39·66 gallons; but as the tank has, also, grown larger, this amount is not shown by measure. Iron expands ·000006964 for each degree, or for 50°, about three and a half ten thousandths; so that the circumference of the tank is increased ·7917 of an inch—the diameter by ·252 of an inch; and the capacity for each inch of hight by ·62 of a gallon. Therefore the apparent gain is only 39·04 gals. for each inch of the tank at 20°. It is to be noted, however, that no allowance is here made for the fact, that the temperature of the tank is always higher or lower than that of the oil; that the yearly mean is greater than 50° Fah., and that nothing was said of the increased hight of the tank. All, of course, for the reason of their insignificance, and because the the expansion of the iron was taken as not interfering with the figures of the tank.

"The above results agree with the writer's experience of oil stored in this vicinity." T.

Tidioute, Pa.

Rights of Inventors.

MESSRS. EDITORS:—I so fully believe in the rights of inventors, that I am sorry to see them hazarded by any attempt to urge them to an extreme and ridiculous extent. I therefore have little sympathy with the criticisms of your correspondent, G. W. P., who objects not merely to Mr. Greeley's argument in defense of the idea of protection for a term of years, as distinct from perpetual protection, but to the idea itself, as embodied in our Patent Laws.

It seems to me that Mr. Greeley and G. W. P. have both made a serious mistake in regarding an invention as ordinary property. The particular machine one may build is ordinary property, and may be so held. But the principle of its construction is not a piece of property. An invention is not a creation,—it is a discovery. When one invents he simply takes a principle which is as old as the laws of nature.

The laws which apply to property do not forbid one to imitate another in his transactions. They only prevent him from taking the material thing which the other has secured, whether it be land, or a gold nugget, or a machine. But the Patent system has its foundation in the idea that a man may not only hold a machine which he may build, but that he may also forbid any one to imitate that machine. The Australian miner, referred to by G. W. P., had a right to the gold nugget, just as an inventor has a right to his particular machine. But no law forbids another to imitate his example and "strike his pick a few inches into the earth," in the hope of finding, and holding for his own, another $50,000 nugget.

The proper defense of the Patent system is found only when one views it as a system of rewards, offered by the community, for the unfolding of natural principles to meet the community's needs. If one does not like the rewards offered, he need not do the work. If the community does not want the work, it need not offer the reward. But every community does greatly need this service, and so cannot afford to neglect to offer the reward. But talk about "innate and perpetual right" is entirely out of place.

The Patent system is for the good of the whole community, and is not legislation in behalf of a particular class. Let every wise man defend it upon the ground of what is for the good of the community. Let attention be called to the fact that a people cannot prosper except as it shall employ some persons to unfold and wisely apply the as yet hidden laws of nature. Let there be the most resolute opposition to any suggestion to abolish the Patent Laws, in view of the fact that the community cannot afford to dispense with that service which the Patent Laws invite by offering to that service suitable rewards. If the rewards now offered are not sufficient, let that be shown, and a people, having even the beginnings of wisdom, will anxiously seek the increase of these rewards. But why should one talk about "innate and perpetual right," unless it be with the idea of bringing the whole system into contempt? J. D. B.

Clinton, Mass.

Nocturnal Hail storms.

MESSRS. EDITORS:—In response to your request in issue of July 10, concerning "the occurrence of hail storms *between sunset and sunrise*," I will state that probably the greatest hail storm that ever transpired in this section of country, occurred here two years ago this summer. An intensely hot day was succeeded by a beautiful evening, pleasantly tempered with gentle southerly breezes. At half past eight, a large black cloud moved heavily toward the zenith from the west; its interior blazing continuously with red lightning, while the increasing reverberations of heavy thunder, apparently shook the earth to its very center. Domestic animals were unmanageable, and the human mind was fraught with awe and apprehension. Occasionally, gusts of chilling air swept from the northeast, bearing fragments of fleecy vapor, which manifested electrical excitement upon nearing the great cloud. After a few seconds of ominous silence, the storm burst forth. An avalanche of hail of immense size, driven by a furious gale from the west, denuded trees of twigs and foliage, and did immense damage to property; in many instances killing fowls and small animals, and leaving scarcely a pane of glass in windows exposed to its fury. The Erie Railway company alone lost several thousand panes from the skylights of their machine shops. At the conclusion of the storm, which lasted fifteen minutes, I picked up hail of an oblate spheroidal form, measuring two inches in diameter and three fourths of an inch axially. The storm limited its fury to a district four miles in length by one mile in width. F.

Susquehanna Depot, Pa.

Mr. J. J. Weber, of St. Clair, Schuylkill Co., Pa., writes that a hail storm occurred at that place, May 13, about 10 o'clock, P.M. "The windows of houses, on the northwest side, were, in some instances, broken, though the hailstones were small. They came down very thick and with tremendous velocity.

"We had another hail storm here about seven or eight weeks ago. On this occasion the hail stones came thicker and faster than on the previous one, the ground being yet covered with them in some places, half an hour after the storm had subsided.

"I have noticed that hailstones never fall when the clouds are low; that whenever they fall you cannot see a distinct outline of a cloud, all being dark overhead, showing that hailstones come from an immense hight, through the cold current of air running from the north pole to the equator. I have often noticed three or four currents of air running one under the other in opposite directions, and my belief is that whenever the vapor is carried up to, or beyond the current of air coming from the pole, hailstones are formed; if not carried so high, it descends again in the form of rain."

How to Make Good Bread.

MESSRS. EDITORS:—Liebig justly complains of the stationary character of bread-making; but in recommending the use of chemicals only, that by the generation of carbonic acid gas in the oven render the dough spongy, he loses sight of the general demand for good *fermented* bread, and that the fermentation should be accelerated, improved, and rendered reliable to insure a good product. The desired pleasant taste and flavor of good bread are due to vinous fermentation, in which sugar and alcohol are formed from starch, and carbonic acid gas directly evolved, which, in this manner, remains more intimately combined with the dough. While the soft dough is constantly stirred, air should be introduced from below to accelerate and insure the process of fermentation, which only requires about two hours, or less if the ferment was sufficiently vigorous, to be ready for molding, and shortly after for the oven. This has been practically demonstrated. The phosphoric acid, to increase the nourishing property, could be added while the fermentation proceeds, and thus the advantages claimed by Prof. Horsford's baking powder, combined with those by thorough fermentation, are economically and safely obtained.

The fermentation by air-treatment is patented, but the patentee gives it free for family use, reserving to himself the right to the manufacture of articles when engaged in by bakers and manufacturers of fermented beverages, etc. He will cheerfully give further information to parties interested. The same process holds good for purifying drinking water, by injecting air into private cisterns, wells, or other receptacles. R. D'HEUREUSE.

P. O. Box 6,844, New York city.

Anthracite Ashes for Earth Closets.

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN for July 17, page 36, your article on "Moulé's Patent," speaks of the ashes of anthracite coal as a deodorizer. The suggestion is of great importance; for even in the country, one cannot always get earth without disfiguring his ground, or sending, with expense, to a distance. And it is quite convenient to find a new place for the disposition of coal ashes.

But an important question has occurred to me—the value of composition of night soil with ashes of anthracite coal as a fertilizer. I have looked in vain, through some cyclopædias, to discover the elements of these ashes.

If Mr. Waring, or if the company whose advertisement you publish, could give a favorable answer to the question of the value of the mixture, the introduction of the earth closets might be much facilitated, and the health and lives of the community, as well as the household convenience, be very greatly acknowledged. May my question be answered?

E. BUCKINGHAM.

Deerfield, Mass.

[The fertilizing value of night soil, mixed with anthracite coal ashes, compared to that mixed with dry earth, in both cases the proper proportions being observed, we estimate roughly at about as three to four, taking the average character of soils into consideration. On stiff clay soils it would be better than this, and in any case it would be a valuable compost.—EDS.

What Chemistry Tells us of Life.

The following closing remarks of the Faraday lecture, delivered by M. J. Dumas, June 17th, before the Chemical Society of London, are worthy the attention of those who are striving after ultimate causes. Their eloquence and force are especially striking, while the sound philosophy they embody teaches the inutility of vain speculation upon matters that must ever be taken on faith.

"If the discoveries which we have witnessed during the last half century do not justify pride, they at least excuse it. But, to bring back man to our appreciation of truth, it suffices to tell him that—if he has become more expert in the art of observing, if he employs with more certainty the art of experimenting, if the logic proper to the sciences leads him more surely to the discovery of the laws of nature—he has not as yet advanced one step towards the knowledge of causes.

"Let us consider, in particular, what he knows on the subject of the materials which his life sets in motion in its development, and the contrast will be striking.

"If I question the physiologist, on the subject of these millions, or milliards, of compounds, misnamed organic, of which the chemist transforms, reproduces, or creates at pleasure the species, he will reply to the three following questions:—Are these compounds living?—No! Have they lived?—No! Are they capable of living?—No!

"If I ask the chemist himself if these compounds belong to mineral chemistry—to the chemistry of raw (brut) substances—he will reply, Yes!

"Organized matter, not capable of being crystallized, but destructible by heat, the only matter which lives, or has ever lived—this matter, a subordinate agent of the vegetating power in plants, of the motion and sensation of animals, cannot be produced by chemistry; heat does not give birth to it; light continues to engender it under the influence of living bodies.

"Let us not be disturbed by a quibble. The ancients admitted that nature alone produces organic matter, and that the art of the chemist is limited to transforming it. To-day we might, perhaps, even pretend that chemistry is powerful enough to replace, in all respects, the forces of life, and to imitate its processes; let us keep to the truth.

"The ancients were mistaken when they confounded, under the name of organic matter, sugar and alcohol, which have never lived with the living tissue of plants or the flesh of animals. Sugar and alcohol have no more share of life than bone-earth, or salts contained in the various liquids. These remnants, or rubbish of life, placed amidst organic matter, are true mineral species, which must be brought back to, and retained among, 'brut' bodies. Chemistry may produce them in the same sense that she manufactures sulphuric acid or soda, without, for all that, having penetrated into the sanctuary of life.

"This subject remains what it was—inaccessible, closed. Life is still the continuation of life; its origin is hidden from us as well as its end. We have never witnessed the beginning of life: we have never seen how it terminates.

"The existing chemistry is, therefore, all powerful in the circle of mineral nature, even when its processes are carried on in the heart of the tissues of plants or of animals, and at their expense; and she has advanced no further than the chemistry of the ancients, in the knowledge of life and in the exact study of living matter; like them, she is ignorant of their mode of generation.

"Where, then, is true organized matter, or matter susceptible of organization? What is its chemical constitution? What is its mode of production? What is its manner of growth?

"Instead of myriads of species, one would feel disposed to recognize but eight or ten at most, if one may be allowed to consider elementary types of organization as chemical species. Be this as it may, in the origin of beings which have life we see cells appear, and in the heart of their types we find cells or organic elements, and, still beyond these, germs of cells.

"In these cells, or in the spaces between them, we observe inert products, aliments, excretion, substances stored up. It is the cell, it is the germs which proceed from life, which live, which engender life, and then die. The substances which are contained in, or which surround these organs, are subordinate accidents, products rejected by organization, or destined to its use, but distinct from life.

"Every organized being is born of a germ; every plant from a seed; every animal from an egg. The physiologist has never seen the birth of a cell, excepting by the intervention, or as the produce, of a mother cell.

"The chemist has never manufactured anything which, near or distant, was susceptible even of the appearance of life. Everything he has made in his laboratory belongs to 'brut' matter; as soon as he approaches life and organization, he is disarmed.

"Thus for a century past, the empirical elements of matter have been recognized and separated; their combinations have been multiplied to infinity; physical forces have been brought back to a common origin—motion—and one has been at pleasure changed into the other; and yet—

"Is the intimate nature of matter known to us?—No! Do we know the nature of the force which regulates the movement of the heavenly bodies and that of atoms?—No! Do we know the nature of the principle of life?—No!

"Of what use, then, is science? What is the difference between the philosopher and the ignorant man?

"In such questions the ignorant would fain believe they know everything; the philosopher is aware he knows nothing. The ignorant do not hesitate to deny everything; the philosopher has the right and the courage to believe everything. He can point with his finger to the abyss which separates him from these great mysteries—universal attraction which controls 'brut' matter, life which is the source of organization and of thought. He is conscious that knowledge of this kind is yet remote from him, that it advances far beyond him and above him.

"No: life neither begins nor ends on the earth; and if we were not convinced that Faraday does not rest wholly under a cold stone, if we did not believe that his intelligence is present here among us and sympathizes with us, and that his pure spirit contemplates us, we should not have assembled on this spot, you to honor his memory, I to pay him once more a sincere tribute of affection, of admiration, and respect!"

An Imported Steam Plow.

A steam plow and accompanying apparatus, imported by Colonel Wm. E. Patterson from Leeds, England, was lately put in operation on the recent purchase of that gentleman in New Jersey.

Colonel Patterson's large tract of land is to be devoted to the culture of sugar beet. As the soil is a sandy loam, closely akin to that in which the French have been so successful in sugar beet culture, Colonel Patterson sees no reason why a profit cannot be realized in this country in the same direction.

The test of this steam plow was made in the presence of a considerable number of people, including General Capron, of the United States Agricultural Bureau at Washington. This gentleman, having beaten his sword into a plowshare, has, from the first, taken active interest in the subject of relieving horses from this arduous and exhausting labor. Through his intervention, the apparatus, which cost $13,000, was admitted free of duty, and, at its successful operation on Tuesday, no one evinced a higher degree of satisfaction.

The machinery is by no means complicated. At opposite sides of the space to be plowed are two steam engines upon wheels. On the trial on Tuesday they stood three hundred yards apart. The plow has six shares. It is a distinct piece of mechanism, and is fastened to a steel wire cable extending between the two locomotives across the ground to be turned over. It is literally a shuttle cock between two steam battledores. It moves at the speed of a hundred yards a minute, turning six furrows a foot each in width, and eight inches in depth. Its average work, therefore, is twenty acres per day. The locomotives are snag machines, capable of being applied to many useful purposes independent of duty as steam plowers.

A man rides on the plow as it crosses the soil. General Capron essayed a trip or two, guiding the machine like an expert upon a velocipede. One of the experts who mounted it just after him, had less good fortune. One of the diggers struck a buried boulder. When an irresistible body in motion strikes against an immovable one, a rumpus must be the result. In this case the man upon the machine was slung high into the air. The concussion broke off two of the teeth of the digger, but as a new one immediately replaced it, the accident was a matter of little consequence.

Of this large track of ground much is virgin soil. The trunks of many cedars, showing slight evidences of decay, were brought to light by the steam plowshares. These were crunched up by them as if they were mere touchwood. The soil above them is largely made up of decayed vegetable matter, and, in the opinion of all who were present, the sugar beet will produce in it enormous crops. A digging machine accompanies the plow, intended for use in soils where roots and stones are obstacles to the course of the plowshare. This is a wonderful apparatus. It so triturates the stiffest soil that a Yankee might put it into bladders and vend it as a substitute for snuff.

To work the machinery costs extremely little. Anything anwers as fuel, and, at the rate of twenty acres a day, a large estate is soon put under cultivation. The locomotives are then ready for ordinary duty as steam engines, either to grind or thrash, sow or mash.—*Journal of Franklin Institute.*

Glycerin and Distillation.

We think, says the *Druggist's Price Current*, the time has come when the use of any glycerin having the least impurity, should be abandoned, as the price of the pure article is so low that there is but a slight difference between it and that of impure.

For medical purposes, for extracts, as a substitute for sugar in medicinal sirups, pure glycerin only should be used, and will specially be valuable in warm weather, as glycerin does not ferment, and the sirups will hence keep much better than sugar would.

The perfumer will find it to his advantage to use a pure glycerin, as it requires less perfume. We would particularly warn against the use of an impure article for hair-oils or hair-tonics, as the lime or lime salts cause an irritation of the scalp and the consequent falling out of the hair. Glycerin having any odor is not fit to be used for these purposes, even if the odor be covered by perfume, as the perfume will volatilize first and leave the rancid smell.

For the benefit of those not versed in chemistry, we give a few simple and practical tests, to detect impurities in glycerin:

1. Specific gravity. Employ Baumé's hydrometer. Glycerin, weighed at the temperature of 60° Fahrenheit, should have no less than 29° B.; if it contains lime or alkalies, one degree should be deducted, as these substances make it heavier.

2. Odor. Rubbed on the hand, it should be perfectly inodorous. Impure glycerin, under this test, has a disagreeable smell. The impurity causing this odor is mostly butyric acid, as by contact with the glycerin, it forms a very volatile glycerole. Such an article will always grow worse by age.

3. Lime, or salts of lime. Take a solution of oxalic acid, add some spirits of ammonia, and mix this with a small portion of glycerin; if the mixture remains limpid, the glycerin is free from lime; if a white precipitate forms, then lime is present.

4. Chlorine, or chlorates. Add a few drops of solution of nitrate of silver to the glycerin; if a white percipitate forms, the above impurities are present.

5. Sugar, grape or cane, is an adulteration which is sometimes found in foreign glycerin. Cane-sugar can be detected by the taste, as glycerin is not as sweet as sugar; but grape-sugar can be discovered by the polarization of light, which requires a costly apparatus, or by caustic potash, which requires an expert. Hence, when glycerin is expected to contain sugar, it should be given to an experienced chemist.

One of the most recent improvements in the distillation of glycerin is the process patented through the Scientific American Agency, by O. Laist, of Cincinnati, Ohio, and heretofore noticed in our columns. The glycerin is heated in the still by means of fire, to the point required; but, as glycerin is liable to decompose on being heated in a vessel filled with air, a small jet of steam is introduced into the still to expel the air, and, as the steam condenses in the condenser, a vacuum is thus created. The condenser is so arranged that the gylcerin condenses while the water and volatile impurities evaporate; a draft being created to prevent their condensation.

As the glycerin is liquid at over 300° Fahrenheit, no loss by evaporation need be feared. Of course all mineral (not volatile) impurities remaining in the still, while all volatile impurities evaporate, the glycerin must come out entirely pure, and must be of the highest specific gravity, as no water can condense.

Glycerin made by this process was found to be inodorous, colorless, and of a specific gravity of 1·253, being more than the United States Dispensatory requires, besides being free from all mineral impurities.

New Dose for Hogs.

A singular discovery, says the *Druggist's Circular*, has just been made at Cincinnati. It seems that a man upset his kerosene lantern into his meal bin, and he noticed afterwards that his hogs ate the damaged fodder with avidity. This gave him an idea, and by experiment he found that five weeks' feeding with the kerosene mixture made one of his hogs so fat that it could scarcely stand. The animal was then fried into lard with the following result: When cool, the lard did not congeal, but the addition of a certain amount of potash resolved the contents of the kettle into three distinct substances—the first, a light, transparent oil, better than kerosene or sperm oil; the second, a jelly-like substance, which turned to soap; and last, a small residuum of insoluble muscle.

The quality of the meat as food not being mentioned, we may infer that kerosene pork is not considered a delicacy.

NEW TEST FOR BLOOD STAINS.—Upon the authority of the London *Lancet*, an important test for blood had been discovered in Australia; consisting of the application of tincture of guaiacum and ozonized ether, which produces a beautiful blue tint with blood or blood stains. The test is excessively delicate; and we happened to be present at a lecture given by Mr. Bloxam, in which he showed some experiments with it, and added that, in the case of a blood stain twenty years old, he had extracted a single linen fiber with an almost inappreciable amount of stain on it. The characteristic blue color was immediately induced by the test, and readily detected by microscopical examination. The testimony of so able a chemist leaves no doubt as to the value of the discovery. Ozonized ether, we may remark, is merely a solution of peroxide of hydrogen in ether.

M. ARAGO was the first to observe that a wire, when traversed by a powerful current, and plunged into iron filings, retained around it considerable quantity—a mass of the thickness of a quill.

Device for Tightening Tires of Wagon Wheels.

The purpose of this invention is to produce means whereby tires may be set cold, properly tightened, and held without the usual rivets or bolts.

Fig. 1 is the representation of a portion of a wheel with this device attached. The two ends of the tire to be joined are provided with two right angular pieces of metal, A, welded to the tire, as shown in the engraving. A screw bolt passes from one of these angular pieces, or blocks, through the other, and is drawn up to any required extent by turning the nut, B, upon it. This tightens or sets the tire.

When the tire is sufficiently tightened a metallic box, C, Figs. 1 and 2, is placed over the pieces, A, and the other attachments described, and is held to place by the nuts and bolts, D, Figs. 1 and 2. This box is intended to strengthen the rim of the wheel enough to compensate for the cutting away of the rim, and to protect the inclosed parts from injury and exclude dirt.

The inventor claims for this invention simplicity, strength, and economy. Heating is avoided by its use in the setting of tires, and the required degree of tension can be attained with accuracy.

Patented through the Scientific American Agency, January 5,1869, by Harris and Harvey Pearson, of Depeyster, N. Y. A part, or the whole of the right for the United States will be sold. For further particulars address as above.

Fig. 1

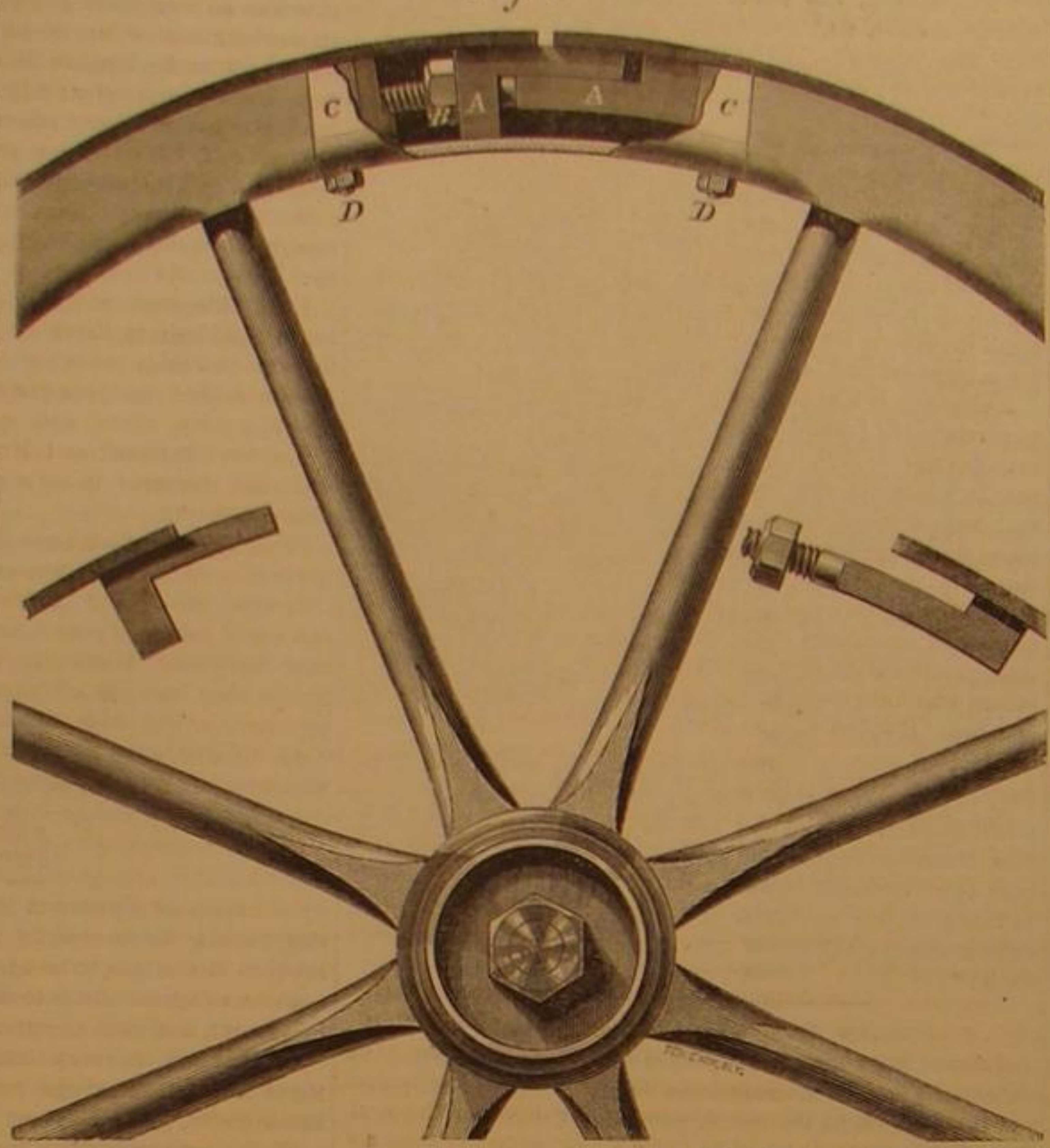


Fig. 2

PEARSON'S TIRE TIGHTENER.

To Measure Hights.

A very compact and useful instrument, called the "Apomecometer," that can be carried in the waistcoat pocket, for ascertaining the vertical hights of towers, spires, and other buildings, has been invented in England. It cannot be better explained than by quoting the description given by Mr. Millar, the inventor: "The 'Apomecometer' is constructed in accordance with the principles which govern the sextant, viz., as the angles of incidence and reflection are always equal, the rays of an object being thrown on the plane of one mirror are from that reflected to the plane of another mirror, whereby making both extremes of the vertical hight coincide exactly at the same point on the horizon glass; so that, by measuring the base line we obtain a result equal to the altitude."

The Emperor Napoleon III. as a Man of Science.

The Emperor Napoleon III., says a contributor to the London *Scientific Review*, has frequently been before the public in the capacity not only of an ardent promoter of scientific research, but also as an original investigator in some of the most interesting branches of physical science. His little work on *The Cannon* met with considerable success, and at the time at which it appeared was calculated to throw much light upon this dreadful engine of war. But his physical and mechanical investigations have been most often directed to the development of the peaceful arts.

At the time that François Arago was secretary of the Academy of Science in Paris, the Emperor (then Prince Louis Napoleon) presented a very interesting paper on the disturbances of the magnetic needle—the result of some investigations carried on at Ham, in which it was remarked that the iron bars at the windows interfered very much with the oscillations of the needle. This paper found its place in the *Comptes Rendus* of the Academy, where it may be consulted with interest by those who follow up the gradual development of magnetic science.

Some years ago the emperor was astonished at the great space occupied by flour when packed in sacks in the usual manner, and imagined that it might be compressed into a much smaller bulk, and be thus rendered of much easier transport. He at once authorized some experiments to be made on the subject, which resulted in the flour being submitted to powerful hydraulic pressure, and served to the various regiments in tin cases, not only occupying a very small bulk, but protecting the flour from the damp of the atmosphere, and so preventing it from becoming moldy.

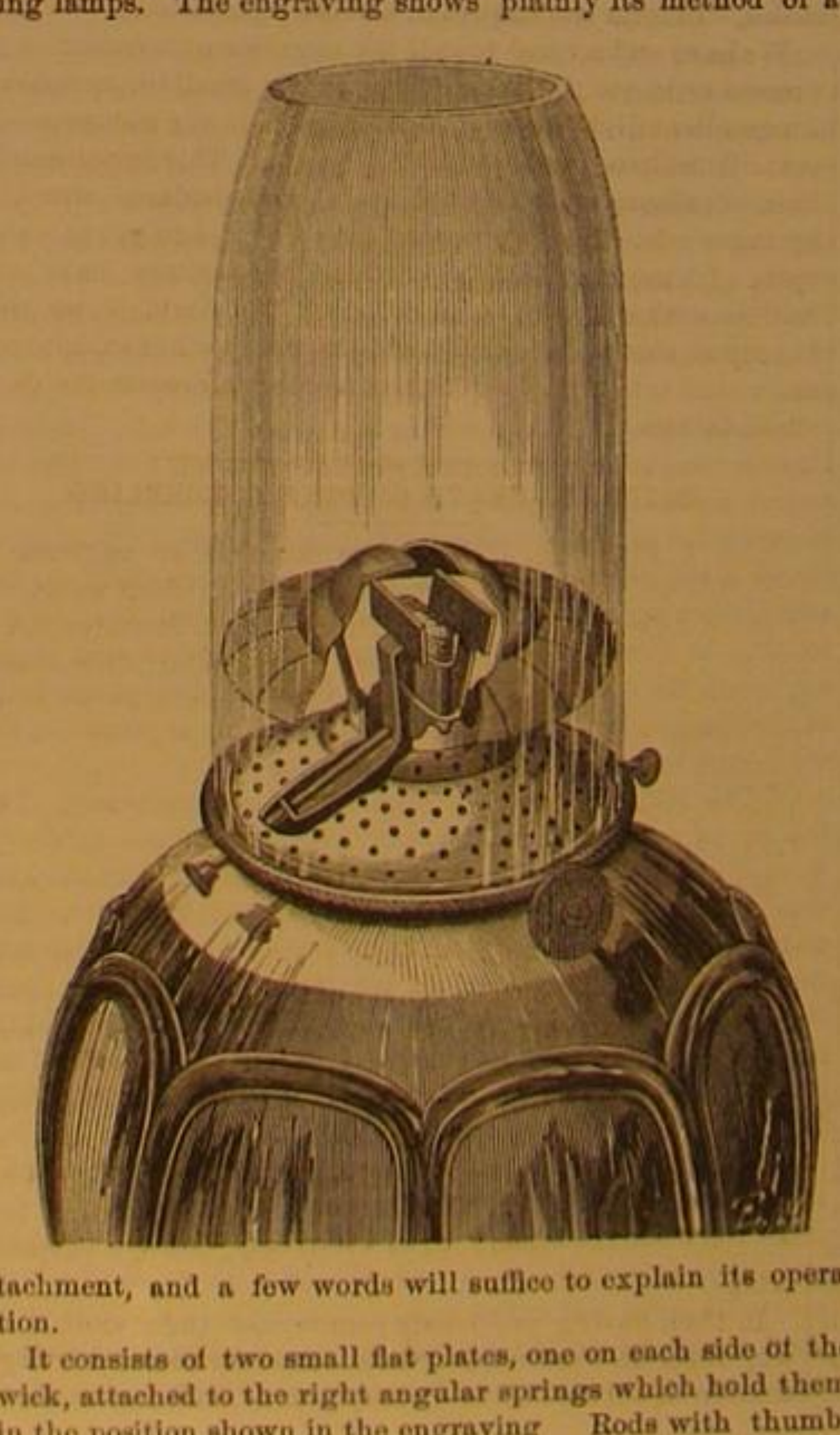
But, besides his own practical researches, into the details of which we cannot enter here, the Emperor of the French has distinguished himself most conspicuously as a promoter of scientific research in France, and has thus set an admirable example to the other crowned heads of Europe, some of whom appear already to see the advantages of following it. Within the last few years, as we have occasionally noticed in this journal, chemical, agricultural, astronomical, and physical researches have been carried on by various eminent men at the Emperor's private cost, and have had very considerable influence upon the progress of science in Europe.

It was, then, with much pleasure that we witnessed the departure last week, for Paris, of Mr. Chas. Hutton Gregory, President of the Institution of Civil Engineers, accompanied by several distinguished members, to present to the Emperor Napoleon III. the diploma of honorary member of their institution. The deputation was received most graciously by His Majesty, who requested that his sincere thanks might be conveyed to the members for the honor conferred upon him. The cordiality which marked the official reception, and the special and even friendly hospitality which followed it, showed that the Emperor warmly appreciated the compliment which had been paid to his scientific attainments and to his enlightened encouragement of scientific pursuits and public works.

The family of the Bonapartes has numb red many very distinguished men of science. Napoleon I., when at St. Helena, remarked that if he had to begin his life again he would follow a scientific career; Prince Lucien Bonaparte has made himself a reputation in science by his chemical researches. Prince Charles Bonaparte was one of the most renowned ornithologists of this century, and the present Prince Napoleon has already distinguished himself by his voyages and travels, undertaken for the purpose of promoting scientific knowledge.

A NEW LAMP EXTINGUISHER.

This is a new, simple, and ingenious device for extinguishing lamps. The engraving shows plainly its method of attachment, and a few words will suffice to explain its operation.



It consists of two small flat plates, one on each side of the wick, attached to the right angular springs which hold them in the position shown in the engraving Rods with thumb-pieces at their outer ends pass through the metal work which supports the chimney, and abut against each spring at, or nearly at the angles. Pressure upon the thumb-pieces—the thumb being placed on one, and the forefinger on the one opposite—forces the plates together, compressing the wick, and extinguishing the flame. Our rural friends will see the analogy between this operation and the old and long-practiced method of snuffing out a candle with the fingers.

Patent pending through Scientific American Patent Agency For further information address Grayson and Hyndman, Odell, Ill.

Coppering and Tinning Iron.

Cast iron is easily coppered by simply immersing it in a solution of copper vitriol, but the coating of copper thus produced does not adhere to the iron. The copper will adhere to the iron when employing the galvanic current, chiefly when the cast iron had been previously coppered or immersed in a solution of cyanide of potassium and copper. The great advantages which would arise from the perfection of a plan by which iron could be coated with copper at a cheap rate, induced Messrs. Elsner and Philip, of Berlin, to undertake a series of experiments to ascertain if the coppering could not be effected more economically than by employing cyanide of potassium, and in this they have been successful. To coat iron the article must be well cleaned in rain or soft water and rubbed before immersion in the solution, which may be either chloride of potassium or chloride of sodium containing a little caustic ammonia added, or tartrate of potash, with a small portion of carbonate of potash. At the extremity of the wire, in connection with the copper or negative pole of the battery, is fixed a thin flattened copper plate, and the article to be coated is attached to the wire from the zinc or positive pole, and both are then immersed in the solution, the copper plate only partially. The liquid should be kept at a temperature of from 15° to 20° C., and the success of the operation depends on the strength and uniformity of the galvanic current. When the chlorides are employed, the coating is of a dark, natural copper color, and with tartrate of potash it assumes a red tinge, similar to the red oxide of copper. When sufficiently covered, the article is rubbed in saw dust, and exposed in a current of warm air to dry, when the metal will take a fine polish and resist all atmospheric influence.

A coating of tin is frequently applied to certain kinds of castings, chiefly to cooking utensils, thus preventing them from rusting, and also preserving the food to be cooked from taking a black tinge. The tin applied must be free from lead, or the food is liable to become poisoned.

The articles to be tinned are first turned in a lathe, or otherwise well cleaned, and washed with dilute muriatic acid of 8° or 10° B., or with sulphuric acid. The articles are now dried and heated up to the melting point of tin; the fluid tin is then rubbed either with a cork, or a ball of cotton, on the bright surface of the iron to be tinned. Too low a temperature of the pots causes too thick a coating, and too high a tem perature prevents the tin from adhering to the iron. Sal ammoniac, or chloride of zinc and ammonium, is employed in the operation to keep the surface of the metal free from oxidation.

The tinning of iron by Mr. Morris Stirling's patent process is thus described in Ure's "Dictionary," vol. iii., p. 925, thus: "For this purpose the sheet, plate, or other form of iron previously coated with zinc, either by dipping or by depositing from solutions of zinc, is taken, and after cleaning the surface by washing in acids, or otherwise, so as to remove any oxide or foreign matter which would interfere with the perfect and equal adhesion of the more fusible metal with which it is to be coated, it is dipped into melted tin, or any suitable alloy thereof, in a perfectly liquid state, the surface of which is covered with any suitable material, such as fatty or oily matters, or the chloride of zinc, so as to keep the surface of the metal from oxidation, and such dipping is to be conducted in a like manner to the process of making tin plate or of coating iron with zinc."

Tinned iron articles which are deficient in tin, oxidize more rapidly than iron without any tin coating, owing to a galvanic reaction caused by the contact of tin and iron. A coating of zinc, on the other hand, more effectually protects the iron from oxidation, even if this coating is only partial, but as zinc is readily dissolved in acids, salt brine, etc., iron vessels coated with it cannot be used for cooking purposes.

Iron may also be coated with zinc by the galvanic current. —*Practical Treatise on Metallurgy by Crookes and Rohrig.*

INGROWING TOE NAIL.—Dr. Babb (*Medical Times and Gazette*) has used "with uniform success" in ingrowing nail, a saturated solution of the persulphate of iron. Success depends upon the thoroughness with which a bit of cotton saturated with it is insinuated between the nail and the fungous flesh, the cotton being also turned back over the flesh on the outside.

ALL construction is limited and circumscribed by the fixed laws of nature. To violate these is to court ruin.

Scientific American.

MUNN & COMPANY, Editors and Proprietors.

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

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

☞ "The American News Company," Agents, 121 Nassau street, New York.

☞ "The New York News Company," 8 Spruce street.

☞ Messrs. Sampson, Low, Son & Marston, Booksellers, Crown Building, 188 Fleet street, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

☞ Tubner & Co., 60 Paternoster Row, London, are also Agents to receive subscriptions.

☞ A. Asher & Co., 20 Unter den Linden, Berlin, are Agents for the German States.

VOL. XXI., No. 6...[NEW SERIES.]....*Twenty-fourth Year.*

NEW YORK, SATURDAY, AUGUST 7, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

BALANCING HEAVY CYLINDERS.

The shaking of heavy cylinders, grindstones, millstones, etc., etc., when out of balance, depends upon and is caused by the irregularity of centrifugal force on the opposite sides of the wheel. That is, if the centrifugal force, or the sum of the tendencies to fly off in tangents to their arcs of revolution, possessed by all the particles on the lighter side, be represented by a, and that on the heavier side by b, the power to which the shaking is due will be represented by the expression $b - a$. Suppose, in a given case, b equals a pressure of 4,000 pounds, and a equals 3,750, the force with which the cylinder would be shaken would be 250 pounds moving from one side of the axis to the other, and a vibration would be produced upon each interchange of place between the heavier and lighter sides, having for one of its elements of measure the ratio existing between the difference of the centrifugal forces of the opposite sides, and the weight of the cylinder.

If all the supports of such unbalanced wheels or cylinders were perfectly rigid and inelastic, no vibration would be felt, but the strain upon the axle journals and boxes would remain undiminished, so that greater strength of parts would be necessary in order to avoid breakages, and loss of power would accrue.

In order that a cylinder may be perfectly balanced, when in motion, it is necessary that the sum of the moments of the particles on one side (that is the sum of their several weights multiplied into their several velocities), should exactly equal the sum of the moments of the particles on the other side, when the cylinder is running at any speed.

This can never be more than approximately attained in practice. The writer, who has had considerable experience in balancing heavy cylinders, designed to run at high speeds, has found the following method the best:

The cylinder being keyed upon its axle, as it is intended to run, is lifted by a tackle or crane, and lowered, so that each of its journals rests upon a stout steel straight-edge placed so that its upper surface is exactly level, and parallel with its fellow.

These straight-edges should not only be so rigid as to suffer no sensible deflection from the weight of the cylinder to be balanced, but they should be very hard and as smooth as it is possible to make them; and great care should be taken to keep them free from indentations. The journals of the cylinder must also be round and polished in order to secure delicate action.

All the friction is thus converted into rolling friction, and this is reduced to a minimum. The cylinder can now be loaded on its lighter side, or *vice versa*, until it will remain perfectly motionless when stopped in any part of its revolution. We have balanced heavy cylinders in this way until they would revolve by placing upon either side one twenty-thousandth of their weight.

The method sometimes practiced of suspending a cylinder by the centers of the journals is not sufficiently delicate. Either the lathe centers will be so forced in as to greatly increase friction, or there will be some play, so that the center of suspension will be outside the center of the axle. The latter makes no difference where the cylinder can roll, as on the steel straight-edges, but when suspended from a point, it will certainly defeat the attainment of any great degree of accuracy.

SMALL INVENTIONS MOST PROFITABLE.

The adjective "small," as used in the above heading, is employed for want of a better term, to indicate devices of the most simple character, requiring little mechanical skill in construction, and little genius to invent. Such inventions are, for the most part, the result of ideas based upon some happy suggestion. The question "Why could not this be done in some other way?" has often been the indirect cause of putting thousands of dollars in the pockets of men of inventive talent. Such men at once grasp the possibilities, and perhaps the next morning sees them with a model whittled out, and preliminary steps toward securing a patent in progress.

Not a few men, however, after having conceived good and practical ideas neglect them. "It is such a little thing. There cannot be much money in it even if it should prove the very thing wanted." Thus they fritter away chances to make money. The chances are that small inventions will pay better than large ones. To work out and develop grand and complex ideas, requires time and often large expenditures. For the most part, these inventions apply to some particular branch of industry and the demand for them is limited. But small inventions are of more universal application, and, if useful, a large demand is created at once.

A shoe peg is a small thing; a little prism of wood with a quadrangular pyramid at one end. But little as it is, could a man so improve it that it would be only a little better than it now is, while its cost would remain the same, a patent on such improvement would be immensely valuable. Why? Because shoe pegs are in universal demand; and what everybody wants, it takes large quantities to supply.

In a recent conversation with an inventor, he recounted numerous inventions that he had let slip when the idea of their practicability first occurred to him, since patented by others who have made money on them. This is not a solitary instance. Hundreds have given like testimony in our hearing. Many men, overlooking the small to grasp the large, have let fortunes slip through their fingers.

One of the most notable small inventions is that of the gimlet-pointed screw. Slight as was the change made by this improvement, it has virtually driven the old form of screw from the market, and the profits already made and now making upon its sale, are such as to make it one of the most valuable patents ever issued.

The value of an improvement must be indeed small, if it will not repay the expense of patenting with a profit into the bargain. Ideas should not be frittered away any more than money. The law recognizes original and useful mechanical ideas as property, and makes as ample provision for the security of such property as for any other. Ideas may or may not be valuable, but mistakes in estimating their worth do not oftener occur than in judging of other property. And, were a comparison to be instituted between the success achieved by inventors and that attained by lawyers, physicians, or any other profession involving chiefly brain labor, nothing like the disparity generally supposed to exist would be found. In fact, we believe the difference to be in favor of the inventor, and that this useful class of men, are on the average, better fed, housed, and clothed, and more likely to have a snug balance in bank than lawyers, doctors, or literary men.

We admit that they are often made the dupes of sharp swindlers, who contrive to gain for little or nothing the reward of their honest labors. But people in other occupations are also cheated. Inventors, as a class, are singularly honest in their own dealings, and so are not apt to doubt the honesty of others. This is one of their characteristic mistakes, which, together with some other business mistakes they are apt to make, will form the subject of a subsequent article.

We have endeavored to call the attention of inventors in the present article to the value of apparently small improvements. An excellent illustration of this was given in our last issue—the portable railroad invented by A. Peteler. This invention, Mr. Peteler informs us, was laughed at, and declared worthless by many when it was proposed to patent it, and yet in a short space of time, very limited portions of territory have been sold for over sixty thousand dollars. We could if we chose to extend this article, easily adduce many other examples to show that it is not wise for the inventor to despise the day of small things.

OBITUARY.--DEATH OF JOHN A. ROEBLING.

John A. Roebling, C. E., whose fame as an engineer has made his name familiar throughout the civilized world, died at the residence of his son in Hicks street, Brooklyn, on the 22d of July. His death resulted from lockjaw, caused from an injury to his foot, which rendered amputation necessary. The bruise was received while he was in company with his son engaged in surveying the approaches to the projected East River Suspension Bridge, about to be erected between New York and Brooklyn.

Mr. Roebling, was born June 12, 1806, at Muhlhausen in Thuringia, Prussia. He received the degree of C. E., from the Royal Polytechnic School at Berlin, and it is worthy of notice that the subject of his graduating thesis was suspension bridges. With this class of structures his name will ever be identified.

He came to the United States in 1831, and bought a considerable tract of land near Pittsburgh, Pa. He soon after commenced the practice of his profession, and continued it upon various railways and canals for more than ten years, before the time ripened for him to carry out his ideas of a suspension bridge.

In 1844, having previously commenced the manufacture of wire rope, he was awarded the contract for reconstructing the wooden aqueduct of the Pennsylvania Canal across the Alleghany River, upon the suspension principle, which he successfully accomplished. This aqueduct consisted of seven spans, each 162 feet in length. The wooden trunk which held the water, was supported by two continuous wire cables, seven inches in diameter. The Suspension Bridge across the Monongahela, at Pittsburgh, succeeded. This bridge has eight spans 188 feet long, and the cables are 4½ inches in diameter.

Mr. Roebling contracted, in 1848, to erect four suspension aqueducts on the line of the Delaware and Hudson Canal, all of which were completed in due time. In 1851 the great Suspension Bridge at Niagara, was commenced, and was completed, so that the first locomotive crossed in March, 1855. This was an engineering feat, that compelled the universal acknowledgment of Mr. Roebling's great genius.

At the time the Niagara Bridge was commenced, Mr. Roebling also commenced a bridge over the Kentucky River, on the line of the Southern railroad, leading from Cincinnati, to Chattanooga. This bridge progressed no farther than the completion of the towers, owing to financial failure on the part of the company. This bridge would, if completed, have been a more remarkable work than the one at Niagara, the span being 1,224 feet.

The subsequent works of Mr. Roebling, were the bridge over the Alleghany River at Pittsburgh,—the most elegant suspension bridge probably in this continent; and the Ohio Bridge at Cincinnati, completed in 1867.

The reports, plans, and specifications of the East River bridge are completed, and Mr. Roebling will have a worthy and able successor in his son, who has assisted his father in his later works.

Altogether few men have lived whose history can record a series of more brilliant successes than that of Mr. Roebling. He leaves behind him monuments of his greatness, and his name will pass into history among the brightest of those who have achieved immortality, by benefiting the human race. That he has been cut off thus on the threshold of his greatest undertaking, adds to our sincere regret; but that he could not live to see its completion, will not detract from the well-won renown of its gifted and accomplished designer.

CURRENCY REFORM NEEDED—HOW IT MAY BE ACCOMPLISHED.

An important movement in commercial circles is now on foot, having for its object a radical reform in our present currency. The means to be adopted to secure this reform is an association whose aim is to press upon the minds of citizens in general, and upon Congress in particular, a method whereby an elastic currency that will continuously accommodate itself to the needs of the business community may be substituted for the present utterly inelastic and inefficient medium.

The experience of the last few days is sufficiently convincing of the urgent need of reform. During that time money has demanded so high a rate of interest that it failed to meet the most pressing requirements of legitimate business, and most serious business depression has spread over the land.

Never in the history of this country was business more unstable than now, never a time when it was so difficult to tell what the morrow would bring forth.

While our special province precludes the opening of our columns to protracted discussion and debate upon questions of finance, we feel that it is our duty to notice and second, a movement which, if wisely conducted, can scarcely fail to accomplish much good to the country at large.

The control of the money market has hitherto been to a great extent in the hands of the financial vultures of Wall street, parasites upon the commonwealth who suck the blood of the people, only pausing at intervals to allow their victims to accumulate a fresh supply. The silly moths who cannot keep out of the flame and get their wings singed in foolish speculations in stocks, have our sympathy for their weakness, but were the evil influences of stock gambling confined to these feeble sufferers, we should hardly consider it worth our while to notice them. But when combinations of unprecedented magnitude have so far secured control of financial interests that they can tighten or relax the money market at will, it is time to see whether the country must quietly submit to the financial disturbances they now create at pleasure.

That no one man, or one thousand men, or one hundred thousand men should have it in their power to control the money market appears to us so self-evident as to need no protracted argument.

In 1857, when the banks throughout the country, struck with what proved subsequently to be a senseless panic, refused discounts, the merchants of New York compelled their suspension by withdrawing their deposits. The history of that disastrous financial crisis teaches how much the country loses upon the occurrence of any such suspension of general business.

An exchange has demonstrated that the loss accruing to all classes during twelve months succeeding the panic of 1857 was equal to \$2,700,000,000, or in round number \$200,000,000 in excess of the present national debt.

In other words a panic of one year in trade cost us as much in money as a war of four years.

How are panics to be avoided? The plan originated by the New York *Mercantile Journal*, an outline of which we gave in a leading article published in our issue of December 2, 1868, is advocated at present by the promoters of the "Currency Reform Association."

This plan has been rapidly gaining converts in opposition to deep-rooted prejudice. Although at first sight there may appear to be serious objections to its adoption, we believe a careful examination will show them to be baseless. This plan is set forth in the following extracts from the financial and commercial platform of the journal referred to:

"We hold that next in importance to the joint and harmonious action of capital and labor, is the supply of a currency based upon sound financial principles. The first requisite for business is a token universally recognized throughout the land as the true representative of a dollar. The Government is fully competent to issue such a token, especially when deeply indebted, as at present; and no other standard or measure of a dollar should be tolerated. This necessarily excludes the paper dollar issued by corporations, purporting to be redeemable in coin, upon demand; and advisedly so, because these private issues have always proven extremely treacherous and delusive. Either gold and silver should constitute the only permissible circulating medium, or they should be demonetized, so that the periodical panics which harass the business world might be avoided.

"We hold that the true method of adjusting the national finances to insure justice to all and injury to none is most simple and easy. The Government should pay off the 5-20 bonds so soon as the five-year option shall have matured, by issuing legal tender notes so far as necessary, provided such payment could be made *honestly*, the terms under which the bonds were issued being fully considered. If such payment can be shown to be unjust, and contrary to the law authorizing the issue of the 5-20 bonds, then the Secretary of the Treasury should be instructed to issue legal tender notes to the amount of at least $200,000,000, and be directed to purchase and cancel such other Government obligations therewith as could be bought on the open market at the lowest figures. To absorb any surplus of legal tender notes that might at any time exist, over and above the legitimate demands of trade, and to inaugurate a "self-adjusting currency regulator," the the Secretary of the Treasury should be furthermore directed to issue, when required by any person presenting legal tender notes (amounting to, say $1,000 or its multiple), bonds bearing interest at the rate of three and sixty-five one hundredths per cent (ten cents per day on each $1,000), both principal and interest payable on demand, in legal tender notes, at any time after sixty days from date of issue. Interest to be paid semi-annually until the principal is demanded, and then in full to date."

This currency regulator has been aptly compared to the governor upon a steam engine, the treasury representing the boiler, and the business of the country the engine. If the boiler be strong enough the accumulation of steam in it beyond the needs of the engine at any particular moment does no harm. When more steam is wanted, the governor (rate per cent with interchangeability) operates to give an ample supply, and when less is wanted it adjusts the valve to the diminished requirements of the engine.

A national bank organization was recently effected in this city by a convention of leading bankers from nearly every State in the Union. How this organization is regarded by shrewd observers will appear in the following extract from an exchange: "This organization consummated last week shows that they intend to be ready for any and every emergency. Thus organized, they can collect within ten days millions of dollars for a corruption fund, and no matter how great an excitement may arise against the banks, the people would be powerless for several years, during which they could be worried out, leaving the bankers in possession of the field, triumphant in their ruinous profits."

The only way to defeat organization is by a counter organization, and it is for this reason that we see hope in a well organized association of merchants and manufacturers to meet powerful coalitions whose object is to enrich themselves at the expense of all other interests.

Having in our former article discussed the plan of a self-adjusting currency of legal tender notes, convertible *at will of the holder* into bonds bearing interest at the rate of 3·65 per cent, we will not at this time again discuss it. But to those who are inclined to raise objections we will say, that after having considered it deliberately and carefully for months we fail to see a flaw in it. It takes all power over the money market from the Secretary of the Treasury, and from all cliques and combinations, and puts it right where it ought to be in the hands of the people, individually, but not collectively, thus effectually defeating combination.

To carry out the figure of the steam engine the governor is at present in the wrong place. Instead of having it on the engine, commerce, whose movements we wish to control and render uniform, it is now actuated by the motion of another engine—Secretary of the Treasury—without a governor and a law unto itself. So erratic and fitful are its movements that one moment we are without steam, and the next running at a speed which threatens our very existence. Merchants and manufacturers, who can scarcely at this moment collect enough of outstanding accounts to meet current expenses, ought to carefully consider this subject.

Should the present administration meet this question on its merits, irrespective of adverse influences which will inevitably be brought to bear against it, the wisdom of such a course will secure the grateful recognition of the entire country, and a fame second to none achieved by any administration since the formation of our Government.

The French Cable Laid.

The French Atlantic Cable has been successfully laid, making in all, three cables which have been stretched between the Eastern and Western hemispheres. The Great Eastern has proved herself especially useful in the laying of long cables, and should she now be laid up forever, her history will always be connected with that of the most remarkable enterprises ever undertaken and completed. The efficiency of submarine cables, and their immunity from interruption through the effect of atmospheric electricity, suggests the expediency of connecting all large sea ports by cables instead of land lines.

JOSHUA SHAW, ARTIST AND INVENTOR.---THE EARLY HISTORY OF THE COPPER PERCUSSION CAP.

The biography of distinguished men, is not only a pleasant but a profitable study. Especially is this the case, when the subject of personal history has risen from humble obscurity by his own talents and industry to high and honorable position, in the observance of those moral qualities which constitute an example worthy of imitation.

In this pushing age we do not perhaps think often enough of the brave pioneers in invention, who cleared away obstacles, and smoothed the path of progress, before we came on to the stage of action.

It may well be questioned whether any invention in the art of gunnery, since the introduction of gunpowder, was a longer stride in advance than the invention of the copper percussion cap.

Joshua Shaw, whose name will ever be connected with this improvement and the extension of the principle to the discharge of heavy artillery, was born in the eventful year 1776, at Bellingborough, Lincoln Co., England. By the courtesy of Mr. John Dickinson, a grandson of Mr. Shaw, now residing at Fort Hamilton, Long Island, we have been put in possession of a manuscript autobiography, written by Mr. Shaw, at the request of William Dunlap, an epitome of which is embodied in the latter's "History of the Rise and Progress of the arts of Design in the United States," published in 1834. To this interesting and characteristic manuscript, with the voluminous correspondence held by Mr. Shaw with various European governments and particularly with the Ordnance Department of the United States, we are principally indebted for the facts contained in this sketch.

Mr. Shaw was left an orphan at the age of seven years, by the death of his father, and he says: "I had from that moment to earn my dinner before I ate it; and, like Bloomfield's farmer boy, I had to watch the cattle and keep the sparrows away from the cornfields; a kind of domestic Crusoe of the lonely field and common, with an old gun on my shoulder, and carrying a noisy instrument called the "bird-claps." With these I was able to frighten away the little intruders, but many a time when my own supply of food ran short, I had compassion on them, and would say: 'How hard it is to be without bread, I will give them time to pick a few grains and then either fire the gun or start the rattlers." Three years did the young artist watch the sparrows, occupying the hours and relieving the monotony of his task by drawing pictures in the sand, of owls, pigs, and other objects, animate and inanimate, thus evincing the early budding of a genius destined in the future to be recognized and honored by the world. Nor was his attention wholly absorbed by his passion for drawing; our young aspirant learned to read and write, making the sand his rude though ample page, in the three years of his shepherd boy life, during which time his wages was *one penny per day*. At the end of that time, his mother having in the mean time married, he was called home to assist in the business of his stepfather, a plumber and glazier by occupation, at the end of which time, Mr. Shaw, a lad of about fifteen years, was again obliged to shift for himself. An uncle now gave him *nine weeks'* schooling, the only regular tuition he had during his life. He then obtained employment upon one of the rural mail-routes, and entered His Majesty's service as a mail carrier. This employment did not last long, and again he says: "I found myself threatened with the prospect of dining on roasted sloes and bilberries, and driving the sparrow and yellow hammer from the forbidden feast. I was on my way home, and, being hungry, I purchased by the way some cheese and bread, which the shopkeeper, out of respect I suppose for the elevated situation I had occupied as mail carrier, wrapped in part of a newspaper, which I read at my leisure after dining. Amongst other things an advertisement met my eye, 'Wanted, an apprentice to the Sign, Coach, and House-painting business, apply by letter, post-paid, to George Sparrow, Stamford, Lincolnshire. A premium will be expected.' I turned short about and traveled twenty miles that same day, determined to see Mr. Sparrow, but as he expected a premium, I had but small hopes of success, except my talent for drawing should be a recommendation. My hand however, had only been tried upon crows, magpies, owls, mice, and other familiar objects, while I was drill officer of the cow-pasture, and lest I should be imperfect, I sat down, and with my finger drew upon the dust which covered the road, a pig, a goose, and such other objects as were suggested, and in this way night overtook me before I had reached the sixteenth milestone. I budged along with only nine shillings in my pocket which belonged to my stepfather, in deep reflection upon coming events and possible results. At eight in the evening I reached Stamford, and the house in which the great Apelles of the place resided. How my heart palpitated as I touched the knocker."

Here our aspirant remained all night, and in the morning, after trial, was accepted without a premium, in consideration of his talent in drawing. In this way he reached the first and lowest rung of the ladder, which he at once began to climb so vigorously that in time he was placed in charge of the business. His first exploit of a public nature was the painting of the Commandments in St. Michael's Church, with the King's arms, and beneath it Moses and Aaron, agreeably to the old English custom. He now began to acquire considerable reputation as a painter of the pictorial signs of the period. His employer having become jealous of Mr. Shaw's reputation, a separation took place, the latter purchasing freedom from his last year of service for twenty pounds sterling, and removing to Manchester, where he was installed foreman of a very respectable establishment. It was here that he formed a resolution to become an artist in the highest sense of the term, and to that end commenced a system of constant and laborious practice, taking for his studies dead game, flowers, fruit, and landscape.

At length he was so fortunate as to find purchasers for three or four subjects in rapid succession, and emerged from the obscurity he had hitherto been forced to sustain into public notice as an artist of considerable promise. He now went to London where he met with much discouragement from cold-hearted critics, and after staying there three years, retired to Bath, where he practiced his art for some seven years with increasing reputation. He now met with some encouragement from the surrounding gentry and nobility, and as he was a good sportsman and possessed of fine social gifts, he became a frequent guest at their tables.

He next returned to London, where he enjoyed considerable popularity and received many commissions; but being so unfortunate as to differ in politics from the aristocratic directors of the British Institution, he was subjected to persecution, and the prize awarded to his painting of the deluge, by that institution, was with-held. This and other subsequent events disgusted him with England, and he resolved to come to America. He had previously, however, made the acquaintance and secured the warm personal friendship of Benjamin West, then President of the Royal Academy, who urged him to canvass for a membership in that institution, but he refused to stoop to what he considered a degradation, the begging for honors to which he considered his merits entitled him.

He, therefore, after obtaining introductory letters from West to many distinguished men of the time in the United States, came to Philadelphia, where he permanently established himself. He was the bearer of West's celebrated picture of "Christ Healing the Sick," a present to the Philadelphia Hospital, where he placed it appropriately, and where it still hangs.

In 1814 he invented the copper percussion cap. He, however, kept the discovery secret until his arrival in America, when he sought to obtain a patent for it, but was refused on the ground of his being an alien, the law at that time denying a patent to aliens unless they had resided two years in the country. His claim to the origination of the invention was, however, recognized, although a patent was refused.

It was undoubtedly owing to this fact that Mr. Shaw became at a later period, an urgent advocate of reform in the patent laws of the United States, and their present liberal provisions are attributable doubtless, in considerable measure, to his exertions. The transactions of the Franklin Institute contain many papers upon the subject of patent law prepared by him.

During the delay the public got possession of the improvement, and Mr. Shaw failed to reap any adequate reward for his invention. In 1822 he obtained a patent for the percussion cap and lock for small arms, and, in 1828, another for percussion locks and wafer primers for cannon. The justice of his claims was afterward disputed, the invention being attributed in part to Alexander John Forsyth, clerk of Belhelvie, Aberdeenshire, Scotland, to the celebrated Joseph Manton, London, and to John Day, of Barnstable, England, but the specifications attached to their patents show that the copper cap as patented by Mr. Shaw, was a thing unknown to them. They had a knowledge of fulminates and methods of firing them, but there was only one thing in common with their methods and that of Mr Shaw, the discharge of fulminates by percussion.

After a protracted investigation of his claims, the United States subsequently awarded Mr. Shaw $25,000, a very small portion of its real debt to the accomplished inventor. The award speaks volumes for the genuineness of Mr. Shaw's claims, but little for the generosity of the Government toward the gifted son of her adoption, who had bestowed upon the world, to use the language of the Committee of Patents, in their report on Mr. Shaw's claims bearing date Feb. 10, 1846, "is one of the most ingenious, and one of the most useful inventions of modern times." Of this award Mr. Shaw only received $17,000, the estimate of his claims being subsequently unjustly reduced to that amount.

Mr. Shaw received in 1817, or about that time, a premium from the Emperor of Russia for improvements in naval warfare.

In 1833 he visited England with a view to obtaining the adoption of improvements in cannon locks, which he had made, and the wafer primer for cannon which has been so largely used. Russia also adopted his improvements, agreeing to pay a stipulated sum for every piece of artillery upon which it was placed, but which we are informed neither Mr. Shaw, nor his family after his death, ever received.

Mr. Shaw died in Sept., 1860. He was long a member of the Franklin Institute, and contributed many valuable papers to its transactions, and enjoyed the friendship and confidence of many of the most distinguished men of his time. His genius as an artist has been universally acknowledged, but it is evident that his genius for work was the real basis of his success. As a controversialist he wielded a vigorous and fearless pen, and though one of the most genial and kind-hearted of men, was unsparing where he deemed censure deserved. He was the originator of several minor inventions besides the more important ones relating to discharge of artillery. Among these was the swivel diamond for glaziers.

His life was a constant warfare with obstacles and difficulties, but he retained his vigor to extreme old age, setting an example of perseverance and integrity well worthy of admiration and imitation.

We would call attention to an advertisement on the last page of this paper of a paper mill for sale. The building is substantial, the machinery is in good running condition, and adapted to making both coarse and fine paper. To a practical manufacturer the property will be sold on very advantageous terms.

CALCULATION OF THE AMOUNT OF ICE WHICH CAN BE PRODUCED FROM A GIVEN AMOUNT OF COAL IN THE MODERN ICE MACHINE.

BY P. H. VANDER WEYDE, M.D.

The amount of ice produced by an ice machine, worked by means of an exhaust or condensing air pump, driven by steam power, is easily determined, theoretically, from the amount of coal burned in the furnace of the steam boiler. It has been proved that the combustion of one pound of anthracite coal produces, in round numbers, 14,000 units of heat, and that in order to freeze water of 72° Fah., it is necessary to abstract, besides 40° of sensible heat, 140° of latent heat—together 180°—which, for one pound of water is, of course, equivalent to 180 units of heat. As this number of units is the eightieth part of the 14,000 units produced by the combustion of one pound of coal, it is clear that the heat produced by the combustion of one tun of coal is equivalent to the heat to be abstracted from 80 tuns of water of 72°, in order to change it into ice.

But in practice we find here exactly the same state of affairs as is the case with the steam engine. Theoretically, a steam engine ought to produce at least 700 units of force (foot-pounds) for every unit of heat consumed; in practice, good machinery only produces from about 70 to 100 foot-pounds, from about one tenth to one seventh part of the theoretical amount. In the best ice machines, thus far constructed, instead of freezing 80 tuns of water for every tun of coal consumed, only from about 8 to 11 tuns of ice are produced, also, from one tenth to one seventh part of the theoretical amount, proving, thus, the remarkable fact, that in both the steam engine and the ice machine, exactly the same relation exists between the theoretically calculated effects and the practical results.

As, however, all the best ice machines accomplish the conversion of the heat of the fuel into the freezing operation by the intervention of a steam engine, the fact that they practically produce only from one tenth to one seventh of the amount of the cold they theoretically should produce, is solely due to the other fact, that the steam engine, itself, practically produces only from one tenth to one seventh of the amount of power which would be strictly equivalent to the number of heat units consumed. It must not be lost sight of that it is only the power of the steam engine which generates the cold in the freezing machines, and that, therefore, improvements in the steam engine, which bring its practical results nearer to the theoretical standard, will at once exert their influence on the amount of ice the ice machines can produce, and, consequently, also on the cost of the ice manufactured in these machines.

Moreover, it appears that the kind of freezing machines in question, which convert power into cold, notwithstanding they are yet in their infancy, have already attained such a degree of excellence, that they are ahead of that class of machines which convert heat into power, either by steam, hot air, or any other possible means, as it is proved that they produce the full theoretical equivalent of cold (negative heat) for the number of foot-pounds employed; namely, cooling one pound of water one degree for a power equivalent to 700 pounds, descending one foot, which, expressed in the adopted scientific manner, is one unit of negative heat for every 700 foot-pounds consumed.

Discovery of the Weight of Air.

The following extracts from a letter addressed to the *Chemical News* by the Abbé A. Hamy will be read with interest:

It has long been asserted that, before Galileo's experiment in 1643, the weight of air had not been demonstrated. However, many learned men, both of former times and of the present century, acknowledged that Aristotle attempted to demonstrate this important fact, while, at the same time, they are unanimous in declaring that the means employed by him were inadequate to the end he wished to accomplish. The honor of the great discovery is now yielded incontestably to Galileo, and what chance I shall stand of restoring the glory of it to the philosopher appears doubtful; but my conviction is, that he has a right to it, although his opinions on the nature of gravity differs from those of modern scientific men.

In "De Cælo," lib. 4, we read: "*Suo enim in loco gravitatem habent omnia præter ignem. Signum cujus est, utrem inflatem plus ponderis quam vacuum habere.*" "In their own medium, all bodies except heat, have weight; the proof of which is, that a leathern bottle weighs more when filled with air than it does when empty." It was, I believe, on this experiment that Aristotle founded his assertion of the gravity of air; and the only ground on which men of science based their opinion that the merit of the discovery was not due to him was, that in endeavoring themselves to test the truth of this assertion, many of them failed to detect any difference in weight between a bladder filled with air and one entirely empty. Such were the arguments used till the time of Galileo; then by the exact measurement of the gravity of air, the failure of Aristotle's experiment could be accounted for; and, during the present century, in all elementary books in which the barometer is mentioned the vain attempt of Aristotle to measure the real weight of air is also spoken of. But it appears to me, that the arguments used by the philosopher's enemies failed to prove what they really intend. Of course they are are right if they can demonstrate that he experimented with air at the same pressure as that of the atmosphere. But what grounds have they for such an opinion? Is it that they attribute to Aristotle what are, in reality, the failures and mistakes of his followers? We have, on the one side, the clear assertion that all bodies except heat, possess weight; and, on the other, Aristotle furnishes us with a process for the verification of this statement, which consists in weighing, not an extensible bladder, but an almost inextensible leathern jar successively full and empty of air. Now, what conclusion are we to arrive at from such premises? That it is impossible to succeed? Or might it not be more correct to say, that by a process, the details of which have not been transmitted to us, Aristotle himself succeeded in proving the gravity of air, while the attempts of his followers to do the same resulted in failure? For myself, I believe that the great philosopher, by means of a blow pipe, confined in his leathern jar more air than it would contain at the normal pressure; and, after weighing it, first empty and then full, he found such a difference that he could positively assert the gravity of air.

In these days, when *a priori* arguments are so decried, we may be allowed to dissent from a similar reasoning which would rob antiquity of its glories. Therefore, instead of saying, "Although Aristotle stated that air was heavy, he tested it by a wrong process which tended rather to prove the contrary," it would be more just to say, "Although Aristotle made use of a process, which, at first sight, appears a wrong one, yet, as we find that by the supposition of compressed air he might succeed, we conclude that he discovered the truth, since it was he who asserted the fact."

Self-Sealing Gas Retort Lids.

Self-sealing lids for gas retorts having a mechanically fitting edge, have been introduced in one of the London gas works, and are said to answer the purpose well. The lids are circular, and are stamped out of plate iron, being buckled to give them stiffness. The mouthpiece is faced true, and the projecting edge of the lid is truly turned to a semicircular section, so as to give only a line of bearing all around. Screwed up, this bearing is said to be, and to remain, gas tight, which is certainly more than would have been supposed. The makers of these lids, Messrs. Tangye Bros., of Birmingham, remark as follows:

The chief advantages obtained are: 1. The sound sealing of the retort during the whole time it is carbonizing the charge of coal, there being no jointing medium between the lid and the mouthpiece. 2. The lid requires no preparation on the part of the stoker, beyond slightly scraping the surface to remove entraneous grit or dirt. 3. The lids are only about two thirds the weight of the whole form in general use; a lid of a 16-in. mouthpiece weighing a little over 20 lbs. 4. The self-sealing lid reduces labor, saves wear and tear, obviates all the inconvenience and discomfort consequent on the preparation of luting, and effects a great reduction in the working expenses. The cost attending the process of "luting" in several large gas works exceeds £1,000 per annum, ranging in various works from 20s to 35s per mouthpiece. It will be obvious that a round lid is the most convenient and the cheapest form. Some engineers are having the mouthpieces of D-retorts adapted for round lids, by carrying the bottoms down the necessary depth for that purpose.

Boiler Inspector's Reports for June.

The Boiler Inspector's reports for June show that during the month 319 visits of inspection have been made, 573 boilers examined—465 externally and 139 internally—and 26 tested by hydraulic pressure. The whole number of defects discovered, 354; of which 31 were regarded as especially dangerous. These defects were distributed as follows: Furnaces out of shape, 16. Fractures in all, 56—2 dangerous. Burned plates, 45—1 dangerous. Blistered plates, 50—6 dangerous. Cases of incrustation and scale, 45. Cases of external corrosion, 33—4 dangerous. Cases of internal corrosion 2. Cases of internal grooving, 1. Water gages out of order, 5 Boilers without blow-out apparatus, 3. Blow-out apparatus out of order, 3—1 dangerous. Safety-valves overloaded, 7—3 dangerous. Steam gages out of order, 48—2 dangerous. Boilers without gages, 2. Boilers with loose stays, 2, Seam rips, 4—all dangerous. Mal-construction, 1—dangerous. Cases of deficiencies of water, 6—3 dangerous.

The Locomotive calls the attention of steam users to the necessity of exercising greater care in the raising of safety-valves. It says: "It is the practice of many, to lift the valve suddenly, and then let it fall, the spindle thereby receiving a violent blow; and in numerous cases we find the spindle sprung to such an extent by this practice, that the valve can lift but very little, and in some instances not at all. The valve should be raised carefully and let down gently; not only for the reasons above stated, but from the fact that nothing is more dangerous than the sudden shock caused by the valve being suddenly opened and shut. Valves should be frequently raised to prevent their becoming stuck, but too much care cannot be used in the operation.

"During the month, several cases of this evil have come to our knowledge, in one of which it was necessary to cut the spindle out, after the cap had been taken off."

ELECTRO-PLATING OF PAPER OR OTHER FIBROUS MATERIAL. The *Druggist's Circular* says: "A mode has been devised for depositing copper, silver, or gold, by the electric process, upon paper or any other fibrous material. This is accomplished by first rendering the paper a good conductor of electricity, without coating it with any material which will peel off. One of the best methods is to take a solution of nitrate of silver, pour in liquid ammonia till the precipitate formed at first is entirely dissolved again; then place the paper, silk, or muslin, for one or two hours in this solution. After taking it out and drying well, it is exposed to a current of hydrogen gas, by which operation the silver is reduced to a metallic state, and the material becomes so good a conductor of electricity that it may be electro-plated with copper, silver, or gold, in the usual manner. Material prepared in this manner may be employed for various useful and ornamental purposes.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

RAILROAD accidents succeed each other with alarming frequency, simply adding fresh chapters of horror, and shedding no fresh light on their cause. Railroad companies continue to assert through the press and in our law courts that they have made ample provision against these catastrophies in their bye-laws and regulations, that they are therefore responsible only in a subordinate degree, and that the blame and punishment must rest upon the officials immediately intrusted with the safety of the traveling public. The practice of these companies would seem to be to work their lines with the least possible cost and to reap the largest possible dividends. An open draw-bridge, a broken rail, or a defective axle is too often discovered by its effect upon a passenger train; or, again, a collision is the result of a sleeping—probably overtasked—engineer. The question to be considered is not are these railroad laws sufficient, but is there ample provision made for their due fulfillment.

We learn from an exchange that considerable excitement is felt in Wallingford and Shrewsbury, Vermont, upon the discovery of a mountain of of lead. This mountain formerly belonged to the late Morton Dawson. Last spring a son of his, in making sugar, built an arch of the loose stone found in that section. After adjusting his pan and kindling a fire, he noticed melted lead or solder run out of the fire. He supposed his pan was melting down, and removed it, but found it entire, and also found that the melted metal came from the stones of the arch. It is said that specimens have been sent to Washington, New York, and Boston, for examination.

At the coming fair at St. Louis, a large amount is to be distributed in premiums for cotton. The St. Louis *Republican* says: "We understand that these premiums will be awarded as follows:—For the best bale of upland or short staple cotton $500. For the best bale of New Orleans, or long staple cotton $500. The St. Louis Fair Association have added to this a third premium of $250 for the best bale of cotton raised in Missouri. The cotton entered must be of the growth of 1869, and the bales must not weigh less than 450 pounds each. Sea Island and Peeler cotton are excluded from competition.

The acidity of mine waters, so often noticed and so deleterious to steam boilers, has been the subject of some remarks by Dr. Willigk, who has analyzed water from a coal pit in Bohemia. It contained acid sulphates and free sulphuric acid in notable quantity. He recommended that it should be filtered over witherite (natural carbonate of baryta), which is abundant in the locality. The experiment was successful, and prevented the corrosion of the boilers or machinery. Chalk or limestone would have proved equally efficacious.

Two thirds of all the prints made in the United States are produced in New England. Massachusetts and New Hampshire can print from ninety to ninety-five thousand pieces weekly; New York State, New Jersey, and Pennsylvania can print about ninety thousand weekly. Of all these there are three of the largest printing companies that have a capacity to print one half of this whole production.

Thirteen hundred and fifty men were engaged in changing the gage of the Missouri Pacific Railroad. So complete were the preparations and facilities that the feat was accomplished in the incredible short time of twelve hours, and without the loss or delay of a single train. The business of the road is progressing now as usual.

Isaac Heene, of Duxbury, Mass., being invited to address a school, responded by offering each scholar an acre of good land to plant on shares, he manuring and plowing the same, and promising in two years to give a clear title to such as had improved the land in a farm-like manner.

It is officially announced by M. Lesseps, that the ceremonies of the opening of the Suez canal will take place on the 17th of next November. The two great enterprises by which the year 1869 will be distinguished in history, are the Union Pacific railroad and the Suez canal.

The colored mechanics of Baltimore, and the State of Maryland, are forming trades unions and societies of their own, as the white workingmen deny them admission to their unions.

The construction of a ship canal from New Orleans to Lake Pontchartrain, it is asserted, would diminish greatly the port charges in pilotage and towage.

Answers to Correspondents.

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

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

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

A. S. G., of D. C.—The power necessary to drive a train of wheelwork seven hours, so that a driven wheel, one inch in diameter, may revolve 40 revolutions per minute, with four pounds at its periphery, may be computed as follows: 1 inch×3·1416=3·1416 inches, 3·1416 inches×40=125·664 inches the circumferential motion per minute. This multiplied by 420, the number of minutes in seven hours,=52778·88 inches=4398·24 feet. As four pounds of resistance are to be overcome through this distance in seven hours we have for the power required 17592·96 foot-pounds. To accomplish this work by a weight falling through a space of seven feet, th weight must weigh one seventh of 17592·96 pounds, which is 2513·28 pounds making no allowance for friction, which will, we estimate, require in your case, twenty per cent more power than this, making the entire weight required, nearly 3,016 pounds.

C. R. F., of N. J.—As good a tool as you can use for roughing down a large wooden drum on the shaft where it is to run, is an old file ground down to a sharp point. This will not split out fragments even though it should catch in a knot or a nail. When the approximate form has been attained you can use a gouge, chisel, and sandpaper to finish. A rest good enough for the purpose can generally be made of hard-wood plank suspended with nails from and braced to the joists overhead.

T. R. J., of Mass.—The best tool to burr off small castings is a vulcanized emery wheel. If you have much such work to do it will pay for itself soon in the saving of files. To remove the rust from such castings, put them—a bushel at once—in a tumbling barrel, with leather cuttings and chips, they will soon wear bright. This will not however take the rust from the inside of small hollow castings. To clean such, dip in dilute sulphuric acid—1 part of commercial acid to ten of water—wash in hot lime water, and dry in the tumbler with dry sawdust.

H. H., of Ohio.—Experiment can only determine your first querry. We think, however, that you will find it difficult to make an alloy of platina and silver, whose fusing point will be exactly what you require. The asbestos used in making clothing is a variety of amphibole not containing much alumina.

C. R., of Vt.—Saws may be made to cut so smoothly that a very good finish may be obtained by sand-papering only. You will find such saws at work in manufactories of veneers, and it would pay you before proceeding further with your invention to visit some such establishment.

S. McN., of Cal.—The substance you send us is nothing but wood charcoal mixed with a little sand and sufficient plastic clay to cement it into lumps. How it came fifty feet below the surface where you found it must be a matter of conjecture. Charcoal is however, unchangeable at ordinary temperatures, and it may have remained there a thousand years.

A. G., of N. Y.—Good strong glue is the best thing for fixing emery to cloth belts for polishing wood.

P. O., of Mich.—You are mistaken in supposing a cylindrical adjutage will permit the largest flow of water. The form which permits the greatest flow is that of a truncated cone with its base in the direction of the flow.

F. J. E., of Md.—There is no danger of poisoning wells by using sulphate of iron (green vitriol) as a disinfectant. It is often administered as a tonic by physicians.

C. R. M., of Del.—We presume you could find a market in New York for blackberry wine. It has quite a reputation as a r medy in diarrhea, dysentery, and similar compl ints.

S. R. M., of N. Y.—A foot-pound is the measure of the force necessary to raise one pound one foot high.

G. S., of Ill.—Your weather indicator will no doubt operate well, but a more simple barometer may be made by simply placing inside a glass tube, or long vial, a dime's worth of pulverized gum camphor, filling with water, and then hermetically sealing the tube.

C. S., of Pa.—Your article on "Property in Invention," is so like a great number of others received on the same subject that we cannot for the present give it insertion.

J. W. R., of N. J.—Glass is probably the best article you can use for breaking the electric circuit.

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.

Window Shade and Curtain Fixture.—J. W. Foard, San Francisco, Cal.—The object of this invention is to produce an improved device for adjusting the tension of the cords used in operating window shades or blinds.

Mining Machine.—David Morris, Bartlett, Ohio.—The object of this invention is to produce a new and improved instrument for cutting out coal n the mines, which will operate more easily and conveniently, and with greater effect, than any heretofore in use.

Railroad Joint and Track Brace.—Granville E. Jarvis, Grafton, West Va.—The object of this invention is to provide a simple, cheap, and durable brace, adapted to be fastened to the cross ties so as to press against the outer side of the rail, and support it at the joints and elsewhere, and at the same time to hold the rail in place and prevent its sliding or "working" endwise on steep grades.

Velocipede.—David J. Farmer, Wheeling, West Va.—The object of this invention is to provide for the public a velocipede designed for use, ordinarily, on land, but capable of running equally well on water, so that when the rider arrives at a lake, river, or other sheet of water, he can ride directly on to it, and cross it in that manner, without the necessity of dismounting, or stopping to effect any change in his vehicle.

Cotton-warp Dresser.—W. H. Boyden, Rockland, R. I.—In this invention the racks and bars are constructed and hung differently from anything of the kind in use heretofore, in order that they may be more readily and conveniently cleaned when necessary, and a motion is given to the racks, bars, and rods, entirely independent of that given to the thread, in order that when the thread stops, the other parts referred to may keep in motion, and, thereby, the sizing of the thread may be prevented from adhering to them.

Heating Stove.—George A. Huntley, Quincy, Ill.—This invention relates to that class of stoves in which a current of air, to be heated, is caused to pass up between the outer wall of the fire pot and the inner wall of the stove drum; and the invention consists in the peculiar formation of said air passage, whereby the current of air is made to pass, either back and forth, in a zig-zag course, as it rises, or else to pass around the fire pot in an ascending spiral line, so as to become thoroughly heated before it is discharged from the stove, the outer wall of the stove remaining comparatively cool.

Rotary Oven.—D. A. Kennedy, Darien, Wis.—This invention has for its object to furnish a simple, convenient, and effective oven, which shall be so constructed and arranged as to do its work better, and with less expenditure of fuel, than the ovens constructed in the ordinary manner.

Eaves-trough.—Lewis Granger and Luke Phillips, Memphis, Mich.—This invention has for its object to furnish an improved machine, by means of which eaves-troughs may be easily, quickly, conveniently, and accurately formed.

Shelving for Stores.—William Koch and George Koch, Cass, Pa.—This invention has for its object to furnish an improved mode of constructing store shelves, which will enable the shelves, and the goods which they contain, to be quickly removed from the store, should it become necessary on account of fire or other accident.

Safety Stove for Railroad Cars.—Cyrus Sanborn, Chichester, N. H.—This invention has for its object to furnish an improved railroad stove, which shall be so constructed and arranged, that should the car or stove be accidentally overturned the fire may be extinguished before it can do any damage, and which shall, at the same time, be simple in construction, and will occupy small space in the car.

Corn Planter.—H. C. Beshler, Berrysburgh, Pa.—This invention has for its object to furnish a simple, strong, durable, reliable, and cheap corn planter, and which shall be so constructed that it may be conveniently adjusted to drop the corn continuously, kernel by kernel, or in hills, as may be desired.

Plow Beams.—James L. Baldwin, Troy, Pa.—This invention has for its object to furnish an improvement in the construction of plow beams, so as to diminish the shock when the plow strikes an obstruction, to prevent the plow from being broken or the team from being injured, and which shall be simple in construction, inexpensive, and readily applied.

Tub.—Ezra Caswell, Lyons, N. Y.—This invention has for its object to furnish an improved means of connecting the cover, or lid, with, and securing it to the body of the tub, so as to make the said tub perfectly tight, and which shall at the same time be simple in construction, effective in operation, and easily and conveniently operated.

Measure Holder.—George W. Burwell, Zanesville, Ohio.—This invention has for its object to furnish an improved holder for holding the measures in which molasses, sirups, oils, etc., have been measured, which shall be so constructed as to allow the drainings from the measure to run back into the cask, and at the same time protect the measure and cask from flies and dust.

Tire Upsetter.—N. P. Quick, Carmel, N. Y.—This invention has for its object to furnish an improved tire upsetter, which shall be so constructed and arranged that it may be readily attached to the rear part of the anvil, and easily detached when no longer required for use, and which shall at the same time be simple in construction and effective in operation.

Centrifugal Hulling Mill.—Charles S. Bailey, New York city.—This invention has for its object to furnish a simple, convenient, and effective hulling mill, designed especially for hulling cotton seeds, but which may be applied with equal facility and advantage for hulling other seeds, and which shall at the same time be so constructed as to remove automatically nails or other pieces of iron that may have got into the seed accidentally.

Plant Protector Attachment to Plows.—John Ahearn, Baltimore, Md.—The object of this invention is to provide an easily adjusted plant protector for plows, such as are used for plowing between the rows of young plants for cultivating, that can be readily attached to any size or style of plow, whether single or double mold board, without driving screws, or boring holes in any part of the plow, and which may be readily adjusted to allow more or less earth to be turned up toward the plants in the rows and turn the clods back into the furrow.

Cotton Seed Planter.—J. M. Elliott, Winnsborough, S.C.—This invention consists of a peculiar arrangement in a one-wheel planter of an adjustable plow, relatively to the wheel, so as to be gaged by it. Also, of an improved arrangement of feeding pin wheel and fixed pins in a hopper surrounding in part the axle of the supporting wheel. Also, certain other details of arrangement.

Dust Pan.—P. A. Schanck, Matawan, N.J.—This invention consists in providing a stiffening plate for the mouth, to prevent it from bending upwards and in so shaping the bottom, that, when resting on the floor, the edge will fit closely to the floor, and admit of sweeping the dust into it without requiring the heel to be held up by one hand to bring the edge down, as must be done with those now in use.

Harrows.—E. A. Goodes, Philadelphia, Pa.—This invention relates to improvements in harrows designed to adapt them to work in uneven ground and also for transportation to or from the place of operation, more advantageously than any now in use.

Smoothing-Iron Polisher and Glosser.—James Davies, East New York, L. I.—The object of this invention is to provide a simple and convenient implement for polishing sad-irons to remove the starch, which sometimes adheres to the faces thereof, when ironing and also to lubricate the same, with a substance which will cause the iron to impart a glossy surface to the starched clothes.

Machine for Dressing Feathers.—Robert Glore, Nashville, Tenn.—This invention relates to improvements in machines for dressing feathers by steaming, designed to provide a more efficient apparatus than any now in use; and consists in an improved arrangement of heating tubes and valves within the cylinder commonly used in machines of this character.

Car Coupling.—W. C. Tilton, Spring Place, Ga.—This invention relates to improvements in car couplings, designed to provide an arrangement whereby they may be self-coupling and thereby prevent the necessity for an attendant to stand between the cars when they come together to present the links to the openings in the buffer heads, whereby persons are frequently severely injured.

Cooking and Heating Range.—C. K. Edwards, New York city.—This invention relates to improvements in ranges having for its object to provide certain improvements in the arrangement of the fire part, calculated to concentrate the heat either under the kettle holes or under the oven when required or to equalize it between the two. Also, to provide in connection with the improved cooking ranges, heating chambers or radiators for heating air and giving it off to conducting pipes to be conveyed to rooms for heating.

Apparatus for Oiling Machinery.—Chas. A. Morton, Biddeford, Me.—The object of this invention is to provide an oiling apparatus for machinery, whereby the oil may be supplied in measured quantities and thrown in jets in such places as it is difficult to reach readily, and which may be also used with equal facility for ordinary purposes. It consists of an oil vessel provided with a pump, and a directing tube, which is so constructed that it may be held and the pump worked by one hand, while the tube may be guided by the other.

Fleece Bundling Apparatus.—Jas. Walton, Roseburg, Oregon.—This invention relates to improvements in apparatus for bundling fleeces of wool and other substances of like character, and has for its object to provide a means for accomplishing the same more rapidly and in a better manner than can be done by any devices now in use. It consists of a compressing case, having three fixed sides, two folding sides, and a vertically moving bottom in which the wool or other substance is compressed, cords being previously arranged in the said case and held by hooks around the bottom and prongs of a trifurcated cover and other hooks, so that they will encircle the bundle twice laterally and once longitudinally for tying when it has been fully compressed by the folding sides and movable bottom. The cords are disconnected from the bottom hooks by the upward movement of the bottom in compressing the bundle.

Machine for Crossing the Fiber of Felts, Bats, Wadding, etc.—L. Robinson, Matteawan, N. Y.—This invention consists of a machine having a broad platform over which the fabric is passed back and forth from the carding machine, whereon suitable rolling or laying mechanism is placed to receive a thin webbing from another carding machine delivered in a direction perpendicular to that in which the first named fabric moves, and deliver it under the pressure of the laying rollers moving back and forth, and laying it in a zig-zag course as the fabric moves in one direction, the vacant angles being filled as the fabric is moved in the other direction.

Gage Attachment for Head Blocks.—Nathan Hunt, Salem, Ohio.—This invention consists of a sliding nut applied to a dovetailed way on the bracket of the head block, and capable of being readily clamped to the said way to move with it or loosened to slide back on it after setting, and provided with a screwed rod sliding freely through a fixed bracket in the same direction with the nut, and having a collar, which, striking against the face of the bracket through which it slides, arrests the motion of the nut and the sliding bracket, at the point required for setting the log. The said nut is then released from the bracket to which it is clamped while setting, and drawn back together with and by the said screwed rod against a stop preparatory to the next setting, and then clamped to the way or bracket again. The invention also embraces certain swinging stops to be interposed between the collar of the screw and the arresting bracket, to be used where required for setting for stuff of different thicknesses.

Lid Lifter.—Wm. Worley, Newark, West Virginia.—This invention relates to a new and useful household implement, designed for various purposes.

Rat and Game Trap.—Thomas B. Van Pelt, Westport, Mo.—This invention relates to new and useful improvements in traps for catching rats and other animals.

Hat Machine.—John D. Parsons, Yonkers, N. Y.—This invention relates to a new and improved method of brushing the brims of hats while they are being manufactured.

Mounting Pictures.—C. J. Billinghurst, McArthur, Ohio.—This invention relates to a new and useful improvement in the operation of mounting photographs and other similar pictures.

Firearms.—L. T. Delassize, New Orleans, La.—This invention relates to new and useful improvements in firearms.

Brick Machine.—S. W. Bennett, Jr., Monroe, La.—This invention relates to a new and improved machine for making bricks, and has for its object simplicity and economy in construction, rapidity of execution, and pressure power requisite to form perfect bricks from well-tempered clay.

Portable and Convertible Coffer Dam.—Samuel Lewis, Williamsburgh, N. Y.—This invention relates to a new and improved method of constructing coffer dams for building piers and other submarine structures, and in making the same convertible into other forms, for raising sunken vessels; and it consists in forming the coffer dam in two or more sections, the sides of which are partitioned off into water and air-tight compartments, each section having a removable side, and all the sides being provided with suitable tubes and other appliances for filling the compartments with either air or water at all times, whereby the sections may be submerged or floated, as may be desired. It also consists in so constructing the coffer dam, that it may be made (with two of its sections) to inclose a sunken vessel, thereby affording means for raising the same. Patented July 6, 1869.

Machine for Thrashing and Hulling Clover Seed.—Z. Miller, Canal Fulton, Ohio.—This invention has for its object to furnish an improved machine for thrashing and hulling clover seed, which shall be simple in construction and effective in operation.

Horse Collar.—Jacques Meyer, Williamsburgh, N. Y.—This invention relates to certain improvements in horse collars, whereby the same can be made adaptable to all sizes of horses' necks, and whereby separate hames can be dispened with. The invention consists in the application within the leathering covering of a wooden stay, or frame, whereby the collar is made strong and stiff, and whereby the use of hames is dispensed with.

Stock Shed and Rack.—T. Brod. Myers, Palatine, West Virginia.—This invention relates to a new sheep shed and rack, which is so constructed that the roof can be readily swung up to protect the animals from the inclemency of the weather, while it can as readily be thrown into a vertical position to keep the animals away from the rack while the same is being filled with hay. The roof can also be entirely removed during fine weather.

Machinery for Feeding Wool and other Fibers to Preparing and Carding Machines.—Wm. Clissold, Dudbridge Works, near Stroud, county of Gloucester, England.—This invention relates to a new feeding apparatus, which consists of a box (for receiving the fibers to be fed) fitted with a bottom formed of reciprocating bars, which move forward the fibers to the discharging mouth at the front end of the box. Over the discharging mouth works a pair of inclined reciprocating transverse comb plates, which slide in vertical guides and mass the fiber as it passes from the box into a loose, thick sheet or bat.

Plow.—A. N. Edwards, Greenville, Ala.—This invention relates to a new fastening device for plows and shovels of all kinds, its object being to retain the share firmly and still to allow the ready removal and replacement of the same, so that shares and shovels of different kinds may be used on one standard.

Pocket Oil Can.—John P. Haines, New York city.—This invention relates to an improved oil can for lubricating purposes, so constructed that it can be readily carried in the pocket of a person, to be used when required without soiling or tearing said pocket, or otherwise injuring the garments or soiling the hands of the party using it.

Water and Steam Engines.—I. N. Forrester, Bridgeport, Conn.—This invention relates to a new manner of operating the slide valve on water and steam engines on which a fly-wheel cannot be applied, and has for its object to prevent the stopping of the engine when the slide valve, during its passage from one port to the other, closes both.

Dampening Attachment to Lithographic Machines.—Jonathan Walton, Brooklyn, N. Y.—This invention relates to a new apparatus for dampening lithographic stones in printing machines, and has for its object to regulate the amount of moisture imparted to the stone at each move, and also to adjust the device to longer or shorter stones.

Adjustable Step Ladder.—Robert R. Croasdale and Peter Rink, Reaville, N. J.—This invention has for its object to construct a step ladder, in which the steps can be adjusted into a horizontal position, whatever may be the degree of elevation of the ladder. The invention consists in pivoting each end of each step in two side bars, so that the latter will be adjustable to set the steps at any angle to the bars; and in providing a brace frame which has an up-and-down adjustable connecting rod.

Sole Sewing Machine.—Frederich Vetter, New York city.—This invention relates to a new machine for attaching soles to the uppers of boots and shoes, and consists in the general arrangement of parts for operating the needle and for adjusting the shoe holder to the same; also in the means for adjusting all parts to sewing shoes of different size.

Watch Wheel Holder.—August Wilhelm Klentoff, Oakland, Cal.—This invention relates to a new implement for holding small wheels, such as are used for watches, to allow their ready cleaning and repairing. The invention consists of a tool, in which a series of spring jaws are held that will, when fitted over the spokes of the wheel, securely hold the same to the tool.

Method of Raising Sunken Vessels, etc.—Samuel Wm. Maquay, Footscray, near Melbourne, British Colony of Victoria.—This invention consists in the use and application of hydrogen, or other light gases, singly or in combination (excepting only atmospheric air) for the purpose of raising sunken vessels or materials and sustaining those which are afloat, whether such gas or gases be produced above or below the water. But as it is proposed to use hydrogen gas as the flotative agent (believing it to be the most suitable for the purpose), there is designed an apparatus for producing the same while under water in order to save the trouble and expense of pumping it down from above the surface. And further, as the pressure varies according to the depth of water, there are constructed receptacles for the gas which are self-regulating so as to prevent their bursting as they rise to the surface and the pressure becomes lessened.

Windmill.—Henry C. Briggs, Fishersville, N. H.—This invention relates to improvements on the windmill heretofore patented to Nehemiah Trull on the fourth day of October, 1864, and consists in an improved arrangement of means for supporting and adjusting the vanes.

Tanning Apparatus.—O. W. Bean, Farmington, Texas.—This invention relates to improvements in machinery for treating hides in tanning, and consists of an arrangement of apparatus to be placed in a vat containing water, and adapted to break and scour the hides.

Current Wheel.—John Dennison, Hillsboro', N. H.—This invention relates to improvements in current wheels, having for its object to provide an improved feathering arrangement of the buckets, calculated to adapt the wheels for application to the current, either transversely or longitudinally. Also for spreading the buckets to be acted on by the water or for adjusting them so as not to be acted on.

Water Wheel.—Ferdinand Mehrmann, Fountain City, Wis.—This invention relates to a new water wheel, which is so constructed that the power of the water will be entirely exhausted, and that the whole apparatus be very effective and operate most satisfactory.

Ditching Machine.—Robert Conarroe, Camden, Ohio.—This invention consists in an improved arrangement of the driving and supporting mechanism, whereby the cutting is gaged irrespective of the surface of the ground. Also in an arrangement of the suspending devices for the elevator and the plow, whereby either may rise and pass over obstructions which may be encountered. Also in an arrangement for adjusting the tension of the elevator chain. Also in the draft apparatus for the application of animals in advance of the tongue; and also in an improved arrangement of the discharging chutes.

Harrow.—Henry C. Lezott, Osage, Iowa.—This invention consists in an improved construction of the harrow in respect of the adaptation of the form thereof for the application of the teeth to the ground. Also in the combination of the same, with a truck under an arrangement whereby it may be readily elevated above the ground for transportation by the operator, whether sitting on the truck or walking behind it.

Fanning Mill.—J. Ashton, Red Wing, Minn.—This invention consists (1) in an improved arrangement of the hopper, slide gate, and shoe, for equalizing the grain upon the sieves. 2. In an improved arrangement of spring-suspending devices for the shoe which supports the sieves. 3. In an improved arrangement of the wings of the fan to facilitate the movement of the inflowing air. 4. In an improved arrangement of the orifices in the sieves for separating the grain. 5. In an improved construction of the sieve-supporting shoe, whereby the pitch of the sieves can be adjusted without changing the others. 7. In an adjustable air-regulating sieve for regulating the blast upon the final screen.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING JULY 20, 1869.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

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

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

For copy of Claim of any Patent issued within 30 years ... $1

A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from ... $1 *upward, but usually at the price above-named.*

The full Specification of any patent issued since Nov. 20, 1866, at which time the Patent Office commenced printing them ... $1·25

Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.

Full information, as to price of drawings, in each case, may be had by addressing

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

92,689.—Velocipede.—Daniel W. Atherton, Detroit, Mich.

92,690.—Centrifugal Hulling Mill.—C. S. Bailey, New York city.

92,691.—Fluid Meter.—Phinehas Ball and Benaiah Fitts, Worcester, Mass.

92,692.—Hemmer for Sewing Machines.—H. C. Bartleson, Toledo, Ohio.

92,693.—Mechanism for Starting Sewing Machines.—S. K. Bassett, Galesburg, Ill.

92,694.—Mounting Pictures.—C. J. Billinghurst, McArthur, Ohio.

92,695.—Lamp Burner.—Ebenezer Blackman, Norwalk, Ct.

92,696.—Hydrant.—Geo. N. Bowman, Pottsville, Pa.

92,697.—Wind-Wheel.—Henry C. Briggs (assignor to D. Arthur Brown and Company), Fishersville, N. H.

92,698.—Plow.—T. E. C. Brinly, Louisville, Ky.

92,699.—Composition-Core or Form for Making Castings.—Austin Burt, Detroit, Mich.

92,700.—Fruit and Clothes Dryer.—Thos. B. Carroll, Indianapolis, Ind.

92,701.—Tub.—Ezra Caswell (assignor to himself and Philip Ganse, Jr.), Lyons, N. Y.

92,702.—Brick Kiln.—W. V. Cecil, Monmouth, Ill.

92,703.—Vegetable Masher.—Hannah F. Chase, Boston, Mass.

92,704.—Enameled Hat.—E. S. Cheney and Geo. P. Perry, Providence, R. I.

92,705.—Machine for Feeding Wool, etc., to Carding and other Machines.—Wm. Clissold, Dudbridge Works, near Stroud, England.

92,706.—Attachment for the Ends of Swingle-Trees.—Ezra Cole, Fairfield, Mich.

92,707.—Ditching Machine.—Robert Conarroe (assignor to himself, Howard Young, Wm. Kenworthy, Jesse Jacoby, and David J. T. Smyers), Camden, Ohio.

92,708.—Adjustable Step Ladder.—R. R. Croasdale and Peter Rink, Reaville, N. J.

92,709.—Construction of Spading and other Forks.—E. C. Denio and G. K. Babcock, New Hartford, N. Y.

92,710.—Curtain Fixture.—John Doyle, Hoboken, N. J.

92,711.—Range.—C. K. Edwards, New York city.

92,712.—Potato Digger.—Henry Farmer, Pontiac, Mich.

92,713.—Harvester Rake.—J. R. Finley, Delphi, Ind.

92,714.—Combined Harrow and Cultivator.—W. J. Funk (assignor to himself and Harrison B. Oatman), Portland, Oregon.

92,715.—Clothes-Pin or Clamp.—Peter Gardner, Gloucestershire, England, assignor to himself, D. E. Atherton, and E. A. Van Cise, Mount Pleasant, Iowa.

92,716.—Method of Hanging Reciprocating Saws.—Jas. Gargett, Alma, Mich.

92,717.—Harness-Saddle Tree.—Geo D. Gillett, Meridian, N. Y.

92,718.—Ejector.—G. W. Glass, New Brighton, Pa.

92,719.—Harrow.—E. A. Goodes, Philadelphia, assignor to himself, S. F. Mathews, and W. Mathews, Mechanicsburg, Pa.

92,720.—Eave-Trough Former.—Lewis Granger and Luke Phillips, Memphis, Mich.

92,721.—Lock-Nut.—Thos. Hagan, Rochester, Pa.

92,722.—Loom for Weaving Irregular Fabrics.—Chas. Heptonstall (assignor to Orville Peckham, trustee; and Orville Peckham, trustee, assignor to C. Heptonstall, P. M. Stone, and Jonathan Boyd), Providence, R. I.

92,723.—Harvester.—L. B. Hoit, Cedar Falls, Iowa, and M. Laflin, Chicago, Ill., said Hoit having assigned his right to said Laflin.

92,724.—Cotton-Gin Rib.—W. J. Horton, Newburg, assignor to himself and J. S. Napier, Mount Hope, Ala.

92,725.—Faucet Plug.—Gardner Howland, Brunswick, and E. T. Ford, Stillwater, N. Y.

92,726.—Method of Hanging Shafting.—Daniel Hussey, Lowell, Mass.

92,727.—Portable Picket Fence.—G. W. C. Jarvis and Chas. Graves, Lapeer, Mich.

92,728.—Corn Planter.—J. B. Johnson, Rock Island, Ill.

92,729.—Watch-Wheel Holder.—August W. Kientoff, Oakland, Cal.

92,730.—Fishing Jack.—M. D. Kirk and W. H. Belnap, Sturgis, Mich.

92,731.—Shelving for Stores.—Wm. Koch and Geo. Koch, Cass, Pa.

92,732.—Horse-Rake.—J. B. Koon, Aurelius, assignor to Alden and Company, assignors to G. J. Letchworth, Auburn, N. Y.

92,733.—Door Knob.—G. B. Lothrop, Boston, Mass.

92,734.—Butter Tub.—David Lown, Poughkeesie, N. Y.

92,735.—Thrashing Machine.—Stephen Mapes, Buffalo, N. Y.

92,736.—Process and Apparatus for Utilizing the Waste Coal of Mines.—T. M. Mitchell, Philadelphia, Pa., assignor to the Anthracite Fuel Manufacturing Company, Philadelphia.

92,737.—Drying and Baking Apparatus for Preparing Fuel from Waste Coal.—T. M. Mitchell, Philadelphia, Pa., assignor to the Anthracite Fuel Manufacturing Company, Philadelphia.

92,738.—Mixing Apparatus for Preparing Waste Coal for Fuel.—T. M. Mitchell, Philadelphia, Pa., assignor to the Anthracite Fuel Manufacturing Company, Philadelphia.

92,739.—Artificial Leg.—Robert Moore, Oswego, N. Y.

92,740.—Spring-Bed Bottom.—G. W. Morrill, Sterling, Ill.

92,741.—Propelling Apparatus.—Howell Mulford, Philadelphia, Pa.

92,742.—Stock Shed and Rack.—T. Brod. Myers, Palatine W. Va.

92,743.—Imitation Fabric of Paper Cloth.—J. H. Newton, Holyoke, Mass.

92,744.—Fertilizer from Sea-Weed.—J. G. Nickerson, Boston, Mass.

92,745.—Water-Closet.—Wm. I. Page, Boston, Mass.

92,746.—Alarm for Sailing-Vessels.—Zadock Pangborn, Algonac, assignor to George Clark, W. P. Campbell, and A. H. Mills, Detroit, Mich.

92,747.—Tempering Steel Castings.—Chas. Parkin and Sam. Trethewey, Allegheny county, Pa.

92,748.—Valve Cock.—Thos. Ramsden, Allegheny City, and H. M. Davis, Pittsburgh, Pa.

92,749.—Potato Digger.—Benj. Reamer and Cornelius Van Derzee, Albany, N. Y.

92,750.—Machine for Crossing Fibers in Forming Bats for Felting.—Lyman Robinson (assignor to John Falconer), Matteawan, N. Y.

92,751.—Treating and Revivifying Bone-black.—John Rogers and Lawrence Reid, Brooklyn, N. Y. Patented in England April 1, 1869.

92,752.—Boiler Flue Scraper.—Mitchell A. Salomons, Boston, Mass.

92,753.—Railroad Car Heater.—Cyrus Sanborn (assignor to himself and Benjamin F. Leavitt), Chichester, N. H.

92,754.—Dust Pan.—P. A. Schanck, Matawan, N. J., assignor to himself and R. L. Merritt, Boston, Mass.

92,755.—Ladder.—Bronson Schoonmaker, Plainwell, Mich.

92,756.—Spading Machine.—Lyman Sherwood, Springfield, Ill.

92,757.—Composition for Preventing the Fouling of Ships Bottoms.—Robert Sim, Naples. Patented in England, August 12, 1868.

92,758.—Spring Chair.—H. C. Smith, Washington, D. C.

92,759.—Shoulder Support.—J. B. Smith, Milwaukee, Wis.

92,760.—Organ Action.—Adam Storck, Cincinnati, Ohio.

92,761.—Apparatus for Drawing Tube Skelps.—Stephen P. M. Tasker and Robert Briggs, Philadelphia, Pa.

92,762.—Horse Hay Fork.—John F. Thomas, Ilion, N. Y.

92,763.—Manufacture of Rubber Balls.—John H. Tuttle, East Hampton, Mass.

92,764.—Process of Treating Vulcanized Rubber Thread Waste.—John H. Tuttle, East Hampton, Mass.

92,765.—Lithographic Press.—Jonathan Walton, Brooklyn, N. Y., assignor to Victor E. Mauger, New York city.

92,766.—Lamp Chimney.—Abel Whitlock, Danbury, Conn.

92,767.—Saw Frame.—Abel Whitlock, Danbury, Conn.

92,768.—Implement.—Wm. Worley, Newark, West Va.

92,769.—Stomach Pump.—James M. Youngblood, St. Louis, Mo., assignor for one half to A. J. P. Garesche.

92,770.—Brick Kiln.—Henry W. Adams, Philadelphia, Pa.

92,771.—Lamp Burner.—Thomas Adams, Hudson City, N. J., assignor to Mary A. Van Alen, Brooklyn, N. Y.

92,772.—Plant-protector Attachment to Plows.—John Ahearn, Baltimore, Md.

92,773.—Land Level and Measure.—F. A. Archibald, Con-N. C. Antedated July 15, 1869.

92,774.—Fanning Mill.—Joshua Ashton, Red Wing, Minn.

92,775.—Plow Beam Clevis Attachment.—James L. Baldwin, Troy, Pa.

92,776.—Machine for Breaking and Scouring Hides.—O. W. Bean, Farmington, Texas.

92,777.—Sawmill.—Timothy Beaudry, Levis, Canada.

92,778.—Brick Machine.—S. W. Bennett, Jr., Monroe, La.

92,779.—Camp Stove.—George Benns, Rockford, Ill.

92,780.—Corn Planter.—H. C. Beshler, Berrysburg, Pa.

92,781.—Fireplace Heater.—Bentley C. Bibb, Baltimore, Md.

92,782.—Device for Closing Bottles and Pipes.—Dominicus L. Bollerman and Richard Bollerman, New York city.

92,783.—Harvester Rake.—James B. Bowen, Charles A. Whelan, and Cleanthus A. Reed, Madison, Wis.

92,784.—Machine for Dressing Warp Threads.—Wm. H. Boyden, Rockland, R. I.

92,785.—Hat Ventilator.—Thomas W. Bracher, New York city.

92,786.—Mechanism for Driving Sewing Machines.—John A. Bradshaw, William H. Brown, and Darius Whithed, Lowell, Mass.

92,787.—Bed Bottom.—Charles Bradway, Moquoketa, Iowa.

92,788.—Churn.—Wm. W. Brigg, Home, Tenn.

92,789.—Water Motor.—S. W. Broadwell, Logan, Iowa.

92,790.—Boiler Flue Scraper.—Lester B. Brown, Petroleum Center, Pa.

92,791.—Measure Holder.—George W. Burwell, Zanesville, Ohio.

92,792.—Lifting Bar.—D. P. Butler, Boston, Mass.

92,793.—Spring Lifting Apparatus.—D. P. Butler, Boston, Mass.

92,794.—Clothes Dryer.—Cyrus Carrier, Oswego, N. Y.

92,795.—Metallic Cartridge.—Jules Joseph Chaudun, Paris, France, assignor to himself, Jean Jean Dexant, and Alfred Bernard. Patented in France, March 31, 1865.

92,796.—Door Lock.—H. Clark, Baltimore, Md.

92,797.—"Clothes Dryer."—Edward P. Clark, Millbury, Mass.

92,798.—Drawer Guide.—George S. Curtis and Henry Curtis, Chicago, Ill.

92,799.—Breech Loader.—L. T. Delassize, New Orleans, La.

92,800.—Current Wheel.—John Dennison, Hillsborough, N. H.

92,801.—Mode of Attaching Screws to Knobs.—W. Edson Doolittle, East Haven, Conn.

92,802.—Station-indicator for Railroad Cars.—William H. Eckert and James A. Black, Dayton, Ohio.

92,803.—Plow.—A. N. Edwards, Greenville, Ala.

92,804.—Cotton Seed Planter.—J. M. Elliott, Winnsborough, S. C.

92,805.—Sliding Farm Gate.—Thomas Ellison, Abington, Ill.

92,806.—Plow.—Philip Falker, Lanesville, Ind.

92,807.—Land and Water Velocipede.—D. J. Farmer, Wheeling, West Va.

92,808.—Velocipede.—David J. Farmer, Wheeling, West Va.

92,809.—Grain Gleaner and Smut Machine.—John Ferguson, Fall River, Mass.

92,810.—Fertilizer.—Randall Fish, Washington, D. C.

92,811.—Hoop Skirt.—Edward Fleisher, Cincinnati, Ohio.

92,812.—Curtain Fixture.—J. W. Foard, San Francisco, Cal.

92,813.—Valve Gear for Actuating Steam and Other Enginery.—I. N. Forrester, Bridgeport, Conn.

92,814.—Fanning Mill.—Samuel Foster, Jr., Des Moines, Iowa.

92,815.—Round Comb.—O. B. Gallup, Summit, R. I.

92,816.—Manufacture of White Lead.—I. M. Gattman, New York city.

92,817.—Gage for Making Axles.—Peter Geiser, Waynesborough, Pa.

92,818.—Machine for Dressing Feathers.—Robert Glore, Nashville, Tenn.

92,819.—Twine Holder.—A. J. Goodrich (assignor to Turner, Seymour & Judds), Wolcottville, Conn.

92,820.—Oil Cup.—J. P. Haines, New York city.

92,821.—Thill Coupling.—B. F. Harrison, Newark, N. J. Antedated July 15, 1869.

92,822.—Hot-air Furnace.—O. N. Hart, Winona, Minn.

92,823.—Animal Trap.—Daniel Harwood (assignor to himself and Seth White), Dutch Flat, Cal.

92,824.—Rein Holder.—M. C. Heptinstall, Enfield, N. C.

92,825.—Hand Stamp.—J. E. Higgins, Chas. Merriam, and C. O. Luce, Brandon, Vt.

92,826.—Corn Planter.—Albert Hodgson and Edwin Hodgson, El Paso, Ill.

92,827.—Machine for Cutting Stone and Marble.—T. S. Howard, Savannah, Mo.

92,828.—Head Block.—Nathan Hunt, Salem, Ohio.

92,829.—Coal Stove.—G. A. Huntley, Quincy, Ill.

92,830.—Device for Stopping the Revolution of Spindles in Spinning Machines, etc.—Eugene Huret and F. L. Debruyn, Condette, Pas-de-Calais, France.

92,831.—Paper Box.—G. L. Jaeger, New York city. Antedated June 7, 1869.

92,832.—Card Case.—G. H. James and Josiah James, London, England.

92,833.—Railway Rail Joint.—Granville E. Jarvis, Grafton, West Va.

92,834.—Cultivator and Stalk Cutter.—J. G. Johnson, Carthage, Ill.

92,835.—Cultivator.—C. H. Johnson, Morristown, N. J.

92,836.—Manufacture of Photograthic Pictures.—J. R Johnson, London, England.

92,837.—Combined Corn Planter and Cultivator.—M. J Kavanagh, Joliet, and M. Gregg, Chicago, Ill.

92,838.—Blacking Cabinet.—Lawson P. Keach, Baltimore, Md.

92,839.—Railway Car Coupling.—Orson Kelsey, Commerce, Mich.

92,840.—Rotary Oven.—D. A. Kennedy (assignor to himself, Wm. Wadsworth, and E. D. Murray), Darien, Wis.

92,841.—Window Sash.—S. Kepner, Pottstown, Pa.

92,842.—Rotary Pump.—A. H. Knapp, Needham, Mass. Antedated July 17, 1869.

92,843.—Stovepipe Fastener.—I. W. Lamb, Salem, Mich.

92,844.—Combination Lock.—I. W. Lamb, Salem, Mich.

92,845.—Plow.—W. M. Lanhan, Noblesville, Ind.

92,846.—Saw.—H. A. Lanman (assignor to himself and James Ohlen), Columbus, Ohio.

92,847.—Elevator.—J. S. Lester, Knoxville, Tenn., assignor to himself and L. C. Shepard.

92,848.—Steam Engine Governor.—J. F. Lotellier, Grand Rapids, Mich.

92,849.—Harrow.—H. C. Lezott, Osage, Iowa.

92,850.—Paper-collar Box.—E. A. Locke and W. N. Weeden, Boston, Mass.

92,851.—Fabric Whereof to Make Collars, Cuffs, Bosoms, and other Articles of Wearing Apparel.—Wm. E. Lockwood, Philadelphia, Pa.

92,852.—Clod Fender.—J. W. Loveless, Clark's Hill, Ind.

92,853.—Pencil Case.—Wm. A. Ludden, Brooklyn, N. Y.

92,854.—Device for Raising Sunken Vessels.—S. W. Maquay, Footscray, near Melbourne, Victoria.

92,855.—Washing and Cleansing Fluid.—F. F. N. Marais, New York city.

92,856.—Loom for Weaving Carpets.—John Marsden (assignor to John Crossley and Sir Francis Crossley), Halifax, England Patented in England, Sept. 9, 1867.

92,857.—Globe Valve.—F. O. Matthiessen, Jersey City, N. J.

92,858.—Hanger for Shafting.—E. M. Mayo, Cincinnati, Ohio.

92,859.—Speeder for Spinning and Twisting Roving.—Thomas Mayor (assignor to Orville Peckham, trustee; and said trustee assigns to said Mayor and George Chatterton), Providence, R. I.

92,860.—Shaft Coupling.—William S. McKinney, Cincinnati, Ohio.

92,861.—Corn Planter.—Wm. McLucas, Reinersville, Ohio.

92,862.—Water Wheel.—Ferdinand Mehrmann, Fountain City, Wis.

92,863.—Straw Board.—S. T. Merrill, Beloit, Wis.

92,864.—Horse Collar.—Jacques Meyer, Williamsburgh, N. Y.

92,865.—Machine for Thrashing and Hulling Clover Seed.—Zephaniah Miller, Canal Fulton, Ohio.

92,866.—Car Coupling.—I. N. Mitchell, Arcanum, Ohio.

92,867.—Culinary Vessel.—O. M. Mitchell, Marathon, N. Y.

92,868.—Washing Machine.—Otis M. Mitchell, Marathon, N. Y.

92,869.—Car Brake and Starter.—David M. Moore, Windsor, Vt.

92,870.—Machine for Making Wire Rope.—C. H. Morgan, Worcester, Mass.

92,871.—Mining Machine.—David Morris, Bartlett, assignor to himself and Aaron P. Dewees, Pennsville, Ohio.

92,872.—Oiler for Machinery.—Chas. A. Morton, Biddeford, Me.

92,873.—Tailors' Measuring Apparatus.—Fritz Mueller and Hermann Koeller, New York city.

92,874.—Railway.—W. C. Cockburn Muir, Westminster, England.

92,875.—Composition of Matter to be Used in the Process of Restoring Steel.—Byron W. Nichols (assignor to himself, C. Aultman, George H. Buckius, P. S. Sowers, and A. Clark Tonner), Canton, Ohio.

92,876.—Converting Articles of Cast Iron into Steel.—B. W. Nichols (assignor to himself, C. Aultman, G. A. Buckius, P. S. Sowers, and A. C. Tonner), Canton, Ohio.

92,877.—Hat-brushing Machine.—John D. Parsons, Yonkers, N. Y.

92,878.—Bed Bottom.—Byron Partello, Detroit, Mich.

92,879.—Check Hook.—C. B. Payne, Clinton, Ill.

92,880.—Cultivator Teeth.—E. B. Pratt, Monroe, Wis.

92,881.—Smiths' Anvil Clamp for Holding Tires while being Upset by Hand Forging.—N. P. Quick, Carmel, N. Y.
92,882.—Corn Planter.—Jonathan Rader, Daleville, Ind.
92,883.—Water Meter.—Henry F. Read, Brooklyn, N. Y. Antedated July 13, 1869.
92,884.—Molding Propeller for Water Meters.—H. F. Read, Brooklyn, N. Y.
92,885.—Barrel Head.—George Righter, Radnor, Pa., assignor to himself, George Righter, Jr., and J. G. Maxwell.
92,886.—Fence.—John Riordan, Six Mile, Ind.
92,887.—Miter Box.—M. O. Royce, Boston, Mass.
92,888.—Sulky Land Roller.—Peter Schmitt, Stowartsville, Mo.
92,889.—Corn Planter.—Amos Shellabarger, Miami county, Ohio.
92,890.—Temple for Loom.—Joseph Simpson, Millbury, Mass.
92,891.—Wagon Axle.—S. W. Slocumb, Albany, Ill.
92,892.—Hydrogen Generator and Carbureter.—Byron Sloper, St. Louis, Mo.
92,893.—Ore Concentrator and Endless Sluice Blanket.—C. D. Smith, Drytown, Cal.
92,894.—Manufacture of Wrought Iron and Steel direct from the Ore.—G. H. Smith, New York city.
92,895.—Tag.—T. J. Southworth, Rochester, N. Y.
92,896.—Cradle.—Lewis Sperry, East Windsor Hill, and Lester Robinson, New Haven, Conn., assignors to Lewis Sperry and Adelia Sperry.
92,897.—Legislative Voting Apparatus.—W. M. Springer, Springfield, Ill.
92,898.—Plow.—Henry Stem, Mifflinburg, Pa.
92,899.—Carriage Jack.—Jacob Steuer, Albany, N. Y.
92,900.—Mechanism for Operating the Picking Staff in Looms.—E. P. Terrel, West Liberty, Ohio.
92,901.—Mashing Grain for Distillation.—M. Thompson, St. Louis, Mo.
92,902.—Railway Car Coupling.—W. C. Tilton, Spring Place, Ga.
92,903.—Machine for Sowing and Drilling Grain.—G. A. Titus, Mantorville, assignor to himself and S. B. Pinney, St. Cloud, Minn.
92,904.—Distributer for Sowing and Drilling Grain.—G. A. Titus, Mantorville, assignor to himself and S. B. Pinney, St. Cloud, Minn.
92,905.—Clothes Dryer.—L. A. Towne, La Crosse, Wis.
92,906.—Stove Grate.—Charles Truesdale (assignor to himself and Wm. Resor & Co.), Cincinnati, Ohio.
92,907.—Manufacture of Chipped Beef.—C. L. Tucker, Chicago, Ill.
92,908.—Combined Lamp Wick Trimmer, Chimney Cleaner, and Lifter.—C. M. Tyler, Indianapolis, Ind.
92,909.—Saw.—J. P. Tyler, Penn Yan, N. Y.
92,910.—Cultivator Teeth.—Benjamin Van Bracklin, Le Roy, N. Y.
92,911.—Animal Trap.—T. B. Van Pelt, Westport, Mo.
92,912.—Sewing Machine for Sewing Turned Shoes.—F. Vetter, New York city.
92,913.—Beehive.—Simon Vreeland, Cuba, N. Y.
92,914.—Farm Gate.—Simon Vreeland, Cuba, N. Y.
92,915.—Carriage Wheel.—Simon Vreeland, Cuba, N. Y.
92,916.—Fleece Bundling Apparatus.—James Walton, Roseburg, Oregon.
92,917.—Fence.—J. L. Wellington, Dansville, N. Y.
92,918.—Combined Pistol and Dirk.—Franklin Wesson, Worcester, Mass.
92,919.—Sleeping Car.—M. A. Wheeler, San Francisco, Cal.
92,920.—Cooking Stove.—J. B. Wilkinson, Troy, N. Y.
92,921.—Necktie and Bow.—Elias Woodward, Brooklyn, N. Y.
92,922.—Tinners' Gutter Trough.—J. M. Woolwin, Mechanicsburg, Ohio.
92,923.—Brick Kiln.—A. J. Works, Fair Haven, Conn.
92,924.—Compound Oil for Coating Leather and Metals.—W. K. Wyckoff, Ripon, Wis.
92,925.—Paper File.—P. W. Derham, Brooklyn, N. Y.

REISSUES.

35,429.—Manufacture of Hollow Glass Ware.—Dated June 3, 1862; reissue 3,555.—Division A.—J. S. Atterbury and T. B. Atterbury, Pittsburgh, Pa., for themselves, and assignees of James Reddick.
35,429.—Manufacture of Hollow Glass Ware.—Dated June 3, 1862; reissue 3,556.—Division B.—J. S. Atterbury and T. B. Atterbury, Pittsburgh, Pa., for themselves, and assignees of James Reddick.
42,829.—Ring for Spinning.—Dated May 24, 1864; reissue 3,557.—John Birkenhead, Ilion, N. Y.
52,680.—Rake Tooth Bender.—Dated February 20, 1866; reissue 3,558.—Columbus Coleman, Allegheny City, Pa.
88,476.—Milk Cooler.—Dated March 30, 1869; reissue 3,559.—L. T. Hawley, Salina, N. Y.
89,662.—Pump.—Dated May 4, 1869; reissue 3,560.—D. P. Henry, Windsor, Ill.
25,535.—Horse Rake.—Dated September 20, 1859; reissue 3,561.—A. D. Reese, Phillipsburg, N. J., assignee of T. J. Steffe.
65,607.—Breech-Loading Firearm.—Dated June 11, 1867; reissue 3,562.—B. S. Roberts, U. S. Army.
63,537.—Soda Fountain.—Dated April 2, 1867; reissue 3,563.—E. C. Thompson, Rochester, N. Y., assignee of T. A. Long.
91,186.—Coal Stove.—Dated June 8, 1869; reissue 3,564.—R. B. Varden, Uniontown, Md.

EXTENSIONS.

Machine for Printing Woolen and other Goods.—T. Crossley, of Bridgeport, Conn.—Letters Patent No. 11,118, dated June 20, 1854; antedated April 5, 1854.

Sand Paper Cutting Machine.—Wm. Adamson, of Philadelphia, Pa.—Letters Patent No. 13,153, dated July 3, 1855.
Loom.—S. T. Thomas, of Gilford, N. H.—Letters Patent No. 13,187, dated July 3, 1855.
Knitting Machine.—John Pepper, Gilford, N. H.—Letters Patent No. 13,289, dated July 17, 1855; reissue No. 1,538, dated September 13, 1863.
Water Meter.—H. R. Worthington, Greenburg, N. Y.—Letters Patent No. 13,320, dated July 24, 1855.
Buckles.—S. E. Booth, Orange, Conn., administrator of S. S. Hartshorn, deceased.—Letters Patent No. 13,218, dated July 10, 1855.

APPLICATIONS FOR EXTENSION OF PATENTS.

Dust Deflectors for Windows of Railroad Cars.—James M. Cook, of Boston, Mass., has applied for an extension of the above patent. Day of hearing Sept. 27, 1869.

Policemen's Rattle.—Joseph McCord, of Philadelphia, Pa., has petitioned for the extension of the above patent. Day of hearing, October 25, 1869.

Machine for Manufacturing Corks.—Mary F. Crocker, of West Winsted, Conn., Administratrix of the estate of William R. Crocker, deceased, has petitioned for an extension of the above patent. Day of hearing, September 11, 1869.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

795.—Drilling Machine.—Daniel R. Pratt, Worcester, Mass. March 15, 1869.
1,781.—Hammer for Forging Metals.—P. S. Justice, Philadelphia, Pa. June 9, 1869.
1,829.—Mortising Machine.—John Richards, Philadelphia, Pa. June 15, 1869.
1,831.—Apparatus for Letter Printing.—Wm. H. Williams and J. W. Kellberg, Philadelphia, Pa. June 15, 1869.
1,865.—Pick.—C. A. Hardy, Philadelphia, Pa. June 17, 1869.
1,880.—Apparatus to Facilitate Moving Railway Carriages.—Ezra Hutson, Brockport, N. Y. June 18, 1869.
1,881.—Device for Holding Papers.—L. H. Olmsted, New York city. June 19, 1869.
1,899.—Blowing and Pumping Engines.—A. S. Cameron, New York city. June 21, 1869.
1,900.—Carriage Wheels.—E. G. Woodside, San Francisco, Cal. June 21, 1869.
1,945.—Changing Breech-Loading Shot Guns into Breech-Loading Rifles.—F. Wohlgemuth, New York city. June 26, 1869.
1,953.—Weighing Scales.—Michael Kennedy, New York city. June 28, 1869.
1,957.—Apparatus for Rendering Fatty Matter.—C. J. Everett, Highwood Park, N. J. June 28, 1869.
1,976.—Apparatus for Preserving Animal and Vegetable Substances.—S. H. Davis, D. W. Davis, and F. H. Date, Detroit, Mich. June 30, 1869.
1,988.—Manufacture of Nails or Spikes.—Reinhold Boeklin, Brooklyn, N. Y. July 1, 1869.

PATENT OFFICES,
American and European,
OF
MUNN & CO.,
No. 37 Park Row, New York.

For a period of nearly twenty-five years Munn & Co. have occupied the position of leading Solicitors of American and European Patents, and during this extended experience of nearly a quarter of a century, they have examined not less than fifty thousand alleged new inventions, and have prosecuted upwards of thirty thousand applications for patents, and, in addition to this, they have made at the Patent Office over twenty thousand Preliminary Examinations into the novelty of inventions, with a careful report on the same.

Munn & Co. deem it safe to say that nearly one-third of the whole number of applications made for patents during the past fifteen years has passed through their Agency.

CONSULTATIONS AND OPINIONS FREE.

Those who have made inventions and desire to consult with us are cordially invited to do so. We shall be happy to see them in person, at our office, or to advise them by letter. In all cases they may expect from us an *honest opinion*. For such consultation, opinion, and advice, *we make no charge*. A pen-and-ink sketch and a description of the invention should be sent. Write plainly, do not use pencil or pale ink.

If a SPECIAL SEARCH at the Patent Office is required, which embraces a personal examination of all patented inventions and a report in writing fee of $5 is charged. This examination is only advised in doubtful cases.

To Apply for a Patent, a model must be furnished, not over a foot in any dimension. Send model to Munn & Co., 37 Park Row, New York, by express, charges paid, also a description of the improvement, and remit $16 to cover first Government fee, revenue and postage stamps.

The model should be neatly made of any suitable materials, strongly fastened, without glue, and neatly painted. The name of the inventor should be engraved or painted upon it. When the invention consists of an improvement upon some other machine, full working model of the whole machine will not be necessary. But the model must be sufficiently perfect to show with clearness, the nature and operation of the improvement.

THE GREAT ADVANTAGES

OF MUNN & CO.'S AGENCY are that their practice has been ten-fold greater than any other Agency in existence, with the additional advantage of having the assistance of the best professional skill in every department, and a Branch Office at Washington, which watches and supervises all their cases as they pass through official examination. If a case is rejected for any cause, or objections made to a claim, the reasons are inquired into and communicated to the applicant, with sketches and explanations of the references; and should it appear that the reasons given are insufficient, the claims are prosecuted immediately and the rejection set aside, and usually

WITHOUT EXTRA CHARGE.

Munn & Co. are determined to place within the reach of those who confide to them their business the highest professional skill and experience.

Caveats are desirable if an inventor is not fully prepared to apply for Patent. A Caveat affords protection for one year against the issue of a patent to another for the same invention. Caveat papers should be carefully prepared.

Reissues.—A patent, when discovered to be defective, may be reissued by the surrender of the original patent and the filing of amended papers. This proceeding should be taken with great care.

Designs, Trade Marks, and Compositions can be patented for a term of years; also new medicines or medical compounds, and useful mixtures of all kinds.

When the invention consists of a medicine or compound, or a new article of manufacture or a new composition, samples of the article must be furnished, neatly put up. Also, send us a full statement of the ingredients, proportions, mode of preparation, uses, and merits.

EUROPEAN PATENTS.

American inventors should bear in mind that, as a general rule, any invention that is valuable to the patentee in this country is worth equally as much in England and some other foreign countries. Five Patents—American, English, French, Belgian and Prussian—will secure an inventor exclusive monoply to his discovery among one hundred and thirty millions of the most intelligent people in the world. The facilities of business and steam communication are such that patents can be obtained abroad by our citizens almost as easily as at home. Munn & Co. have prepared and taken a larger number of European patents than any other American Agency. They have Agents of great experience in London, Paris, Berlin, and other cities.

For instructions concerning Foreign Patents, Reissues, Interferences, Hints on Selling Patents, Rules and Proceedings at the Patent Office, the Patent Laws, etc., see our Instruction Book. Sent free by mail on application. Those who receive more than one copy thereof will oblige by presenting it to their friends.

Address all communications to

MUNN & CO.,
No. 37 Park Row, New York City.

Office in Washington, corner of F and 7th streets.

Schedule of Patent Office Fees:

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

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

Mechanical Engravings,

Such as embellish the Scientific American, are generally superior to those of any similar publication, either in this country or in Europe. They are prepared by our own artists, who have had long experience in this branch of art, and who work exclusively for us. There is one pertinent fact in connection with the preparation and publication of an illustration in our columns, that needs to be better understood by many inventors and manufacturers who pursue a short-sighted policy in bringing their improvements to public notice. They often go to a large expense in printing and circulating handbills, which few care either to read or preserve. Now, we undertake to say, that the cost of a first-class engraving, done by our own artists and printed in one issue of the Scientific American, will amount to less than one-half the sum that would have to be expended on a poorer illustration, printed in the same number of circulars, and on a sheet of paper in size equal to one page of our Journal. A printed handbill has no permanent value. Thousands of volumes of the Scientific American are bound and preserved for future reference—beside, we estimate that every issue of our paper is read by no fewer than one hundred thousand persons. Parties who desire to have their inventions illustrated can address the undersigned, who are also prepared to send artists to make sketches of manufacturing establishments, with a view to their publication in the Scientific American. For particulars address

MUNN & CO.,
37 Park Row, New York.

THE ABOVE CUT REPRESENTS OUR patent circular saw with movable or inserted teeth, for which we claim the following advantages over all others:—

The shanks of our saw teeth are elastic, and exert a uniform distension in the sockets. The stability of the plate is in no way affected by inserting new sets of teeth. Each tooth may be independently adjusted to the cutting line.

No rivets, keys, or other objectionable appliances are employed in connection with the teeth; they are as simple in construction as a nut for a bolt, and as easily applied.

In short all the difficulties heretofore experienced in the use of movable teeth for saws, are fully met and obviated by this invention.

The Subscribers manufacture the "W. G. TUTTLE'S PATENT CROSS CUT SAWS," J. H. TUTTLE'S PATENT DOUBLE HOOK TOOTH SAWS;" also, Cast steel Circular and Long Saws. Single and Double Cylinder and other Power and Hand Printing Machinery.

☞ Our Illustrated Catalogues sent free to all, who will please address us.

R. HOE & CO., Manufacturers,
26 tf 29 and 31 Gold st., New York.

Dussauce on the Manufacture of Soap—
JUST READY.

A GENERAL TREATISE ON THE

Manufacture of Soap,

Theoretical and Practical; comprising the Chemistry of the Art, a description of all the raw materials and their uses, directions for the establishment of a soap factory, with the necessary apparatus, instructions in the manufacture of every variety of soap, the assay and determination of the value of alkalies, fatty substances, soaps, etc., etc. By Prof. H. DUSSAUCE, lately of the laboratories of the French Government, author of "A Practical Guide for the Perfumer;" "A Complete Treatise on Tanning, Currying, and Leather Dressing," etc., etc., with an Appendix, containing extracts from the reports of the International Jury on soaps, as exhibited in the Paris Universal Exposition, 1867, numerous tables, etc., etc., The most complete treatise of the kind ever published. Illustrated by engravings. In one volume 8vo. of over 800 pages. Price $10 by mail, free of postage.

CONTENTS.

GLANCE AT THE HISTORY OF THE ART.

SECTION I.—ELEMENTARY NOTIONS OF CHEMISTRY. CHAP. 1.—General Principles. II.—Nomenclature. III.—Equivalents. IV.—Chemical Reactions. V.—Special Characteristics of the Different Classes of Bodies.

SECTION II.—RAW MATERIALS USED IN THE MANUFACTURE OF SOAPS.—CHAP. VI.—Lime. VII.—Potash. VIII.—Soda. IX.—Ammonia. X.—Alkalimetry. XI.—Acids.

SECTION III.—FATTY SUBSTANCES USED IN THE FABRICATION OF SOAPS. CHAP. XII.—General observations on fatty substances. XIII.—Immediate principles of fatty bodies. XIV.—Fatty acids. XV.—Action of acids on fatty bodies. XVI.—General considerations on fixed oils. XVII.—Fixed oils. XVIII.—Animal greases. XIX.—Waxes, resins, turpentines. XX.—Falsifications and assays of fatty matters. XXI.—Volatile oils—resin.

SECTION IV.—ESTABLISHMENT OF A SOAP FACTORY. CHAP. XXII.—Kettles. XXIII.—Lye vats. XXIV.—Soap frames. XXV.—Drying rooms. XXVI.—Divider, molding machine, and minor implements. XXVII.—Plan and description of a soap factory.

SECTION V.—FABRICATION OF SOAPS. CHAP. XXVIII.—The theory of saponification. XXIX.—The preparatory manipulations in the process of making soap. XXX.—Fabrication of marbled soaps. XXXI.—White soap from olive oil. XXXII.—Soap made with bone tallow. XXXIII.—Soap made with oleic acid. XXXIV.—Resinous soaps. XXXV.—Soaps of cocoa oil. XXXVI.—Soft soaps. XXXVII.—Silicated soaps. XXXVIII.—New processes.

SECTION VI.—TOILET SOAPS. CHAP. XXXIX.—White toilet soaps made from lard. XL.—Soap made of tallow. XLI.—Palm oil soap. XLII.—Half palm soap. XLIII.—Cocoa oil soap. XLIV.—Soaps made by the cold process. XLV.—Floating soaps. XLVI.—Powered soaps. XLVII.—Essence of soaps. XLVIII.—Transparent soaps. XLIX.—Soft toilet soaps, or almond, cream, and Windsor soap. L.—Savonettes. LI.—Different preparations of toilet soaps.

SECTION VII.—DIFFERENT MANIPULATIONS TO WHICH THE PASTES OF CRUDE SOAPS ARE SUBJECTED TO BE TRANSFORMED INTO TOILET SOAPS.—CHAP. LII.—The cutting machine. LIII.—Grinding machine. LIV.—Mortars in which to pound the soap. LV.—Molds and Presses. LVI.—Fabrication of toilet soaps. LVII.—Formulæ for perfuming and coloring toilet soaps.

SECTION VIII.—FORMULÆ FOR PREPARING DIFFERENT KINDS OF SOAP AND IMPROVEMENTS IN THE FABRICATION.—CHAP. LVIII.—Preparation of different kinds of soap. LIX.—Improvements in the fabrication of soaps. LX.—Substitute for soap. LXI.—On the changes to be made in the actual processes of saponification by M. D'Arcet.

SECTION IX.—ANALYSES AND ASSAYS OF SOAPS.—CHAP.—LXII.—Determination of the proportions of water. LXIII.—Determination of the proportions of fatty acids. LXIV.—Determination of the proportion of alkali. LXV.—Determination of the proportions of foreign substances. LXVI.—Special methods of analyzing soaps. LXVII.—Different methods of determining the commercial value of soap. APPENDIX.—Soaps as shown in the Universal Exposition, Paris, 1867. Weights, Measures, Thermometers, Hydrometers, Tables, etc., etc.

☞ The above or any of my Books sent by mail, free of postage, at the publication prices. My new revised and enlarged CATALOGUE OF PRACTICAL AND SCIENTIFIC BOOKS, 72 pp. 8vo, now ready, complete to June 1, 1869, will be sent, free of postage, to any one who will favor me with his address.

HENRY CAREY BAIRD,
Industrial Publisher,
406 Walnut st., Philadelphia, Pa.

Pevey's Cupola,

WARRANTED to Melt, with one tun of Coal, 2000 lbs. of Iron MORE than any other Cupola now in use. ABIEL PEVEY,
Patentee and Proprietor, Lowell, Mass. Van Tuyl & Co., No. 273 Cherry st., New York, Agents.

SOLUBLE GLASS,

SILICATE OF SODA AND POTASH—FIRE, Water, Rust, and Mildew-proof, for Painting Cementing, and making Artificial Stone; the same as made by us for the U. S. Government, by order of Com. Perry, in 1862, to coat bombshells in the Navy-yard. Manufactured and sold by us in 5, 10, and 20-gallon kegs and 40-gallon bbls. L. & J. W. FEUCHTWANGER,
P.O. Box 3,616. Chemist & Drug Imp's, 55 Cedar st., N.Y.

STEAM HAMMERS, TURN-TABLES, and Foundery Cranes. Address
14 GREENLEAF & CO., Indianapolis, Ind.

WROUGHT IRON

Beams and Girders.

THE Union Iron Mills, Pittsburgh, Pa. The attention of Engineers and Architects is called to our improved Wrought-iron Beams and Girders (patented), in which the compound welds between the stem and flanges, which have proved so objectionable in the old mode of manufacturing, are entirely avoided, we are prepared to furnish all sizes at terms as favorable as can be obtained elsewhere. For descriptive lithograph address the Union Iron Mills, Pittsburgh, Pa. 21 tf

---

HARTFORD

Steam Boiler

INSPECTION & INSURANCE CO.

CAPITAL........................$500,000.

ISSUES POLICIES OF INSURANCE, after a careful inspection of the Boilers, covering all loss or damage to

Boilers, Buildings, and Machinery,

—ARISING FROM—

STEAM BOILER EXPLOSIONS.

The business of the Company includes all kinds of

STEAM BOILERS,

STATIONARY, MARINE, AND LOCOMOTIVE.

Full information concerning the plan of the Company's operations can be obtained at the

HOME OFFICE, in Hartford, Conn.

Or at any Agency.

J. M. ALLEN, President.
C. M. POND, Vice President.
T. H. BABCOCK, Secretary.

BOARD OF DIRECTORS:

J. M. Allen........................President.
Lucius J. Hendee............President Ætna Fire Ins. Co.
F. W. Cheney.....Ass't Treas. Cheney Bro's Silk Mfg. Co.
John A. Butler............Pres. Conn. River Banking Co.
Charles M. Beach........................of Beach & Co.
Daniel Phillips....................of Adams Express Co.
G. M. Bartholomew..........Pres't American Nat'l Bank.
R. W. H. Jarvis...........Pres't Colt's Fire-Arms Mfg. Co.
E. M. Reed..........Sup't Hartford & N. Haven Railroad.
C. M. Pond.........Treas. Hartford & N. Haven Railroad.
T. O. Enders........................Sec. Ætna Life Ins. Co.
Leverett Brainard...............of Case, Lockwood & Co.
Geo. Crompton......Crompton Loom Works, Worcester.
D. L. Harris.........Pres't Conn. River R. R., Springfield.
Earl P. Mason.....Pres't Prov. & Wor. R. R., Providence.
Hon. E. D. Morgan..............U. S. Senator, New York.

New York Office,
106 Broadway.
THOS. S. CUNNINGHAM, Agent.
R. K. McMURRAY, Inspector.

FOR SALE.

A SECOND-HAND 20-FOOT PATENT

Three-Post Iron Planer,

MADE BY

D. L. HARRIS & CO.,

Will be Sold very low by

HAWKINS & JAMES,

195 Lake Street,

CHICAGO, Ill.

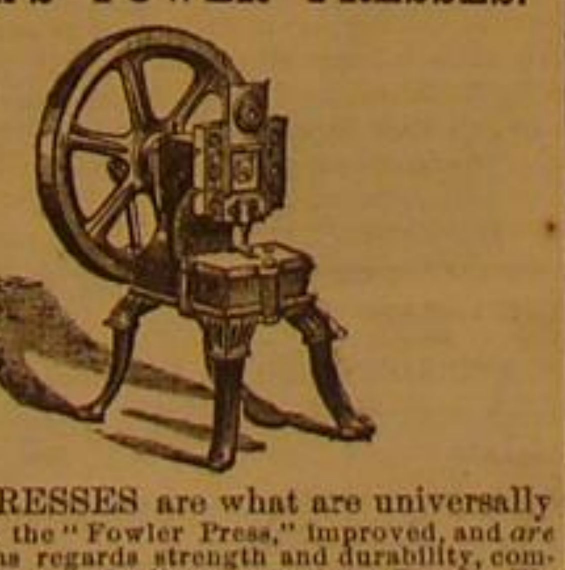
TO SMALL CAPITALISTS.—The Subscriber has a number of important inventions he would like to patent, and he solicits the aid of capitalists to whom he would assign a portion of interest. Among the inventions and discoveries are the following: A Sure Mode of Preventing Lamp Explosions. To Prevent the Burning out of Chimney Backs. How to make Cabbages Head, and prevent Bursting. To prevent the Borer from injuring Peach trees. Address
J. B. WILLIAMS, Pittsburgh, Pa.

THE best **Punching Presses** are made by the Inventor and Patentee of the famous Eccentric Adjustment. Infringements upon said Patent will be severely dealt with. N. C. STILES, Middletown, Conn.

SHINGLE AND HEADING MACHINE—Law's Patent. The simplest and best in use. Shingle Heading and Stave Jointers, Stave Cutters, Equalizers Heading Turners, Planers, etc. Address
TREVOR & CO., Lockport, N. Y.

$9 A Day for all. Address A. J. FULLAM, N.Y.

PARKER'S POWER PRESSES.



THESE PRESSES are what are universally known as the "Fowler Press," improved, and *are without a rival* as regards strength and durability, combined with delicacy of adjustment of the Punch. We have just received

A GOLD MEDAL

From the New Hampshire Art and Mechanics' Association, it being the FIRST PREMIUM awarded on Presses, and was given us over

STILES' POWER PRESS.

☞ Notice is hereby given that ALL PRESSES having an Eccentric Disk on the Crank Shaft, are direct infringements of our Patent, April 13, 1858, reissued Feb. 9th, 1869, and all parties are hereby cautioned against buying or using said Presses without our permission.

PARKER BROTHERS,
West Meriden, Conn. 11 26*

CAUTION.

No Person will be permitted to use Grosvenor's Elliptical Universal Variety Moulding Machines outside of the States of New York and Mass. Machines and deeds of right to use them elsewhere are furnished only by the lawful owners and manufacturers. A. S. & J. GEAR & CO., 91 Liberty st., N. Y., and New Haven, Conn.

☞ Send for pamphlet of particulars.

RICHARDSON, MERIAM & CO., Manufacturers of the latest improved Patent Daniels' and Woodworth Planing Machines, Matching, Sash and molding, Tenoning, Mortising, Boring, Shaping Vertical and Circular Re-sawing Machines, Saw Mills, Saw Arbors, Scroll Saws, Railway, Cut-off, and Rip-saw Machines, Spoke and Wood Turning Lathes, and various other kinds of Wood-working Machinery. Catalogues and price lists sent on application. Manufactory, Worcester, Mass. Warehouse, 107 Liberty st., New York. 17 tf

---

To Electro-Platers.

BATTERIES, CHEMICALS, AND MATERIALS, in sets or single, with books of instruction, manufactured and sold by THOMAS HALL, Manufacturing Electrician, 19 Bromfield street, Boston, Mass. Illustrated catalogue sent free on application. 26 8

LATHE CHUCKS—HORTON'S PATENT—from 4 to 36 inches. Also for car wheels. Address E. HORTON & SON, Windsor Locks, Conn.

WROUGHT-Iron Pipe for Steam, Gas, and Water; Brass Globe Valves and Stop Cocks, Iron Fittings, etc. JOHN ASHCROFT, 50 John St., N. Y.

BOILER FELTING SAVES TWENTY-five per cent of Fuel. JOHN ASHCROFT,
16 tf 50 John st. New York.

FOR STEAM ENGINES, BOILERS, SAW Mills, Cotton Gins, address the ALBERTSON AND DOUGLASS MACHINE CO., New London, Conn. 14 tf

---

CAMDEN

Tool and Tube Works,

Camden, N. J. Manufacturers of Wrought Iron Tube, Brass Work and Fittings, and all the most improved TOOLS for Screwing, Cutting, and Fitting Pipe. Screwing Machines for Pipe, of five different sizes. Pipe Tongs, Common and Adjustable; Pipe Cutters, Pipe Vises, Taps, Reamers, Drills, Screwing Stocks, and Solid Dies. Peace's Patent Screwing Stocks, with dies. No. 1 Screws ¼, ⅜, ½, ¾ Pipe. Price complete, $10. No. 2 Screws, 1, 1¼, 1½, 2 Pipe, $20. No. 3 both screws and cuts off, 2½, 3, 3½, 4, $65.

BENT, GOODNOW & CO., Boston, Mass., Agents for the sale of Patents. FOR SALE—A variety of very valuable "Rights." Send stamp for THE PATENT STAR, Containing descriptions of each.

CATALOGUES SENT FREE.

MATHEMATICAL INSTRUMENTS, 112 pages.
OPTICAL INSTRUMENTS, 72 pages.
MAGIC LANTERNS and STEREOPTICONS, 100pp.
PHILOSOPHICAL INSTRUMENTS, 84 pages.

JAMES W. QUEEN & CO.,
924 Chestnut st., Philadelphia, Pa.

POWER LOOMS. Improved Drop Box.

Spooling, Winding, Beaming, Dyeing, and Sizing Machines Self-Acting, Wool-Scouring Machines, Hydra Extractors Also, Shafting, Pulleys, and Self-Oiling Adjustable Hangers, manuf'd by THOS. WOOD, 2106 Wood st., Philad'a, Pa

---

WOODBURY'S PATENT

Planing and Matching

and Molding Machines, Gray & Wood's Planers, Self-oiling Saw Arbors, and other wood working machinery.

S. A. WOODS, { 91 Liberty street, N. Y.;
Send for Circulars. { 67 Sudbury street, Boston.

THE

Tanite Emery Wheel.

THIS WHEEL CUTS FAST AND DOES not glaze, gum, heat or smell. For circulars address
THE TANITE CO.,
Stroudsburg, Monroe Co., Pa.

GENERAL AGENTS:—Hart Manufacturing Co., 243 Pearl st., New York. Post & Goddard, 117 Liberty st., New York. Bloomfield, Myers & Co., 11 Dey st., New York. Charles M. Ghriskey, 508 Commerce st., Philadelphia. American Twist Drill Co., Woonsocket, R. I. Thomas Flint & CO., 29 Federal st., Boston. A. Reuter & Son, 15 North Howard st., Baltimore, Md.

SPECIAL AGENT:—D. D. Elston, 189 Duane st., N. Y.

SPECIAL NOTICE.—EVERY Tanite Emery Wheel is carefully tested, before being sent from the factory, at a speed about DOUBLE that at which it is guaranteed to run. Customers can rely, with confidence, on the SAFETY as well as upon the cutting properties of these wheels.

Sault's Patent

FRICTIONLESS LOCOMOTIVE VALVES, easily applied; require no changes.
12 tf M. & T. SAULT COMPANY, New Haven, Conn.

WOOD WORKING MACHINES.

Smith's Improved Woodworth Planer & Matcher, Sash and Door, Molding, Mortising, and Tenoning Machines, Scroll Saws, Saw Mills, etc., at reduced prices. Address CHARLES H. SMITH, 135 North 3d st., Philadelphia, Pa.

For Machinists' Tools,

OF SUPERIOR QUALITY, WITH ALL Modern Improvements. Also, Improved Nut and Bolt Machinery. Address R. A. BELDEN & CO.,
New Haven, Conn.

R. BALL & CO., Worcester, Mass., Manufacturers of Woodworth's, Daniel's, and Dimension Planers; Molding, Matching, Tenoning, Mortising Shaping, and Boring Machines; Scroll Saws, Re-Sawing Hand Boring, Wood Turning Lathes and a variety of other Machines for Working Wood. Also, the best Patent Door, Hub, and Rail Car Mortising Machines in the world. ☞ Send for our Illustrated Catalogue.
RICHARD BALL. E. P. HALSTED.

Lucius W. Pond,

MANUFACTURER OF

MACHINISTS' TOOLS,

NEW AND IMPROVED PATTERNS OF Lathes, Planers, Drills, Milling Machines, Boring Mills, Slotting Machines, Gear and Bolt Cutters, and Punching and Shearing Machines. Dealer in

IRON & WOOD-WORKING MACHINERY.

Works at Worcester, Mass. Office, 98 Liberty st., N. Y.
S. N. HARTWELL, General Agent.

Bridesburg Manf'g Co.,

OFFICE No. 65 NORTH FRONT STREET,
PHILADELPHIA, PA.,

Manufacture all kinds of Cotton and Woolen Machinery including their new

SELF-ACTING MULES AND LOOMS,

Of the most approved style. Plans drawn and estimates furnished for factories of any size. Shafting and mill gearing made to order.

WOODWORTH PLANERS a SPECIALTY—From new patterns of the most approved style and workmanship. Wood-working Machinery generally. Nos. 24 and 26 Central, corner Union street, Worcester, Mass. Warerooms, 42 Cortlandt street, New York.
WITHERBY, RUGG & RICHARDSON.

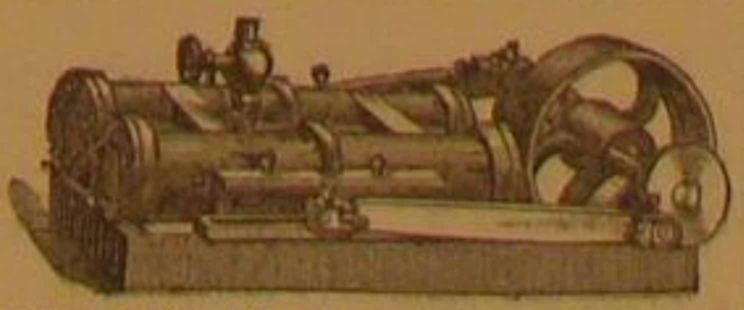
IRON STEAMERS, HULLS, & LIGHTERS. Estimates & Specifications furnished on application. HENRY J. DAVISON, 77 Liberty st., New York, Agent for Pusey, Jones & Co. 21 tf

---

H. BOARDMAN, Lancaster, Pa.—Superior Patent Cork-cutting Machinery, Hard-laid Twine, Cord, and Rope Machinery, with Pat. Stop & Condenser

---

HICKS' DUPLEX CUT-OFF ENGINES.

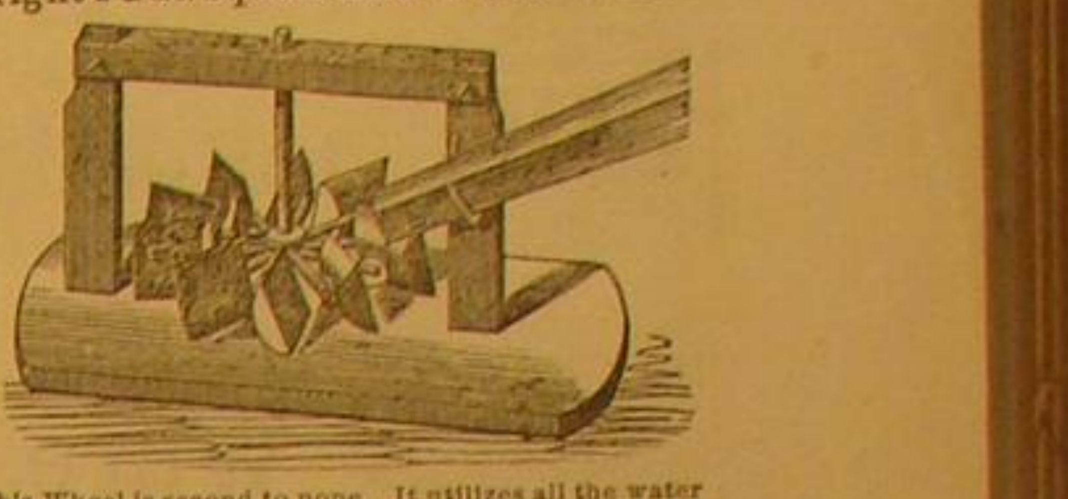


CUT OFF AT ANY DESIRED POINT; exhaust perfectly free during whole stroke. Unequaled for correctness of principles, economy in operation, and perfection of Workmanship. 20-Horse Power $750. THE HICKS MANUFACTURING CO.,
1 os 1 is tf 85 Liberty st., New York.

ASHCROFT'S LOW-WATER DETECTOR will insure your Boiler against explosion. JOHN ASHCROFT, 50 John st., New York. 16 tf

---

Wright's Pat. Square Dish Water Wheel



This Wheel is second to none. It utilizes all the water applied, be it more or less; is cheap, simple, powerful, easily transported, and can be put in running order at small expense. For circulars or further particulars, address E. H. PECKHAM & CO.,
Box 6711, Postoffice, New York.

STOCKS, DIES, AND SCREW PLATES Horton's and other Chucks. JOHN ASHCROFT, 50 John st., New York. 16 tf

---

THE CELEBRATED

STERLING

SIX CORD, SOFT FINISH.

Spool Cotton.

EQUAL, IF NOT SUPERIOR to any KNOWN THREAD. WELL ADAPTED TO

Hand and Sewing Machine Work.

A. T. Stewart & Co.,

NEW YORK,

Sole Agents for the United States.

WOOD-WORKING MACHINERY.—THE subscriber is the New York Agent for all the Manufacturers, and sells at their prices.
3 tf c S. C. HILLS, 12 Platt street.

$15.00

$20.00

THE COLLINS METAL WATCH FACTORY.—Full Jeweled Hunting Levers—Gents and Ladies' sizes.

The $15 Watches, in appearance, and for time, are equal to gold ones costing $150. Those of extra fine finish, at $20, are not surpassed by $200 gold watches. For TIME, ELEGANCE, FINISH, and DURABILITY, no imitation of gold can begin to compare with the Collins Metal. Excepting the intrinsic value, it is equal to gold.

Chains from $2 to $8.

JEWELRY.—We are manufacturing all kinds of Jewelry of the Collins Metal, Pins, Earrings, Sleeve Buttons, Lockets, Studs, Finger Rings, Bracelets, Charms, Odd Fellow and Masonic Pins, etc., all of the latest and most elegant styles, and fully equal to gold in appearance and wear.

TO CLUBS.—Where six Watches are ordered at one time, we will send one extra Watch free of charge.

Goods sent to any part of the United States by express, to be paid for on delivery. Money need not be sent with the order, as bills can be paid when goods are taken from the express office. Customers must pay all express charges. We employ no Agents; orders, therefore, must be sent directly to us. In ordering, write plainly the name, town, county, and State. Customers in the city will remember that our ONLY OFFICE is No. 335 Broadway, cor. Worth st., (up stairs), New York.
C. E. COLLINS & CO.

Steam Engines.

BABCOCK & WILCOX'S Pat. Cut-off and Governor combined. Greatest economy of fuel, regularity of speed, and simplicity of construction. BABCOCK, WILCOX & CO., 44 Courtlandt st., New York.
26 tf eow

L. D. FAY, Manufacturer and Dealer in Machinists' Tools and Woodworking Machinery. Manufactory, Worcester, Mass. Warehouse and Salesroom, St. Louis, Mo. Large variety of Lathes, Lathe Chucks, Engines, Sawmills, etc. Enclose stamp for catalogue. 20 eow

---

J. P. GROSVENOR, OF LOWELL, MASS., Patentee of the Older, and also, of the more Recent Improvements in Variety Molding Machines, consisting of the Variety Elliptical, Universal and Double Serpentine Molding and Planing Machines, and my Adjustable Circular Saw Benches. I am prepared to furnish these machines, to be used in any and all parts of the United States, (and the Right to Use goes with them,) at my list prices. Also, the various kinds of Wood-working Machinery. Address, for information and Machines,
J. P. GROSVENOR,
91 Liberty st., New York city, or at Lowell, Mass.
☞ Send for Descriptive Circular. 26 tf eow

PUMPING AND BLAST ENGINES, manufactured under Shaw & Justice's recent Patents. The cheapest, most simple, and efficient engines yet made. PHILIP S. JUSTICE.
Offices:—No. 14 N. 5th st., Philadelphia, and 42 Cliff st., New York. Shops:—17th and Coates sts., Philadelphia.

MERRICK & SONS,

Southwark Foundery,

No. 430 Washington Avenue, Philadelphia.

William Wright's Patent
VARIABLE CUT-OFF STEAM ENGINE,
Regulated by the Governor.
Merrick's SAFETY HOISTING MACHINE,
Patented June, 1868. DAVID JOY'S PATENT
VALVELESS STEAM HAMMER.
D. M. Weston's Patent
Self-Centering, Self-Balancing Centrifugal Sugar-Draining Machine.
AND
HYDRO EXTRACTOR
For Cotton and Woolen Manufacturers.
New York Office, 62 Broadway

IMPROVED ALUMINUM BRONZE

Hunting Case Watches.

From the Scientific American of April 11, 1868.

"The color of the metal closely resembles that of 18c. gold, is more grateful to the eye and its luster brilliant," etc.

When desired these watches will be sent to any express office, and permission of examination granted upon payment of freight charges.

Description of goods and metal sent free upon application. An inspection of my goods is earnestly solicited.

J. D. HUGUENIN VUILLEMIN
No. 44 Nassau st., New York

For sale by all respectable dealers.

Advertisements.

Advertisements will be admitted on this page at the rate of $1.00 per line. Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

Ball, Black & Co.,

565 and 567 BROADWAY,

MANUFACTURERS OF

ENGLISH STERLING

Silver Ware.

THE FACILITIES OF BALL, BLACK & CO. FOR MANUFACTURING, ENABLE THEM TO OFFER A LARGER VARIETY OF PATTERNS, AND AT LOWER PRICES THAN ANY OTHER HOUSE IN THE TRADE.

16 os tt

WANTED—A Situation as Foreman by a Practical Boiler Maker, who is thoroughly acquainted with Locomotive, Marine, and all branches of the Boiler business. Good Testimonials. Address W. HARTILL, Postoffice, Philadelphia.

PATTERN LETTERS KNIGHT BROS.

FOR SALE OR TO LET.— The Putnam Paper Mills, situated six miles north of Peekskill, N. Y., on the road to Lake Oscawanna. The property consists of a substantial stone building, complete machinery, in running condition, and every requisite for the manufacture of coarse or fine papers. Inquire of L. HALLOCK, 106 Madison Ave., Or of Messrs. GALE & THOMPSON, at the premises.

WILL BE SOLD AT A LOW PRICE.— One Pratt & Whitney Screw Machine, with small tools complete. One Compound Planer, with Vise. Two Power Planers, 4 ft. 4 in. bed. One Hand Lathe, 5 ft. bed. All of the above are of Pratt & Whitney's make, and are as good as new. Also, full sets of Wrenches, Taps, Fluters, and Drills. Apply to DEFOREST MAN'F'G CO., Birmingham, Conn.

THE PAPER TRADE REPORTER

—A NEW PAPER—

IS SENT MONTHLY TO OVER 1,100 Paper Mills, from Maine to California, besides to over 1000 machinists, millwrights, water wheel, & boiler makers those dealing in and otherwise interested in the manufacture of Paper, making it a thorough advertising medium for those dealing in articles used by Paper Makers. Subscriptions one dollar per year. Advertisements 25c. per line, 8 words to a line, which must be sent in before the 27th of each month. MANAHAN & MILLAR, Paper Warehouse 10 Spruce street, N. Y.

FOR SALE.

BRICK Factory, with Water Power, at Birmingham, Conn., within 3 hours' ride from N.Y. city. Factory 100x30 feet, three stories high, very substantially built, nearly new, well-lighted, contains two Turbine Wheels of 20-horse power each, with Shafting, etc., is accessible by both water and rail, and well adapted to almost any kind of manufacturing business, particularly a machine shop for the manufacture of fine work. Price $17,000, one half on mortgage if desired. Will be rented if not sold. Apply to CHAS. L. RICHARDS, 38 Park Row, New York.

ROBERT McCALVEY, Manufacturer of HOISTING MACHINES AND DUMB WAITERS. 602 Cherry st., Philadelphia, Pa.

WIRE ROPE.

Manufactured by

JOHN A. ROEBLING,

Trenton N. J.

FOR Inclined Planes, Standing Ship Rigging, Bridges, Ferries, Stays or Guys on Derricks & Cranes, Tiller Ropes, Sash Cords of Copper and Iron, Lightning Conductors of Copper. Special attention given to hoisting rope of all kinds for Mines and Elevators. Apply for circular, giving price and other information.

os 14tf

ONE WRIGHT'S Pat. Cut-off Engine, 60-Horse Power, nearly new, in fine order, for sale cheap. Inquire of HALL & WHITTEMORE, Havana, or J. H. Fountain & Co., Elmira, N. Y.

Lancaster File Co.,

LANCASTER, PA.,

Manufacturers of

Superior Cast Steel Files and Rasps.

DEAD STROKE POWER HAMMERS, Made under Shaw & Justice Patents, greatly Improved. Model Licenses granted to build on favorable terms. PHILIP S. JUSTICE, 42 Cliff st., New York, and 14 N. 5th st., Philadelphia.

PUMPING And Blast Engines,

MADE under Shaw & Justice Patents, are very much the MOST EFFICIENT and ECONOMICAL IN WORKING, and by far the CHEAPEST PUMPING ENGINE yet made, with no lubricating parts, and entirely automatic. They pump mud or sand freely, and work perfectly well under water. Pumps capable of delivering from 10 to 10,000 gals. per minute supplied to order. Licenses to build granted on very favorable terms. See Scientific American, July 17th. Apply to PHILIP S. JUSTICE, 14 N. 5th st., Philadelphia.

W. ZINSSER & CO., 197 William st., N.Y., Manuf'rs of Varnishes, Lackers, White Shellac, Sealing Wax, Cements, etc., & dealers in Manf'd Articles.

BLOODSTONE, for burnishing, for sale by L. & J. W. FEUCHTWANGER, 55 Cedar st., New York, Chemists, and Drug and Mineral Importers.

London..........................48 Cannon street.

H. KOHNSTAMM, Manufacturer of

ULTRAMARINE,

And Importer of English, French, and German Colors, Paints, and Artists' Materials, Bronzes, and Metals. No. 3 Tryon Row, New York, opposite City Hall.

MAYS & BLISS,

MANUFACTURERS of PATENT SCREW and Lever Presses, Double-acting Presses, Cutting and Stamping Dies,

Machinery for Petroleum Cans.

Tinner's Tools made to Order. Plymouth st., near Catharine Ferry, Brooklyn, N. Y.

We Put Genuine Waltham Watches

Into the hands of purchasers in any State, Territory, Town, Village, or Frontier Settlement, at the Lowest New York Wholesale Prices. The Express Companies take them from us and deliver them to the customers in any part of the Union, however remote. The package can be opened, and the watch examined, and not till then is the purchaser required to pay for it; and if, on examination, it is not satisfactory, there is no obligation to receive it. Our descriptive and illustrated Price List gives full information in regard to the watches, and our plan of sending them by express. Every one should have a copy; we send it postpaid on application; no return stamps required. When you write, please state that you saw this in the SCIENTIFIC AMERICAN. HOWARD & CO., Jewelers and Silversmiths, No. 619 Broadway, New York.

SOLUBLE GLASS (LIQUID SILEX), OR Silicate of Soda and Potash, Fire, Water, Mildew, and Rust-proof, for Cementing and Painting. Manufactured by us from pure materials. L. & J. W. FEUCHTWANGER, Chemists & Drug Import's, 55 Cedar st., N.Y. P.O. Box 3616.

WATER WHEELS.

POOLE & HUNT, Baltimore,

Manufacture

Leffel's Double Turbine Water Wheels,

For Use in the Southern States.

Marvin & Co.'s

ALUM AND DRY PLASTER

FIRE & BURGLAR

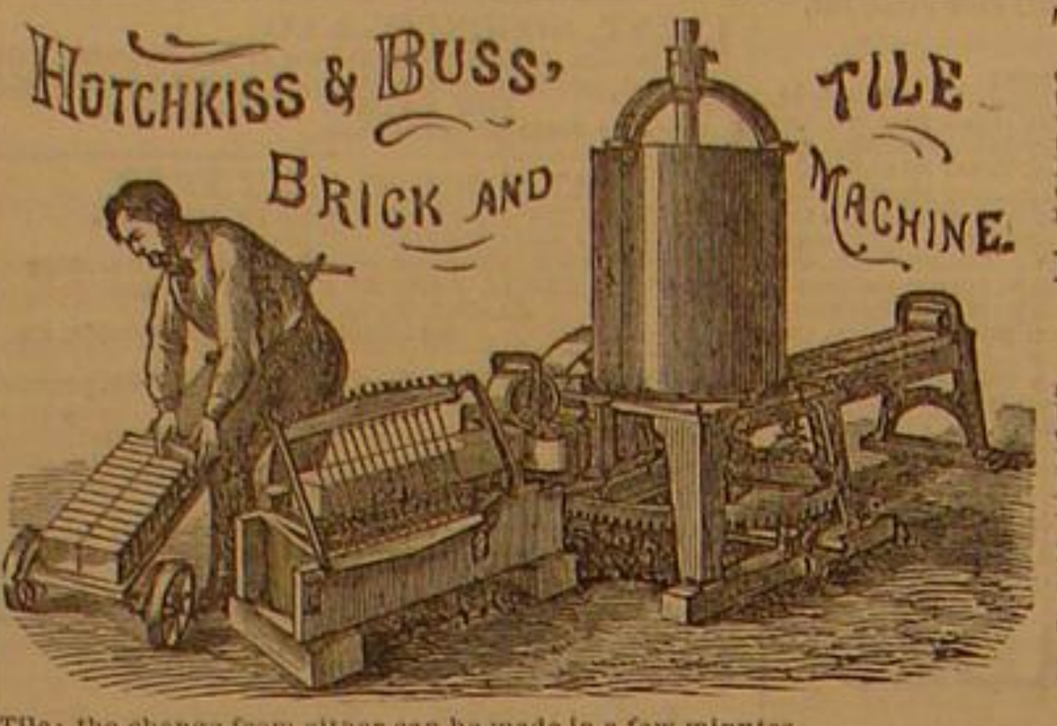
SAFES

ARE THE MOST RELIABLE MANUFACTURED. PLEASE SEND FOR A CATALOGUE.

(OLDEST SAFE MANUFACTURERS.)

PRINCIPAL WARE-HOUSES: 265 Broadway, New York. 721 Chestnut st., Phila. 108 Bank st., Cleveland, Ohio.

AND FOR SALE BY OUR AGENTS IN THE PRINCIPAL CITIES THROUGHOUT THE UNITED STATES.



THIS MACHINE IS CONstructed and operated on a different plan from all others, and, therefore, should not be confounded with them. We do not wish to bear the odium justly attached to other Brick Machines. We only ask a fair examination of ours on its own merits.

No Molds are Used with this Machine.

Any intelligent brick maker will, after an examination of ten minutes, be convinced that THIS IS THE ONLY WAY OF PRODUCING PERFECT BRICK, and he will then know WHY ALL OTHER MACHINES HAVE FAILED.

EVERY COMMUNITY should have one of our Machines, to make its own Brick and Tile, the price being low, and any intelligent person can work it.

We furnish with each Machine one Brick Die and three Tile Dies, making it complete for both Brick and Tile; the change from either can be made in a few minutes.

This is the only Machine that will make both Brick and Tile.

We would prefer that parties wishing to purchase would bring some of the clay they intend using, and see it worked into Brick and Tile.

We have placed the Machine at the LOWEST CASH PRICE, hoping to meet the wants of those with limited means.

IT IS THE BEST, STRONGEST, AND CHEAPEST MACHINE EVER OFFERED TO THE PUBLIC.

Horse power will make from 15,000 to 20,000 brick per day.
Steam " " 25,000 to 35,000 " "

Prices of Yard, Township, County, and State Rights according to location.

DESCRIPTIVE CIRCULARS FREE.

The Machine can be seen in operation by calling on the

HOTCHKISS & BUSS' BRICK AND TILE MACHINE CO.,
Office, 143 Maine Street, Cincinnati, Ohio.

Reynolds' Turbine Water Wheels.

No Complex, Duplex, or Triplex complications. All such are costly, perishable, easily clogged, inaccessible. Mill Gearing, Shafting, and Pulleys. Send for Illustrated Pamphlet. GEORGE TALLCOT, 96 Liberty st., New York.

INCREASE TWIST DRILLS, FLUTED HAND REAMERS, exact to Whitworth's Gage, and Beach's Patent Self-centering Chuck, manufactured by Morse Twist Drill and Machine Co., New Bedford, Mass.

WATER WHEELS.— Warren's Turbine is the best made, the most economical, durable, and cheapest wheel in the market. A. WARREN, Agent American Water Wheel Co., 31 Exchange st., Boston, Mass.

THE GENUINE

Coes Screw Wrenches,

WITH A. G. COES' PATENT LOCK FERRULE, Manufactured by **A. G. COES & CO.,** Successors to L. & A. G. Coes, Worcester, Mass. ESTABLISHED IN 1839.

PATENT AIR TREATMENT, immensely benefits Malting, Brewing, Distilling, Winemaking, Baking, the Conserving of fruit, all curing, fermentation, etc. Pamphlets free. RIGHTS FOR SALE. Also, for PERFECT GOLDEN-TRACTION BY ZINC. Grooved Wheel R.R. BRAKE, Cord Attachment. Apply to R. d'HEUREUSE, Box 6844, N.Y.

LECOUNT'S PATENT HOLLOW LATHE DOGS AND CLAMPS.—A set of 8 Dogs from 3/8 to 2-in., inclusive, $8. A set of 12 from 3/8 to 4-in., $17.30. Five sizes Machinists' Clamps, from 2 to 6-in., inclusive, $11. Send for Circular. C. W. LECOUNT. South Norwalk, Conn. 16 tf eow

B. F. STURTEVANT'S NEW PATENT IMPROVED FAN AND PRESSURE BLOWERS MANUFACTORY & SALESROOM 72 SUDBURY ST. BOSTON.

Root's Wrought Iron Sectional Safety Boiler.

OVER 100 SOLD—TESTED TO 300 lbs.,—no large sheet-iron shell to explode. Economical and Durable. All sizes on hand. Also, Steam Engines, Steam Pumps, etc. Send for Pamphlets and Price Lists. JOHN B. ROOT, 95 and 97 Liberty st., New York.

GREAT ECONOMY IN

WATER POWER.

LEFFEL'S DOUBLE TURBINE WATER WHEEL.—Best Wheel in Existence.—Manufactured by **JAS. LEFFEL & CO.,** at Springfield, Ohio, and New Haven, Conn. New Illustrated Pamphlet for 1869 sent free on application. 6 1os1is eow tf

VARIETY IRON WORKS, York, Pa., Grist & Saw Mill Machinery a Specialty. Burnham's Improved Turbine Wheel. Iron Railing, Architectural, Bridge, and Car Castings. Send for circular. E. G. SMYSER.

SCHLENKER'S PATENT BOLT CUTTER NEW INVENTION. ADDRESS, HOWARD IRON WORKS, BUFFALO, N.Y.

BODINE'S JONVAL TURBINE WATER Wheel, combining great economy in the use of water, simplicity, durability, and general adaptation to all positions in which water can be used as a motive power. We are prepared to furnish & warrant the same to give more power than any overshot or other turbine wheel made, using the same amount of water. Agents wanted. Send for descriptive circular. BODINE & CO., Mann's, Mount Morris, N. York, and Westfield Mass.

18 os tf eow

AT DR. HERO'S SCHOOL FOR YOUNG LADIES are advantages to be found in no other school in the world. EMILY A. RICE, Principal. Send for circular to DR. J. HERO, Westboro, Mass.

F. W. BACON,— Consulting Engineer, 84 John st., New York.— Especial attention given to Erecting Machinery, Shafting, and Belting. The Indicator applied to Steam Engines. Instruments furnished and Instruction given.

THE ROSS MILL will grind—wet or dry—every kind of material. To be seen at 9 Spruce st., New York. Send for circulars. HENRY JACKSON, Consulting Engineer.

PATENT IMPROVED BAND-SAW MAchines manufactured and sold by FIRST & PRYIBIL, 175 & 177 Hester st., N. Y. city. We also offer Band-Saw Blades, imported and domestic, of the best qualities at reduced prices. Send for Circular and Price List.

STEAM AND WATER GAGES, STEAM Whistles, Gage Cocks, and Engineers' Supplies. 16 tf JOHN ASHCROFT, 50 John st., New York.

PORTABLE STEAM ENGINES, COMBINing the maximum of efficiency, durability and economy, with the minimum of weight and price. They are widely and favorably known, more than 600 being in use. All warranted satisfactory or no sale. Descriptive circulars sent on application. Address 14 tf J. C. HOADLEY & CO. Lawrence, Mass

BUERK'S WATCHMAN'S TIME DETECTOR.— Important for all large Corporations and Manufacturing concerns—capable of controlling with the utmost accuracy the motion of a watchman or patrolman, as the same reaches different stations of his beat. Send for a Circular. J. E. BUERK, P. O. Box 1,057, Boston, Mass.

N. B.—This detector is covered by two U. S. patents. Parties using or selling these instruments without authority from me will be dealt with according to law.

Philadelphia Advertisements.

☞ Philadelphia Advertising Patrons, who prefer it, can have their orders forwarded through T. V. Carpenter, resident Agent, 1506 Poplar st.

The Harrison Boiler.

THIS IS THE ONLY REALLY SAFE BOILER in the market, and can now be furnished at a *GREATLY REDUCED COST.* Boilers of any size ready for delivery. For circulars, plans, etc., apply to

HARRISON BOILER WORKS,

Philadelphia, Pa.; J. B. Hyde, Agent, 119 Broadway, New York; or, to JOHN A. COLEMAN, Agent, 36 Kilby st., Boston, Mass. 19 tf os

SAWS. EVERY DESCRIPTION Guaranteed under a forfeiture of $1000, to cut the most lumber with the least expense

Henry Disston & Son,

PHILADELPHIA. Special attention paid to our new style Circular, Belt, Cross-cut, Mill, and Hack Saws. Orders received from England, Ireland, and the Continent.

Drawing Materials.

WHATMAN'S PAPERS.—White and Yellow Roll Drawing Paper, 40 and 54 inches wide. Tracing Muslin, Tracing Paper. Muslin-backed Drawing Paper, 40 and 54 inches wide. Winsor & Newton's Colors India Ink. Faber's Drawing Pencils, etc., etc. Priced Catalogues sent free. JAS. W. QUEEN & CO., 924 Chestnut st. Philadelphia.

BEST AND CHEAPEST

HINKLEY FAMILY KNITTER ONE NEEDLE ONLY KNITS EVERYTHING

AGENTS WANTED

Largest Discount to AGENTS.

SEND for Sample Stocking(complete)to New York Office Hinkley Knitting Machine Co., 176 Broadway. "Handsomest work we have ever seen."—Sci. Am.

LAMB KNITTING MACHINE

THE BEST IS THE CHEAPEST—4,000 sold this year. Agents wanted everywhere. Send for sample stocking that no other machine can do. Address LAMB KNITTING MACHINE M'F'G CO., Chicopee Falls, Mass.

PARLOR STEAM ENGINE—Made entirely of Metal; Boiler and Furnace complete; will work for hours if supplied with water, etc.; free from danger; a child can work it. Sent free, with instructions, for $1 three for $2 50. WALTER HOLT, 102 Nassau st, New York.

THE NOVELTY IRON WORKS— Foot E. 12th st., and 77 and 83 Liberty st., New York, Manufacture the most approved Stationary Steam Engine, with Variable Cut-off, now in use.

Factory, Trenton, N. J.. ...Office, No. 2 Jacob st., N. Y. ☞ Branch Office for Pacific Coast, No. 606 Front st., San Francisco, Cal.

PATENT SOLID EMERY WHEELS, Specially adapted to Grinding Saws, Mills, and Edge Tools. Solid Wheels for Brass Work, warranted not to Glaze. Also, Patent Emery Oil and Slip Stones, the best article in use for Planer Knives, Carpenters' Tools, and for Finishing Down Iron Work. NORTHAMPTON EMERY WHEEL CO., Leeds, Mass. 18 tf os

MECHANICAL DESIGNERS ENGRAVERS ON WOOD.

KNAPP & CO.,
8 and 10 John St., N. Y.

Davis' Adjustable Spirit Level,

PLUMB, AND INCLINOMETER. **Unequaled in Accuracy, Durability, and Simplicity.** It is rapidly superseding all other Levels. Agents wanted. Send for circular. J. W. STORRS & CO., 252 Broadway, New York.

IRON PLANERS, ENGINE LATHES, Drills, and other Machinists' Tools, of Superior Quality, on hand and finishing. For sale Low. For Description and Price, address NEW HAVEN MANUFACTURING CO., New Haven, Conn. 5 tf os

FREE.—Our New Catalogue of Improved STENCIL DIES. More than $200 A MONTH is being made with them S. M. SPENCER & CO., Brattleboro Vt.

KIDDER'S PASTILES—A Sure Relief for Asthma. STOWELL & CO., Charlestown, Mass.

THE WOODWARD STEAM-PUMP MANUFACTURING COMPANY, Manufacturers of the Woodward Pat. Improved Safety Steam Pump and Fire Engine, Steam, Water, and Gas Fittings of all kinds. Also, Dealers in Wrought-iron Pipe, Boiler Tubes, etc. Hotels, Churches, Factories, & Public Buildings, Heated by Steam, Low Pressure. Woodward Building, 76 and 78 Center st., cor. of Worth st. (formerly of 77 Beekman st.), N.Y. All parties are hereby cautioned against infringing the Patright of the above Pump. G. M. WOODWARD, Pres't.

NESTER'S COMBINED CARPENTER'S Tool saves one fourth the labor at Weather Boarding. Inquire of the Trade. Send stamp for circular to 27 Park Row, New York.